

Project co-financed by the European Regional Development Fund

FINAL D3.1.1

Transnational Indicators and Assessment Methods for Buildings and Urban areas

WP3 Testing

CESBA MED Sustainable MED Cities

Fostering low-carbon strategies and energy efficiency in specific MED territories: cities, islands and remote areas

Priority axis-Investment Priority-Specific Objective 2-1-1

Partner in charge (Authors)

C.A. Balaras, E.G. Dascalaki, K.G. Droutsa (NOA)

Partners involved (Co-Authors)

A. Morro, G. Barbano, (iiSBE), L. Chanussot (RAEE), J. Cazas (EVBDM), M. Zidar, I. Bačan (EIHP), X. Martí i Ragué (Gov of Catalonia), R.P. Borg (UoM), A. Presotto (UDINE)

Proposal Prepared by PP8 NOA for A.3.1 Distribution: Public Date: June, 2017



Lead contractor of Deliverable:

PP 8 - NATIONAL OBSERVATORY OF ATHENS (NOA)

History

Version	Description	Lead PP	Date
1.1	Initial Draft	NOA	06.03.2017
1.2	First Version	NOA, iiSBE	17.03.2017
1.3	Second Version	NOA, PP contributions	17.05.2017
1.4	Final Draft	NOA, iiSBE, UoM, EIHP	16.06.2017
1.5	Approved Final Version by WP3 leader		June 2017

Citation

Balaras C.A, Dascalaki E.G, Droutsa K.G., Morro A., Barbano G., Chanussot L., Cazas J., Zidar M., Bačan I., Martí i Ragué X., Borg R.P., Presotto A. (2017): **CESBA MED D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas**, CESBA MED Consortium, Marsaille.

Acknowledgements

The work was conducted in the frame of CESBA MED (990) Sustainable MED Cities project co-financed by the European Regional Development Fund. CESBA MED is a 36-month project (2016-2019).

Project Partners: City of Torino - TO (Italy, Coordinator), iiSBE Italia R&D srl - iiSBE (Italy), Municipality of Udine – UDINE (Italy), EnvirobatBDM - EVBDM (France), Rhônalpénergie Environment - RAEE (France), Government of Catalonia - Gov of Catalonia (Spain), Municipality Sant Cugat del Vallès - SCUGAT (Spain), University of Malta – UoM (Malta), National Observatory of Athens – NOA (Greece), Association of Common European Sustainable Built Environment Assessment - CESBA (Austria), Energy Institute Hrvoje Požar - EIHP (Croatia), Urban Community of Marseille Metropolitan Province - MPM (France).

This report was created with the joint effort of the CESBA MED partners.



Contents

Section	1	Page
1. Execut	tive Summary	4
2. Introd	uction	5
	2.1 Overview of Issues-Indicators	7
	2.2 Work Overview	9
3. Transr	national Methods & Indicators	10
4. Analys	sis	23
	4.1 Generic Indicators	23
	4.2 CESBA MED Set of Indicators	27
	4.3 SBTool Multi-Criteria Assessment	31
5. Refere	ences	32
APPENDI	ICES	33



1. Executive Summary

The objective of A.3.1 "Analysis of existing transnational methods and Key Performance Indicators (KPIs) for the assessment of buildings and urban areas" is to identify the method and the set of KPIs that are more suitable in energy and sustainability plans for public buildings, in order to increase their impact and effectiveness. This report elaborates deliverable **D.3.1.1** "Transnational Indicators and assessment methods for buildings and urban areas". The work is based on available transnational sets of indicators for the assessment of the sustainability of buildings and small urban areas, which have been developed within the frame of 11 transnational projects and 2 public assessment systems (P.A.S.). The report presents a comprehensive overview of the available information in order to derive a generic list of indicators based on the level of relevance, operability and affordability of the available indicators in the Mediterranean context.

The report is structured into 3 main parts:

Part 1 discusses the available performance indicators under the main issues and categories considered in this work.

Part 2 presents a detailed overview of the existing performance indicators that have been developed within 11 European projects and 2 P.A.S. for the sustainability assessment of buildings and small urban areas.

Part 3 outlines the results from the classification of the existing performance indicators to select two sets of indicators at building and urban scale, presented in the form of a catalogue. It also includes a description of the revised SBTool multi-criteria assessment methodology for the urban scale in the Mediterranean context.

The lead partner of this deliverable is NOA. All project partners have contributed in the different sections in accordance to the work allocation.



2. Introduction

Buildings are the leading energy consuming sector, representing about 40% of the final energy consumption in Europe, and have a major impact on the natural environment. Energy efficiency improvement is a key European strategy to reduce the environmental impact of buildings. However, common energy efficiency plans do not fully exploit the potential for synergies that groups of buildings may offer. The implementation of large scale energy efficiency measures at city, district, neighbourhood or block level (e.g. district heating and cooling, photovoltaics and solar thermal installations) have clearly demonstrated that a building scale is not an optimal approach for reaching significant and cost-effective solutions. On the other hand, decision making processes for the design and assessment of interventions are more complex at larger scales due to the number of the various sustainability themes that need to be addressed (Figure 1).

	City	District	Neighborhood	Block	Building
- E	urban form land use	urban form land use	urban form land use	land use	land use
yste	street network	street network	street network	public transport	public transport
50	mobility policies	sustainable mobility	sustainable mobility	sustainable mobility	sustainable mobility
ŧ	waste emissions energy production	waste emissions energy production	waste emissions energy production	waste emissions energy production	waste emissions energy production
ironme	energy consumption	energy consumption	energy consumption microclimate	energy consumption resources use microcerate	energy consumption resources use microclimate
Env	water management	water management	water management	water management	indoor comfort water management
	biodiversity	biodiversity	biodiversity	biodiversity	biodiversity
-	access to culture	access to culture	access to culture	access to culture	access to culture
2	diversification	diversification	diversification	access to services	access to services
omy	work equity	work equity	work equity	equity	health
35	externalities	externalities	externalities	externalities	
0.0	safety	safety	salety	safety	safety
U U					

Figure 1. Sustainability themes at different scales [Barbano et al. 2016].

Indicators are metrics that can be used to determine how well the sustainability objectives are achieved. They can be expressed as

- numerical values (e.g. how much energy is used normalized per unit floor area of the building, so that it is possible to compare different buildings or against other benchmarks; how much water is consumed per building occupant or building occupant) or
- ratios and percentages (e.g. what is the percentage of renewables that cover power or heat demand; what percentage of waste is recycled).

Various performance indicators are available for benchmarking different building and urban attributes or characteristics, facilitating decision making, assessing specific project requirements, or ensuring compliance with regulations and norms. These indicators quantify what one is trying to achieve and thus may need to select and use several of them at different stages of their work or process.

Opinions vary as to which one is the most important since they all depend on the user or the intent. Apparently, different indicators can support the diverse needs of stakeholders and their priorities, to support decision making. For example, in routine building design practice, the first step is to calculate peak power demand (loads) or energy demand, in an effort to minimize system sizing and thus meet building code requirements or minimize first cost. Depending on the opportunities for a given project, efforts may focus on building architecture, selection of different thermal envelope materials and components and then electromechanical (E/M) systems. Other indicators may also be used for the assessment of indoor environmental quality and occupant the well-being. This usually includes indoor thermal comfort conditions under free floating conditions (e.g. minimum and maximum indoor temperature), indoor visual comfort conditions (e.g. daylight) and indoor air quality (e.g. different air flow rates and minimum fresh outdoor requirements).



Simple numeric metrics may be easily associated with a building's energy performance (i.e. lower or higher energy use) as a result of the building's characteristics, design, equipment selection and overall operation. This way, one can compare different design scenarios in order to optimize building construction, operation or assess energy refurbishment scenarios and alternatives, and use these indicators to quantify and substantiate selections to the different stakeholders.

Indicators can be considered at different scales, e.g. Building or District scale. In some cases they share some common indicators, with building scale values contributing to a larger scale, e.g. a neighbourhood or a district scale (Figure 2).



	Number	Name
	D.1	Energy
	D.1.1	Operational Primary Energy Demand
nemi	D.1.2	Delivered Energy Demand
Inviro	D.1.3	Renewable Energy on Site
w	D.2	Impacts
	D.2.1	Global Warming Potential
à	D.8	Acoustic Comfort
Š	D.8.1	Acoustic Environment
À.	D.10	Operational Costs
Eoon	D.10.1	Operational Energy Costs

Figure 2. Breakdown examples of Building (left) and District (right) indicators [Barbano et al. 2016].

Selected indicators may also be targeted for evaluating the district energy status or neighbourhood central systems for small scale areas (e.g. up to 12 buildings). They can be suitable for energy networks analysis [Barbano et al. 2016] and for example may include:

- Evaluation of district energy status, e.g. percentage of energy demand to be covered by renewables, surplus of electricity from renewables, available storage capacity
- Evaluation of neighbourhood readiness for central systems, e.g. central heating, central cooling and smart grids.

One of the most important industry-led initiatives to harmonise environmental performance indicators is that of the Sustainable Building Alliance (**SBA** http://www.sballiance.org). SBA assembled various representatives from major building assessment schemes (e.g. BREEAM, HQE, DGNB, SB Tool, LEED) and developed a harmonised framework of common metrics that focus on four life cycle analysis indicators:

- non-renewable primary energy consumption,
- CO₂ equivalents,
- drinking water consumption and waste production, as well as measures of
- thermal comfort and indoor air quality.

The Common European Sustainable Built Environment Assessment (**CESBA** http://wiki.cesba.eu) has been working to respond to the perceived confusion caused by the proliferation of various building assessment schemes, by bringing together various projects and platforms led by public authorities. A set of KPIs that form the basis for the CESBA 'building signature', include:

- primary energy use,
- CO₂ emissions,
- reused/recycled materials,
- water consumption,

Final D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5



- solid waste,
- building life cycle costs,
- health and wellbeing factors (IAQ and thermal comfort),
- monitoring/optimisation in operation.

Over the past few years, the European Commission has recognized the importance developing a common EU framework of core indicators for the environmental performance of buildings and released the Communication on Resource Efficiency Opportunities in the Building Sector - **COM(2014)445**. This Communication identified the need for a common European approach to assess the environmental performance of buildings throughout their lifecycle, taking into account the use of resources such as energy, materials and water. The six macro objectives that will be translated into indicators include:

- Greenhouse gases from life cycle energy use
- Resource efficient material life cycles
- Efficient use of water resources
- Healthy and comfortable spaces
- Resilience to climate change
- Optimised life cycle cost and value.

The **CESBA MED** work focuses on identifying the most suitable transnational sets of indicators for the integrated assessment of public buildings and urban areas in the Mediterranean context, addressing the main dimensions of sustainability.

2.1 Overview of Issues-Indicators

The emphasis of **CESBA MED** is on the energy use of **public buildings** in the context of their surrounding urban area. This work considers various indicators for **three major issues** (*in alphabetical order*):

- Economic
- Environmental
- Social

and numerous categories of various commonly used indicators that are briefly discussed in the following subsections.

> Economic Issue

Most decision making processes are influenced to a great extent by the project's economic aspects. Improving the building's energy performance has a direct impact on first and operational costs. For example, starting with the efforts to minimize loads one can reduce the size of equipment and thus minimize first cost, which includes materials, labour, overhead, VAT etc. Some design options and materials may last for the life time of the building, while others will extend over the life time of the components that may run over several years or decades. For high performance buildings, construction costs average 3 to 10% higher than standard alternatives, but using energy efficient equipment or exploiting renewables will reduce operational costs by up to 40-50% lower than for conventional buildings, with proper operation and maintenance.

Different economic indicators are used for appraising the benefits and financial attractiveness of different design options and scenarios. For example, the simple payback period (PBP) that is commonly used and easily understood in the market. More accurate but more demanding methods are sometimes considered, e.g. accounting rate of return (ROR) or average annual rate of return on investment (RRI) discounted cash flow (e.g. the net present value (NPV) and internal rate of return (IRR) methods). Life cycle costing (LCC) and analysis (LCCA) methodologies can be used to reach cost optimal levels. However, they are not easy to



implement since they require information on energy prices, different material/equipment costs, and a number of relevant rates (e.g. variables and cash flow components) that may be difficult to realistically define in uncertain financial times.

Different indicators can be used in order to assess the benefits and financial attractiveness of different design options for new buildings and renovation scenarios for existing buildings. Starting from the simple payback period (PBP) that is commonly used and easily understood in the market, to more accurate but more demanding calculation methods like accounting rate of return (ROR) or average annual rate of return on investment (RRI) discounted cash flow (e.g. net present value (NPV) and internal rate of return (IRR) methods). Progressively the focus is placed on life cycle costing (LCC) and analysis (LCCA) methodologies that can be used to reach cost optimal levels for the entire lifetime of the building. However, these methods are not easy to implement since they require information on energy prices, different material/equipment costs, and a number of relevant rates (e.g. variables and cash flow components) that may be difficult to realistically define in uncertain financial times.

Environmental Issue

Environmental issues that relate to new and existing buildings involve the use of natural resources, various gaseous emissions (that are directly related to greenhouse gases and linked to global warming), waste etc. They can impact the air, land (use, preservation, open available green areas), and water (consumption, pollution, waste). The rational use of fresh water resources, the exploitation of rain water and waste water treatment, are some major environmental priorities, especially in the Mediterranean basin. The area also has a sensitive and significant biodiversity, with numerous indigenous plants that are suitable for landscaping and also have reduced water needs.

The emphasis of CESBA MED is on building energy use. Most commonly used energy related indicators, which quantify a building's energy performance, include the normalized final (site) energy breakdown of different fuels (e.g. renewables, electricity, heating oil, natural gas) and primary (source) energy consumption that facilitates the assessment of environmental impact (e.g. emissions). Although different time steps may be used (e.g. hourly, monthly), the most common is on an annual basis (e.g. annual energy consumption or annual emissions). In addition, indicators can be used for evaluating different scenarios for equipment and system selection that can lower the total building's energy consumption, specific end-use energy consumption, e.g. related to HVAC equipment, lighting, service hot water, major office equipment, appliances and other plug loads, vertical transportation etc. Emissions are then directly related to the specific energy carriers. Environmental emissions are usually expressed in CO₂ emissions (or equivalent) in kg per unit floor area of a building or aggregated as total quantities.

> Social Issue

For the social aspects, the indoor environmental quality (IEQ) and well-being of occupants inside the buildings, involves, thermal, visual and acoustical comfort, and proper indoor air quality. Temperature and humidity levels provide helpful insight on the prevailing conditions that effect thermal comfort. Detailed simulation results and monitoring data can be used to assess prevailing conditions and for example, identify overheating conditions in summer (implying thermal discomfort) or even in winter that means energy waste beyond discomfort. The minimum indoor temperature in winter and the maximum indoor temperature in summer can be used as indicators for checking compliance with the desirable indoor conditions and preliminary assessment of peak sensible loads. Similarly, indoor humidity can reveal relevant priorities for humidification in winter or dehumidification in summer and support the preliminary assessment of peak latent loads. On an annual basis, spaces should have no more than 1% of the annual occupied hours over/under the desirable set point



temperature. The predictive mean vote (PMV) and percentage people dissatisfied (PPD) are common thermal comfort indicators in order to quantify indoor thermal conditions and further assess the impact on occupancy.

Visual comfort is an integral part of proper IEQ and a critical design parameter in commercial buildings, since it improves productivity and overall functions. In terms of energy consumption, for some building categories, lighting may constitute a major final end-use and may also contribute to internal heat loads.

Another relevant indicator is the indoor air velocity that impacts thermal comfort conditions. Computational fluid dynamics (CFD) simulations can handle the complex phenomena and provide the necessary information in order to optimize the architectural and system design. CFD data visualization of spaces allows users to easily follow path lines and flow mixing resulting from mechanical or natural ventilation in order to evaluate the effectiveness of natural or mechanical ventilation systems. CFD may also be used to assess indoor air quality, outdoor pollution and concentrations of contaminants, which are compared against standards and health regulations.

Air ventilation and circulation plays a dominant role in achieving comfort conditions and securing the necessary amount of fresh (outdoor) air by natural, mechanical and/or hybrid ventilation. Minimum air flow rate of fresh outdoor air is a commonly used indicator, which depends on the building end-use, the number of occupants and the generation of indoor pollutants. Minimum requirements per person (m3/h/person), according to the maximum occupancy (person/m² net occupiable floor area) to ensure proper indoor air quality are set by standards and technical regulations.

On an urban scale, transportation infrastructures, including public transport, availability of safe bicycle routes, suitable pedestrian streets etc, are major elements for sustainable urban development. Public safety and security are also important social aspects that influence the well-being of residents and working visitors. Accessibility to public spaces (e.g. community centres and services, parks) and other services (e.g. broadband networks) are also very important social criteria.

2.2 Work Overview

Several European projects and other public or commercial programs and initiatives have addressed these issues and have proposed different methods, tools and indicators. Accordingly, there is an abundance of available knowhow but on the other hand there is a need to collectively look at these outcomes in order to establish a common basis of a methodology and tool set that is suitable for the refurbishment of public buildings in the urban context of the MED area.

CESBA MED exploits available information from 14 transnational projects and public assessment systems. They are critically reviewed in order to develop a **generic list** of CESBA MED **set of indicators at building and urban scale** that will allow the sustainability assessment of public buildings and areas in the context of the Mediterranean area.

CESBA MED will produce an assessment system composed by a generic framework (CESBA MED SN Generic Framework) and the locally contextualized assessment tools (CESBA MED SNTools). The reference assessment methodology adopted by CESBA is the SBTool of iiSBE that gives the possibility of a total contextualization of tools to local conditions. The SBTool assessment methodology, originally developed for the building scale, is adapted for the application at urban scale. Finally, an integrated multi –criteria CEBA MED assessment methodology is developed to connect the assessments at building and urban scale.



3. Transnational Methods & Indicators

The starting point of CESBA MED are the available information and main results from 14 transnational projects and public assessment systems (P.A.S.) dealing with energy efficiency at building and urban scale. They all define and use several indicators in their methods in order to assess sustainability of buildings at different scales. The main projects and P.A.S. considered in this work are outlined next in alphabetical order and they are elaborated in detail in **Appendix A**.

Transnational Projects

CABEE - Capitalizing Alpine Building Evaluation Experiences (ASP ALPINE Space Programme, European Territorial Cooperation, 2013-15) http://www.cabee.eu

A rating tool at cluster scale that contains criteria based on quantitative and qualitative criteria dealing with environmental, social and economic issues. More information in Appendix A.1.

CAT MED - Platform for Sustainable Urban Models (Interreg MED,2013-15) http://www.catmed.eu

A common system of urban sustainability indicators to track the evolution of urban systems in time. Different indicators are organized around four main axes: territorial management & urban design, mobility & transport, natural resources management and social and economic cohesion. More information in Appendix A.2.

CEC5 - Demonstration of Energy Efficiency and utilization of renewable energy sources trough public buildings (Interreg Central Europe, 2010-12) http://wiki.cesba.eu/wiki/CEC5

CESBA Tool is a transnational sustainability assessment tool at building scale based on common indicators dealing with process, environmental, social and economic issues. More information in Appendix A.3.

CLUE - Climatic Neutral Urban Districts in Europe (Interreg IVC, 2011-14) http://www.clue-project.eu

A set of 50 criteria and indicators for sustainability assessment at cluster and neighborhood scale. The indicators are all quantitative and performance based. Similar indicators with ITACA. More information in Appendix A.4.

ENERBUILD - Energy Efficiency and Renewable Energies in the Building sector (ASP ALPINE Space Programme, European Territorial Cooperation, 2010-12) http://www.enerbuild.eu

A transnational sustainability assessment tool at building scale based on common indicators dealing with process, environmental, social and economic issues. More information in Appendix A.5.

EPISCOPE - Energy Performance Indicator Tracking Schemes for the Continuous Optimisation of Refurbishment Processes in European Housing Stocks (IEE, 2012-14) http://www.episcope.eu

A scheme of energy performance indicators to access national actions for tracking and assessing refurbishment plans for improving the energy performance of building stocks. More information in Appendix A.6.

FASUDIR - Friendly and affordable sustainable urban districts retrofitting (FP7, 2014-16) http://fasudir.eu

A set indicators at building and district level for assessing the three issues of sustainability: environmental, economic and social aspects. Calculation methods and benchmarks of KPIs are defined. More information in Appendix A.7.



IRH-MED - Innovative Residential Housing MED (Interreg MED, 2010-12) http://wiki.cesba.eu/wiki/IRH_med

A common framework for residential building sustainability assessment in MED areas that can be used as a basis for the implementation of future regional initiatives. More information in Appendix A.8.

NewTREND - New integrated methodology and tools for retrofit design towards a next generation of energy efficient and sustainable buildings and districts (H2020, 2015-18) http://newtrend-project.eu

An efficient collaborative design platform that accounts for current best practices in the design process for energy efficient refurbishment of buildings. More information in Appendix A.9.

OpenHouse - Benchmarking and mainstreaming building sustainability in the EU based on transparency and openness (open source and availability) from model to implementation (FP7, 2010-12) http://www.openhouse-fp7.eu

A common European methodology to assess the sustainability of buildings based on the existing certification schemes and European standards, using a transnational set of indicators. More information in Appendix A.10.

SuPerBuildings - Sustainability and Performance Assessment and Benchmarking of Buildings (FP7, 2010-12) http://cic.vtt.fi/superbuildings

A set of sustainability indicators for buildings and methods for the assessment and benchmarking considering the output of the standardization processes, focusing on the validity of indicators, comparability of assessment results, benchmarking criteria. More information in Appendix A.11.

Public Assessment Systems (P.A.S.)

> Eco-Quartier - French Label Eco Quartier (Eco-District) http://www.eco-quartiers.fr

A French label to formalize sustainable development of districts and assess Eco-districts. The approach is compatible with the Reference Framework for Sustainable Cities (http://rfsc.eu). The approach considers 20 commitments of a common charter, covering life quality and users practices; territorial development; environment and climate. More information in Appendix A.12.

Protocollo ITACA- Environmental label (Federal Association of the Italian Regions, with the scientific support of iiSBE and ITC-CNR) http://wiki.cesba.eu/wiki/Protocollo Itaca

A voluntary environmental label promoted by the Italian Regions based on the international assessment methodology SBMethod of iiSBE and it has been contextualized at local level by several regions to support specific policies in promoting sustainable buildings. A national version is also under development to create a point of reference for the market stakeholders. Similar indicators with CLUE. More information in Appendix A.4.

QDM- Quartiers Durables Méditerranéens (Sustainable Mediterranean Neighbourhoods) http://www.envirobatbdm.eu/baroque

A local and contextualised approach to sustainability in neighbourhood planning for local authorities. It is based on a bottom up and participative approach, using 8 themes, 31 criteria and 240 indicators. More information in Appendix A.13.



Table 1. Overview of CESBA MED project partner involvement in preparing the background information and review of existing projects & public assessment systems (P.A.S.)

					P	roject	S						P.A.S.	
CESBA MED Partners	CLUE	FASUDIR	CABEE	CAT-MED	EPISCOPE	ENERBUILD	CECS	OPEN HOUSE	IRH-MED	SuPerBuildings	NewTREND	Eco-Quartier	Protocollo ITACA	QDM
LP-TO	~			~										
PP1-iiSBE		>									>		~	
PP2-UDINE							~							
PP3-EVBDM														√
PP4-RAEE			~			~						~		
PP5-Gov of Catalonia									~					
PP6-SCUGAT														
PP7-UoM								>						
PP8-NOA					~									
PP9-CESBA														
PP10-EIHP										✓				
PP11-MPM														

The available indicators are clustered into **three (3) major sustainability Issues** and **nineteen (19) main Categories**, illustrated in Figure 3. The various categories are listed in <u>alphabetical order</u>, not in terms of their importance.

In order to facilitate the organization of the available information and easy cross reference, a common letter coding is introduced as follows:

- > Each issue is denoted by a three letter code (the three first letters of the issue's name)
- Each category is denoted by a two letter code: the first letter (in caps) and the second letter of the category's name, in case of category with a single-word name, OR the first letter (in caps) of the first word and the first letter (in caps) of the last word of the category's name, in case of category with a more than one word name.





Figure 3. Issues and corresponding Categories (listed in alphabetical order) of indicators.

A complete list of the corresponding indicators for each category and criterion are summarized in Table 2. They are listed in <u>alphabetical order</u>, not in terms of their importance.



Table 2. Indicators and Criteria under the main Issues & Categories (listed in alphabetical order). The spatial coverage is based on the building scale and/or neighbourhood scale.

			ECONOMIC (ECO) ISSUE			
				Bu	uilding (B)	and (N) scale
Category	Criterion		Indicator (units)	B	N	B&N
		1	Affordability of housing property (m ²)		٠	
	Housing value	2	Affordability of housing rental (%)		٠	
	Local economy	3	Support to local economy (%)		•	
	Prevention of prejudice	4	Prevention of prejudice		•	
۲		5	Future evolution and modularity		•	
inti		6	Gentrification index (-)		•	
	Social &	7	Labor force participation (%)		•	
	Economic	8	Potential Employment (%)		•	
	cohesion	9	Social housing ratio (%)		•	
		10	Social mixing and solidarity based economy		•	
		11	Unemployment rate (%)		•	
osts	Capital cost	1	Additional costs for energy efficiency and sustainability (€)			•
t Co		2	Investment costs (€/m²)			•
nen		3	Investment costs aggregated (€)		•	
vestm		4	Participation of local authority in the total investment cost (%)		٠	
5	Performance	5	Return on investment (%)			•
	Benchmarking & Targeting	1	Verifiable sustainable targets			•
	Cost benefit	2	Cost benefit analysis focused on sustainability			•
osts	Energy cost	3	Operational energy costs (€/m ²)			•
e C	Lifergy Cost	4	Operational energy costs aggregated (€)			•
e cycl	Non- Energy cost	5	Operational non-energy costs aggregated (€)		٠	
Life		6	Cost in operational phase (€)			•
	Total cost	7 8	Life cycle costs (-) (€)	•		
		9	Life cycle costs aggregated (€)		•	
		1	Communication and information management (%)			•
lent	Building	2	Information and participation of users			•
geme	operation	3	Synergy management (-)		•	
ana		4	User information (-)	•		
ğ	Social & Economic cohesion	5	Environmental activities in primary school (%)		•	



ECONOMIC (ECO) ISSUE								
Category	Criterion		Indicator (units)	Bu Neighb	ilding (B) ourhood	and (N) scale		
		1	Aesthetic quality (-)		•			
	Architectural	2	Enhance architectural, cultural and landscape patrimony (yes/no)		•			
	Benchmarking & Targeting	3	Setting verifiable environmental targets (-)	•				
	Building energy performance	4	Energy optimization during planning (-)	•				
	Cultural heritage	5	Monument or monumental value / Historical value (-)			•		
		6	Building works quality control	•				
		7	Community management (yes/no)		•			
Quality		8	Community planning (yes/no)		٠			
	Process & Planning	9	Finalising the design phase (yes/no)		٠			
		10	Integrated design in the planning process (-)		٠			
		11	Plus 6 (+6) project management (yes/no)		•			
		12	Process and planning quality (-)			•		
		13	Project management (yes/no)		•			
		14	Working with skilled professionals (yes/no)		•			
	Risk	15	Long term stability of value (€)			•		
	management	16	Risk management (-)		•			
	Territorial management & Urban design	17	Urban complexity, Shannon-Wiener index (-)		•			
	Flexibility &	1	Flexibility and adaptability, during the life of the project (yes/no)		•			
	Adaptability	2	Flexibility and adaptability, programming (yes/no)		•			
		3	Assessing the current situation (yes/no)		•			
e	Process &	4	Competent professional team		•			
Valı	Planning	5	Economic advantage of cluster in comparison to single buildings (-)		•			
		6	Equipment and services pooling		•			
	Social &	7	Tourist frequency trends, seasonality overnight stays (%)		•			
	cohesion	8	Tourist frequency trends, seasonality tourists (%)		٠			



	ENVIRONMENTAL (ENV) ISSUE									
				Bui Neighbu	Iding (B)	and (N) scale				
Category	Criterion		Indicator (units)	B	N	B&N				
	Building site	1	Ecological quality of the building site (-)	•						
ty	Land preservation	2	During programming, design and before the beginning of the works; the land is maintained through mowings, prunings, maintenance of canals and hedges (yes/no)		•					
ersi		3	Change in ecological value of the site, species(-)			•				
odiv		4	Connectivity of green spaces (%)		•					
Bic	Dublic crosses	5	Diversity (yes/no)		•					
	Public spaces	6	Ecological corridors and continuity (yes/no)		•					
		7	Use of local plants (%)		•					
		8	Vegetal areas (%)		•					
	Building	1	Escalators and moving walks design and efficiency (-)	•						
	vertical transportation	2	Lift design and efficiency (-)	•						
		3	Stairs and ramps planning (-)	•						
	Embodied energy	4	Embodied energy demand (kWh/m ²)	•						
		5	Annual heat generation for space heating and DHW (kWh/m ²)			•				
		6	Cooling demand (kWh/m ²)	•						
	Final energy	7	Delivered energy demand (kWh/m ²)			•				
		8	Energy consumption (Toe/inhabitant)		•					
		9	Heating demand (kWh/m ²)	•						
		10	Peak energy demand			•				
20		11	Abiotic Depletion Potential (kWh/m ²)	•						
Energ		12	Consumption of non-renewable primary energy (kWh/m ²)			•				
		13	Operational primary energy (kWh/m ²)			•				
	Primary energy	14	Primary energy for cooling (%)		•					
		15	Primary energy for heating (%)		•					
		16 17	(%) Primary energy for public lighting (kWh/yr)		◆◆					
		18	Total primary energy demand (kWh/m ²)	+	1	•				
		19	Renewable electricity production (%)		•					
		20	Renewable energy on site (%)	+	1	•				
	Renewables	21	Share of renewable primary energy in total primary energy demand (kWh/m ²)	•		1				
		22	PV-power plant (kWh/a)	•						
	Virtual power systems	23	Electric energy and Virtual power systems		•					



	ENVIRONMENTAL (ENV) ISSUE							
				Buil Neighbo	ding (B) urbood	and (N) scale		
Category	Criterion		Indicator (units)	B	N	B&N		
	Eco-mobility	1	Eco-mobility potential of a building in its context (km/unit)			•		
	Effects on surrounding buildings	2	Impacts on surrounding buildings (%)		•			
		3	Acidification potential (kgSO ₂ -eq/m ²)			•		
		4	Acidifying emissions, Intensity (%)		•			
		5	Annual CO2 emissions (kgCO ₂ /m ²)			•		
		6	CO2 emission factor heat supply (kg/kWh)			•		
		7	CO2 emissions (tonnes CO2-eq/yr)		٠			
		8	Eutrophication potential (kgPO ₄ -eq/m ² yr)			•		
	Emissions	q	(kgCO ₂ -eq/m ² yr)			•		
		10	Global Warming (-)		•			
		11	(kgCO ₂ -eq/m ² yr)			•		
		12	Intensity of GHG emissions (%)		٠			
S		13	Ozone depletion potential (kgR11-eq/m ² yr)			•		
		14	Photochemical Ozone creation potential (kgC ₂ H ₄ -eq/m ² yr)			•		
pac		15	Photo-oxidants emissions, Intensity (%)		•			
<u></u>		16	Light on properties (lx)		•			
		17 18	Light pollution (-) (%)		•			
	Light pollution	19	Luminaire intensity (cd)		•			
		20	Luminance (cd/m ²)		•			
		21	Upward Light		•			
	Outdoor	22	Monitoring of air quality (%)		•			
	conditions	23	Thermal comfort of outdoor areas (%)		•			
	Raw materials	24	Abiotic Depletion Potential elements (kgSB- eq/m ² yr)			•		
		25	Accessibility to differentiated waste collection (%)		•			
		26	Accessibility to waste sorting facilities (%)			•		
	Solid waste management	27	Composting (-)	•				
		28	Construction and demolition waste generation (kg/m ²)			•		
		29	Recyclable waste storage (m ²)	•				
	Water pollution	30	Water pollution due to material leaching (mg/m ² yr)			•		



	ENVIRONMENTAL (ENV) ISSUE							
				Buil Neighbo	ding (B) urbood	and (N) scale		
Category	Criterion		Indicator (units)			B&N		
		1	Conservation of built environment (%)		•			
	Preservation	2	Preservation of land (%)			•		
	Quality	3	Site quality (-)		•			
	Soil sealing	4	Permeability of site / land (%)			•		
	Enstial	5	Change of land use (-)		•			
e	planning	6	Imperviousness change, Imperviousness coefficient (-)		•			
Us		7	Green zones & recreation areas (m ² /inhabitant)		•			
and		8	Green zones & recreation areas density (%)		•			
		9	Green zones & recreation areas proximity (%)		•			
		10	Outdoor space (-)		•			
	Urban design	11	Population density (inhabitants/ha)		•			
		12 13	Urban compactness (dwelling/m ²) (m ³ /m ²)		•			
		14	Urban context (-)		•			
		15	Urban conversion (%)		•			
ials	ECO materials	1	Low-pollutant and low-emission materials (-)	•				
Materia	Emissions	2	Building materials and construction, OI3 index (-)			•		
	Embodied water	1	Embodied water use (m ³ /m ²)			•		
		2	Intensity of water treatment (%)		•			
	Freshwater	3	Operational water use (m ³)			•		
		4	Water consumption (I/inhabitant day)		•			
		5	Dedicated network (yes/no)		•			
		6	Intensity of rainwater usage (%)		•			
5	Rainwater	7	Landscaped and accessible retention ponds and ditches (yes/no)		•			
Vate		8	Rainwater collection from roofs (%)		•			
5		9	Respecting streaming continuity (yes/no)		•			
	Total water use	10	Operational water use and waste water (m ³)			•		
		11	Intensity of wastewater treatment (%)		•			
		12	Waste management & (l/inhabitant day)		•			
	Wastewater	13	(%)		•			
		14 15	Wastewater management (⁷³) (m ³ /m ²)			•		
		16	Water consumption & use of rainwater (-)	•				

Final D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5



SOCIAL (SOC) ISSUE								
Catagory	Critorion		Indicator (units)	Bui Neighbo	lding (B) ourhood	and (N) scale		
Category	Citterion		indicator (diff(s)	В	Ν	B&N		
	Broadband	1	Access to a broadband communication network, areas (%)		•			
	network	2	Access to a broadband communication network, population (%)		•			
	Elovibility	3	Flexibility of residential buildings (%)			•		
		4	Flexibility use (%)		•			
		5	Access to parks and open spaces (-)		•			
		6	Adaptation to users practices (yes/no)		•			
ility		7 8	Availability of green(%)spaces(m²/inhabitant)		•			
	Public space	9	Barrier-Free accessibility of the district (%)		•			
	planning	10	Community gardens (yes/no)		•			
		11	Parks and vegetated spaces network (yes/no)		•			
		12	Public space quality (yes/no)		•			
sibi		13	Shared community spaces (yes/no)		•			
cces		14	Access to services and facilities (%)		•			
Ă		15	Collective facilities and outsourcing of services (%)		•			
		16	Community support (yes/no)		•			
	Services & Leisure facilities	17	Proximity to leisure facilities (%)		•			
		18	Proximity to services (%)		•			
		19	Proximity to services and leisure facilities (%)		•			
		20	Social gatherings and common cluster activities (-)		•			
	Street network	21	Cyclomatic complexity of the street network (-)		•			
		22	Development and integration of land parcels (%)		•			
	Urban planning	23	Homogeneity of the urban fabric (%)		•			
		24	Mixing functions (yes/no)		•			
		1	Indoor A-weighted sound pressure level (dBA)			•		
mfort	Noise - Indoor	2	Weighted sound pressure from ventilation (dBA)	٠				
Ŝ		3	Building area over noise limit (%)		•			
stic	Noise - Outdoor	4	Noise pollution, silence quality – day (%)		•			
cou		5	Noise pollution, silence quality – night (%)		•			
Ā	Noise pollution management	6	Accoustics studies (yes/no)		•			
dir ality	Indoor air quality	1	Concentration of pollutants (µg/m ³)			•		
Ai Qua	Outdoor air quality	2	Number of days with bad air quality (days/yr)		•			



SOCIAL (SOC) ISSUE								
				Bui Neighbo	lding (B) purbood	and (N) scale		
Category	Criterion		Indicator (units)	B	N	B&N		
ty & Irity	Energy & Management systems	1	Objective/subjective safety measures (-)		٠			
Safet Secu	Green production	2	Local production of food (m ² /inhabitant)		•			
	Mobility	3	Pedestrian safety paths (%)		•			
		1	Predicted Mean Vote (-)			•		
fort	Indoor	2	Predicted Percentage Dissatisfied (%)			•		
- Tuo	conditions	3	Thermal comfort in summer (-)	•				
nal C	_	4	Exploitation of local resources: sun, daylight, wind (-)		•			
Ther	Outdoor conditions	5 6	Heat island effect (-) (yes/no)		•			
		7	Microclimate Index I (-)		•			
		1	Availability of safe bicycle routes (m)		•			
		2	Bicycle and pedestrian network quality (-)		•			
		3	Bicycle facilities (-)		•			
	Mobility & Alternative transportation	4	Car sharing pool/station (yes/no)		•			
		5	Contiguity of bicycle and car routes (%)		•			
		6	Pedestrian streets and walkways, area (%)		•			
		7	Pedestrian streets and walkways, length (%)		•			
		8	Proximity to bicycle lanes and paths (%)		•			
		9	Shared mobility (%)			•		
		10	Parking facilities (number/dwelling)		•			
oort	Parking	11	Parking facilities, Off-street parking spaces (%)		•			
lsue	facilities	12	Parking places with innovative features (%)		•			
E E		13	Bicycle Parking (%)	•				
		14	Access to public transport nodes, areas (%)		•			
		15	Access to public transport nodes, population (%)		•			
	Public	16	Access to public transport, District Accessibility Index (-)		•			
	transportation	17	Accessibility of public transport, stops and frequency (-)	•				
		18	Accessibility to public transport, Lense index (-)			•		
		19	Dwellings with access to public transport (%)		•			
	Street network	20	Connectivity of the street network (number/m ²)		•			
		21	Cul-de-sac roads and path ratio (%)		•			



SOCIAL (SOC) ISSUE									
Category	Critorian		Indicator (units)	Building (B) and Neighbourhood (N) scale					
category	Citterion		malcator (units)	В	Ν	B&N			
		22	22 Scale of the street network (m)						
		23	Traffic modal split (%)		•				
Artificial lighting		1	Illuminance (lx)			•			
<u>Co</u> <	Daylighting	2	Daylight factor (%)			•			

Depending on the amount of information required for the definition of the indicators they can also be grouped into three categories, depending on the **level and complexity of their calculation**:

- Basic (B): using simple parametric calculations, values from literature, benchmark averages,
- Standard (S): using standards, simple tool calculations, simple measurements or utility bills,
- Advanced (A): using advanced software for dynamic simulations

and in some cases based on a combination of calculation approaches, for example, Basic and Advanced (B&A).

Furthermore, the available indicators can be categorized according to their spatial coverage (Table 2) based on the **scale** of their application at

- Building Scale (B)
- Neighbourhood Scale (N)
- Both (**B&N**)

The **CESBA MED set of indicators** at **building scale** will allow the sustainability assessment of public buildings with different end-uses (e.g. school, offices, residential). At **urban scale** the CESBA MED set of indicators will allow the sustainability assessment of areas at different scales and physical boundaries.

- A small urban scale area (Neighbourhood scale, e.g. block/cluster of buildings) includes 5 15 buildings with a traditional composition, e.g. few buildings (adjacent or separated) with an internal courtyard.
- A large urban scale (e.g. neighbourhood) covers an area of 200-400 m in size that can be crossed in 10-15 min walk and incorporates 200-1500 inhabitants. The CESBA MED set of indicators will also consider different time scales to facilitate the sustainability assessment of existing urban areas

The **CESBA MED set** of indicators at urban scale will allow the sustainability assessment of an area concerning:

- Existing urban areas
 - actual performance assessment in order to take snap shot of the urban area and to identify the sustainability critical issues;
 - potential performance related to retrofit scenarios in order to identify the most cost effective sustainable retrofit scenario;
 - monitoring of urban retrofit actions in order to evaluate the effectiveness of urban retrofit actions and the achievement of the sustainability performance targets.
- New urban developments
 - potential performance of alternative planning options in order to identify the most cost effective sustainable development option;
 - monitoring of new urban developments in order to monitor new urban development and the achievement of the performance targets.

The two CESBA MED sets of indicators at

- Building scale and
- Neighbourhood (Urban) scale



are composed by indicators selected from existing sets developed by the previous EU projects and P.A.S. The available indicators are presented in detail for each project and P.A.S. (**Appendix A**). These information sheets (their contents are elaborated in the template in Appendix A.O) include:

- Short description of the project and its objectives
- Short list of indicators used in the specific project
- Detailed presentation of the indicators (e.g. name, units, categorization using the abbreviated codes for issue/category/level/scale, a brief description, the calculation method, and reference sources for more information).

The **code name for each indicator** follows the abbreviated notation from Table 2 as: *"Issue.Category.Number"*. For example, *"Energy consumption"* is denoted as *"ENV.En.8"*.

An overview of the available indicators and their association with all the projects and P.A.S. considered in this work are summarized in **Appendix B** (Project List of Indicators_Overview.xlsx). Over **210 indicators** have been identified. As illustrated in the exert in Figure 4, each indicator is identified in terms of the issues (ECO, ENV, SOC), categories, descriptive name and units, the calculation complexity (B, S, A), the spatial coverage (B, N), linked to the specific projects and P.A.S. considered in this work. The counter column indicates the number of times that the specific indicator has been used. The last column is used for supplementary notes to provide clarity on specific processes or approaches.



Figure 4. Exert of the overview of available indicators and frequencies in transnational projects and PAS (Appendix B).



4. Analysis

The analysis of the available information provides some useful insight with regard to the most relevant indicators. The goal of the following analysis is to identify from the generic list of indicators used in the transnational projects consider in this work, the ones that are most commonly used under each of the main issues (ECO, ENV, SOC) and specific categories, while at the same time identify common trends, for example, the commonly used calculation approaches. The analysis considers both **Building & Neighbourhood (Urban)** scales. The outcome of this analysis provides the appropriate CESBA MED set of indicators that will then be coupled with a multi-criteria assessment methodology in order to derive the specific CESBA MED key and core performance indicators.

4.1 Generic Indicators

The generic list of indicators from the EU projects and P.A.S. considered in this work include a **total** of **216 indicators** (Table 2). Some of the indicators are expressed with different units. The breakdown of the indicators based on their spatial coverage (Figure 5) is as follows:

- 24 indicators (11% of the total) at Building Scale (only)
- 142 indicators (66% of the total) at Neighbourhood (urban) Scale (only)
- 50 indicators (23% of the total) are common and apply at both B&N scale.

Considering that some indicators are common and used at both building and neighbourhood scales, their breakdown is as follows:

- 74 indicators (34%) at Building Scale
- 192 indicators (89%) at Neighbourhood (urban) Scale



Figure 5. Number of indicators at building (B) scale, neighbourhood (N) scale, and both B&N scale.

In terms of the **level and complexity of their calculation**, the majority of the indicators are derived using standard calculations (Figure 6). A total of **98 indicators** or 45% are based on **standard calculations**, followed by **advanced (50 indicators** or 23%), **basic (40 indicators** or 19%) and their combinations thereafter (i.e. S&A for 25 indicators or 12%, and only one for B&S, B&A and B&S&A).

Final D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5





Figure 6. Number of indicators with different levels of calculation complexity (B: Basic, S: Standard, A: Advanced) and their combinations thereafter.

Specifically, for the indicators that use **Basic calculations**, 21 of them are included in the ECO issue, 13 in ENV issue and 9 in SOC issue (Figure 7a). Of the ones using **Standard calculations**, 28 indicators are included in the ECO pillar, 63 in ENV pillar and 34 in SOC pillar (Figure 7b), while for the ones that use **Advanced calculations**, 11 are included in the ECO issue, 35 in ENV issue, 31 and in SOC issue (Figure 7c).



Figure 7. Number of indicators that use a-Basic, b-Standard and c-Advanced level calculations for the main sustainability issues and categories.

The following sections elaborate the most popular indicators under the three main issues.

ECONOMIC (ECO)

A total of 55 indicators (addressed 66 times in total) are assigned under Economic (ECO) issue. The two most popular categories under the specific issue are Quality (Qu) and Equity (Eq).

ECO - Quality (ECO.Qu)

A total of 17 indicators are assigned under «ECO.Qu» amongst the various projects and P.A.S. considered during this work. Specifically, 3 of them address the neighbourhood scale (N), 3 the building scale (B) and 11 both scales (B&N). These indicators have been addressed 21 times in total, following different calculation methodologies. The majority use a "Standard" level calculation approach (53%), followed by "Basic" level approach (47%).

Final D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5



ECO - Equity (ECO.Eq)

A total of 11 indicators are assigned under «ECO.Eq» amongst the various projects and P.A.S. and all of them address the neighbourhood scale (N). These indicators have been addressed 14 times in total, following different calculation methodologies. The majority use a "Standard" level calculation approach (36%), followed by "Advanced" level approach (36%) and 28% use a "Basic" level approach.

ENVIRONMENTAL (ENV)

A total of 93 indicators (addressed 133 times in total) are assigned under Environmental (ENV) issue. The two most popular categories under the specific issue are Impacts (Im) and Energy (En).

> ENV – Impacts (ENV.Im)

A total of 30 indicators are assigned under «ENV-Im» amongst the various projects and P.A.S. considered during this work. Specifically, 15 of them address the neighbourhood scale, 13 both B&N scales and 2 indicators the building scale. These indicators have been addressed 46 times in total, following different calculation methodologies. The majority use a "Standard" level calculation approach (37%), followed by 30% that use both "Standard" and "Advanced" level approaches, 27% that use an "Advanced" level approach and only 6% use a "Basic" level approach.

> ENV – Energy (ENV-En)

The emphasis of CESBA MED is on building energy use. A total of 23 indicators are assigned under «ENV-En» amongst the various projects and P.A.S. considered during this work. Specifically, 9 of them address the building scale, 7 both B&N scales and 7 the neighbourhood scale. These indicators have been addressed 33 times in total, following different calculation methodologies. The majority use a "Standard" calculation approach (57%), 26% use both "Standard" and "Advanced" level approach, 13% use "Advanced" level approaches and only 4% use a "Basic" level approach.

SOCIAL (SOC)

A total of 67 indicators (addressed 94 times in total) are assigned under Social (SOC) issue. The two most popular categories under the specific issue are Accessibility (Ac) and Transport (Tr).

SOC - Accessibility (SOC.Ac)

A total of 24 indicators are assigned under «SOC.Ac» amongst the various projects and P.A.S. considered during this work. Specifically, 23 of them address the neighbourhood (N) scale and only 1 both B&N scales. These indicators have been addressed 33 times in total, following different calculation methodologies. The majority use an "Advanced" level calculation approach (42%), followed by "Standard" level approach (29%), "Basic" level approach (25%) , while only 4% use both "Standard" and "Advanced" level approaches.

SOC - Transport (SOC.Tr)

A total of 23 indicators are assigned under «SOC.Tr» amongst the various projects and P.A.S. considered during this work. Specifically, 19 of them address the neighbourhood (N) scale, 2 the building (B) scale, and 2 both B&N scales. These indicators have been addressed 35 times in total following different calculation methodologies. The majority use a "Standard" calculation approach (48%), followed by "Advanced" level approach (39%) and 13% use both "Standard" and "Advanced" level approaches.



TOTAL (215 indicators)









NEIGHBOURHOOD SCALE (142 indicators)





ECONOMIC (13) **ENVIRONMENTAL (28)** SOCIAL (9) Thermal Comfort Air Quality Biodiversity Quality 4% Energy 11% 23% 25% Investment Costs Wate Acoustic Co 23% 14% 11% Manage 15% Materials Accessibility 4% 11% Land Use 7% Transport Life Cycle costs 22% Impacts Visual Comfor 46% 22%

BUILDING & NEIGHBOURHOOD SCALE (50 indicators)

4.2 CESBA MED Set of Indicators

The practical issues one needs to consider in order to identify a manageable number of indicators should address some general aspects (e.g. stakeholders, clarity and accuracy) and specific items related to energy and environmental aspects (e.g. energy demand and consumption, emissions).

• Stakeholders

Different indicators can support the diverse needs and priorities of public authorities, policy makers and other public and private technical stakeholders (e.g. urban planners, investors, SMEs, grant managers, owners, construction companies, solutions providers, users), in their efforts to assess and improve the overall environmental, social and economic performance of buildings. The clarity of the indicators is critical, in order to properly support the decision making process of specific stakeholders, without demanding elaborate training for using them and being able to readily adopt them.

• Clarity & Accuracy

Effective indicators should be based on scientifically and robust calculations that provide clear results that can be easily communicated and understood by the stakeholders. Simplicity and reproducibility should not conflict with accuracy. Input uncertainties that may result from increased complexity to determine the necessary data from which they are derived, require time consuming data collection processes or very complicated simulations, will impose unnecessary burdens and may limit the applicability of the indicators.

• Primary vs Final Energy Consumption & Emissions

The primary energy, i.e. the source energy that has not been subjected to any conversion or transformation process (e.g. power plant), is used to produce the energy delivered to the building (e.g. electrical energy). Most European and national approaches consider primary (source) instead of final (site) energy consumption. For natural gas and oil, the multiplier to obtain the primary energy is about 5% and 10% higher, respectively. However, for electricity generated from conventional power plants, depending on the MED area this may be about three times higher. From a resource depletion point of view, it is necessary to evaluate the primary energy. However, from an occupant's or owner's perspective, the final energy use is directly related to the operating costs of the building. Final energy consumption is usually retrieved from energy bills and utilities for existing buildings or estimated using appropriate calculation tools.

Energy consumption may be normalized, for example, per unit floor area, unit volume or weather conditions (e.g. using heating- or cooling-degree days) and may even be expressed for different end-uses at either the building scale and/or neighbourhood scale (e.g. for heating or cooling). The definition of the reference floor



area (e.g. gross floor area, heated floor area, useful floor area) using internal or external dimensions, should be carefully specified. Energy use per inhabitant is commonly used for comparison at large (national) level.

The use of primary energy is necessary for calculating the environmental impact and CO_2 emissions. Environmental emissions are expressed in CO_2 emissions (or equivalent) in kg per unit floor area of the building and depend on the specific primary fuel. National or even regional conversion factors for calculating the primary energy consumption from calculated or measured final energy consumption depends on the fuel and the fuel mix for generating electricity. Comparing CO_2 emissions one may optimize the selection of different equipment that use different fuels.

• Total vs Specific end-uses Energy Consumption

Due to the climate characteristics of the Mediterranean region, cooling energy is of special interest for the scope of CESBA MED. Lighting and plug loads can also be of significant importance in commercial and public buildings. Depending on the specific end-uses (e.g. heating, cooling, ventilation, lighting, etc) and the use of different energy carriers, it is important to consider both total and the breakdown of specific energy use.

Embodied energy (EE) in building materials, equipment and systems, is attracting more attention as buildings' energy consumption continues to decrease as a result of strict regulations, codes, building practices and market advances. It is important for new building constructions or other public works to select materials and equipment with low EE. For building refurbishments one needs to also account for the EE of any materials or equipment that are removed, in addition to the new ones. However, there are several obstacles to consider in order to easily handle this type of analysis, given that there is limited availability of local (national) tools and databases.

The CESBA MED indicators cover:

- All issues (Economic, Environmental, Social) and main sustainability aspects, with an emphasis on environmental-energy related issues
- Both scales: Building (B) and Neighbourhood (N)
- Different stakeholders

taking into account their

Frequency of use in the existing projects considered during this work (i.e. how frequently used are the indicators – Section 3.1)

and complying with the following requirements

- Operational: calculate the indicators on the basis of easily accessible open data and information from existing databases;
- > Affordable: calculate the indicator through a cost and time effective process;
- Practical: support decision making processes for the sustainability improvement of public buildings and urban areas;
- Suitable: support certification processes at building and urban scale;
- **Relevant**: for the Mediterranean context.

The **two sets** of **CESBA MED indicators** at **Building Scale** & **Neighbourhood** (urban) **Scale** are defined with the intent to be used in assessment activities for the:

- Evaluation of the actual level of sustainability of urban areas and public buildings;
- Identification of the most cost effective retrofit scenario for sustainable urban areas and public buildings;
- Evaluation of alternative design options for new sustainable urban developments and public buildings;
- Development of target based action plans for sustainable public buildings;
- Sustainability certification of public buildings and urban areas.



Eventually one needs to consider a realistic number of indicators. This is critical in order to secure the practical aspects during implementation, e.g. time constraints, complexity and relevant accuracy for collecting the main input data, etc. This is the trend and current practice within several projects, e.g. ENERBUILD includes 16 KPIs, similar with NewTREND that includes 16 core KPIs, while FADUSIR includes 20 KPIs for building and district level.

				ENVIRONM		IENTAL (ENV) ISSUE					
				Category Criterion		1	Ecological quality of the huilding site ()				
		Biodiversity	Bublic spaces	2	Chapter in ecological value of the site reactor (.)						
					Public spaces	2	Escalators and moving walks design and				
				Building vertical		1	efficiency (-)				
						2	Lift design and efficiency (-)				
				transportation	3	Stairs and ramps planning (-)					
				Embodied energy	4	Embodied energy demand (kWh/m²)					
					5	Annual heat generation for space heating and DHW (kWh/m ²)					
						6	Cooling demand (kWh/m²)				
			2	Final energy	7	Delivered energy demand (kWh/m²)					
				e 1		9	Heating demand (kWh/m²)				
				5		10	Peak energy demand				
						11	Abiotic Depletion Potential (kWh/m²)				
					Primary	12	Consumption of non-renewable primary energy (kWh/m ²)				
					energy	13	Operational primary energy (kWh/m²)				
						18	Total primary energy demand (kWh/m²)				
						20	Renewable energy on site (%)				
					Renewables	21	Share of renewable primary energy in total				
ECONOMIC (ECO) ISSUE				22	primary energy demand (kWh/m²)						
					Eco-mobility potential of a building in its						
			Eco-mobility	1	context (km/unit)						
				3	Acidification potential (kgSU ₂ -eq/m ²)						
				5	Annual CO2 emissions (kgCO ₂ /m ²)						
		Additional costs for aparquefficiency and		Emissions	6	CO2 emission factor heat supply (kg/kWh)					
ent .	Capital cost	1	sustainability (€)			8	Eutrophication potential (kgPO ₄ -eq/m ³ yr)				
ost str		2	Investment costs (€/m ²)			9	Global Warming (kgCO2-eq/m* yr)	SOCIAL (SOC) ISSUE			L (SOC) ISSUE
avel 0	Performance	5	Return on investment (%)	t;		13	Otone depletion notential (kr811-eg/m ² /r ²)	Category	Criterion		Indicator (units)
	Benchmarking		VestBable sustalable targets	<u>ă</u>		14	Photochemical Ozone creation potential	Accessibility	Flexibility	3	Flexibility of residential buildings (%)
ts	& Targeting	1	vermable sustainable targets	=		14	(kgC ₂ H ₄ -eq/m ² yr)	Acoustic	A	1	Indoor A-weighted sound pressure level (dBA)
Š	Cost benefit	2	Cost benefit analysis focused on sustainability		Raw materials	24	eq/m ² yr)	Comfort Noise - Indoor		2	Weighted sound pressure from ventilation
de	Energy cost	3	Operational energy costs (€/m ²)			26	Accessibility to waste sorting facilities (%)	Air	Indoor air	-	(dBA)
د در		4	Operational energy costs aggregated (€)		Solid waste	27	Composting (-)	Quality	quality	1	Concentration of pollutants (µg/m ³)
5	Total cost	6	Cost in operational phase (€)		management	28	Construction and demolition waste generation			1	Predicted Mean Vote (-)
		8	Life cycle costs (C)			29	(kg/m ⁺) Recyclable waste storage (m ²)	le to	Indoor	2	Predicted Percentage Dissatisfied (%)
Ħ		1	Communication and information management		Water		Water pollution due to material leaching	her	conditions	3	Thermal comfort in summer (-)
eme	Building	-	(%)		pollution	30	(mg/m² yr)	C Outdoor		7	Microclimate Index I (-)
anag	operation		mormeton and participation of users	Land Use	Preservation	2	Preservation of land (%)	Mobility &		9	Sharod mobility (%)
Σ		4	User information (-)	مد	500 sealing		remeability of site / fand (76)		transportation	9	Shared mobility (76)
	Benchmarking & Targeting	3	Setting verifiable environmental targets (-)	tera	ECO materials	1	Low-pollutant and low-emission materials (-)	Parking facilities		13	Bicycle Parking (%)
	Building energy performance	4	Energy optimization during planning (-)	Ë	Emissions	2	Building materials and construction, OI3 index (-)	Tra	Public	17	Accessibility of public transport, stops and frequency (-)
ality	Cultural	5	Monument or monumental value / Historical		Embodied water	1	Embodied water use (m³/m²)	transportation		18	Accessibility to public transport, Lense index
ð	Process &	6	Building works quality control	Ę	Freshwater	3	Operational water use (m²)		A		()
	Planning	12	Process and planning quality (-)	Wat	total water use	10	Operational water use and waste water (m ³) Waste water management (m ³ /m ²)	*) # Artificial 1 Illuminance (Illuminance (lx)	
	Risk management	15	Long term stability of value (€)		Wastewater	16	Water consumption & use of rainwater (-)	Com	Daylighting	2	Daylight factor (%)
management						-					

Building Scale Indicators (listed in alphabetical order)



Neighbourhood (urban) Scale Indicators

(listed in alphabetical order)

							inaccaso (anno)								
			Land		During programming, design and before the beginning of the works: the land is maintained										
			preservation	2	through mowings, prunings, maintenance of										
		2		,	canals and hedges (yes/no) Change in accelerical value of the site species(.)										
		2		4	Connectivity of green spaces (%)										
				i i i i		5	Diversity (yes/no)								
				ä	Public spaces	6	Ecological corridors and continuity (yes/no)								
						7	Use of local plants (%)								
						8	Vegetal areas (%)								
						5	Annual heat generation for space heating and DHW (kWh/m ²)								
					Embodied	7	Delivered energy demand (kWh/m²)								
					Final energy	8	Energy consumption (Toe/inhabitant)			SOCIA					
						10	Peak energy demand	Category	Criterion	SUCIA	Indicator (units)				
				>		12	Consumption of non-renewable primary energy (kWh/m ²)		Broadband	1	Access to a broadband communication				
				erg		13	Operational primary energy (kWh/m²)		communication	-	network, areas (%)				
					Primary	14	Primary energy for cooling (%)		network	2	network, population (%)				
				energy	15	Primary energy for heating (%)	F	Flovibility	3	Flexibility of residential buildings (%)					
						16	Primary energy for public lighting (%)			4	Flexibility use (%)				
						17	Total primary energy demand			5	Access to parks and open spaces (-)				
					Renewables	18	Renewable electricity production (%)			6	Adaptation to users practices (yes/no)				
					-	19	Eco-mobility potential of a building in its			8	Availability of green spaces (%, m²/inhabitant)				
					Eco-mobility	1	context (km/unit)		Public space	9	Barrier-Free accessibility of the district (-)				
					surrounding	2	Impacts on surrounding buildings (%)		planning	10	Community gardens (yes/no)				
	F	CONOL	AIC (ECO) ISSUE		buildings			lity		11	Parks and vegetated spaces network (yes/no)				
Category	Criterion		Indicator (units)			3	Acidifying emissions Intensity (%)	diss		12	Public space quality (yes/no)				
		1	Affordability of housing property (m ²)			5	Annual CO2 emissions (keCO ₂ /m ²)	8		13	Shared community spaces (yes/no)				
	riousing value	2	Affordability of housing rental (%)			6	CO2 emission factor heat supply (kg/kWh)	٩		14	Access to services and facilities (%) Collective facilities and outsourcing of services				
	Local economy	3	Support to local economy (%)	acta		7	CO2 emissions (tonnes CO ₂ -eq/yr)			15	(%)				
	Prevention of prejudice	4	Prevention of prejudice	Ē		8	Eutrophication potential (kgPO4-eq/m²yr)		Services &	16	Community support (yes/no)				
₽	projemice .	5	Future evolution and modularity		Emissions	9	(kgCO2-eq/m² yr)	Leisure facilities	Leisure	17	Proximityto leisure facilities (%)				
inti		6	Gentrification index (-)			10	Global Warming (-) Potential (INVI» (==7)		18	Proximity to services (%)					
-	Social &	7	Labor force participation (%)			12	(kwn/m-)		19	Proximity to services and leisure facilities (%)					
	Economic	8	Potential Employment (%)			13	Orone depletion potential (kg811-en/m2vr)		20	activities (-)					
	conesion	9	Social housing ratio (%)							14	Photochemical Ozone creation potential		Street network	21	Cyclomatic complexity of the street network(-)
		10	Social mixing and solidarity based economy			15	(kgC ₂ H ₄ -eq/m ² yr) Photo oxidants omissions (atopsity (%)		University	22	Development and integration of land parcels				
10		11	Unemployment rate (%) Additional costs for energy efficiency and			16	Light on properties (Ix)		orban planning	23	Homogeneity of the urban fabric (%)				
tso:		1	sustainability (€)		Light	17	Light pollution (-, %)		Noise - Indoor	1	Indoor A-weighted sound pressure level (dBA)				
t	Capital cost	2	Investment costs (€/m²)	Light pollution		19	Luminaire intensity (cd)	골보		3	Building area over noise limit (%)				
ţ		3	Investment costs aggregated (€)		ponution	20	Luminance (cd/m²)	nfo Dife	Noise - Outdoor	4	Noise pollution, silence quality - day (%)				
Ives		4	investment cost (%)			21	Upward Light	8 8 <u></u>		5	Noise pollution, silence quality - night (%)				
	Performance	5	Return on investment (%)		Outdoor	22	Monitoring of air quality (%)		Noise pollution management	6	Acoustics studies (yes/no)				
	Benchmarking & Targeting	1	Verifiable sustainable targets		conditions	23	Thermal comfort of outdoor areas (%)		Indoor air	1	Concentration of pollutants (ug/m ²)				
sts	Cost benefit	2	Cost benefit analysis focused on sustainability	Raw materials		24	Abiotic Depletion Potential elements (kgSB- eq/m ² yr)	Air q Quality 0 q	quality Outdoor air	-					
8	Energy cost	3	Operational energy costs (€/m ²)			25	Accessibility to differentiated waste collection		quality	2	Number of days with bad air quality (days/yr)				
cy cle	chergy cost	4	Operational energy costs aggregated (€)		Solid waste	26	Accessibility to waste sorting facilities (%)	Energy & Managem	Energy & Management	1	Objective/subjective safety measures (-)				
jų.	Non- Energy cost	5	Operational non-energy costs aggregated (€)		management	28	Construction and demolition waste generation	Safety &	systems						
-	Total cost	6	Cost in operational phase (€)		Water	20	(kg/m ²) Water pollution due to material leaching	Security	y Green production Mobility	2	Local production of food (m ² /inhabitant)				
	Total Cost	9	Life cycle costs aggregated (€)		pollution	30	(mg/m² yr)			3	Pedestrian safety paths (%)				
÷		1	Communication and information management (%)		Preservation	1	Conservation of built environment (%)	Ŧ	Indoor	1	Predicted Mean Vote (-)				
me	operation	2	Information and participation of users		0.17	2	Preservation of land (%)	, The second sec	conditions	2	Predicted Percentage Dissatisfied (%)				
Tage		3	Synergy management (-)		Quality Soil sealing	3	Site quality(-) Permeability of site / land (%)	2		4	exploitation of local resources: sun, daylight, wind (-)				
Mai	Social & Economic	5	Environmental activities in primary school (%)		Son searing	+	Change of land use (-)	Ē	Outdoor	5	Heat island effect				
	cohesion	1			Spatial	-	Imperviousness change, Imperviousness	É	2010110113	6	(yes/no) Microclimate Index I (-)				
	Architectural	1	Aesthetic quality (-)	Se			coefficient (-)			1	Availability of safe bicycle routes (m)				
		2	patrimony (yes/no)	P		7	Green zones & recreation areas (m ² /inhabitant)			2	Bicycle and pedestrian network quality (-)				
	Cultural	5	Monument or monumental value / Historical	2		9	Green zones & recreation areas density (%)			З	Bicycle facilities (-)				
	The second se		*erec (-)		Urban design	10	Outdoor space (-)		Mobility &	4	Car sharing pool/station (yes/no)				
	nentage	7	Community management (yes/no)					Alternati							
	nentage	7	Community management (yes/no) Community planning (yes/no)		Urban design	11	Population density (inhabitants/ha)		Alternative	5	Contiguity of bicycle and car routes (%)				
	nemage	7 8 9	Community management (yes/no) Community planning (yes/no) Finalising the design phase (yes/no)		Urban design	11 12	Population density (inhabitants/ha) Urban compactness (dwelling/m ²)		Alternative transportation	5	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%)				
ality	Process &	7 8 9 10	Community management (yes/no) Community planning (yes/no) Finalising the design phase (yes/no) Integrated design in the planning process (-)		Urban design	11 12 13	Population density (inhabitants/ha) Urban compactness (dwelling/m ²) (m ² /m ²)		Alternative transportation	5 6 7	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, length (%)				
Quality	Process & Planning	7 8 9 10 11	Community management (yes/no) Community planning (yes/no) Finalising the design phase (yes/no) Integrated design in the planning process (-) Internal project management (yes/no)		Urban design	11 12 13 14	Population density (inhabitants/ha) Urban compactness (dwelling/m ²) (m ² /m ²) Urban context (-) Urban conversion (%)		Alternative transportation	5 6 7 8	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, length (%) Proximity to bicycle lanes and paths (%)				
Quality	Process & Planning	7 8 9 10 11 12	Community management (yes/no) Community planning (yes/no) Finalising the design phase (yes/no) Integrated design in the planning process (-) Internal project management (yes/no) Process and planning quality (-)	Materials	Urban design	11 12 13 14 15 2	Population density(inhabitants/ha) Urban compactness (dwelling/m ³) (m ⁵ /m ²) Urban context(-) Urban context(son (%) Building materials and construction, OI3 index		Alternative transportation	5 6 7 8 9	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, length (%) Proximity to bicycle lanes and paths (%) Shared mobility(%)				
Quality	Process & Planning	7 8 9 10 11 12 13	Community management (yes/no) Community planning (yes/no) Finalising the design phase (yes/no) Integrated design in the planning process (-) Internal project management (yes/no) Process and planning quality (-) Project management (yes/no) Mondane with sfland and main factor for for	Materials	Urban design Emissions Embodied	11 12 13 14 15 2	Population density (inhabitants/ha) Urban compactness (dwelling/m ²) Urban context(-) Urban conversion (%) Building materials and construction, OI3 index (-)	μα	Alternative transportation Parking	5 6 7 8 9 10	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, length (%) Proximityto bicycle lanes and paths (%) Shared mobility (%) Parking facilities (number/dwelling) Parking facilities (number/dwelling)				
Quality	Process & Planning	7 8 9 10 11 12 13 14	Community management (yes/no) Community planning (yes/no) Integrated design hase (yes/no) Integrated design in the planning process (-) Internal project management (yes/no) Project management (yes/no) Working with skilled professionals (yes/no) Inon zeros stability dualue (re)	Materials	Urban design Emissions Embodied water	11 12 13 14 15 2 1	Population density (Inhabitants/ha) Urban compactness (Weiling/m ²) (m ² /m ²) Urban conversion (%) Building materials and construction, OI3 index (-) Embodied water use (m ² /m ²)	tiodsu	Alternative transportation Parking facilities	5 6 7 8 9 10 11	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, length (%) Proximityto bicycle lanes and paths (%) Shared mobility (%) Parking facilities (number/dwelling) Parking facilities (OP6street parking spaces (%)				
Quality	Process & Planning Risk management	7 8 9 10 11 12 13 14 15 16	Community management (yes/no) Community planning (yes/no) Integrated design in the planning process (-) Integrated design in the planning process (-) Internal project management (yes/no) Project management (yes/no) Working with skilled professionals (yes/no) Long term stability of value (£) Risk management (-)	Materials	Urban design Emissions Embodied water	11 12 13 14 15 2 1 2 2	Population density (Inhabitans(Inha) Urban compactness (dweiling/m ³) Urban context(-) Urban context(-) Building materials and construction, OI3 Index (dweiling materials and construction, OI3 Index Embodied water use (m ⁵ /m ³) Intensity of water treatment (%) Decentional uncertex of (=1)	Transport	Alternative transportation Parking facilities	5 6 7 8 9 10 11 12 14	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, area (%) Shared mobility (%) Parking facilities (mber/dwelling) Parking facilities, Off-street parking spaces (%) Parking places with invoustive features (%)				
Quality	Process & Planning Risk management Territorial	7 8 9 10 11 12 13 14 15 16	Community management (ves/no) Community planning (ves/no) Integrated design in the planning process (-) Integrated design in the planning process (-) Internal project management (ves/no) Process and planning quality (-) Project management (ves/no) Working with skilled professionals (ves/no) Long term stability of value (€) Risk management (-)	Materials	Urban design Emissions Embodied water Freshwater	11 12 13 14 15 2 1 2 3 4	Population density (Inhabitants/ha) Urban compactness (Inveiling/m ³) (mt/mt) Urban context(-) Building materials and construction, OI3 Index (-) Embodied water use (mt/m ³) Intensity of water treatment (%) Operational water use (mt)	Transport	Alternative transportation Parking facilities	5 6 7 8 9 10 11 12 14	Contiguity of bicycle and car routes (%) Pedestrian streets and waikways, area (%) Pedestrian streets and waikways, (eight (%) Shared mobility (%) Parking facilities (number/dwelling) Parking facilities, Offstreet parking spaces (%) Parking paizes with innovative features (%) Access to public transport nodes, areas (%)				
Quality	Process & Planning Risk management Territorial management & Urban decien.	7 8 9 10 11 12 13 14 15 16 17	Community management (ves/no) Community planning (ves/no) Finalising the design phase (ves/no) Intergrade design in the planning process (-) Internal project management (ves/no) Process and planning quality (-) Process and planning quality (-) Process management (ves/no) Working with skilled professionals (ves/no) Long term stability of value (€) Risk management (-) Urban complexity, Shannon-Wiener index (-)	Materials	Urban design Emissions Embodied water Freshwater	11 12 13 14 15 2 1 2 3 4 5	Population density (Inhabitants/ha) Urban compactness (Idveiling/m ³) Urban context(-) Urban context(-) Urban context(-) Building materials and construction, OI3 index (-) Embodied water use (m ⁺ /m ³) Intensity of water treatment (%) Operational water use (m ⁺) Water consumption (I/inhabitant day) Dedicated network (key/no)	Transport	Alternative transportation Parking facilities	5 6 7 8 9 10 11 12 14 15	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Proximity to bicycle lanes and paths (%) Shared mobility (%) Parking facilities (number/dueling) Parking facilities (number/dueling) Parking facilities (number/dueling) Parking paties with innovative features (%) Access to public transport nodes, areas (%) (%)				
Quality	Process & Planning Risk management Territorial management & Urban design	7 8 9 10 11 12 13 14 15 16 17 1	Community management (ves/no) Community planning (ves/no) Integrated design in the planning process (-) Integrated design in the planning process (-) Integrated design in the planning process (-) Process and planning quality (-) Process and planning quality (-) Project management (ves/no) Working with skilled professionals (ves/no) Long term stability of value (€) Risk management (-) Urban complexity, Shannon-Wiener index (-) Fielbility and adaptability, during the life of	Materials	Urban design Emissions Embodied water Freshwater	11 12 13 14 15 2 1 2 3 4 5 6	Population density (Inhabitants/ha) Urban compactness (Idvelling/m ³) Urban context(-) Urban context(-) Building materials and construction, OI3 index (-) Embodied water use (m ⁴ /m ³) Intensity of water treatment (%) Operational water use (m ⁴) Water consumption (I/inhabitant day) Dedicated network (yes/no) Intensity of rainwater usage (%)	Transport	Alternative transportation Parking facilities Public transportation	5 6 7 8 9 10 11 12 14 15 16	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Proximityto bicycle lanes and paths (%) Shared mobility (%) Parking facilities, (number/dwelling) Parking facilities, Off-street parking spaces (%) Parking paces with innovative features (%) Access to public transport nodes, areas (%) Maccess to public transport, District Accessibility Index (-)				
Quality	Process & Planning Risk management Urban design Flexibility & Adaptability	7 8 9 10 11 12 13 14 15 16 17 1	Community management (yes/no) Community planning (yes/no) Integrated design hase (yes/no) Integrated design hase (yes/no) Process and planning guality (-) Process and planning guality (-) Project management (yes/no) Working with skilled professionals (yes/no) Long term stability of value (C) Risk management (-) Urban complexity, Shannon-Wiener index (-) Fieldbility and adaptability, during the life of the project (yes/no) Fieldbility and adaptability. Guring the life of the project (yes/no)	Materials	Urban design Emissions Embodied water Freshwater Rainwater	11 12 13 14 15 2 1 2 3 4 5 6 7	Population density (Inhabitans(Inha) Urban compactness (dweiling/m ³) (m ² /m ³) Urban context(-) Urban conversion (Sk) Building materials and construction, OI3 Index (b) Embodied water use (m ⁵ /m ³) Intensity of water treatment (Sk) Operational water use (m ⁵) Water consumption ((/inhabitant day) Dedicated network (yet/no) Intensity of rainwater usage (Sk) Landscaped and accessible referencino ponds and	Transport	Alternative transportation Parking facilities Public transportation	5 6 7 8 9 10 11 12 14 15 16 18	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, area (%) Proximity to bicycle lanes and paths (%) Shared mobility (%) Parking facilities, Off-street parking spaces (%) Parking places with invovative features (%) Access to public transport nodes, population (%) Accessio to public transport, District Accessibility Index (-)				
Quality	Process & Planning Risk management Urban design Flexibility & Adaptability	7 8 9 10 11 12 13 14 15 16 17 1 2	Community management (yes/no) Community planning (yes/no) Integrated design in the planning process (-) Integrated design in the planning process (-) Integrated design in the planning process (-) Process and planning quality (-) Project management (yes/no) Working with skilled professionals (yes/no) Lang term stability of value (E) Risk management (-) Urban complexity, Shannon-Wiener index (-) Flexibility and adaptability, during the life of the project (yes/no) Flexibility and adaptability, programming (yes/no)	Materials	Urban design Emissions Embodied water Freshwater Rainwater	11 12 13 14 15 2 1 2 3 4 5 6 7 8	Population density (Inhabitants/ha) Urban compactness (Investing/m ³) (mr/m ³) Urban context(-) Building materials and construction, OIS Index (-) Embodied water use (m ³ /m ³) Intensity of water treatment (%) Operational water use (m ³) Water consumption (I/Inhabitant day) Dedicated network (yes/no) Intensity of rainwater useg (%) Landscaped and accessible retention ponds and ditches (yes/no)	Transport	Alternative transportation Parking facilities Public transportation	5 6 7 8 9 10 11 12 14 15 16 18 19	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, area (%) Proximity to bicycle lanes and paths (%) Shared mobility (%) Parking facilities, Off-street parking spaces (%) Access to public transport nodes, areas (%) Access to public transport nodes, areas (%) Access to public transport, Jostrict Accessibility Index (-) Accessibility to public transport, Lense Index(-) Dwellings with access to public transport (%)				
Quality	Process & Planning Risk management Territorial management & Urban design Flexibility & Adaptability	7 8 9 10 11 12 13 14 15 16 17 1 2 3	Community management (ves/no) Community planning (ves/no) Finalising the design phase (ves/no) Intergrade design in the planning process (-) Internal project management (ves/no) Process and planning quality (-) Process and planning quality (-) Process and planning quality (-) Rocess and qual	Materials	Urban design Emissions Embodied water Freshwater Rainwater	11 12 13 14 15 2 1 2 3 4 5 6 7 7 8 9	Population density (Inhabitants/ha) Urban compactness (Inveiling/m ³) (mt/mt) Urban context(-) Building materials and construction, OI3 Indes (-) Embodied water use (mt/m ³) Intensity of water treatment (Hs) Operational water use (mt) Water consumption (I/Inhabitant day) Dedicated network (key/no) Intensity of rainwater usage (Hs) Landscape and accessible retention ponds and diches (yex/no) Rainwater collection from roofs (Hs) Rainwater collection from roofs (Hs)	Тапѕрогі	Alternative transportation Parking facilities Public transportation	5 6 7 8 9 10 11 12 14 15 16 18 19 20	Contiguity of bicycle and car routes (%) Pedestrian streets and waikways, area (%) Pedestrian streets and waikways, area (%) Proximity to bicycle lanes and paths (%) Shared mobility (%) Parking facilities (number/dwelling) Parking facilities, Off-street parking spaces (%) Parking paties with innovative features (%) Access to public transport nodes, areas (%) Access to public transport nodes, population (%) Accessibility to public transport, Lense index(-) Dwellings with access to public transport (%) Connectivity of the street network (number/m ³)				
alue Quality	Process & Planning Risk management Territorial management & Urban design Flexibility & Adaptability Process &	7 8 9 10 11 12 13 14 15 16 17 1 2 3 4	Community management (ves/no) Community planning (ves/no) Finalising the design phase (ves/no) Integrated design in the planning process (-) Integrated design in the planning process (-) Project management (ves/no) Project management (ves/no) Working with skilled professionals (ves/no) Long term stability of value (€) Risk management (-) Urban complexity, Shannon-Wiener index (-) Fiexibility and adaptability, during the life of the project (ves/no) Fiexibility and adaptability, programming (ves/no) Assessing the current situation (ves/no) Competent professional team	Materials	Urban design Emissions Embodied water Rainwater Total water	11 12 13 14 15 2 1 2 3 4 5 6 7 7 8 9 10	Population density (Inhabitants/ha) Urban compactness (Idveiling/m ³) (mt/mt) Urban context(-) Urban context(-) Urban context(-) Building materials and construction, OI3 index (-) Embodied water use (mt/m ³) Intensity of water treatment (%) Operational water use (mt) Water consumption (I/inhabitant day) Dedicated network (yes/no) Intensity of rainwater usage (%) Landstoped and accessible refer frion ponds and dichtes (yes/no) Rainwater collection from roots (%) Respecting streaming continuity (yes/no) Operational vater use and wate water (mt)	Tansport	Alternative transportation Parking facilities Public transportation Street network	5 6 7 8 9 10 11 12 14 15 16 18 19 20 21	Contiguity of bicycle and car routes (%) Pedestrian streets and waikways, area (%) Proximity to bicycle lanes and paths (%) Shared mobility (%) Parking facilities (number/dwelling) Parking facilities, Offstreet parking spaces (%) Parking palaces with innovative features (%) Access to public transport nodes, areas (%) Access to public transport nodes, areas (%) Access to public transport, loss index (%) Index (.) Dwelling with access to public transport (%) Connectivity of the street network (number/m ²) Cul-de-sar codes not public transport (%)				
Value Quality	Process & Planning Risk management Territorial management Flexibility & Adsprability Process & Planning	7 8 9 10 11 12 13 14 15 16 17 1 2 3 4 4 5	Community management (yes/no) Community planning (yes/no) Integrated design has (yes/no) Integrated design has (yes/no) Integrated design has (yes/no) Process and planning guality (-) Project management (yes/no) Working with skilled professionals (yes/no) Long term stability of value (£) Risk management (-) Urban complexity, Shannon-Wiener index (-) Fiexibility and adaptability, gorgamming (yes/no) Assessing the current situation (yes/no) Competent professional team Economic advantage of culter in comparison to single building (-)	Materials	Urban design Emissions Embodied water Freshwater Rainwater Total water use	11 12 13 14 15 2 1 2 3 4 5 6 7 8 9 10 11	Population density (Inhabitants/Ina) Urban compactness (dweiling/m ³ (m ³ /m ³) Urban context[-) Urban context[-) Building materials and construction, OI3 Index (-) Embodied water use (m ³ /m ³) Intensity of water treatment (%) Operational water use (m ³) Water consumption (I/habitant day) Dedicated network (ye4/no) Intensity of rainwater usage (%) Landsraped and accessible referencion ponds and ditches (ye4/no) Respecting streaming continuity (ye4/no) Operational water use and waste water (m ³) Intensity of watewater treatment (%)	Tansport	Alternative transportation Parking facilities Public transportation	5 6 7 8 9 10 11 12 14 15 16 18 19 20 21 22	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, area (%) Proximity to bicycle lanes and paths (%) Shared mobility (%) Parking facilities, Off-street parking spaces (%) Parking places with innovative features (%) Access to public transport nodes, population (%) Access to public transport nodes, population (%) Accessito public transport, Lense index(?) Dweilings with access to public transport (%) Connectivity of the street network (number/m?) Culide-acc roads and path ratio (%) Scale of the street network (m)				
Value Quality	Process & Planning Risk management Territodia management Flexibility & Adsprability Process & Planning	7 8 9 10 11 12 13 14 15 16 17 17 2 3 4 4 5 6	Community management (yes/no) Community planning (yes/no) Integrated design phase (yes/no) Integrated design in the planning process (-) Integrated design in the planning process (-) Integrated design in the planning process (-) Process and planning quality (-) Project management (yes/no) Working with skilled professionals (yes/no) Long term stability of value (E) Risk management (-) Urban complexity, Shannon-Wiener index (-) Fleidbility and adaptability, during the life of the project (yes/no) Fleidbility and adaptability, during the life of the project (yes/no) Fleidbility and adaptability, programming (yes/no) Competent professional team Economic advantage of clutter in comparison to single buildings (-) Equipment and services pooling	Materials	Urban design Emissions Embodied Treshwater Rainwater Total water use	11 12 13 14 15 2 1 2 1 2 3 4 5 6 7 8 9 10 11 12	Population density (Inhabitants/ha) Urban compactness (Meetling/m ³) (mt/m ³) Urban context(-) Building materials and construction, OI3 Index (-) Building materials and construction, OI3 Index (-) Building materials and construction, OI3 Index (-) Building materials and construction, OI3 Index (-) Department of water treatment (%) Dedicated network (yes/no) Intensity of railmater usage (%) Landscaped and accessible retention ponds and ditches (yes/no) Respecting streaming construity (yes/no) Operational water use and waste water (m ²) Intensity of wastewater treatment (%) Water management (/)nhabitant day)	Transport	Atternative transportation Parking facilities Public transportation Street network	5 6 7 8 9 10 11 11 12 14 15 16 18 19 20 21 22 23	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, area (%) Proximity to bicycle lanes and paths (%) Shared mobility (%) Parking facilities, Off-street parking spaces (%) Parking facilities, Off-street parking spaces (%) Access to public transport nodes, areas (%) Access to public transport nodes, areas (%) Access to public transport nodes, areas (%) Accessibility to public transport, Lense index(-) Dwellings with access to public transport (%) Connectivity of the street network (number/m) Cui-de-asc roads and path ratio (%) Traffic modal split (%)				
Value Quality	Process & Planning Risk management Territorial management & Urban design Urban design Planning Planning Social &	7 8 9 10 11 12 13 14 15 16 17 1 2 3 4 5 6 7	Community management (ves/no) Community planning (ves/no) Finalising the design phase (ves/no) Intergrated design in the planning process (-) Internal project management (ves/no) Process and planning quality (-) Process and planning quality (-) Process and planning quality (-) Rocess and quality (-) Rocess and quality quality (-) Rocess and quality quality (-) Rocess and quality (-) Rocess and quality (-) Completent professional team Economic advances of cluster in comparison to single buildings (-) Equipment and services pooling Tourist frequency trends, seasonality overright stay (-)	Materials	Urban design Emissions Embodied water Freshwater Total water use Wastewater	11 12 13 14 15 2 1 2 2 3 4 4 5 6 6 7 7 8 9 10 11 12 13	Population density (Inhabitants/ha) Urban compactness (Meetling/m ³) (mr/m ³) Urban context(-) Building materials and construction, OI3 index (-) Embodied water use (m ³ /m ³) Intensity of water treatment (%) Operational water use (m ³) Water consumption (I/inhabitant day) Dedicated network (yet/no) Intensity of rainwater useg (%) Landscaped and accessible retention ponds and ditches (yes/no) Rainwater collection from rode (%) Respecting streaming continuity (yes/no) Operational water use and waster water (m ³) Intensity of wastewater treatment (%) Water conservent (I/inhabitant day) Beremoval (%)	tootseer	Atternative transportation Parking facilities Public transportation Street network Artificial	5 6 7 8 9 9 10 11 12 14 15 16 18 19 20 21 22 23 1	Contiguity of bicycle and car routes (%) Pedestrian streets and walkways, area (%) Prosimity to bicycle lanes and paths (%) Shared mobility (%) Parking facilities (number/dwelling) Parking facilities (number/dwelling) Parking facilities (number/dwelling) Parking places with innovative features (%) Access to public transport nodes, areas (%) Access to public transport, District Accessibility Index (-) Accessibility to public transport, Lense index(-) Dwellings with access to public transport (%) Connectivity of the street network (number/m ²) Cui-de-ace roads and path ratio (%) Scale of the street network (m) Traffic modal split (%) Illuminance (x)				



4.3 SBTool Multi-Criteria Assessment

The CESBA MED Generic Framework for Sustainable Neighborhoods is based on the "SBEMethod" (Sustainable Built Environment Method) developed by iiSBE (international initiative for a Sustainable Built Environment). The SBEMethod is a generic multi-criteria analysis methodology for assessing the sustainability of the built environment. Starting from a set of assessment entries (criteria), the SBEMethod provides a final concise score about a building, urban area or territory overall performance. The SBEMethod [Moro 2017] constitutes the reference assessment methodology for the CESBA MED SN Generic Framework.

The SBEMethod [Moro 2017] is organized in:

- Issues (describe general themes for sustainability assessment)
- Categories (address particular aspects of issues)
- Criteria (detail specific aspects of categories).



Each issue includes a different number of categories, each one of them describing a specific aspect of the issue that it belongs to. Categories include different criteria, each of them describing a particular aspect of the corresponding category. Criteria represent the basic assessment entries used to characterize an urban area from the very beginning of the assessment process. The indicators quantify the performance with respect to each criterion. In principle, several indicators can be associated with the same criterion, since one can define multiple strategies to quantify the urban area performance with regard to a specific criterion. However, in most cases, each criterion is generally associated with a single indicator. A final concise score summarizes the overall performance of an urban area with respect to all criteria. The score is computed starting from indicator values following an assessment procedure that is based on three main steps, i.e. characterization, normalization and aggregation step. The relevant procedures are detailed in D3.3.1 [Moro 2017].



5. References

Barbano G., N. Eßig, P. Mittermeier, M. Orova, P. Beagon, L. Claudi, J.F. Gómez-Salcedo, F. Kiedaisch (2016). Definition of sustainable Key Performance Indicators, NEWTREND Project, H2020 Program, European Commission. http://newtrend-project.eu/wp-content/uploads/2015/11/NewTREND_WP2_D2.2_KPI_GB04_V5.2.pdf

Moro A. (2017). CESBA MED D3.3.1 Testing Protocol, CESBA MED Consortium, Marsaille.

CABEE http://www.cabee.eu CAT MED http://www.catmed.eu CEC5 http://wiki.cesba.eu/wiki/CEC5 CLUE http://www.clue-project.eu ENERBUILD http://www.enerbuild.eu EPISCOPE http://www.episcope.eu FASUDIR http://fasudir.eu IRH-MED http://fasudir.eu IRH-MED http://wiki.cesba.eu/wiki/IRH_med NewTREND http://newtrend-project.eu OpenHouse http://newtrend-project.eu SuPerBuildings http://cic.vtt.fi/superbuildings Eco-Quartier http://www.eco-quartiers.fr Protocollo ITACA http://wiki.cesba.eu/wiki/Protocollo_Itaca QDM http://www.envirobatbdm.eu/baroque



Appendix A

OVERVIEW OF PROJECTS & ASSOCIATED INDICATORS

- A.0 Template for project presentations
- A.1 CABEE
- A.2 CAT-MED
- A.3 CEC5
- A.4 CLUE
- A.5 ENERBUILD
- A.6 EPISCOPE
- A.7 FASUDIR
- A.8 IRH-MED
- A.9 NewTREND
- A.10 OPEN HOUSE
- A.11 SuPerBuildings
- A.12 Eco-Quartier
- Protocollo ITACA (see A.4)
- A.13 QDM



A.0 - Template for Project/Indicator presentations

Project funding source (logo)

PROJECT ACRONYM

Project logo

Full project name Project website

Provide a short general project description (less than 200 words). Outline objectives and achieved results, state period and source of funding.

INDICATORS

	Performance indicator name (units)									
XXX.XX.XX	ISSUE	(CATEGORY	LE	VEL	SCALE				
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	e.g.		e.g. Energy	B-Basic /	S-Standard	B-Building				
	Environment			/ A-A0	dvanced	N-Neighborhood				
GENERAL										
Description	Provide a general description of the indicator, explain what it represents and how it is used									
Background	ckground State whether this indicator has been adopted from a previous project; in such a case name t project and give a valid reference for it									
References	Give valid references for English speaking readers to get further insight on the indicator. Supply									
	references as numbers in brackets. The corresponding full reference will be supplied in the									
	section "REFERENCE	:5".								
LEVEL Derived from	Coftware tool		Operational d		In citu	maaguramanta				
Check - X - as	Software tool	/		dld	Othor					
appropriate)		JIIS	Empirical/Lite	rature	Other	(specify)				
Details	Provide details to ju	stify the	"Level" characteriza	ition (basic/s	tandard/adva	nced) of the indicator				
	given in the appoint	ed space	e above. Provide info	prmation reg	arding the cor	nplexity of the				
	describe the complexity of the tool and refer to its cross-national availability									
Areas covered	Highlight the main areas that are covered by the indicator and those that are not. Give the									
	necessary information (areas covered/limitations) to highlight the added value of the indicator									
	approach under the specific project, and if known, as opposed to the one(s) proposed in other									
	This information will be helpful especially if there are more than one projects proposing different									
	approaches for the same indicator,									
Barriers	Discuss the difficulties encountered while assessing/applying the indicator. Refer to its									
Dutin	transnational applicability.									
Rating	Provide information on existing rating schemes for the indicator									
Kejerences Give valid references for English speaking readers to get further insight on the methodo is followed to derive the indicator. Include reference numbers here. Provide full reference					le full references					
	under "REFERENCES	" section	۱.							
SCALE										
Application	Provide the range of	fexisting	g examples from the	application	of the indicato	or to justify its				
	classification as sma	ll (buildi	ng) or large (neighbo	ourhood) sca	ile.	head) of the indicator				
Details	given in the appoint	stily the	scale characteriza	ition (buildin	g / neignbour	nood) of the indicator				
Multiscale	Discuss whether it is	possible	e or not to extrapola	te the indica	tor result from	n single building to a				
	group of buildings of	f similar	function							
References	Give valid reference	s for Eng	lish speaking reader	rs to get furt	her insight on	existing applications				
	of the indicator in pi	ilot studi	ies. Supply reference	es as numbei	's in brackets.	The corresponding full				
RFFFRFNCFS	reference win be su	oplieu III								
[1]	Publication reference (see exam	ple A.6 for format styl	e) Provide w	eb source(if ava	ilable): http://				
[2]	[2]									

FINAL D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5



A.1 - CABEE



CABEE Capitalizing Alpine Building Evaluation Experiences



http://www.cabee.eu/

CABEE was a transnational Alpine project to create and implement an Alpine-wide guideline for definition, procurement, production, assessment and promotion as well as learning about new and refurbished Nearly-Zero-Emission-Buildings (NZEB) and their neighbourhoods.

CABEE capitalized information from finished and ongoing EU-projects but also projects from the Alpine Space program. It focused on a mass oriented approach with low entry barriers and an ongoing Open-Source support. Pilot activities were settled on public tendering, users' behaviour and toward a 100% eco-assessment approach. The integration of micro smart energy grids was explored.

Furthermore, markets for NZEBs have been prepared, especially in cooperation with public authorities and SMEs.

CABEE harmonized existing tools and policies and formulated a common transnational Alpine-wide Guideline - CESBA - for buildings and a Knowledge-Hub, which has exceed the project life time, the CESBA Wiki. All results of CABEE can be downloaded from the <u>CESBA wiki</u>.

In the CABEE pilot projects, only 15 'must' indicators have been tested on all the pilots. The others have been tested only on some pilot depending on the contextualization.

Then, we only give here details of the 15 'Must' indicators that have really been tested and 9 indicators that are not in other projects/tools.

ISSUE/Category	criterion name	indicator
ENV-En 4	Electric energy and Virtual power systems (VPS)	percentage of appliances connected to the VPS
ENV-En 12	Primary Energy for Heating	percentage of PE compared to law limit
ENV-En 11	Primary Energy for Cooling	percentage of PE compared to law limit
ENV-En 13	Primary Energy for Public Lighting	percentage of PE compared to law limit
ENV-Im 14	Intensity of GHG emissions	percentage of GHG emissions over the average
ENV-Im 3	Access to waste sorting facilities	users within walking distance from sorting facilities
ENV-Im 13	Impact on surrounding Buildings	quality reduction of neighbouring buildings and areas
ENV-LU 6	Preservation of land	Ratio of previously used land over



		total
ENV-Wa 2	Intensity of Rainwater Usage	ratio of collected and consumed rainwater
SOC-TR 7	Internal Accessibility (public transport)	district accessibility index
SOC-Tr 13	Shared mobility	inhabitants with access to shared mobility
SOC-Ac 11	Proximity to services	ratio of inhabitants within 300 m over total
SOC-Ac 8	Collective facilities and outsourcing of services	inhabitants within 50 m of communal housing services
SOC-Ac 9	Flexibility of residential buildings	percentage of living surface with flexible floor plans
SOC-Ac 1	Access to a broadband communication network	ratio of inhabitants with broadband access
SOC-Ac 13	Social gatherings and common cluster activities	established services and social gatherings
SOC-TC 3	Exploitation of local resources: sun, daylight, wind	points for outdoor numerical simulations present
SOC-SS 3	Local production of food	surface of garden areas per capita
SOC-SS 5	Objective/subjective safety measures	number of established safety measures
FIN-Va 2	Economic advantage of cluster in comparison to single buildings	cost reduction through common strategies
FIN-Qu 5	Process and planning quality	points depending on planning activity report
FIN-Qu 6	Risk management	synergies with risk management plan
FIN-Ma 1	Communication and information management	ratio of informed/trained adult inhabitants
FIN-Ma 4	Synergy management	synergies with management plan


INDICATORS

	Electric energy and Virtual power systems (%)						
ENV.En.23	ISSUE	C	ATEGORY	LE	VE	L	SCALE
	Environmental		Energy		N		
GENERAL							
Description	Intent: Optimize electr	ic ei	nergy managemer	nt within th	ne b	uilding cl	uster.
	Indicator: Percentage of	ndicator: Percentage of electric appliances connected to the virtual power system					
	Unit of measure: %						
Background	CABEE Cluster Tool						
References	This indicator was expe	erim	ented in CABEE pr	roject [1],	[2]		
LEVEL	-	1					
Derived from	Software tool		Operational data	3		In situ n	neasurements
	Simple Calculations	Х	Empirical/Literat	ure		Other (s	specify)
Details	Assessment method: A	vir	tual power system	integrates	s tw	o existin	g concepts of Virtual
	Power Plant (VPP) and	Virt	ual Power Load (V	'PL). It com	1bir	ies load, s	storages and
	generations into a sing	le a	ggregation. For the	e documer	ntat	ion of the	e VPS use the
	template from Alpenergy project (www.alpenergy.net).						
Areas covered	VPS concerns all types	VPS concerns all types of building and all sizes of areas.					
Barriers	Two main barriers for t	Two main barriers for this indicator :					
	 Only few area 	s ha	ive a VPS system				
	 It's very difficult 	ult t	o evaluate the exi	sting appli	anc	es and m	ore over wich ones
	are connected	l to	the VPS				
Rating	Score: The score for th	is in	dicator is 20. Assig	gn 20 point	ts if	all the el	ectric appliances
	are connected to the V	PS a	and 0 points if non	e of them	is c	onnected	I. Determine the
Defense	other scores proportio	nall	y.		21		
References	This indicator was expe	erim	iented in CABEE pi	roject [1], [[2]	and Alper	hergy project{3]
Application	This indicator can be u	co d	for buildings but i		t	d for hui	Iding clustors or
Application	wider areas	seu	for buildings but is	s more auc	ipte		luing clusters of
Details	The interest of the indi	cato	or is to evaluate th	e canacity	to	share nro	duction and adapt
Details	it to the consumption	For	this you need to	have vario	lis r	oroductio	n plants and also
	various types of consul	not	ion that you can n	nanage to	crea	ate a virti	ual load.
Multiscale	The calculation can be	don	e at building level	if power p	olan	ts exists l	but a real efficiency
	need different power plants and different consumptions profile.						
		-		1	r	-	
References	[1], [2]], [3]						
•							
REFERENCES		_		_			

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf
[3]	http://alpenergy.net/images/stories/White_Book_VPS.pdf



	Primary energy for cooling (%)								
ENV.En.14	ISSUE	C	ATEGORY	LEVI	EL	SCALE			
	Environmental		Energy	S		N			
GENERAL									
Description	Intent: Reduce the need of energy for cooling.								
	Indicator: Percenta	age of p	rimary energy und	ler the limit.					
	Unit of measure: %								
Declaration		.1							
Background	This indicator was) ovnorim	onted in CAREE n	roject [1] [2]					
		experiii	lented in CABLE p	i oject [1], [2]					
Derived from	Software tool	- T	Operational dat	a	In situ r	neasurements			
Derived from	Simple Calculation	s X	Empirical/Litera	ture	Other (specify)			
Details	Assessment metho		sess this criterion	estimate (vi	a project a	assumptions or via			
Detans	actual data if avail	ahle) the	e cooling primary	energy requir	rement of	every building in the			
	cluster [kWh/m2].	Aggrega	ate these values th	rough a weig	phted mea	in over the floor			
	surfaces, to obtain	a cluste	er value.		,				
	Divide the cluster	neating	primary energy re	quirement by	/ the local	limit and multiply			
	by 100 to obtain th	ne perfo	rmance as a perce	entage ratio.					
Areas covered	Cluster composed	of the s	ame types of build	lings. The val	ues are di	fferent for each type			
	of building and thu	is the bi	uilding group must	t be compose	d of only	one type of building.			
	Concerning the dif	Concerning the different thermal regulations and calculations in different countries,							
	the absolute values are not comparable but the ratio is comparable.								
Barriers	Two main barriers	for this	indicator :						
	 the consu 	mption	calculation and re	quirement av	vailable in	cludes not only			
	cooling de	emand.	Thus it could be co	omplicated to	o find just	the cooling demand			
	and the c	orrespo	nding requiremen	t.					
	- the requir	ements	are different for	each type of I	ouilding ar	nd then if the cluster			
	is compos	is composed of different types of buildings, the ratio cannot be compared with							
	any requirement								
	indicator can be the average of the % of each building.								
Ratina	Score: The score for this indicator is 40. Assign 40 points if the result, evaluated								
	through the assess	ment m	ethod. is equal or	less than the	25% of th	ne local limit.			
	For example, if the	limit is	100 kWh/m2 to r	each the max	imum sco	re, the cluster			
	energy performan	ce has to	be equal or lowe	er than 25 kW	/h/m2. Ass	sign 0 points if the			
	cluster energy per	formanc	e is equal or high	er than the lo	cal limit. [Determine the other			
	scores proportiona	illy.							
References	This indicator was	experim	ented in CABEE p	roject [1], [2]					
SCALE									
Application	This indicator is sp	ecific fo	r building clusters	even if it is b	ased on ir	ndividual building			
	values.								
Details	The interest of the	indicate	or is to evaluate n	ot the efficier	ncy of eac	h building but the			
N 4	global efficiency of	the gro	up of buildings.	- f - !					
iviuitiscale		ased or	the performance	e of each build	aing but tr	he interest of the			
	giobal periormanc	e is to fi	ave an average Va	so officiont b	ipie, some	ult is that the cluster			
	can be more efficie	nt (or n	of than the rea	uirement ave	n if all the	huildings don't			
	reach the requiren	hent				. Sunungs uon t			
References	[1] [2]	iciit.							
nejerences	[+], [4]								

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Primary ene	rgy foi	heating (%)							
ENV.En.15	ISSUE	C	ATEGORY	LE	VEL	SCALE				
	Environmental		Energy		S	N				
GENERAL										
Description	Intent: Reduce the	Intent: Reduce the need of energy for heating.								
	Indicator: Percent	age of pi	imary energy und	der the limit	t.					
	Unit of measure: 9	Jnit of measure: %								
Background	The target percen	tage for	the cluster energy	/ performai	nces is set ad	ccording to the				
	objectives promot	ed by th	e European Comr	nission with	nin the Prog	ram Horizon 2020				
References	This indicator was	experim	ented in CABEE p	roject [1], [2]					
LEVEL	Γ		Γ							
Derived from	Software tool		Operational dat	а	In situ r	measurements				
	Simple Calculation	is X	Empirical/Litera	ture	Other (specify)				
Details	Assessment meth	od: To as	sess this criterion	, estimate	(via project a	assumptions, or via				
	actual data if avai	able) the	e heating primary	energy req	uirement of	every building in				
	the cluster [kWh/	n2]. Agg	regate these valu	es through	a weighted	mean over the floor				
	surfaces, to obtain	i a cluste	r value.		h	the state of the state but state is a				
	by 100 to obtain t	neating bo porfo	primary energy re	quirement	by the local	limit and multiply				
Areas covered	Cluster composed	of the s	ame types of built	lings The v). Values are di	fferent for each type				
Areus covereu	of building and th	on the h	uilding group mus	t he compo	sed of only	one type of building				
	Concerning the di	ferent tl	nermal regulation	s and calcu	lations in dif	fferent countries				
	the absolute value	es are no	t comparable but	the ratio is	comparable					
Barriers	Two main barriers	for this	indicator :							
	- the consi	umption	calculation and re	equirement	available in	cludes mostly not				
	only heat	ing dem	and. Then it could	l be compli	cated to find	just the heating				
	demand	and the o	corresponding rec	uirement.						
	- the requi	rements	are different for	each type o	of building ar	nd then if the cluster				
	is compo	sed of di	fferent types of b	uildings, th	e ratio cann	ot be compared with				
	any requ	any requirement								
	To solve this problem, an average requirement can be established for the Cluster or the									
	indicator can be t	ne avera	ge of the % of eac	h building.						
Rating	Score: The score for this indicator is 40. Assign 40 points if the result, evaluated									
	through the asses	sment m	ethod, is equal or	less than t	he 25% of th	ne local limit.				
	For example, if the		100 KWN/M2 to r	each the m		re, the cluster				
	cluster energy per	formance	a is equal or high	er than the	local limit	Sign U points if the				
	scores proportion	ally	e is equal of flight							
References	This indicator was	exnerim	ented in CABEE n	roiect [1] [21					
SCALE	This indicator was	схрени			, 2]					
Application	This indicator is so	ecific fo	r building clusters	even if it is	s based on ir	ndividual building				
	values.									
Details	The interest of the	indicate	or is to evaluate n	ot the effic	iency of eac	h building but the				
	global efficiency o	f the gro	up of buildings.			_				
Multiscale	The calculation is	based or	the performance	e of each bu	uilding but th	ne interest of the				
	global performant	e is to h	ave an average va	lue. For exa	ample, some	e new buildings can				
	be very efficient a	nd some	old buildings not	so efficient	t but the res	ult is that the cluster				
	can be more effici	ent (or n	ot !) than the req	uirement e	ven if all the	e buildings don't				
	reach the require	ment.								
References	[1], [2]									

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Primary ener	gy for	[.] public lighti	ng (%)			
ENV.En.16	ISSUE	C	ATEGORY	LE	VE	L	SCALE
	Environmental		Energy		S		N
GENERAL							
Description	Intent: Reduce the Indicator: Percenta Unit of measure: %	ntent: Reduce the need of energy for public lighting. ndicator: Percentage of primary energy over the limit. Jnit of measure: %					
Background	CABEE Cluster Too	bl					
References	This indicator was	experim	ented in CABEE p	roject [1],	[2]		
LEVEL							
Derived from	Software tool		Operational dat	а		In situ r	measurements
	Simple Calculation	s X	Empirical/Litera	ture	X	Other (s	specify)
Details	Assessment method: To assess this criterion, estimate (via project assumptions, or via actual data if available) the public lighting primary energy requirement of all public areas in the cluster [kWh/m2]. Aggregate these values through a weighted mean over the floor surfaces, to obtain a cluster value. Divide the cluster public lighting primary energy requirement by the local limit and multiply by 100 to obtain the performance as a percentage ratio.						
Areas covered	All types of buildin	g cluste	r areas.				
Barriers	Estimating the pub points is quite easy power of each ligh	Estimating the public lighting consumptions is not so easy. If the number of lighting points is quite easy to find, the estimation of the consumption needs to know the power of each lighting points and the average lighting hours					
Rating	Score: The score for this indicator is 40. Assign 40 points if the result, evaluated through the assessment method, is equal or less than the 25% of the local limit. For example, if the limit is 100 kWh/m2 to reach the maximum score, the cluster energy performance has to be equal or lower than 25 kWh/m2. Assign 0 points if the cluster energy performance is equal of higher than the local limit. Determine the other scores proportionally.						
References	[1], [2]				_		
SCALE							
Application	This indicator is sp	ecific fo	r building clusters	•			
Details	This indicator is sp	ecific fo	r building clusters	as it conce	erns	the area	s between the
	buildings and not t	he build	lings themselves.				
Multiscale	-						
References	This indicator was	experim	ented in CABEE p	roject [1],	[2]		
DEFEDENCES							

REFERENCES							
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf						
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf						



	Accessibility t	o wa	ste sorting fa	acilities	(%)				
ENV.Im.26	ISSUE	С	ATEGORY	LE	VEL	SCALE			
	Environmental		Impacts		S	B / N			
GENERAL	_								
Description	Intent: It aims to inc	Intent: It aims to increase recycling quota and raise residents' awareness of source							
	Indicator: Percentage	reparation and recycling.							
	Unit of measure: %	se or u.		s than 50 h	inom waste	sorting racinties.			
Background	CABEE Cluster Tool								
References	This indicator was e	xperim	nented in CABEE p	roject [1], [2]				
LEVEL									
Derived from	Software tool		Operational dat	a	In situ r	neasurements			
	Simple Calculations	X	Empirical/Litera	ture	Other (s	specify)			
Details	Assessment method	l: To as	ssess this criterion	, calculate	the amount	of users who have			
	access to waste sort	ing fac	cilities in the same	building o	r in its imme	diate vicinity.			
	at cluster scale or w	ider			ieu io a was	te management plan			
	Quantify also effort	Quantify also efforts relating to waste avoidance and recycling through information							
	and educational car	and educational campaigns.							
Areas covered	All types of building	group	S.						
Barriers	The access to waste	sortin	g facilities has not	the same	signification,	/influence for			
	enterprises (mostly	the wa	aste management	is included	in a 'cleanin	ng service') and for			
	housing (people are	direct	ly involved. So if y	ou have a g	group of buil	ding composed of			
	tertiary and housing	g buildi	ing, the result will	be difficult	to compare	to a housing or a			
	tertiary building clu	ster ra	tio. to calculate the p	umbor of u	core for oach	h huilding ocnocially			
	for the tertiary build	lings o	r for example for	shons or ni	sers for each	s building especially			
	for the tertiary built	The tertiary buildings of for example for shops of public services.							
Rating	Score: The score for	this in	dicator is 15. Assi	gn 15 point	s if the resu	It of the evaluation			
	is equal to 100% and	d 0 poi	nts if none of the	inhabitants	s has easy ac	cess to waste			
	sorting. Determine	the oth	ner scores proport	ionally.					
References	This indicator was e	xperim	nented in CABEE p	roject [1], [2]				
SCALE		_							
Application	This indicator is not	specifi	ic for building clus	ters. It can	be calculate	d for each building.			
Details	This indicator is just	the su	Im or the average	value of all	the building	g that composed the			
	building group.								
	The interest of the i	ndicate	or is to evaluate o	n one side	the efficienc	y for each building			
	and the global effici	ency o	t the group of bui	dings.		. fan ar de le 1919			
Multiscale	Ine interest of the i	ndicate	or is to evaluate o	n one side '	the efficienc	y for each building			
Peferences	This indicator was a	vnerim	ented in CAPEE of	uiligs.	21				
rejerences	This multator was e	vheuu	ienteu in CABEE p	ojeci [1], [∠]				

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Impacts on surro	bui	nding buildir	ngs (%)			
ENV.Im.02	ISSUE	C	ATEGORY	LE	VE	L	SCALE
	Environmental		Impacts	S/A			N
GENERAL							
Description	Intent: Quantify the im Indicator: Percentage o Unit of measure: -	pac f qı	t on surrounding uality reduction of	buildings. f neighbou	ring	building	s and areas.
Background	CABEE Cluster Tool						
References	This indicator was expe	rim	ented in CABEE p	roject [1],	[2]		
LEVEL							
Derived from	Software tool Simple Calculations	Х	Operational data Empirical/Litera	a ture		In situ r Other (s	neasurements
Details	Assessment method: Er surrounding buildings a through established syr and areas outside the c	Assessment method: Environmental measures should not have negative effects on surrounding buildings and clusters. The impacts of shading, wind, vegetation, transport through established synergies should not influence negatively neighbouring buildings and areas outside the cluster boundary.					
Areas covered	Cluster composed of th	Cluster composed of the same types of buildings.					
Barriers	This indicator can be ba qualitative evaluation a The quantitative evalua because it needs studie For example impact of s TC 3)	This indicator can be based on standard calculation only if the impact is define as qualitative evaluation and not quantitative. The quantitative evaluation of the impact of surrounding building is complicated because it needs studies for different types of impacts which can be complicated to do. For example impact of shading or ventilation is difficult to calculate (see indicator Soc					
Rating	Score: The maximum score for this indicator is 15. Assign: I 15 if the cluster does not affect the comfort of surrounding area I 7 if the cluster slightly affects the comfort of surrounding area I 0 if the cluster influences negatively the existing surroundings						
References	This indicator was expe	This indicator was experimented in CABEE project [1], [2]					
SCALE	· · · · · · · · · · · · · · · · · · ·				-		
Application	This indicator is specific	: foi	r building clusters				
Details	The interest of the indic the global impact of the	The interest of the indicator is to evaluate not the impact of each single building but the global impact of the group of buildings.					
Multiscale	-						
References	This indicator was expe	rim	ented in CABEE p	roject [1],	[2]		

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Intensity of GHG emissions (%)								
ENV.Im.12	ISSUE	C	ATEGORY	LE/	/EL	SCALE			
	Environmental		Impacts		S	N			
GENERAL									
Description	Intent: Reduce the Indicator: Percenta Unit of measure: %	Intent: Reduce the per capita emission of CO2. Indicator: Percentage of GHG emissions over the average. Unit of measure: %							
Background	CABEE Cluster Too			[4] [6					
References	This indicator was experimented in CABEE project [1], [2]								
LEVEL Derived from	Software tool	Software tool Operational data In situ measurements							
Derived from	Simple Calculations	x	Empirical/Litera	a turo	X Other (specify)			
Details	Assessment metho actual data if availa criteria. Associate e vector [kg CO2 / kV for its emission fact emissions from all o To obtain a relative emissions as follow Consider as energy scenario for the em Calculate as averag demands correspon emission factors), a The relative perform emissions of the av value.	d: To as ble) th ach co /h]. For or, to c compor perfor s: demar ergy ve e the a nded to s above nance erage s	ssess this criterion e overall energy d mponent to the C r each component obtain the amount nents to obtain the mance, calculate the ds the local limits ctors (as the commount of CO2 em the limits, using the scenario, and mult	 estimate (emand of th O2 emission multiply th t of CO2 em e overall CO the compari as defined l mon choices issions the c the common by dividing t iplying by 10 	via project a ne cluster as n factor corr ne energy d issions [kg 0 2 emissions ison metric by laws, and s available in cluster wou n energy ver the actual p 00 to obtain	assumptions, or via s per the previous responding to its emand [kWh / m2] CO2/ m2]. Sum all s of the cluster. as the average CO2 d define a credible n the region). Id have if its energy ctors (and their performance by the n a percentage			
Areas covered	Cluster composed of the same types of buildings. The values are different for each type of building and thus the building group must be composed of only one type of building. Concerning the different thermal regulations and calculations in different countries, the absolute values are not comparable but the ratio is comparable.								
Barriers	The requirements are different for each type of building and thus if the cluster is composed of different types of buildings, the ratio cannot be compared with any requirement. To solve this problem, an average requirement can be established for the Cluster or the indicator can be the average of the % of each building								
Rating	Score: The score for this indicator is 40. Assign 40 points if the result, evaluated through the assessment method, is equal or less than the 25% of the local limit. For example, if the limit is 100 kWh/m2 to reach the maximum score, the cluster energy performance has to be equal or lower than 25 kWh/m2. Assign 0 points if the cluster energy performance is equal of higher than the local limit. Determine the other scores proportionally.								
References	This indicator was e	experin	nented in CABEE p	roject [1], [2	2]				
SCALE									
Application	This indicator is spe values.	cific fo	r building clusters	even if it is	based on ir	ndividual building			
Details	The interest of the global efficiency of	indicat the gro	or is to evaluate n oup of buildings.	ot the effici	ency of eac	h building but the			
Multiscale	The calculation is b global performance be very efficient an can be more efficie	ased or is to h d some <u>nt (or</u> r	n the performance ave an average va old buildings not not !) than the req	e of each bui llue. For exa so efficient uirement ev	Ilding but th mple, some but the res ven if all the	ne interest of the e new buildings can sult is that the cluster e buildings don't_			



	reach the requirement.
References	This indicator was experimented in CABEE project [1], [2]

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Preservation of land and soil (%)						
ENV.LU.02	ISSUE	C	ATEGORY	LE	VEL	SCALE	
	Environmental		Land Use		В	B / N	
GENERAL							
Description	Intent: Reduce lan	d consu	mption by using a	Iready cont	aminated o	r occupied areas for	
	building constructi	ion.					
	Indicator: Re-use c	of previo	ously occupied and	l contamina	ated land fo	r buildings and	
Dushanasad	Infrastructure.	- 1					
Background	CABEE Cluster Tool This is disctory on a superior and dis CADEE provident [4], [2]						
References	This indicator was	experin	nented in CABEE p	roject [1], [_2]		
LEVEL	Software tool Operational data In city measurements						
Derived from	Soliware Looi			d turo	Othor (specify)	
Details	Assessment metho		sess this criterion	assign to	each homog	specify)	
Detulis	cluster a weight as	a weight as follows					
	\mathbb{P} undisturbed land weight = -1						
	? agricultural land weight = 0						
	\square occupied land weight = 3						
	I contaminated la		, ht – 5				
		nu weig	nt – 5				
	Multiply each surfa	ace area	by its weight and	sum the w	eighted valu	ues. Divide the	
	weighted sum by t	he tota	area of the cluste	r. The resu	lt will be a n	umber between -	
	1and 5.						
Areas covered	This criteria can be	e used fo	or all types of build	dings.			
Barriers	There are no barri	ers to u	se this criteria in a	ll countries	and situation	ons.	
Rating	Rating was not in t	he scop	e of the CABEE pr	oject.			
	A scoring has been	i used ju	ist based on partn	ers' agreer	nent		
	Score: The maximu	um scor	e for this indicator	is 15. Assi	gn 15 points	if the calculated	
	value is equal or h	igher th	an 4 and 0 points	f it is equa	l or less thar	1. Determine the	
.	other scores propo	ortionali	<u>y.</u>	[4] [21		
References	This indicator was	experin	nented in CABEE p	roject [1], [2]		
SCALE	The use of land ear		d a a marcala familia i	lelie e e e el fu		f huildin e	
Application	The use of land cal	n be use	a as much for bui	ath seels	or a group o	f building.	
Details	The scoring as a %	makes	it comparable at p	oth scale.	ing cluster la	a vol	
wuitiscale	It is possible to ext	rapolat	e from building lev	el to bulla	ing cluster le	evel. do thom by the total	
	surface	in the t	weighten areas for		ing and divi	ue them by the total	
References	This indicator was	experin	nented in CARFF n	roiect [1] [21		
nejerences	This malcator was	caperin			-1		

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



Intensity of rainwater usage (%)							
ENV.Wa.06	ISSUE	(ATEGORY	LE	VEL	SCALE	
	Environmental		Water		S	N	
GENERAL							
Description	Intent: Maximize	e the use	e of rainwater.	fouloudooo		and MC fluching	
	and laundry	ater col	lected in the zone	for landsca	ipe irrigation	and we nushing	
	Unit of measure	: %					
		. , .					
Background							
References	This indicator wa	as exper	imented in CABEE	project [1]	, [2]		
LEVEL		-	1				
Derived from	Software tool		Operational dat	a	In situ r	neasurements	
	Simple Calculation	ons X	Empirical/Litera	ture	Other (specify)	
Details	Assessment met	hod:		<i>.</i> .			
	To assess this cri	iterion,	calculate the volur	ne of rain v	vater storag	e tanks (as a project	
	estimate or thro	ugn acti	all data, if availabl	ie). Divide t	inis amount	by the maximal	
Areas covered	All types of build	ling grou		ues.			
Rarriers	The water consu	mntion	is different for eac	h type of h	uilding use	and the estimation	
Durriers	of the maximal s	torage	ank volume can be	e sometime	es complicat	ed.	
Rating	Score: The score	for this	indicator is 15.Ass	sign 15 poir	nts if the res	ult of the evaluation	ı
	is equal to 100%	, and if i	t is equal to 0%, a	ssign 0 poir	nts. Determi	ne the other scores	
	proportionally.						
References	This indicator wa	as exper	imented in CABEE	project [1]	, [2]		_
Application	This indicator is	coocific	for building cluste	re over if it	ic bacad an	individual building	
Application	values	specific	for building cluste	rs even ii ii	is based on	individual building	
Details	The interest of t	he indic	ator is to evaluate	not the eff	iciency of ea	ach building but the	
	global efficiency	of the g	roup of buildings.				
Multiscale	The calculation i	s based	on the water cons	umption of	f each buildi	ng but the interest	
	of the global per	forman	ce is to have an av	erage value	e. For examp	ole, some buildings	
	with big roofs ca	n collec	t more water than	they use a	nd some old	buildings cannot	
	collect any wate	r but th	e result is that the	cluster can	i be more ef	ficient (or not !) thar	n
	the requirement	: even if	all the buildings d	on't reach t	the requiren	nent.	
References	This indicator wa	as exper	imented in CABEE	project [1]	, [2]		

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Access to a broadband communication network (%)							
SOC.Ac.02	ISSUE	ATEGORY	LE	VE	L	SCALE		
	Social	А	ccessibility		S		Ν	
GENERAL								
Description	Intent: To ensure of	ccupan	ts access to high-s	peed Inter	net	connecti	ions.	
	Indicator: Percenta	ge of po	opulation with acc	ess to broa	adb	and com	munication.	
	Unit of measure: %							
Background	CABEE Cluster Tool							
References	This indicator was e	experim	ented in CABEE p	roject [1],	[2]			
LEVEL	Γ		Γ					
Derived from	Software tool		Operational data	ial data		In situ r	neasurements	
	Simple Calculations	i X	Empirical/Literat	ture X Other (s		ther (specify)		
Details	Assessment method	d: To as	sess this criterion	, identify a	ll th	ne dwellir	ngs that have acces	iS
	to high-speed Inter	net con	nection, estimate	the occup	anc	y, and div	vide the value for	
	the overall populati	ion of t	he cluster.					
Areas covered	This criteria is for he	ousing	buildings.					
Barriers	The estimation of the	he occu	pancy can be com	plicated. I	n a	first leve	l of calculation the	%
	of connected dwell	ings car	n be used.					
Rating	Score: The score for	r this in	dicator is 20. Assi	gn 20 point	ts if	all the p	opulation in the	
	cluster has access to	o broad	Iband communica	tion and 0	poi	nts if nor	ie of them has the	
.	access. Assign the c	other sc	ores proportional	IY.	21			
References	This indicator was e	experim	ented in CABEE pi	roject [1],	[2]			_
SCALE	This is directory is an a							
Application	This indicator is spe	ecific to	r building groups.					
Details	The high speed inte	ernet co	nnection is for on	e whole bu	uldi Lildi	ing and ti	ne interest of the	
	Indicator is to evalu	late the	buildings and the	eir users th	at a	ire conne	cted.	
Nultiscale	One building is con	nected	or not. Then the %	6 of access	is t	ne sum o	of the users of the	
Defenen	This indicates will and	S.			21			
Kejerences	This indicator was e	experim	ented in CABEE pi	roject [1],	[2]			

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Collective fac	Collective facilities and outsourcing of services (%)							
SOC.Ac.15	ISSUE	С	ATEGORY	LE	VE	L	SCALE		
	Social	А	ccessibility		S		N		
GENERAL									
Description	Intent: To reduce I the cluster. Indicator: Percenta services. Unit of measure: 9	ntent: To reduce housing costs for all users, and to maximize resource consumption in the cluster. Indicator: Percentage of users located at less than 50 m from communal housing services. Unit of measure: %							
Background									
References	This indicator was	experim	ented in CABEE p	roject [1],	[2]				
LEVEL			r		-				
Derived from	Software tool		Operational data	a		In situ n	neasurements		
	Simple Calculation	s X	Empirical/Litera	ture	X	Other (s	specify)		
Details	Assessment method: Several household services can be moved from the private dwellings to communal areas, in order to reduce the square footage needed by the inhabitants and to optimize the consumption of soil, energy, and water in the cluster. This criterion allows verify the amount of users who have access to communal facilities in the same building or in its immediate vicinity. Some example facilities include: laundry, meeting rooms, co-working office space, leisure time areas, dining ball, kitchen and gym								
Areas covered	All types of buildin	g cluste	rs can be evaluate	d.					
Barriers	The indicators just additional points t seems to be easier number of inhabit	The indicators just assess the presence of at least one of the services and don't give additional points to multiple services. The evaluation of the proximity of the dwellings seems to be easier than the evaluation of the inhabitants that needs to know the number of inhabitants per dwelling							
Rating	Score: The score for communal housing has easy access to	or this in g service commo	dicator is 20. Assi s located at less t n facilities. Deterr	gn 20 poin han 50 m, a nine the ol	ts if assi ther	all the in gn 0 poin scores p	habitants have its if none of then roportionally.	n	
References	This indicator was	experim	ented in CABEE p	roject [1],	[2]				
SCALE	-								
Application	This indicator is sp for the group of b	ecific fo uildings	r building groups a	as it concei	rns	common	services establish	ned	
Details									
Multiscale	Basically, because for each building a	of the ca nd the r	alculation based o esult is the sum o	n a distano f the buildi	ce, t ing i	he calcul results.	ation has to be do	one	
References	This indicator was	experim	ented in CABEE p	roject [1],	[2]				

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Flexibility of r	Flexibility of residential buildings (%)							
SOC.Ac.03	ISSUE	C	ATEGORY	LEVE	EL	SCALE			
	Social	A	ccessibility	S		B / N			
GENERAL									
Description	Intent: Provide fun	ctional	flexibility for resid	lential buildin	gs, in orde	er to adapt them t	0		
	living changes and	to age c	of inhabitants. Gro	owing and shr	inking of f	families as well as			
	multigenerational I	iving ar	rangements shou	ld be taken in	to accoun	it.			
	Indicator: Percenta	ge of liv	ving surface with f	flexible floor p	plans and	foreseen adaptabl	e		
	spaces.	spaces.							
	Unit of measure: %	Unit of measure: %							
Background	CABEE Cluster Too								
References	This indicator was e	experim	ented in CABEE p	roject [1], [2]					
					1 · ··				
Derived from	Software tool		Operational dat	a	In situ r	neasurements	_		
	Simple Calculations	X	Empirical/Litera	ture X	Other (specity)			
Details	Assessment metho	d: Whe	n dealing with ma	jor interventi	ons (new	construction and			
	refurbishment), fur	ictional	flexibility has to I	be taken into	account. I	-loor plans with			
	multi-generational	concep	ts (i.e. adaptation	of floor plan	aepenain	g on family size,	_		
	separate access for	apartin	ents, parrier free	accesses and	i sanitary i nabla livin	installation) allow	a		
	To accoss this criter	apartm tion ide	ents and contribution	re to a sustai	nable livir	ig concept.			
	calculate the nerce	ntage o	f the total living a						
Areas covered	Housing buildings	intage 0		ii ca.					
Barriers	The type of activitie	es conce	erned by the indic	ator is not ve	rv detaile	d and then the			
	evaluation of the n	umber o	of activities will no	ot be very obj	ective.				
Rating	Score: The score fo	r this in	dicator is 20. Assi	gn 20 points i	f all the re	esidential areas ha	ve		
	adaptable floor pla	ns and (D points if there a	re no spaces v	with adap	table plan.			
	Determine the othe	er score	s proportionally.						
References	This indicator was e	experim	ented in CABEE p	roject [1], [2]					
SCALE									
Application	This indicator is for	buildin	g groups but it ca	n also be useo	d for build	ings.			
Details									
Multiscale	Basically, the calcul	ation ca	an be done for ea	ch building ar	nd the resi	ult is the weighted			
	sum of the building	results							
References	This indicator was e	experim	ented in CABEE p	roject [1], [2]					

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Proximity to services and leisure facilities (%)									
SOC.Ac.19	ISSUE	С	ATEGORY	LE	VEI	L SCALE				
	Social	A	ccessibility		S	N				
GENERAL			· _							
Description	Intent: To reduce the need for vehicular transport outside the cluster. Indicator: Percentage of users located at less than 300 m from the main services. For rural cluster villages, the score is assigned according to the available services and facilities within the cluster boundaries. Unit of measure: %									
Background	CABEE Cluster Tool	CABEE Cluster Tool								
References	This indicator was exp	erim	nented in CABEE proj	ject [1], [2]					
Derived from	Software tool		Operational data			In situ measurements				
	Simple Calculations		Empirical/Literatur	re	Χ	Other (specify)				
Areas covered	services located in the cluster and outside of it (only the nearest instance). Graphically, overlay to each of these services a circle with a 300 m radius. Calculate how many users are served by these services, by verifying which buildings are included in the radius of all the services. Possible services include: primary schools, health facilities (primary care, emergency services and chemist's), grocery shopping, public services (post office, libraries) Possible leisure facilities include: theatres, museums, port halls. Calculate the percentage of service users of all the considered services For rural village cluster consider all the services within the analysed boundary and assign a score according to the classes reported in the following table. Class 19 Class 2 Local food shop Children's play area Primary school Postal facility Outdoor public access Bank/cash machine area Leisure centre/sport Chemist's centre									
Barriers	This criteria can be calculated for all type of building cluster.The graphical determination of the buildings included in the services area is quite complicated and implies to identify and locate all services you want to include. Some services include in the building Cluster are not always dedicated for it. It can also be complicated to calculate the number of users for each building especially for the tertiary buildings or for example for shops or public services.									
Rating	Score: The maximum s of the cluster inhabita 8 points for each ser 6 points for each ser Class 19 Local food shop Primary school Outdoor public acces area Leisure centre/sport centre Medical centre/doct	re: The maximum score for this indicator is 20. If the considered service supplies all he cluster inhabitants assign: points for each service belonging to Class 1 points for each service belonging to Class 2 ass 19 Class 2 cal food shop Children's play area imary school Postal facility itdoor public access Bank/cash machine ea isure centre/sport Chemist's htre edical centre/doctor								
References	This indicator was exp	erim	nented in CABEE proj	ject [1], [i	2]					

[2]



SCALE	
Application	This indicator is specific for building clusters.
Details	The indicator is based on the services included in the building cluster and not on the
	buildings themselves.
Multiscale	-
References	This indicator was experimented in CABEE project [1], [2]
REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf

http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Social gatherings and common cluster activities (-)									
SOC.Ac.20	ISSUE		CATEGORY	LE	VE	L	SCALE			
	Social	Accessibility		S			Ν			
GENERAL	_									
Description	Intent: Establish co	ommor	n services and socia	l gathering	gs.					
	Indicator: Number	of est	ablished services ar	nd social ga	the	rings.				
	Unit of measure: -									
Backaround										
References	This indicator was	ovnori	mented in CABEE n	roject [1]	[2]					
IFVE	This indicator was	ехреп			[2]					
Derived from	Software tool		Operational data	Operational data		In situ r	neasurements			
	Simple Calculation	S	Empirical/Litera	ture	X	X Other (specify)				
Details	Assessment metho	od: The	criterion evaluates	the numb	er c	of service	s and activities			
	which have been e	establis	hed for the cluster.	Mobility of	conc	epts like	car sharing, bike			
	sharing are taken	into ac	count, sustainable f	ood acqui	sitio	n, time b	ank activities for			
	providing coopera	tion be	etween neighbours.							
			· · · ·							
Areas covered	All types of buildir	ig clust	ers can be evaluate	ed.						
Barriers	The type of activit	ies con	cerned by the indic	ator is not	ver	y detaile	d and then the			
	evaluation of the r	numbe	r of activities will no	ot be very	obje	ective.				
Rating	Score: The score for	or this .	indicator is 25. Assi	gn 5 points	s tor	each ser	vice and activity.			
References	This indicator was	experi	mented in CABEE p	roject [1],	[2]					
SCALE	This is directory is an	:6: - 6								
Application	for the group of h		or building groups a	as it conce	rns	common	services established			
Dataila	for the group of b	unung	5							
Detulis										
References	This indicator was	ovnori	mented in CAREE n	roject [1]	[2]					
Rejerences	This multator Was	experi	menteu în CABEE p		[2]					

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Local production of food (m ² /inhabitant)									
SOC.SS.02	ISSUE		CATEGORY	LE	VE	L	SCALE			
	Social	Sa	fety and Security		S		N			
GENERAL										
Description	Intent: Encourage	the p	roduction of fresh fr	uit and veg	geta	bles				
	Indicator: Surface of garden areas per capita.									
	Unit of measure: r	Unit of measure: m ² /inhabitant								
Background	CABEE Cluster Too	ol								
References	This indicator was	expe	imented in CABEE p	roject [1],	[2]					
LEVEL										
Derived from	Software tool		Operational dat	Operational data		In situ r	neasurements			
	Simple Calculation	ations X Empirical/Literature X Other (spe				specify)				
Details	Assessment metho	od: To	assess this criterior	, calculate	the	surface	of vegetable garde	ns		
	available to the us	ers in	the clusters and div	ide it by th	e nı	umber of	inhabitants.			
Areas covered	Only for housing b	uildin	g clusters							
Barriers										
Rating	Score: The score for	or this	indicator is 25. Assi	gn 25 poin	ts if	the surfa	ace of the vegetab	le		
	garden area is 10 i	m2 fo	r each family unit an	d 0 if the t	here	e are no g	green area.			
	Determine the oth	ner sco	pres proportionally.							
References	This indicator was	expe	imented in CABEE p	roject [1],	[2]					
SCALE										
Application	This indicator is sp	ecific	for building groups	as it conce	rns	common	gardens for the			
	group of building	5								
Details										
Multiscale										
References	This indicator was	expe	imented in CABEE p	roject [1],	[2]					

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Objective/ subjective safety measures (-)									
SOC.SS.01	ISSUE		CATEGOR	Y	LE	VE	1	SCALE		
	Social	Sa	fety and Sec	urity		S			Ν	
GENERAL										
Description	Intent: Provide ob	jectiv	e and subjec	tive safety	to cluste	er u	sers.			
	Indicator: Number of established safety measures.									
	Unit of measure: -									
Background										
References	This indicator was	This indicator was experimented in CABEE project [1], [2]								
LEVEL	-									
Derived from	Software tool		Operati	onal data			In situ measurements			
	Simple Calculation	S	Empiric	al/Literatu	re	X	Other (specify)			
Details	Assessment metho	od: To	assess this	criterion, c	count est	abli	shed safe	ety mea	sures whi	ch
	can be related to a	auton	omous ener	gy supply,	fire alarn	n sy	stems, a	larm sys	tem with	
	presence detector	s.								
Areas covered	All types of buildir	ig clus	ters can be	evaluated.						
Barriers										
Rating	Score: The score for	or this	indicator is	25. Assign	5 points	for	r each saf	ety mea	asure.	
References	This indicator was	expe	imented in	CABEE pro	ject [1], [[2]				
SCALE										
Application	The indicator cond	erns	collective me	easures for	r the buil	din	g cluster.			
Details	The interest of the	e indic	ator is not t	o sum the	measure	s in	each bui	ilding bι	ut to	
	evaluate the comr	non n	leasures at l	ouilding clu	uster leve	el.				
Multiscale										
References	This indicator was	expe	imented in	CABEE pro	ject [1], [[2]				

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Exploitation of local resources: sun. daylight, wind (-)							
SOC.TC.04	ISSUE	(CATEGORY	LEVE	L	SCALE		
	Social	Th	ermal Comfort	Α		N		
GENERAL								
Description	Overheating of buildings can be avoided by detailed planning and appropriate dimensions of transparent surface, glazing properties and shading systems. Within a building cluster the erection of new buildings, enlargements of buildings or demolition of building parts can change the solar radiation on surrounding buildings. Trees can provide shading on buildings and should be planned in accordance with the whole building cluster. Vegetation can alleviate the urban heat island effect, and reduce functioning of air-conditioning and energy consumption. Energy refurbishments and extension can have influences on daylight availability of neighbouring buildings too. Mostly daylight is reduced when new construction is erected, but also positive effect can be reached. Thus, for example, application of an external thermal insulation on a building with application of a new light colored plaster can increase light reflection on neighbouring buildings and allow better daylight conditions. When new buildings are erected, based on the local dominant wind direction, ventilation corridors or ventilation barriers can appear. The artificial surfaces affect urban natural ventilation and the formation of urban wind environment. Therefore, observations of the local climate conditions should be done, the wind direction and wind speed in planning considered. Natural ventilation is a simple and way to alleviate urban heat island effect. Intent: Exploit the local resources and predict the effects interventions into the building cluster. Indicator: Numerical simulation of cluster for urban interventions and building design.							
Background	CABEE Cluster To	ol						
References	This indicator was	experi	mented in CABEE p	roject [1], [2]				
LEVEL Dorived from	Software tool		(Operational dat	2	In citu n	noacuraments		
Derived from	Simple Calculation	19	Empirical/Litera	d ture	Other (s	specify)		
Details	Assessment meth of shadings, daylig new buildings or p	od: Elak ght, nat planting	poration of a digital ural ventilation, an trees.	model of the d effects of in	building (tervention	cluster with analysis ns like erections of		
Areas covered	All types of buildir	ng clust	ers can be assessed	1		-		
Barriers	The elaboration of have especially fo The price of such a	f a digit r ventila a simula	al model needs spe ation effects. ation is therefore h	ecific tools and igh.	d skills tha	at only few people		
Rating	 Score: The score for this indicator is 25. Assign points if a numerical simulation model of the building cluster was elaborated: 10 points for daylighting and shadings model 10 points for natural ventilation simulation 5 points for simulations related to the effects of interventions If there is no simulation, assign 0 points. 							
References	This indicator was	experi	mented in CABEE p	roject [1], [2]				
SCALE				.				
Application	As the indicator is	related	I to the influence o	t the buildings	s on the o	thers, it's specific		
Details	The indicator is a	rs global a	nalvse of the influe	ence of each b	uilding or	n all other buildings.		

[2]



Multiscale	-
References	This indicator was experimented in CABEE project [1], [2]
REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf

http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Accessibility to public transport, Lense index (-)										
SOC.Tr.18	ISSUE	C	ATEGORY	LE	VE		SCALE				
	Social Transport S E						B / N				
GENERAL											
Description	Indicator: Accessibility to public transport index. Unit of measure: - This indicator uses an index called Lense index to evaluate the accessibility of public transport taking into account the walk distance to nodes and the frequency of the buses/train/tram.										
Background											
References	This indicator was experimented in CABEE project [1], [2], [3]										
Derived from	Software tool		Operational data	а		In situ r	neasurements				
	Simple Calculations	Х	Empirical/Litera	ture	X	Other (specify)				
	 follows [LEnSE methodology]. Then, calculate the average accessibility index as follows [LEnSE methodology]. Then, calculate the average accessibility index of the cluster as a weighted average on the number of users per building. Step 1: Walking distance to public transport nodes Determine the walking distance from the building's main entrance to each public transport node served by rail, bus or tram. Use a notional walking speed of 80 meters per minute. Do not consider nodes that are further than a 500 m radius of the building for bus/tram and 1000 m for rail. Note: 1. For nodes within the radius that are served by the same service/route consider only 										
	2. The distance must k in a straight line over i	oe m naco	easured as it wou cessible objects su	ld be trave ch as builc	lled	on foot, s or river	i.e. do not measure s.				
	 Step 2: Frequency of service at each node For each node that meets the requirements in step 1, determine the total number of services departing/arriving at each node in the following periods for a typical weekday AM 08.00 - 10.00 PM 17.00 - 19.00 										
	For domestic buildin node in the following 08.00 – 10.00 PM 17.0	gs, c peric)0 – :	onsider the numb ods for a typical w 19.00, Saturday: 0	er of servi eekday an 8.00AM –	ces d on 19.0	departin a Saturo 00PM	g/arriving at each day: Weekday: AM				
	Note: 1. For nodes that have route and not a collec	e mu tive	ltiple routes, dete nodal frequency.	rmine the	freq	juency of	service for each				
	2. It is likely that each route at a node will be bi-directional, consider only the route in the direction with the highest frequency of service.3. For trains consider only those routes that have at least two stops within a 20 km radius of the development (Including the stop nearest to the building).										
	Step 3: Calculating the For each node and rou 1. Determine the walk	acc ute: time	essibility index e = Distance to no	de (m) / no	otio	nal walk	speed (80 m/min)				
	2. Determine the serv	ice w	vaiting time= 0.5*	(60/(No. of	f ser	vices du	ring peak time/4))				
	3. Add a reliability fact	or to	o the service waiti	ng time: B	us/t	rams=2,	Train = 0.75				
	4. Determine total acc	ess t	time = walk time +	service w	ait t	ime					
	5. Determine the Faui	vale	nt Building Entran	ce (EBF) fr	eau	encv = 30)/ total access time				



6. For each public transport type calculate the accessibility index = EBEmax + (0.5 other EBE).	* all								
	6. For each public transport type calculate the accessibility index = EBEmax + (0.5* all other EBE).								
7. Then; Sum the accessibility index.	7. Then; Sum the accessibility index.								
Areas covered All areas but housing buildings index has not the same calculation as tertiary build	dings.								
<i>Barriers</i> The graphical evaluation of the distance and the determination of the transports and frequency can be complicated.	nodes								
The index has to be calculated for each building and each transport type.									
As the calculation is different for housing buildings, the results between two diffe	rent								
districts composed of different building types are hardly comparable.									
Rating Score: The maximum score for this indicator is 20. Assign the score according to t	he								
benchmark reported in the following table.									
Public transport accessibility index - benchmark									
Points Capital/regional Capital/regional Small/mediu Rural									
center or inner city district center m town or									
city or district city suburb									
20 22.5 13.5 9.0 4.5									
References									
SCALE									
Application Basically, this indicator is a building scale indicator but it can also be used for buil	ding								
clusters.									
Details The building cluster scale indicator is obtained by adding the building scale index	of all								
buildings within the building cluster.	buildings within the building cluster.								
Multiscale Yes the large level is an extrapolation of the building level.									
<i>References</i> This indicator was experimented in CABEE project [1], [2], [3]									

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf
[3]	Project LENSE – Stepping Stone 2 - Methodology Development towards a Label for
	Environmental, Social and Economic Buildings.



	Shared mobility (%)								
SOC.Tr.09	ISSUE		CATEGORY	LE	VE	L	SCALE		
	Social		Transport	S			B/ N		
GENERAL									
Description	Intent: Enhance sh	Intent: Enhance shared mobility concepts.							
	Indicator: Percenta	age of	people who have a	ccess to sh	are	d mobilit [,]	y initiatives.		
	Unit of measure: %	, 5							
Background	CABEE Cluster Too								
References	This indicator was	experi	mented in CABEE p	roject [1],	[2]				
LEVEL			_						
Derived from	Software tool		Operational dat	а		In situ r	measurements		
	Simple Calculations	s 2	K Empirical/Litera	ture		Survey	X		
Details	Assessment metho	d: To a	assess this criterion	, calculate	the	amount	of people who have		
	access to shared m	obility	initiatives (car-sha	ring, bike-s	shai	ring, e-bil	ke sharing, e-car		
	sharing).								
Areas covered	Only for housing bu	uilding	S.						
Barriers	The evaluation imp	olies to	list all providers of	shared ac	ces	s mobility	/ (bikes, cars) and		
	to ask them the nu	mber	of users within the	building Cl	uste	er. This e	valuation seems		
	impossible for terti	iary bu	ildings because the	e users add	res	s declare	d to share mobility		
	providers is the pri	vate a	ddress of the emplo	oyees and	not	the profe	essional one.		
	It is also impossible	e to lis [.]	t all car sharing pro	viders (bec	aus	e there a	ire too much) and		
	obtain from them t	the nu	mber of their subsc	ribers livin	g in	the build	ding cluster. One		
	other way can be t	o mak	e survey or specific	studies bu	it it	is in man	y cases too costly.		
Rating	Score: The score to	or this	indicator is 20. Assi	gn the max	kimu	um score	if the percentage of		
	inhabitants who ha	ave aco	cess to shared-mob	ility is 100%	% aı	nd 0 poin	ts if the percentage		
	is equal to 0%. Det	ermin	e the other scores p	proportion	ally.				
References	This indicator was	experi	mented in CABEE p	roject [1],	[2]				
SCALE									
Application	This indicator can b	This indicator can be established at building or building cluster level.							
Details	The building cluste	r scale	indicator can be e	valuated di	irec	tly or obt	ained by adding the		
	building scale of all	l build	ings within the buil	ding cluste	r.				
Multiscale	Yes the large level is an extrapolation of the building level.								
References	This indicator was	experi	mented in CABEE p	roject [1],	[2]				

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Communication and information management (%)								
ECO.Ma.01	ISSUE	С	ATEGORY	LE	VE	L	SCALE		
	Economic	Μ	anagement		S	S B/N			
GENERAL									
Description	Intent: Ensure communication and information exchange to ensure correct operation of the buildings and functioning of synergies within the cluster. Indicator: Percentage of trained users with access to information								
Background	CABEE Cluster Tool								
References	The use of this indica [2]	tor fo	r the neighbourho	ood was ex	kper	imented ir	n CABEE project [1],		
LEVEL		_				Г			
Derived from	Software tool		Operational data	a		In situ me	easurements		
	Simple Calculations	<u> </u>	Empirical/Litera	ture	<u> </u>	Other (sp	ecity)		
	activities and on taken decisions. Identified needs by the inhabitants should be discussed and future actions adjusted accordingly. As the actual performance of the cluster depends heavily on the users' behaviour, a distributed information grid should provide users with content, tailored for their needs and responsibilities. In order to ensure the functioning of this information system, users need to be trained on its features, and on how to act when interventions are necessary.								
Areas covered	This indicator covers all types of buildings. It can also be used for building Cluster in addition or to replace a building approach. The indicator is based on training and is for this reason focused on the people 'using' the buildings every day (enough to justify to be trained)								
Barriers	The problem for this district/building cluster level is the time scale of the project often more than 5 years separate the first and the last building. That makes the trainings complicated to organize, the total number of users difficult to evaluate and then the assessment complicated								
Rating	Rating was not in the scope of the CABEE project. A scoring has been used just based on partners' agreement: The maximum score for this indicator is 25. Assign 25 points if all the adult inhabitants (100%) are trained or have access to the important Information of the building cluster and 0 points if no inhabitants are informed (0%). Determine the other scores proportionally. Within the 8 CABEE pilot projects 3 projects had a null, 3 project less than 15 and 2 projects between 15 and 20								
References	This indicator was ex	perim	ented in CABEE p	roject [1],	[2]				
SCALE									
Application	As said before, this in also be used for neig	ndicat hboui	or is easier to mea hood assessment	asure and a but it is m	asse Iore	ess at build complicat	ing level. It can ed.		
Details	At district or building cluster level, buildings are mostly not built or renovated at the same time and thus the trainings at district/building cluster level are organised during a long period of time and are therefore not easy to evaluate.								
Multiscale	It is not possible to extrapolate the indicator from building level to group of building level because the content of information/trainings is not the same at both level but trainings can be organised including both level of information at the same time.								
References	This indicator was ex	perim	ented in CABEE p	roject [1],	[2]				

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Synergy Management (-)										
ECO.Ma.03	ISSUE	C	ATEGORY	LE	VEL	SCALE					
	Economic	Μ	anagement		S	N					
GENERAL	-										
Description	Intent: Provide maintenance of operation of established services and synergies.										
	Indicator: Mainter	Indicator: Maintenance plan									
	Unit of measure: -										
Background	CABEE Cluster To	ol									
References	The use of this ind [2]	icator fo	or the neighbourh	ood was ex	perimented	in CABEE project [1],					
LEVEL											
Derived from	Software tool		Operational dat	а	In situ r	measurements					
	Simple Calculation	IS	Empirical/Litera	ture	X Other ((specify)					
Details	Assessment meth	od: Diffe	rent services may	need a ma	inagement fo	or being initiated,					
	maintained and cl	osed. M	aintenance of ope	ration in m	iost cases wi	ll take the biggest					
	effort and should	therefor	e be organized in	a structure	d way.						
	For each synergy of	operatio	nal requirements	are establis	shed and res	ponsible persons					
	named.										
Areas covered	This indicator cove	ers all ty	pes of buildings.								
Barriers											
Rating	Rating was not in	the scop	e of the CABEE pr	oject. A sco	pring has bee	en used just based					
	on partners' agree	ement :			25	: f = + - = = = = = = = = = = = = =					
	Score: The maxim	um score	e for this indicator	IS 25. ASSI	gn 25 points	If all the synergies					
	nave a manageme	nt pian,	and 0 points if no	ne or the s	ynergies nas	a management					
Poforoncoc	This indicator was		scores proportion	roioct [1]	[7]						
SCALE	This indicator was	experin									
Application	This indicator con	cerns syi	nergies at building	cluster lev	vel.						
Details											
Multiscale	O&M must be pla	nned at	building level but	this indicat	or only cond	erns the					
	management of th	ne syner	gies at building clu	ister level.							
References	This indicator was	experin	nented in CABEE p	roject [1], [[2]						

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Process and planning quality (-)									
ECO.Qu.12	ISSUE	C	ATEGORY	LE	VEL	SCALE				
	Economic		Quality		S	B / N				
GENERAL										
Description	For the improvement of the sustainability of a building cluster, a diagnosis of the situation succeeded by an evaluation of the performance is necessary. During the conception of the project objectives and measurable goals have to be defined for future interventions and planning phases (planned-versus actual-comparison). They can concern refurbishments and new constructions within the cluster boundary as well as services during the operational phase of the cluster. The development of scenarios of the area can help to identify short-term, medium-term and long-term priorities to enhance social, environmental and economic quality of the cluster. As user acceptance is a highly important issue, the participation of the inhabitants and users during the planning phase and implementation of actions should be boost. Awareness-raising and participation should be facilitated by giving the possibility in participation in the decision-making process. The effects and consequences of planned measures should be transparent for cluster members. Economic, social and environmental benefits should become understandable i.e. by explaining effects on basis of the indicators calculation. Indicator: Document with planned quantitative and qualitative objectives, as a result of a participation process.									
Background	CABEE Cluster Too) 								
References	This indicator is us	ed in ma	any sustainable bu	Ilding asses	ssment syste	ems but the use for				
I FVFI	the neighbournoo	u was er	kperimented in CA	BLL project	נןז, נצן					
Derived from	Software tool		Operational dat	а	In situ r	neasurements				
	Simple Calculation	s	Empirical/Litera	ture	X Other (specify)				
Details	Assessment method: As a basis, a detailed program should be elaborated by distinguishing environmental, social, economic improvements with goals tailored to the respective cluster. Life time of the buildings and users types (occupant, tenant, resident, commercial user) should be taken into account. Urgent interventions should become visible and become priority. Constraints, information on sustainability, awareness-raising of the users, consultation of the inhabitants, negotiation with the inhabitants, cooperation of the users are important processes which lead to common objectives and a project which is supported by the cluster inhabitants. Incentive schemes from national and regional programs (renovation of building stock, use of renewable energies and optimization of mobility) should be pointed out and made accessible for the cluster community. Clusters should attract the interest of buildings outside of the boundary and facilitated their integration into the cluster.									
Areas covered	This indicator cove	ers all bu	uilding types and a	ll the neigh	bourhood s	cale.				
Barriers	This indicator is qu	ite simp	ole to assess for ne	ew projects	. For existing	g districts or				
Rating	buildings, it mainly Rating was not in t A scoring has been this indicator is 25 10 points if a doo 15 points if plann 2 0 points otherwi	v does n he scop i used ju . Assign: cumenta ning vari se	ot exist any docun e of the CABEE pro- ist based on partn : ation of the decision iants were conside	nents. oject. ers' agreen on making p ered.	nent: The m process exist	aximum score for ts and it is available;				



References	This indicator is used in many sustainable building assessment system but the use for the neighbourhood was experimented in CABEE project [1], [2]
SCALE	
Application	This indicator is used in many sustainable building assessment systems but the use for the neighbourhood was experimented in CABEE project on 8 pilot projects.
Details	For big renovation or new buildings, the management is very important to reach the sustainability goals. A good programme is the base for sharing objectives at building cluster level.
Multiscale	It is not possible to extrapolate a sustainable building programme at cluster level because the sum of the buildings quality is less than a real common sustainable programme. Evaluation has to be done for the Cluster and for each building.
References	This indicator is used in many sustainable building assessment system but the use for the neighbourhood was experimented in CABEE project [1], [2]

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Risk management (-)								
ECO.Qu.16	ISSUE	C	ATEGORY	LE	VE	L	SCALE		
	Economic		Quality		S		N		
GENERAL									
Description	Risk Management is an important requirement for all planning activities. Often planning and execution is not in line, because of changed framework conditions, which can be related to timelines, founding, conflicting interest of stakeholders, executional works. The cluster should not fall into difficulties, when such unforeseeable circumstances occur. Intent: Limit the risk to achieve the established objectives Indicator: Risk management plan for each synergy with long time prediction during lifecycle Unit of measure: -								
Background	CABEE Cluster Tool								
References	This indicator was e	experin	nented in CABEE p	oroject [1],	[2]				
LEVEL									
Derived from	Software tool		Operational dat	а		In situ r	neasurements		
	Simple Calculations		Empirical/Litera	ture	X	Other (s	specify)		
Details	Assessment method improvement and e limit the risk of losir	I: A risk ach pla ng impo	x management pla inned synergy wit ortant synergies.	an should b hin the clu	e e ster	laborateo r. Alterna	d for each plann tive solutions sh	ed Iould	
Areas covered	This indicator cover	s all bu	ilding types.						
Barriers									
Rating	Rating was not in th	e scop	e of the CABEE pr	oject.					
	A scoring has been u	used ju	st based on partn	ers agreen	nent	t	16 4 0 0 0 4 1		
	Score: The maximur	n score	e for this indicator	IS 25. ASSI	gn ⊿	25 points	If 100% of the	n'alı	
	synergies have a risi	k mana Dotorr	igement plan and	o points if	nor tior	ie or the	synergies has a	risk	
References	This indicator was e	vnorim	ented in CABEE n	roject [1]	[2]	idily.			
SCALE	This indicator was e	хрепп			[2]				
Application	This indicator is spe	cific fo	r building clusters						
Details	For big renovation of	or new	buildings, the ma	nagement	is ve	erv impol	rtant to reach th	ie	
2000.0	sustainability goals.	A good	l risk managemen	it is specifi	cally	v necessa	rv because the t	time	
	duration of a building cluster project is 5 to 10 years and many changes can occur.								
Multiscale	The risk concerns he	ere the	building cluster a	nd not the	bui	ildings by	themselves.		
References	[], [2]		-						
-									

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf



	Economic advantage of cluster in comparison to single							
ECO.Va.05	ISSUE	C	ATEGORY	LE	VFL	SCALE		
	Economic		Value	B/S/A		N		
GENERAL								
Description	Intent: Evaluation of economic advantages of the building cluster Indicator: Cost reduction through common investments and usage of common facilities. Unit of measure: -							
Background	CABEE Cluster Too	bl						
References	This indicator was	experim	ented in CABEE p	roject [1], [2]		_	
LEVEL			I				_	
Derived from	Software tool		Operational data	a	In situ r	neasurements		
	Simple Calculation	s X	Empirical/Litera	ture	Other (s	specify)		
Details	Assessment methor process quality, er	od: Asse ivironme	ss the cost benefit ental and social qu	gathered t ality.	through com	nmon actions in		
Areas covered	The indicator can	oe calcu	lated for different	types of bu	uildings.			
Barriers	The first difficulty evaluation.	is to def	ine common actio	ns that can	be taken in	to account for the		
	The second difficu	lty is to	calculate the cost	benefit of t	these comm	on actions because	!	
	such a calculation action and this cos	implies [·] st has no	to calculate the co It been calculated	ist for each in most cas	building wit ses.	hout the common		
Rating	Score: The score for	or this in	dicator is 25. Assi	gn 25 point	s if the cost	reduction accounts	s	
_	for the 40% and 0	points if	there is no cost r	eduction. A	ssign the ot	her scores		
	proportionally.							
References	This indicator was	experim	ented in CABEE p	roject [1], [2]			
SCALE								
Application	This indicator is sp	ecific fo	r building clusters	as it is ded	icated to co	mmon actions at		
Details								
Multiscale	-							
References	This indicator was	experim	ented in CABEE p	roject [1], [2]			

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.1-Booklet-intro-synergy-grids.pdf
[2]	http://wiki.cesba.eu/wiki/File:CABEE-WP6.2-booklet-studies-synergy-grids.pdf

FINAL D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5

A.2 – CAT-MED



CAT-MED

Mediterranean Metropolis Change Around Time



www.catmed.eu

CAT-MED (2011-2014) was a European MED project that aims to limit emissions of greenhouse gases (GHG) by identifying practical solutions in the dynamics of cities to reduce urban impact, through strategies shared by the 11 participating cities in Spain, France, Italy and Greece. The main aim of CAT-MED was to develop sustainable urban models based on the classical Mediterranean city; compact, complex and where the proximity of public services is determined by people's ability to access them on foot. The project developed a system of common indicators and carried out pilot experiences called the «Green Apple» with the objective of showing the main characteristics of the proposed urban model, both at a planning and building level.



INDICATORS

	Energy consump	Energy consumption (Toe / inhabitant yr)							
ENV.En.08	ISSUE	C	ATEGORY	LE	VE	L	SCALE		
	Environmental		Energy		S		N		
GENERAL									
Description	This indicator estimates the urban energy consumption per inhabitant, considering both the energy and fuel consumption. Excessive energy consumption has a negative effect from a global point of view, depleting natural resources and contributing to increasing the effects of climate change. A more sustainable management of urban energy is necessary, including reducing consumption and the promotion of renewable energy sources, amongst the main policies implemented to mitigate the effects of climate change.								
Background									
References	[1]								
LEVEL									
Derived from	Software tool		Operational da	ita		In situ	measurements		
Derived from	Simple Calculations	Х	Empirical/Liter	ature		Other	(specify)		
Details	Methodology Once the yearly energy consumption data has been determined, all of the different energy type consumption values must be converted into tonnes of oil equivalent following the existing conversion equivalence (for example, 1 MWh of electricity equals 0.086 toe), so the consumptions can be compared. The number of inhabitants can be obtained as the sum of all the existing population census records. For this indicator, it is also important to consider the sectorial disaggregation, as the percentage of energy consumption by each sector (residential, commercial, industrial and transport) over the total energy consumption. Calculation Energy consumption = (Electricity + Natural gas + Hidrocarbon + LP Gas Consumption) / Number of inhabitants.								
Areas covered	Urban areas								
Barriers	Need for: - Energy consumption data per year (electricity, natural gas, hydrocarbon and liquefied petrol gas consumption) - Population census (number of inhabitants)								
Rating	As for the previous indica range for cities.	tor,	we could establish a	a reduction	of 2	0% by 202	20 as the desirable		
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9 CatMed%20Ita-Eng.pdf



	Water consumption (I/inhabitant day)								
ENV.Wa.04	ISSUE	C	ATEGORY	LE	VEL	SCALE			
	Environmental	Water		S		N			
GENERAL									
Description	This indicator mea scarcity is one of the indicator shows the	his indicator measures the water consumption (litres) per inhabitant and per day. Water carcity is one of the biggest hazards related to climate change in Mediterranean cities. This ndicator shows the rational usage of one of the most necessary vital natural resources							
Background									
References	[1]								
LEVEL									
Derived from	Software tool		Operational da	ata	In situ	measurements			
Derived from	Simple Calculations	X	Empirical/Lite	rature	Other	(specify)			
Details	Methodology Once the daily domestic water consumption data has been obtained, the indicator can be simply calculated by dividing the water consumption values by the number of inhabitants. Calculation Water consumption per inhabitant = Domestic water consumption volume / Number of inhabitants * 365 Measurement unit Litres per inhabitant per day								
Areas covered	Urban areas								
Barriers	Need for: – Domestic and to – Population cens	otal wate us (numb	r consumption annu per of inhabitants)	ual data					
Rating	Following the reco desirable level for	mmenda the dom	tions set out by WH estic water consum	IO, 100 litres ption.	per inhabita	nt per day is the			
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf



ENV.Wa.12	Waste management & removal (kg/inhabitant day) Waste management & removal (%)							
ENV.Wa.13	ISSUE	С	ATEGORY LE	LEVEL		SCALE		
	Environmental		Water	S		N		
GENERAL								
Description	This indicator measures the solid urban waste volume generated per inhabitant and per day, and the percentage of selective solid urban waste. Promoting the reduction, reuse and recycling of waste generated in a city is one of the most necessary policies in order to achieve a positive impact on the natural environment. The increase in the amount of waste generated per inhabitant causes both health and environmental issues thus, in addition to an appropriate management and removal policy, reducing and recycling are essential habits for each citizen to practice.							
Background								
References	[1]							
LEVEL	1			1				
	Software tool		Operational data		In situ	measurements		
Derived from	Simple Calculations	Х	Empirical/Literature		Other (specify)		
Arage covered	Based on the solid urban waste management data that can be provided by the municipal waste management department, it is possible to determine the total waste volume per year and the selective solid urban waste volume. Once obtained, the indicators can be calculated applying the corresponding formula for the solid urban waste volume per inhabitant per day and the recycled solid urban waste percentage. Calculation Urban solid waste volume = Total urban solid waste volume per year / Number of inhabitants * 365 Selective urban solid waste % = Selective urban solid waste volume per year / Total urban solid waste volume per year * 100 Measurement unit Kilograms per inhabitant per day Percentage of selective solid urban waste							
Areas covered	Urban areas							
Barriers	Need for: – Total amount of solid – Amount of selective s – Population census (m	urb olid umb	an waste urban waste er of inhabitants)					
Rating	The interval at around 1 around 50% are the des	2 to irab	o 1.4 kg per capita per day and le level	the	selective o	collection rate at		
References								
SCALE								
Application	Urban scale							
Details							_]	
Multiscale								
References								

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9 CatMed%20Ita-Eng.pdf



	CO ₂ Emissions (tonnes CO ₂ -eq/yr)									
ENV.Im.07	ISSUE		CATEGORY	LEV	'EL	SCALE				
	Environmental		Impacts	S		N				
GENERAL										
Description	This indicator measu emissions attributak responsible for the g about 80% of the to sector, represent th	Inis indicator measures the CO ₂ equivalent emissions produced within the local area. CO ₂ emissions attributable to the energy and transport sectors are by far the most important factor responsible for the greenhouse effect (industrialized countries' contribution to total emissions is about 80% of the total). The energy and transport sector, together with the waste management sector, represent the main focus for action by the local authority.								
Background										
References	[1]	[1]								
LEVEL	-		_							
Derived from	Software tool		Operational da	ata	In situ	measurements				
Derived from	Simple Calculation	ons 2	X Empirical/Lite	ature	Other	(specify)				
	This indicator corresponds to the European Common Indicator number two, local contribution to global climate change. Local activities which include the use of fossil fuels (coal, petroleum, natural gas) for energy purposes (including transport) and local waste management have to be considered. The sectorial disaggregation suggested for the CO2 equivalent indicator includes residential, commercial, industrial and transport. The methodology and calculation process for this indicator can be found at: http://ec.europa.eu/environment/urban/common_indicators.htm									
Areas covered	Urban areas									
Barriers	Need for: consumpt	ions, en	nission factors (tonne	s of CO2 per ι	unit of energ	gy) and emission data	1.			
Rating	According to the pro a 20% reduction in e	oposals : emissior	set out by the Europe as per capita and per	ean Commissio year by 2020 i	on in the Ene is the desira	ergy/Climate package ble level for cities	<u>,</u>			
References										
SCALE	-									
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9 CatMed%20Ita-Eng.pdf



	Population density (inhabitants/ha)							
ENV.LU.11	ISSUE		CA	TEGORY	LE	/EL	SCALE	
	Environmental		l	Land Use	Ξ.	5	N	
GENERAL								
Description	Population density is the consolidated urb of the configuration assessment of the ex organized urban plan	the consolidated urban area. The population density indicator provides an initial understanding of the configuration and territorial organization of the city. Its analysis gives rise to a first assessment of the extent of urban sprawl throughout the territory and helps in the definition of organized urban planning.						
Background								
References	[1]							
LEVEL	-							
Darived from	Software tool		(Operational da	ta	In situ	measurements	
Derived from	Simple Calculation	ons	XE	Empirical/Liter	ature	Other	(specify)	
Details	A georeferenced pop city or city boroughs	oulatio	on cer	nsus allows to qua	intify the ind	icator for th	e specific parts of the	
Areas covered	Urban areas							
Barriers	Need for a georefere	enced	popu	llation census				
Rating	For a city with an ave establishes a benchr	erage s nark of	surfac	ce area for public) inhabitants per h	space and gr ectare	een areas, C	AT-MED project	
References								
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf



	Urban compactness (m ³ /m ²)						
ENV.LU.13	ISSUE CATEGORY		LEVEL	SCALE			
	Environmental		Land Use	S	N		
GENERAL							
Description	The level of compactness can be defined as the relation between the usable space of the buildings (volume) and the urban space (area). The compact building expresses the idea of urban proximity, increasing the contact and interchange possibilities. It also optimizes the management of one of the most important natural resources, land.						
Background							
References	[1]						
LEVEL							
	Software tool		Operational da	ata In s	situ measurements		
Derived from	Simple Calculation	ons X	Empirical/Liter	rature Otl	her (specify)		
Details	From the raw digital cadastral data, extract the parcels that do not correspond to buildings (still not included in the urban consolidated area, technical and communications infrastructure, parks and green zones). For each building, estimate the usable space (volume) multiplying the number of floors of each polygon by an agreed constant that represents the height per floor (for example, 3 meters). Finally, calculate the sum of the whole building volume and the whole urban area that are necessary to apply the formula. To calculate the corrected compactness, the public space for pedestrian areas can be obtained as the sum of the area of the polygons included in the public space layer (pedestrian priority public spaces and green zones and recreation areas). Georeferenced population census allows to quantify the indicator for the specific parts of the city or city boroughs. Urban compactness (absolute)=∑ Building volume/∑ Urban area Urban compactness (corrected)=∑ Building volume/∑ Pedestrians public space area Measurement unit Meters (Cubic meters per square meter)						
Areas covered	Urban areas						
Barriers	 Need for: Digital cadastral data of the buildings, including the area and number of floors for each polygon corresponding to each building. Public space digitalization and classification data: pedestrian priority public space (pedestrian streets, walkways, boulevards, promenades, wide sidewalks) and green zones and recreation areas (squares, little squares, gardens, parks and promenades). 						
Kating	compactness and population density. The compactness can be measured over the gross surface area that includes public space and the remaining urban area, or referring to the building surface which is equivalent to the net lot surface. This correlation between density and compactness mentioned above could represent a desirable level of minimum urban compactness (absolute compactness) equal to 5 meters. Nevertheless, it is important to highlight that the range of the indicator is more relevant when we carry out a more detailed analysis of the different areas of the city. This is due to the presence of large areas without buildings such as the land dedicated to communications infrastructures or the green areas, meaning that when the indicator is calculated as a single value (e.g. the whole city), it can generate some results that can be misleading and fall out of the desired range. This is something which has been observed when calculating the indicator for the different territories defined in the city. On the other hand, for corrected compactness the range could be set from 10 to 50 meters as the desirable level.						
References							
SCALE							
Application	Urban scale						


Details	
Multiscale	
References	

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf



ENV.LU.07	Green zones & Green zones &	rec rec	reation areas	(m² /ii densit	nha v (abitan [.] %)	t)		
ENV.LU.08	ISSUE	<u>с</u>	ATEGORY	IF		, , , ,	SCALE		
	Environmental Land Lise			S	-	N			
GENERAL	Environmental		Lana Osc		5		14		
Description	This indicator measures the existing green zones and recreation areas and the relation with the number of inhabitants. Thus, this relation is obtained by the proportion of green zones square meters per inhabitant. Green zones play an important role in the urban environment. They improve the inhabitants' quality of life, especially the air quality. Apart from being places where citizens can enjoy leisure time, squares, gardens and parks help to make up a well balanced city, where the natural spaces mitigate the building and pollution effects.								
Background									
References	[1]								
LEVEL									
D · · · (Software tool		Operational dat	ta		In situ i	measurements		
Derived from	Simple Calculations	Х	Empirical/Litera	ature		Other ((specify)		
Details	Using municipal maps and with the help of orthophotograph or urban planning maps, the useful and existing green zones and recreation area boundaries can be edited in the GIS. The number of inhabitants can be obtained as the sum of all the records existing in the population census. The consolidated urban area boundaries can be obtained with the help of already existing urban planning layers and documents (the already developed urban area plus the new zones that have been allocated), and the comparison with orthophotography or aerial photographs. Calculation Green zones per inhabitant = Green zones & Recreation areas m ² / Number of inhabitants Green zones density = Green zones & Recreation areas m ² / Urban area square meters Measurement unit Square meters per inhabitant Percentage of green zones								
Areas covered	Urban areas								
Barriers	Need for: - Green zones and recreation areas polygons - Census of population (number of inhabitants) - Urban area limits								
Rating	According to WHO recommendations, cities must have at least 10 to 15 square meters of green areas per capita, equally distributed in relation to population density. It is desirable for this ratio to reach values between 15 and 20 square meters of useful green zone per inhabitant.								
References									
SCALE	-								
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9 CatMed%20Ita-Eng.pdf



	Green zones &	Green zones & recreation areas proximity (%)								
ENV.LU.09	ISSUE	(CATEGORY	LE	EVEL		SCALE			
	Environment Land Use				S		Ν			
GENERAL										
Description	This indicator measure or recreation area. The their location is also im them are located on th consolidated urban are	Inis indicator measures the percentage of population that lives next to at least one green zone or recreation area. The presence of green zones and recreation areas in a big city is not enough, their location is also important. The benefits yielded by green zones are less relevant if most of them are located on the outskirts of the cities. Thus, natural spaces must be integrated into the consolidated urban area, close to the population, so that people can easily gain access to them.								
Background										
References	[1]									
LEVEL	1		-				1			
Derived from	Software tool		Operational da	ata		In situ ı	measurements			
	Simple Calculation	; X	Empirical/Liter	ature		Other (specify)			
Arage covarad	Using municipal maps and with the help of orthophotograph or urban planning maps, the useful and existing green zones and recreation area boundaries can be edited in the GIS. The georeferenced population census can be obtained by a traditional relational database join process that relates inhabitants with their address in the georeferenced municipal street guide. The result will be a point layer in which each point represents one person's place of residence. Therefore, there would be as many points as there are inhabitants. Once both layers, green zones & recreation areas polygons and georeferenced population, are included in the GIS, proximity buffers of the green zones & recreation areas can be created with the help of the GIS buffer geo-process. Finally, the population that live near a green zone or recreation area are those that are contained in the buffer layer, which can be obtained by a spatial selection. Calculation Green zones proximity = Inhab. that live next to a green zone / Total number of inhab. * 100 Measurement unit Percentage of population									
Areas covered	Urban areas									
Barriers	-		<u> </u>							
Rating	For the buffer definition, the following criteria will be followed: • 1000 - 5000 square meters area: 300 meters distance • 5000 - 10000 square meters area: 500 meters distance • More than 1 hectare area: 900 meters distance.									
References										
SCALE	1									
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf



	Traffic modal split (%)							
SOC.Tr.23	ISSUE	С	ATEGORY	LEV	'EL	SCALE		
	Social	Transport				N		
GENERAL								
Description	Ine modal split indicator shows which type of transport people use and its proportion to the total number of trips. The distribution of journeys by mode of transport in the urban area is an indicator of the quality of mobility and has a clear relation to the status of air pollution, traffic being a major cause of poor air quality in cities. According to the existing data on the use of public and private transport, the traffic modal split is a basic indicator for the definition of transport policies. The sustainable balance of mobility and the promotion of public transport is one of the main objectives in big cities.							
Background								
References	[1]							
LEVEL								
De rive el free re	Software tool		Operational da	ita	In situ	measurements		
Derived from	Simple Calculations	Х	Empirical/Liter	ature	Other	(specify)		
Details	To obtain the modes of transport used by citizens to travel to their place of work, study or leisure, it is necessary to carry out surveys to collect data in strategic locations in the city. These kinds of analysis are normally carried out by private or municipal companies for their inclusion in mobility and transport studies and planning. Calculation % of trips by car = Trips made by car / Total numbers of trips * 100 % of trips by public transport = Trips made by public transport / Total numbers of trips * 100 % of trips by bicycle = Trips made by bicycle / Total numbers of trips * 100 % of walk trips = Walk trips / Total numbers of trips * 100 Measurement unit Percentage of trips							
Areas covered	Urban areas							
Barriers	-		C · · · · · · ·			o(
Rating	The desirable interval for the trips in the city are ma	the ade	use of private vehic with other modes o	les could be s f transport (p	et below 20 ublic transp	%, so that the rest of ort, walking/cycling).		
References		_						
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf



	Access to public	tra	ansport nod	es (%)				
SOC.Tr.15	ISSUE	C	ATEGORY	LEVE	L	SCALE		
	Social		Transport	S		N		
GENERAL			·					
Description	This indicator measures their place of residence. F encourage people to redu frequent and near the inh private vehicles.	This indicator measures the percentage of population that can find a public transport stop near their place of residence. Proximity to public transport is one of the most important factors to encourage people to reduce their use of private vehicles. A good quality public transport system, frequent and near the inhabitants place of residence can be an alternative to the mass use of private vehicles.						
Background								
References	[1]							
LEVEL								
	Software tool		Operational da	ita	In situ	measurements		
Derived from	Simple Calculations	Х	Empirical/Liter	ature	Other	(specify)		
Areas covered	The bus & tube stops can GIS, according to their la traditional relational dat georeferenced municipal represents one person's are inhabitants. Once bot in the GIS, proximity buffi GIS buffer geoprocess. Fin are contained in the buffer For the buffer definition, followed: • Bus stops: 300 meters d • Tube stops: 500 meters Calculation Bus & tube stop proximity of inhabitants Measurement unit Percentage of population	be i ocat abas str plac ch la ers (nally er la dist	represented as poir ion. The georefere se join process tha eet guide. The res e of residence. The yers, bus & tube st of the bus & tube st of the populations t yer, which can be of following criteria wi nce ance	It entities in a g nced population t relates inhale ult will be a refore, there w ops and georef cops entities can that live next to obtained by a sp Il be	graphic lay on census pitants wit point laye vould be a ferenced p in be creat b bus or tul atial select	er to be included in the can be obtained by a h their address in the r in which each point s many points as there opulation, are included ed with the help of the be stops are those that cion.		
Areas covered	Nood for:							
Barriers	 Need for: Location of bus & tube stops Georeferenced population census (census of population and georeferenced municipal street guide) 							
Rating	Intervals at around 90%-1	.00%	6 are 7the desirable	level of proxim	nity			
References								
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf



	Proximity to bicycle lanes and paths (%)						
SOC.Tr.08	ISSUE	С	ATEGORY	LE	VE	L	SCALE
	Social Transport S				S		Ν
GENERAL							
Description	This indicator measures the length of existing bicycle lanes and paths and their proximity to population. Bike lanes are spaces that act as special lanes dedicated exclusively to bicycles. They are normally marked on the pavement and include symbols with a bicycle and arrow. Their presence, and especially their interconnection, results in a better sharing of road and street space and enhances the quality of life for residents, providing an alternative, healthier and more sustainable form of transport over short distances.						
Background							
References	[1]						
LEVEL	-						
Darived from	Software tool		Operational da	ita		In situ	measurements
Derived from	Simple Calculations	Х	Empirical/Liter	ature		Other ((specify)
Areas covered	Based on the municipal existing cycle lanes and definition. The georefere database join process tha street guide. The result w residence. Therefore, the Once both layers, cycle la proximity buffers of the c buffer geoprocess. Finally are contained in the buffe definition, the following c · Bicycle lanes and paths Calculation Bicycle lanes proximity= It of inhabitants * 100 Measurement unit Percentage of population	carf patence in recent reconstruction reconstruction ycle rite network nhal	tography and with the can be edited ed population censi- lates inhabitants wi e a point layer in wi yould be as many po & paths and georefu- lanes & paths entit e populations that li yer, which can be ol ria will be followed: work: 300 meters di bitants that live nex	the help or in the GIS, us can be th their add hich each por ints as there erenced por ies can be co ve near the otained by a stance for b	f or accobta lress bint coula reat cycl spa uffe e lan	thophotog cording wi ained by a s in the ge represent e inhabitat tion, are in ed with th le lane net titial select er definitio	graphs, the useful and ith the transport plan a traditional relational coreferenced municipal s one person's place of nts. included in the GIS, the help of the GIS twork are those that ion. For the buffer in
Areas covered	Urban areas						
Barriers	Need for: - Cycle lanes and paths, length and itinerary - Georeferenced population census (census of population and georeferenced municipal street guide)						
Rating	The intervals at around 90)%-:	100% are the desira	ble level of	orox	imity	
References							
SCALE							
Application	Urban scale						
Details							
Multiscale							
References							

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9 CatMed%20Ita-Eng.pdf



SOC.Tr.06	Pedestrian streets and walkways, area (%) Pedestrian streets and walkways, length (%)									
SOC.Tr.07	ISSUE	C	ATEGORY	LE	VEL	SCALE				
	Social		Transport		S	N				
GENERAL										
Description	This indicator measures the percentage of pedestrian streets over the total length and area of city streets and roads. Pedestrian streets and walkways provide people with space to travel that is separated from roadway vehicles. Such facilities also improve mobility for pedestrians and provide access for all types of pedestrian travel: to and from home, work, parks, schools, shopping areas, etc. They also provide places for children to walk and play.									
Background										
References	[1]									
LEVEL										
D · 10	Software tool		Operational da	ita	In situ	measurements				
Derived from	Simple Calculation	ns X	Empirical/Liter	ature	Other	(specify)				
Arage covered	Using municipal maps roads and streets net edited in the GIS, acco- length and area of str in the georeferenced Calculation Pedestrian streets pe and roads length * 100 Pedestrian streets pe and roads area * 100 Measurement unit Percentage of pedest Percentage of pedest	Using municipal maps and with the help of orthophotographs or existing information about the roads and streets network, the useful and existing pedestrian streets and walkways can be edited in the GIS, according with the mobility & transport plan definition. Secondly, the total length and area of streets and roads can be obtained as the sum of all the shape records existing in the georeferenced municipal street guide. Calculation Pedestrian streets percentage (length) = Pedestrian streets & walkaway length / Total streets and roads length * 100 Pedestrian streets percentage (area) = Pedestrian streets & walkaway area / Total streets and roads area * 100 Measurement unit Percentage of pedestrian streets in terms of length (%) Percentage of pedestrian streets in term of area (%)								
Areas covered	Urban area									
Barriers	Need for: – Location of pedesti – Georeferenced mu	rian stre	ets and walkways treet guide (line and	d polygon fea	atures)					
Rating	The minimum percen	itage of	space for pedestriar	ns could be s	et at 75% as a	a desirable level				
References										
SCALE										
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9 CatMed%20Ita-Eng.pdf



	Number of days with bad air quality (-)										
SOC.AQ.02	ISSUE	С	ATEGORY	LE	VE	L	SCALE				
	Social		Air Quality		S		Ν				
GENERAL											
Description	This indicator can be defined as the number of days per year in which a bad quality of air has been recorded, considering the most relevant contaminants. That is, the number of days in which the daily limits set by the European regulations have been exceeded for each of these pollutants.										
Background											
References	[1]										
LEVEL											
Derived from	Software tool		Operational da	ata		In situ	measurements				
Derived from	Simple Calculations	Х	Empirical/Liter	ature		Other	(specify)				
Areas sourced	Based on the available int days per year with a bad SO2: Number of days with CO: Number of days with NOx: Number of days with O3: Number of days with PM10: Number of days with PM10: Number of days with Air quality (for each conta Measurement unit Days per year	Based on the available information on levels recorded for each pollutant, select the number of days per year with a bad air quality, according to the following criteria: SO2: Number of days with more than 125 μ g/m3 CO: Number of days with more than 10 mg/m3 NOx: Number of days with more than 50 μ g/m3 O3: Number of days with more than 120 μ g/m3 PM10: Number of days with more than 50 μ g/m3 Calculation Air quality (for each contaminant) = Number of days with bad air quality Measurement unit									
Areas covered	Urban areas	- 6 -		00 CO NO		2 5144.0)					
Rating	Need for recorded levels of contaminants data (SO2, CO, NOx, O3, PM10) The desirable levels in this set of indicators are defined at European Community level. SO2: Daily limit value: 125 μ g/m3. This value should not be exceeded more than 3 times per year. CO: Daily limit value: 10 mg/m3. This value should not be exceeded on any occasion. NOx: Hourly limit value: 200 μ g/m3. This value should not be exceeded more than 18 times per year. Annual limit value: 40 μ g/m3.										
References											
SCALE											
Application	Urban scale										
Details											
Multiscale											
References											

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9 CatMed%20Ita-Eng.pdf



SOC.AC.04	Noise Pollution, Silence quality - day (%) Noise Pollution, Silence quality - night (%)									
SOC.AC.05	ISSUE		ATEGORY	IFVF	,	SCALE				
	Social	Aco	ustic Comfort	S		N				
GENERAL	Booldi	1100								
Description	Noise pollution can be measured as the proportion of population exposed to non-recommended levels of noise, considering both day noise and night noise. According to the World Health Organization, noise seriously harms human health, both from a physical and psychological point of view. The noise caused by traffic, industrial or entertainment activities, is one of the major environmental problems in Europe. The source of noise is associated with the processes of urbanization and the development of transport and industry. While it is a problem mainly in urban areas, in some places it may also affect rural areas. Preserving silence is one of the most important challenges in big cities.									
Background		-								
References	[1]									
LEVEL										
	Software tool		Operational data		In situ	measurements				
Derived from	Simple Calculation	ns X	Empirical/Literature		Other	(snecify)				
	Thanks to the information existing in the georeferenced noise map, it is possible to identify the streets and city areas with noise level bigger than 65 dB during the day and 55 dB during the night. Once this information has been processed, with the help of the georeferenced census of population it is possible to know the number of people exposed to non recommended noise levels. Calculation Silence quality (day) = Number of people exposed to more than 65 dB during the day / Total number of inhabitants * 100 Silence quality (night) = Number of people exposed to more than 55 dB during the night / Total number of inhabitants * 100 Measurement unit Demonstrates of people exposed to more than 55 dB during the night / Total number of inhabitants * 100									
Areas covered	Urban areas									
Barriers	Need for: – Georeferenced nois – Georeferenced mu – Georeferenced pop	se map nicipal s pulation	treet guide census							
Rating	Intervals at around 25 night are the desirable	5% of th e levels	e population during the day	and 15	% of the p	opulation during the				
References										
SCALE										
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9 CatMed%20Ita-Eng.pdf



	Proximity to basic services (%)										
SOC.Ac.18	ISSUE	C	ATEGORY	LEVE	L	SCALE					
	Social	A	ccessibility	S		N					
GENERAL											
Description	This indicator mea considering the fo centers, health cen and selective waste citizens' quality of I facilities, etc.) allow social cohesion and	This indicator measures the percentage of population that lives close to basic services, considering the following classification: supply of food and everyday products, education centers, health centers, social centers, sports centers, cultural centers, entertainment centers and selective waste collection points. Accessibility to basic services in town is essential for the citizens' quality of life. A balanced distribution of basic services (schools, health centers, sport facilities, etc.) allows the population to identify with their closest urban space, increasing the social cohesion and the interrelation between the city and its inhabitants.									
Background											
References	[1]										
LEVEL		Г			Т						
Derived from	Software tool		Operational da	ita	In situ	measurements					
	Simple Calculation	ons X	Empirical/Liter	ature	Other	(specify)					
	georeferencing the of its address in the ge GIS, proximity buffe Finally, the populati in each buffer layer, Calculation : For each basic service Basic services proxir inhabitants)*100 Measurement unit : Percentage of popul	georeferencing the centers using a relational database join process that relates each center with its address in the georeferenced municipal street guide. Once all the layers are included in the GIS, proximity buffers are created for each of them with the help of the GIS buffer geoprocess. Finally, the population that lives close to the basic services centers are those that are contained in each buffer layer, which can be obtained by a spatial selection. Calculation: For each basic service considered: Basic services proximity =(Inhabitants that live near a basic service center / Total number of inhabitants)*100 Measurement unit:									
Areas covered	-										
Barriers	-										
Rating	CAT-MED project se proximity levels for	ts the inte the Medit	ervals at around 90% terranean cities part	% and 100% of t ticipating.	the popula	tion as the desirable					
References											
SCALE											
Application	Urban scale										
Details											
Multiscale											
References											

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
L-1	http://www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf



	Urban complexity, Shannon-Wiener index (-)									
ECO.Qu.17	ISSUE	C	ATEGORY	LEVEL			SCALE			
	Economic		Quality		S		Ν			
GENERAL										
Description	The urban complexity is a mixed uses and services. Wiener index that is one of the service of th	The urban complexity is a measure of the urban system organization. It captures the diversity of mixed uses and services. Urban complexity can be obtained by the application of the Shannon-Wiener index that is one of the several indices used to measure diversity in information theory.								
Background							· ·			
References	[1]									
LEVEL										
Denis ed fuene	Software tool		Operational dat	a		In situ	measurements			
Derived from	Simple Calculations	Х	Empirical/Litera	ture		Other ((specify)			
	First identify the different activity types that will correspond with the Shannon number of species (species richness). This species richness must be the same for all the cities and will be based on the standard European NACE codes classifications. Then, group all the existing entities into this classification based on its similarity. For each entity, assign one of the species or activity types based on its type and description. Apply Shannon index (see calculation formula) where: • n is the number of different activity types (species richness). • Pi is the relative abundance of each species, the proportion of entities of a given species or activity type to the total number of activities existing. • Log2(Pi) is the binary logarithm of the relative abundance of each species. Calculation Urban complexity= $-\sum_{n}^{i=1} P_i * \log_2(Pl)$ Measurement unit Entropy (Shannon index H)									
Areas covered	Urban areas									
Barriers	Need for the census of description of the activitie	ecc	onomic activities, in	cluding th	e ne	cessary i	fields about type and			
Rating	description of the activities to classify them and apply the Shannon index The availability of a georeferenced census of economic activities and institutions and associations makes it possible to obtain this indicator, allowing us to calculate the indicator for specific parts of the city, as long as they are small enough and similar in size. In the particular case of this indicator, the possibility of calculating the diversity of the city in a more detailed way is especially needed in order to be able to compare between different city areas (allows us to detect areas with a lack of activities or with a predominant activity).									
References										
SCALE										
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
	http://www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf



	Social housing ratio (%)										
ECO.Eq.09	ISSUE		CATEGORY	LEV	EL	SCALE					
	Economic		Equity	S		N					
GENERAL											
Description	This indicator meas houses existing in th government, the ma presence of sufficie citizens. This indicat social cohesion.	This indicator measures the social housing percentage in relation with the total number of houses existing in the urban area. The existence of social housing, i.e. housing managed by the government, the main objective of which is to provide housing for citizens for a limited cost. The presence of sufficient social housing provides improved access to housing for lower-income citizens. This indicator shows a first understanding of the municipal commitment to improving social cohesion.									
Background											
References	[1]										
LEVEL											
Derived from	Software tool		Operational da	ata	In situ	measurements					
Derived from	Simple Calculation	ons	X Empirical/Liter	rature	Other	(specify)					
Details	Methodology : The r corresponding to sou houses can be obtain Calculation: Social houses ratio = Measurement unit: Percentage of social	Methodology : The number of social houses can be obtained as the sum of the records corresponding to social housing, according to its type in the housing census. The total number of houses can be obtained as the sum of all the records existing in the housing census. Calculation: Social houses ratio =(Number of social houses / Total number of houses)*100 Measurement unit:									
Areas covered	-										
Barriers	Need for availability	of data	a from census of hous	ing (number a	nd type of h	iouses)					
Rating	CAT-MED project set participating.	ts the r	ninimum desirable val	lue equal to 20	0% for the N	Nediterranean cities					
References											
SCALE											
Application	Urban scale										
Details											
Multiscale											
References											



ECO.Eq.07	Labour force participation (%) Unemployment rate (%)									
ECO.Eq.11	ISSUE	(CATEGORY	LEVEL		SCALE				
	Economic		Equity		S	N				
GENERAL										
Description	The labor force part who are employed percentage of peo information about t quality of life. Separ potentially vulnerab	The labor force participation rate is the percentage of working-age people within an economy who are employed or unemployed but looking for a job. The unemployment rate is the percentage of people in the labor force who are unemployed. This indicator provides nformation about the labor market status, as well as the economy development and citizens' quality of life. Separation by age or gender is also important for this indicator in order to detect potentially vulnerable groups.								
Background										
References	[1]									
LEVEL							-			
Derived from	Software tool		Operational da	ita	In situ	measurements				
	Simple Calculation	ons)	C Empirical/Liter	ature	Other (specify)				
Details	force and unemploy between the numbe working-age people, people and the peop Calculation : Labor force participa people)*100 Unemployment rate force)*100 Measurement unit : Percentage of popul	Wetnodology : The assessment of this indicator is done using existing statistical data on labor force and unemployment. The labor force participation rate is calculated as the proportion between the number of people willing to work (employed and jobseekers) and the number of working-age people, while the unemployment rate is the proportion between unemployed people and the people in the labor force. Calculation: Labor force participation rate =(Number of people in the labor force / Number of working age people)*100 Unemployment rate =(Number of Unemployment people / Number of people in the labor force)*100 Measurement unit:								
Areas covered	-									
Barriers	Need for availability	of labo	or force participation	& unemploy	ment statistic	S				
Rating	CAT-MED project set	s the in	terval at below 10% a	as the desira	ble level.					
References										
SCALE	_									
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES	
[1]	CAT-MED project, Sustainable urban models, Work methodology and results
[-]	http://www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf



ECO.Va.07	Tourist frequency trends, seasonality overnight stays (%) Tourist frequency trends, seasonality tourists (%)								
ECO.Va.08	ISSUE	C	ATEGORY	LEV	ΈL	SCALE			
	Economic		Value	S		Ν			
GENERAL									
Description	This indicator meas tourists and overnig most dynamic sector tourism on the eco within territories. H order to contribute consumption during impacts on climate of	This indicator measures the evolution of the tourist frequency, in relation to the number of tourists and overnight stays per year and tourism seasonality. Relevance Tourism is one of the most dynamic sectors of the economy in most Mediterranean cities. The positive impact of tourism on the economy can provide a solution for job creation and economic development within territories. However, it is necessary to promote an ordered and sustainable tourism in order to contribute to mitigating pollution generated in the cities, to balancing water and energy consumption during the summer period, to reducing CO2 emissions and consequently the impacts on climate change							
Background									
References	[1]								
LEVEL	_		-						
Darived from	Software tool		Operational da	ita	In situ	measurements			
Derived from	Simple Calculations X Empirical/Literature Other (specify)					(specify)			
Details	 Methodology : Based on the tourists registration or hotel occupancy data, which can be obtained from the municipal or regional tourism office, it is possible to identify the number of tourists and overnight stays per year and its seasonality. Calculation: Percent seasonality (tourists) = (Number of tourists in each month/ Total number of tourist)*100 Percent seasonality (overnight stays)=(Number of overnight stays in each month/ Total number of overnight stays)*100 Measurement unit:								
Areas covered	-								
Barriers	Need for data availa	bility on	number of tourists a	nd overnight	stays data p	er month and year.			
Rating	CAT-MED project est between 6% and 119	tablished % as the (the percentage ran desirable levels.	ges of tourists	and overni	ght stays per month a	it		
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

[1] CAT-MED project, Sustainable urban models, Work methodology and results	REFERENCES	
nttp://www.catmed.ell/archivos/desc9_(ativied%20ita-Eng.hdt	[1]	CAT-MED project, Sustainable urban models, Work methodology and results



	Environment	Environmental activities in primary school (%)						
ECO.Ma.05	ISSUE		C	ATEGORY LI	EVE	L	SCALE	
	Economic		Ma	anagement	S		Ν	
GENERAL								
Description	This indicator shows educational activitie One of the most imp especially the childro it is important to Environmental educ impact and to mitiga	This indicator shows the proportion of primary school children that participate in environmental educational activities aimed at building awareness around eco-citizenship. One of the most important tasks of local governments is to raise awareness among citizens, and especially the children, about the environmental problems cities are currently facing. Therefore, it is important to monitor the environmental education initiatives carried out in schools. Environmental education is one of the best ways to ensure a reduction in the environmental impact and to mitigate climate change effects in the future						
Background								
References	[1]							
LEVEL								
Derived from	Software tool			Operational data		In situ	measurements	
Derived Itolii	Simple Calculation	ons 🛛	Х	Empirical/Literature		Other (specify)	
Details	educational activities have been obtained, the indicator can be calculated as the proportion between this number of students data and the total number of students in primary school. Calculation: Environmental education= (Pupil participating in environmental activities /Total number of primary school pupils) * 100							
Areas covered	Urban areas							
Barriers	 Need for: Data availability on: Number of educational activities related to urban environment in primary schools and number of pupils participating. Total number of primary school pupils. 							
Rating	CAT-MED project sets the intervals at about 75% and 100% of the students as the desirable level for the Mediterranean cities participating.							
References								
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

IED project, Sustainable urban models, Work methodology and results
/www.catmed.eu/archivos/desc9_CatMed%20Ita-Eng.pdf
1E /v

A.3 – CEC5





CEC5

Demonstration of energy efficiency and utilisation of renewable energy sources through public buildings



http://www.projectcec5.eu

CEC5 applies energy efficiency and use of RES in public buildings as examples for others to follow. CEC5 also developed an approach that allows for a harmonized assessment to making buildings more sustainable. Demonstrating the benefits of low-emission buildings, energy efficiency and RES is not the responsibility of the construction sector. Instead, the public sector needs to lead the way. Organizations engaged in developing sustainable buildings joined CEC5 and formed a consortium uniting cities and regions that are the owners of buildings. The project strives to establish energy efficient public buildings that serve as examples for others, to find a common framework for assessing sustainable buildings and to contribute to the European Union ambitious climate targets. To encourage the use of best practices in making buildings energy-efficient, CEC5 cooperated with a group of transnational projects supported by DG Environment in developing an approach called the Common European Sustainable Building's energy efficiency. CESBA). Together these projects identified key indicators for assessing a building's energy efficiency. CESBA is adaptable, open-source and provides one easy-to-use benchmark and assessment method. CEC 5 was financed by Interreg Central Europe Programme 2007-13 and lasted from 2011 till 2014.



INDICATORS

	Accessibility of public transport								
SOC.Tr.17	PILLAR	CA	TEGORY	LE	VE	L	(SCALE	
	Social	Т	ransport	S				В	
GENERAL									
Description	This indicator is used to facilitate the choice of sites which easily accessible for public transport networks to reduce the use of private vehicles. This indicator uses the real distance and time spent by pedestrians to reach stops of public transportation network from the main pedestrian entrance of the building to the stops e to calculate the accessibility index of public transportation for each line, for then compare the calculated values to the performance scale benchmarks and attribute the score.								
Background	This indicator has been adopted in a previous project called "ENERBUILD - ENERgy Efficiency and Renewable Energies in the BUILDing Sector in the Alpine Space.								
References	This indictor was experimented in Project CEC5 [1] [2]								
LEVEL									
Derived from	Software tool		Operational d	ata		In situ	measu	rements	
	Simple Calculations	X	Empirical/Lite	erature					
Details	 Evaluation is based on the following criteria: The stop of each bus or train line is evaluated as a single stop in both directions. Bus lines are evaluated only if they work on weekdays, between 7:00 am and 7:00 pm, with a minimum frequency of each hour and not more than 300 m from the ground. Railway lines are evaluated only if they work on weekdays, between 7:00 and 19:00, with a minimum passing time of no less than 500 m from the ground. The stop of each line counts as a single stop. If the same stop is used by multiple lines, the number of lines is counted. If there are two or more stops on a line in the above mentioned radius, only one is counted. 								
Areas covered	Once identified public transportation network type, stops (with special attentions to interchange nodes about urban and suburban bus transportation lines) and timetable, the main area that cover this indicator comprehends a radial distance of 300 meters for bus service and a radial distance of 500 meters for train service, from the main pedestrian entrance of the building. Service timetables of public transportations must be referring to weekday in the following time bands: 7:00-9:00, 17:00-19:00.								
Barriers	It is necessary to pre accessibility of, to es stops are included in	ecisely id timate n 1 the area	entify the borders umber of users of p a	of the area y public trans	you por	want to c	alculate identify	the which bus	
Rating	maximum value crite	eria of 30) points						



	Criteria	Max. points					
	Points for each bus-station in a radius of 300 m with hourly frequency or shorter frequency	6					
	Points for each bus-station in a radius of 300 m with half-hourly frequency or shorter frequency						
	Points for each railway station in a radius of 500 m with hourly frequency or shorter frequency						
	Points for each railway station in a radius of 500 m with half-hourly frequency or shorter frequency	8					
References	This indictor was experimented in Project CEC5 [1] [2]						
SCALE							
Application	This indicator can be used for buildings but it can be adapted for	r building					
	clusters or wider areas.						
Details							
Multiscale							
References	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project	"					
	"CEC5 Tool – New Buildings"						

REFERENCES	
[1]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"
[2]	"CEC5 Tool – New Buildings"



	Bicycle Parking (%)								
SOC.Tr.13	PILLAR	C.	ATEGORY	LEVE	L	SCALE			
	Social		Transport	S		В			
GENERAL				l.		L			
Description	This indicator shows the percentage between numbers of bicycles, parked in a functional and safe way, and the numbers of users in the building for facilitate the installation of bicycle slots.								
	The aim is a shift from individual car traffic to bicycle and pedestrian traffic for short and medium distances. As a result, energy demand and CO2 emissions decrease, and the impact of emissions and noise on people's health and the environment get reduced. However, a pre-condition for the regular use of bicycles in everyday traffic, is a sufficient number of bike sheds or/and slots, that should be close to entrances, roofed and protected against theft. The aim is to provide users the fastest possible and barrier-free access to their bicycles and must be in close proximity (<30 meters) of the entrance area.								
Background	FASUDIR - Friendly and affordable sustainable urban districts retrofitting. Indicators set at building and district level for assessing the three pillars of sustainability: environmental, economic and social aspects.								
References	This indictor was e	experime	ented in Project Cl	EC5 [1] [2]					
LEVEL									
Derived from	Software tool		Operational d	ata	In situ	measurements	X		
	Simple Calculations		Empirical/Lite	erature					
Details	Points are awarded required number o sufficient number o	based o f parking of user-fr	n the number of av g spaces depends or riendly bicycles slot	ailable parking n the type of bu s/areas of the	g spaces of uilding. Th quality is	f the quality and the le criterion is met if a available.	a		
	Quality of bicycles	slots/are	eas:						
	- All bicycles parkir	ig spaces	s for users of longer	r parking times	: (> 30 mir	nutes)			
	- The location of the and must be in clos	e bicycle e proxin	s slots/area must b nity (<30 meters) of	e accessible by f the entrance a	v cycling, n area.	nust have good light	ing		
	- Bicycle underground parking spaces or in underground car parks must be easily accessible by cycling, may be separated from the outside by only one door at maximum and must have direct access to the building.								
	- Bicycle parking spaces for visitors / short-term parking must be accessible at ground level and not be in lockable rooms.								
Areas covered	Parkings do not have to be necessarily located in peripheral areas, such as in fixed bike racks or dedicated spaces, but can also be located in others common areas easily accessible from the building, such as lobby and garage.								
Barriers	It is not clear the w	ay throu	gh which you assig	n the maximur	n points.				
Rating	Referenced the max presence of dedicat inhabitants of the a	kimum v æd bicyc rea	alue criteria of 25 p le parking space, re	points, the poin eferred to the c	its are assi occupant s	igned on the base of of the building, or tl	the he		
References									



SCALE	
Application	This indicator can be used for buildings but it can be adapted for building clusters or wider areas
Details	
Multiscale	
References	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project" "CEC5 Tool – New Buildings"

REFERENCES	
[1]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"
[2]	"CEC5 Tool – New Buildings"



	Low pollutant and low emission materials (-)								
ENV.Ma.01	PILLAR	C	ATEGORY	LE	EVEL		SCALE		
	Environmental		Materials		S		В		
GENERAL									
Description	A building is like a third skin. Over 90% of our lives are spent in buildings. In so far the quality of the buildings and of the air strongly affects our quality of life.								
	The quality of indoor air in rooms is not only determined by the user, but also by the used construction material and the chemicals it contains.								
	Solvents, formaldehyde or pesticides can escape from the construction material and so pollute rooms and make them hazardous for people's health possibly for weeks. Under consideration of the technical requirements, the "pollutant content" in building materials and therefore also in the air can be reduced by up to 95%.								
	Goal-oriented planning (e.g. constructive protection instead of chemical protection, maintenance-free and easy-to-clean constructions, choice of material suitable for use) as well as a tendering that aims at emission-reduction, leads to both better quality of work at the construction site and better indoor-climate for the users.								
Background	This indicator has been adopted in a previous project called "ENERBUILD - ENERgy Efficiency and Renewable Energies in the BUILDing Sector in the Alpine Space.								
References	This indictor was experimented in Project CEC5 [1] [2]								
LEVEL									
Derived from	Software tool		Operational d	ata	Ir	n situ mea	surements		
	Simple Calculations		Empirical/Lit	erature	X				
Details	Before the start of the work, together with the responsible building company a list of building products is drafted ("Agreed building products"). In addition, the materials suppliers, at least within two weeks since the beginning of the work, must submit a complete list of all the products used for construction and any documentation that may be necessary to ensure the minimum ecological quality. All construction products used must be controlled and authorized by an external consultant or by an independent internal specialist. At the same time as the mandatory controls of the								
	work direction, at least three inspections of the yard must be carried out. Only construction products on the list can be used. Concrete construction products can only be found in the site in their original packaging. At the conclusion of the project, the client receives a final report on the measurements employed with documentation value.								
Areas covered									
Barriers	Even if the score is it is not easy to obt obtain are the mate	assigned ain the ba erials cer	in a qualitative wa asic data to calcula tifications	ay, by testin te the score	g the pr . The m	resence of b nost difficult	elow elements, t elements to		
Rating	Referenced the ma	ximum va	alue criteria of 60 p	ooints.					
	Criteria						Max points		



	Does exist a documentation of the ecological optimization of the materials during the planning phase?	10
	The tender for all craftworks have been declared ecologically?	
	100 % of works	20
	90 % of works	15
	70 % of works	10
	Have all products of all craftworks been declared ecologically?	
	100 % of works	30
	90 % of works	20
	70 % of works	10
	Does an ecological building supervision exist? Did the supervisor do regularly inspections on the building site?	
	Total construction process	20
	Parts of the construction process	10
	Total	60
References		
SCALE		
Application	This indicator can be used for buildings but it can be adapted fo	r building
	clusters or wider areas	C
Details		
Multiscale		
References	"CEC5 Tool – New Buildings"	
-	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"	

REFERENCES	
[1]	CEC5 Tool – New Buildings"
[2]	CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Process and	l plan	ning quality	/ (-)				
ECO.Qu.12	PILLAR	CA	ATEGORY	LF	EVE	L	SCALE	
	Economic		Quality	S			B/ N	
GENERAL								
Description	Building has to be u to be evaluated thr method is to launch	Building has to be useful and built to answer a specific need. This adaptation to the needs has to be evaluated through adaptation to the use and users and sustainability. One efficient method is to launch competition to select the conception team.						ıas
Background	This indicator has l and Renewable Ene	been adop ergies in t	ted in a previous p he BUILDing Sector	roject calle • in the Alp	ed "E ine S	NERBUIL Space.	D - ENERgy Efficie	ncy
References	This indictor was e	xperimen	ted in Project CEC5	-[1] [2]				
LEVEL								
Derived from	Software tool		Operational da	ata		In situ	measurements	
	Simple Calculations	X	Empirical/Lite	erature				
Details	Gurculations		1					
Areas covered								
Barriers								
Rating	Maximum value cri	teria of 2	5 points.					
	Criteria						Points (max. 25))
	Is there any docun	nentation	on the decision-mak	ing process	s?		10	
	Have variants been	n verified a	and evaluated?				5	
	Is verification and	confirmat	ion of variant 0?				5	
	Is there a docume	nted evalu	ation scheme for ch	ecking vari	ants	ſ	4	
	city planning						2	
	Accessibility and in	ncreased t	raffic				2	
	Exploitation of lan	d - soil qua	ality				2	
	energy efficiency	natorials					2	
References							2	
SCALE								
Application	This indicator can be	e used for	buildings but it can l	pe adapted	for	building cl	usters or wider area	a s
Details								
Multiscale								
References	"CEC5 Tool – New	Buildings						
	"CEC5 Result Book	lets - Key	deliverables and be	enefits of th	ne Cl	EC5 Projec	ct"	

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	User inform	atio	n					
ECO.Ma.04	PILLAR	С	ATEGORY	LE	EVE	L	SCALE	
	ECO	M	anagement	В			В	
GENERAL								
Description	Users have a signific provide useful infor energy point of view	Users have a significant influence on the energy consumption of buildings. The goal is to provide useful information to users for manage the building in an efficiently way, from an energy point of view and without compromising comfort.						
Background	This indicator has be and Renewable Ener	een ado rgies in	pted in a previous p the BUILDing Secto	project calle or in the Alp	ed "E oine S	NERBUIL Space.	D - ENERgy Efficien	су
References	This indictor was ex	perime	nted in Project CEC	5 [1] [2]				
LEVEL								
Derived from	Software tool		Operational d	ata		In situ	measurements	
	Simple Calculations		Empirical/Lite	erature	Х			
Details	User information is provided through a manual. It should include the main aspects of the topics such as: room temperature (heating / cooling regulation), mechanical ventilation and ventilation through the windows, sun and reverb protection, general lighting and workplace lighting, efficient use of energy-consuming appliances (PCs, printers, etc.)							pics
	Verify that technical documentation relating the construction is archived and that such documentation is accessible to the operator in order to optimize its management and maintenance.							
	In particular, check	which o	of the following doc	uments are,	, or v	vill be, arc	chived:	
	- General report							
	- Specialist reports							
	- Technical drawing	S						
	- Maintenance plans							
	- "As-Built" drawing	S	g the construction i	haco of the	huil	ding (qua	h ac photographic	
	or/and video docum	ientatio	on, technical reports	s, etc.)	; Dun	lung (suc	ii as pilotograpiile	
Areas covered								
Barriers								
Rating	Maximum value crit	eria of i	25 points.					
References								
SCALE								
Application	This indicator can be	used fo	r buildings but it can	be adapted	l for l	building cl	usters or wider areas	;
Details								



Multiscale	
References	"CEC5 Tool – New Buildings"
	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Heating der	nand	l (kWh/m2 y	r)					
ENV.En.09	PILLAR	(CA	TEGORY	LE	LEVEL			SCALE	
	Environmental			Energy	A			В		
GENERAL										
Description	Reducing energy d and aimed at reduc	emand fo ing the u	or 1se	heating is a long-te e of energy and all	erm solution emissions c	n th of ha	at can be armful suł	estimat ostance:	ed in advand s.	ce
	A well-insulated building with low-emissivity glass allow to reduce energy consumption for heating environments, offering a high degree of comfort. The high temperature of inner surfaces of the building, in an identical external temperature condition, causes that the perceived temperature results to be higher.									
Background	This indicator has and Renewable En	oeen ado ergies in	ppt th	ed in a previous pi e BUILDing Sector	roject callec in the Alpin	l "El ne S	NERBUIL pace.	D - ENE	Rgy Efficien	су
References	This indictor was e	xperime	nt	ed in Project CEC5	[1] [2]					
LEVEL										
Derived from	Software tool	Х	ζ	Operational d	ata		In situ	meası	urements	
	Simple Calculations			Empirical/Lite	erature					
Details	Calculation of the t The calculation mu	hermal e st be pe	ene rfo	ergy parameter for rmed on the micro	heating wi oclimate.	th P	HPP vers	ion 6.1 ((2012).	
Areas covered										
Barriers										
Rating	Maximum value of	100 poir	nts							
	Scoring is based on	the hea	tin	g energy paramete	er required	for	PHPP.	.1 4	/17.1	
	The minimum requirements by Heating Energy Parameter are based on the Area/Volume ratio.									
	- For buildings with an A/V ratio of 0.8 or higher the minimum parameter is 50 kWh/m2 of Effective energy related area in sm									
	- For buildings, while for buildings with an A/V ratio of 0.2 or less the minimum parameter is 3 kWh/sm of Effective energy related area in sm.					S				
	The intermediate v	alues of	th	e minimum requir	ements are	der	ived from	linear	interpolatio	n.
	The maximum scor kWh / sm of Effecti	e is assi ve energ	gn y i	ed regardless of th related area in sm	e A/V ratio	for	Heating E	Energy F	Parameter <	15
	The minimum scor building reaches 50 A / V over 0.8) . Fo applies. The maximum scor	e of 25 is) kWh / r buildin re of 100	s a m2 gs is	ssigned when the l 2 of Effective energ with an Low A / V assigned in the pr	heating ene gy related a ratio, rigor esence of a	rgy rea ous hea	paramete in sm (on minimun ting energ	er for th ly for bu n requir gy parai	e PHPP of th uildings with rements meter of max	e 1 x.
	15 kWh / m2 of Eff The intermediate v	ective er alues re	nei Sul	rgy related area in	sm. polation					
	The intermetiate v		su	it in onit inteat intel	polation.					



References	
SCALE	
Application	This indicator can be used for buildings
Details	
Multiscale	
References	"CEC5 Tool – New Buildings" "CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Cooling dem	nand	(kWh/m2 y	r)			
ENV.En.06	PILLAR	С	ATEGORY	LEVEL		SCALE	
	Environmental		Energy	A		В	
GENERAL							
Description	In last years the act a secondary role. H active cooling rate consumption, cooli	In last years the active cooling of buildings, (kindergartens, municipalities and gyms) played a secondary role. However in the last few years more and more buildings are growing at an active cooling rate with a large number of windows. General optimization of energy consumption, cooling energy must be avoided or minimized.					
Background	This indicator has h and Renewable Ene	oeen ado ergies in	pted in a previous p the BUILDing Secto	roject called "E r in the Alpine S	ENERBUIL Space.	D - ENERgy Efficiend	су
References	This indictor was e	xperime	nted in Project CECS	5 [1] [2]			
LEVEL	L						
Derived from	Software tool	X	Operational d	ata	In situ	measurements	
	Simple Calculations		Empirical/Lit	erature			
Details	Calculation of the t	hermal e	nergy parameter for	r cooling with F	PHPP vers	ion 6.1 (2012).	
Areas covered							
Barriers							
Rating	maximum value of	100 poir	nts.				
	Score assignment is	s based o	on the PHPP power u	ıseful heat para	ameter.		
	The basis for calcul temperature limit.	ation in	PHPP on the "summ	er" sheet shou	ld be the 2	25°C over	
	The criterion for assignment of the score is the implementation of systems to reduce the cooling load and limit solar emissions (window size, quality and window orientation, temporary sun protection, reduction of internal heat sources, activation of a thermal mass for cooling, etc.).						
	These systems are	evaluate	d on the basis of the	following refe	rence valı	ies:	
	- overpass the over	current	temperature of 25°C	C max. 10% (PH	IPP sheet	"summer")	
	- cooling load per s	pecific a	rea max. 5 W/m2 (P	HPP Sheet "Coo	oling Load	ł")	
	The minimum scorvalue of 15 kWh/m	e of 10 is 2 EBFa.	assigned when the	energy cooling	g paramete	er has a maximum	
	The maximum scor of 5 kWh/m2 EBFa.	e of 100	is assigned when th	e energy coolir	ng parame	eter value is equal to	
	The intermediate v	alues of	the minimum requi	rements are de	rived fron	n linear interpolation	a.
References							
SCALE	1						



Application	This indicator can be used for buildings
Details	
Multiscale	
References	Publication reference: "CEC5 Tool – New Buildings" "CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Operational	Prim	ary energy	demar	ıd (kWh	/m2 yr)		
ENV.En.13	PILLAR	CA	TEGORY	LE	VEL	SCALE		
	Environmental		Energy	А		B / N		
GENERAL								
Description	The goal is to reduce chain processes from	The goal is to reduce the overall energy consumption of buildings in all areas, considering the chain processes from the beginning						
Background	This indicator has be and Renewable Ener	een adop gies in t	ted in a previous p he BUILDing Sector	roject calle r in the Alpi	d "ENERBUIL ne Space.	D - ENERgy Efficiency	7	
References	this indictor was exp	periment	ed in Project CEC5	[1] [2]				
LEVEL								
Derived from	Software tool	X	Operational d	ata	In situ	measurements		
	Simple Calculations		Empirical/Lite	erature				
Details	Calculation of the primary energy demand with PHPP program - version 6.1 (2012)-, aligned to draft ISO 52000 Operational primary energy demand.							
Areas covered								
Barriers								
Rating	Maximum value of 1	25 point	S.					
	Primary energy factors apply in PHPP program referred to all energy consumptions including heating systems, cooling systems, hot water-production systems, lighting systems and other power application. The minimum score of 25 points is assigned when a primary energy parameter of 240 kWh/m2 of Effective energy related area in sm per year is reached. The maximum score of 125 is assigned when a primary energy parameter of max. 120 kWh/m2 of Effective energy related area in sm per year is reached. The intermediate values result from linear interpolation.							
References								
SCALE								
Application	This indicator can be	used for	buildings					
Details								
Multiscale								
References	Publication reference	e:						
	"CEC5 Tool – New B	uildings	9					
	"CEC5 Result Bookle	ts - Key	deliverables and be	enefits of th	e CEC5 Proje	ct"		

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Global Warming Potential (kgCO2-eq/m2 yr)							
ENV.Im.11	PILLAR		CA	TEGORY	LEVEL		SCALE	
	Environmental	Impacts		S / A		B / N		
GENERAL								
Description	The goal is to reduce	e goal is to reduce CO2-equivalent emissions during building life cycle.						
Background	This indicator has be and Renewable Ener	his indicator has been adopted in a previous project called "ENERBUILD - ENERgy Efficiency nd Renewable Energies in the BUILDing Sector in the Alpine Space.						
References	This indictor was ex	perin	nent	ed in Project CEC5	[1] [2]			
LEVEL								
Derived from	Software tool		Х	Operational da	ata	In situ	measurements	
	Simple Calculations			Empirical/Lite	erature			
Details	Calculation of primary energy parameter with PHPP program -version 6.1 (2012)							
Areas covered								
Barriers								
Rating	Maximum value of 7	'5 poi	nts.					
	The CO2-equivalent including heating sy and other power app	The CO2-equivalent factors are applied in PHPP program referred to all energy consumptions including heating systems, cooling systems, hot water-production systems, lighting systems and other power application.						
	The minimum score	of 10) poi	nts is assigned wh	en maximum	value of 60	kWh/m2 of Effectiv	ve
	energy related area The maximum score	in sm e of 75	i per 5 poi	year is reached. ints is assigned wh	en maximum	value of 26	5 kWh/m2 of Effecti	ve
	energy related area	in sm	per	year is reached.			,	
References								
SCALE								
Application	This indicator can be	used	for b	ouildings, but it can	be adapted to	o neighborh	oods	
Details								
Multiscale								
References	Publication reference	ce:						
	"CEC5 Tool – New B	Buildi	ngs"					
	"CEC5 Result Bookle	ets - K	Key d	leliverables and be	nefits of the	CEC5 Proje	ct"	

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Thermal comfort in summer (-)							
SOC.TC.03	PILLAR	CA	TEGORY	LEVE	L	SCALE		
	Social	Ther	mal Comfort	А		В		
GENERAL								
Description	In our modern architecture and change destination uses make possible that summer energy consumption reaches or even exceeds winter one, even in our latitudes.							
	For guarantee them consider, bring to a	mal comfo thermal o	ort, the main aspect comfort loss or to a	is represented high energy co	to solar e nsumptio	emissions that, if not on.		
	Creation of a pleasa better concentratio loads therefore pos	nt indoor n especia e a specia	climatic condition lly for office buildin l planning challeng	essentially con 1gs which requ e.	tributes t ire a high	o user wellness, and internal thermal		
	Thermal comfort is regulations on wor	an impor kplaces st	tant factor for user ipulate limits value	satisfaction on that must be r	workplacespected	ces. The relative and guaranteed.		
	An optimal combination systems protection, indoor temperature	ation betv , heat insu e every se	veen window area a alations and other i ason.	ratio, heating a nfluentially fac	nd cooling tors, ensu	g systems, sun re a comfortable		
	For reasons of energy efficiency, passive systems (such as night cooling, gravity ventilation in combination with efficient shading systems - as required by the relevant emission areas), are generally preferred to active cooling systems (such as surface, and air cooling). The use of active cooling systems requires a detailed proof that the comfort goals according to EN ISO ÖN 7730 were achieved, by simulating the most critical areas. With active systems the planned room temperatures (and partly also the desired room humidity) can be better reached. Still, in addition to the increased energy use, further parameters, such as draft and radiation asymmetries nlav a substantial role for the actual comfort conditions.							
Background	This indicator has b and Renewable Ene	been adop ergies in tl	ted in a previous p ne BUILDing Sector	roject called "E in the Alpine S	NERBUIL Space.	D - ENERgy Efficiency		
References	This indictor was e	xperimen	ted in Project CEC5	[1] [2]				
LEVEL								
Derived from	Software tool	X	Operational da	ata	In situ	measurements		
	Simple Calculations		Empirical/Lite	erature				
Details								
	For buildings with a glass surface area below 35% of the total facade and without excessive internal loads (normal use of offices, classes, gyms, etc.), the test of summer efficiency can be provided with methods Stationary or semi-stationary. (ÖNORM B8110-3, KB * according to OIB RL-6 or PHPP)							
	For buildings with a high percentage of glass surface, over 35% of the total, or buildings / environments with special internal loads (conference rooms, exhibition areas, computer rooms, etc.), it is necessary to provide dynamic simulations of ambient temperatures Which demonstrate the cooling loads and energy used for cooling.							
	For Buildings witho cooling load calcula conditions are main	out installention / sim ntained fo	ed cooling capacitie nulation under defin r critical areas.	es or with free- ned climatic co	cooling sy nditions, o	vstems: dynamic evidence that comfort		



	For Buildings with activ 2078, cooling demand a the type of cooling (sur Displacement ventilatio	ve cooling: Cooling load calculation according to OEN H 6 according to. OEN B 8110-6, installed cooling capacity, in- face cooling, air cooling: on, air swirl, mixed ventilation, combination systems, etc.	040 or VDI dication of)				
Areas covered							
Barriers							
Rating	maximum value of 150	points.					
	Criteria		Max points				
	Building with less tha	n 35% windows surfaces and without active cooling syst	em				
	Analysis based on ON	B8110-3	50				
	or analysis based on (DIB RL-6; KB* < 0,4 kWh/m ³ a	50				
	or analysis based on (DIB RL-6; KB* < 0,6 kWh/m ³ a [1]	35				
	or analysis PHPP exce	eeding 26 °C < 5 %	65				
	Dynamical building si climate, flexible shadi	mulation (at least for critical rooms) considerating the long systems and the respected usage of the building	ocal				
	Exceeding 26°C<5% v	Exceeding 26°C<5% without active cooling systems (e.b. free night cooling)					
	Exceeding 26°C < 10%	Exceeding 26°C < 10% without active cooling system					
	Exceeding 26°C < 3% between 26°C and 27	Exceeding 26°C < 3% without active cooling system. It is possible to choose between 26°C and 27 °C, to be indicated in the report					
	Analysis to prevent air currents (v < 0,1 m/s, Δ T < 2K at the domicile) 75						
References	ÖN EN ISO 7730:2006 ÖN EN 15251:2007	Ergonomie der thermischen Umgebung – Analytische Bestimmung und Interpretation der thermischen Beha des PMV- und PPD-Indexes und Kriterien der lokalen thermischen Behaglichkeit [ISO 7730: 2005] Eingangsparameter für das Raumklima zur Auslegung	aglichkeit und				
	AStV	Bewertung der Energieeffizienz von Gebäuden – Raumluftqualität, Temperatur, Licht und Akustik Arbeitsstättenverordnung (AStV): Verordnung des Bundesministeriums für Arbeit, Gesundheit und Sozia der Anforderungen an Arbeitsstätten und an Gebäude Baustellen festgelegt und die Bauarbeiterschutzverord geändert wird, 1999	les, mit auf Inung				
	CFD	CFD (Computional Fluid Dynamics) – Software Fluid					
SCALE	l						
Application	This indicator can be use	d for buildings					
Details							
Multiscale							
References	Publication reference:						
	"CEC5 Tool – New Buil	dings"					



"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"	
--	--

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Comfort ventilation - hygiene and soundproofing (dBA)							
SOC.AC.02	PILLAR	CA	TEGORY	LE	LEVEL		S	SCALE
	Social	Acou	stic Comfort	S				В
GENERAL								
Description	Controlled ventilation must contribute to improving air quality and overall improvement in the quality of environments and, even for this reason, sound input system is also has been considered. The goal is to avoid exceeding the maximum noise level value of 1dB when the ventilation system is activated, that means system will not disturb you during normal use of the room.							
Background	This indicator has h and Renewable Ene	been adop ergies in tl	ted in a previous p ne BUILDing Sector	roject called in the Alpi	d "E ne S	NERBUIL Space.	D - ENEF	Rgy Efficiency
References	This indictor was e	xperiment	ted in Project CEC5	[1] [2]				
LEVEL								
Derived from	Software tool	X	Operational da	ata		In situ	measu	rements
	Simple Calculations		Empirical/Lite	erature				
Details	The objective is reached when standard acoustic intensity (evaluated "A") caused by activity of the system should not exceed the expected background noise level and low frequency acoustic emissions are considered and separately evaluated. While standard acoustic intensity (evaluated "C) should not exceed the expected background noise level by more than 20 dB, considering the octave bandwidth of more than 63.							
Areas covered								
Barriers								
Rating	maximum value of	40 points.						
	Criteria							Max points
	Sound transmission calculation (depending on the room use), prognostic of expected sound presser level							
	LA,nT < 30 dB e L	C(50-400،	0),nT < 50 dB					20
	Sound emission r	neasurem	ent (calculation?) c	on most exp	ose	d working	g place	
	LA,nT < 30 dB e LC(50-4000),nT < 50 dB 30							
	Sound emission measurement (calculation?) on most exposed working place							
References		າວເວບ-400	∪,,111 × 30 UD					70
SCALE								
Application	This indicator can be	e used for l	ouildings					



Details	
Multiscale	
References	"CEC5 Tool – New Buildings" "CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"


	Availability	of Da	ylight (%)			
SOC.VC.02	PILLAR	CA	TEGORY	LEVE	L	SCALE
	Social	Visu	ial Comfort	S / A		В
GENERAL						
Description	This indicator provi calculated separate B "Energy and Supp	des the ca ly for the ly"in PHP	alculation procedu building and it's an P.	re for mid dayl integrant part	ight facto t of the as	r. The factor is sessment of category
	If daytime light is co in all the building. T considered negative	orrectly us 'he goal is e.	sed, we can reduce reaching a dayligh	energy consur at factor of 5%,	nption fo while a fa	r artificial lightning actor below 2% is
	The table below sho respective daylight 17:00 in winter, and	ows the da factor. Th l from 8:0	aylight requiremen ese values conside 00 to 18:00 in sumr	ts through day r an annual wo ner, in cloudy a	light inte orking ho atmosphe	nsity on the urs from 7:00 to ere conditions.
Background	20 16 12 10 8 6 5 4 3 25 2 1.5 1.25 1 20 This indicator has b	een adop	Gewünschte Be	Reiner Tag	eslichtante * * * * * * * * * * * * * * * * * * *	eil (%) % & str % % 500 2000 • Raum LD - ENERgy
References	Efficiency and Rene	wable En	ergies in the BUILD	Ding Sector in t	he Alpine	Space.
LEVEL		.permient		(+) (+)		
	Software tool		Operational da	ata	In citu	
Derived from	Software tool		operational da	ata	measu	irements
	Simple Calculations	X	Empirical/Lite	erature		
Details	It's extremely diffice exposition because For these reasons is	ult evalua there's a o preferre	te light intensity of constantly variation d to define cloudy a	a room expos n of sun positic atmosphere co	ed to dire on and of nditions	ct sunlight direct irradiation.
Areas covered						



Barriers									
Rating	maximum value of 40 points.								
	The calculatio of room. This Ep = daylight i Ehz= horizontz	The calculation is the relation between available external daylight and indoor light intensity of room. This ratio is called Daylight Factor (D) and is expressed as a percentage. Ep = daylight intensity on work surface							
			Delate						
		D values	Points						
		< 2 %	0						
		2-3 %	10						
		3-4 %	30						
	Technical	5 %							
	points evenly resulting arith	distributed in usual living places of the metic calculation of other values	building. The mid daylight value is the	е					
References									
SCALE									
Application	This indicator of	can be used for buildings							
Details									
Multiscale									
References	Normative ref	ference:							
	ÖNORM EN 15 Anforderunge "CEC5 Tool –	5193: 2008 01 01. Energetische Bewerte en an die Beleuchtung. Österreichisches New Buildings"	ıng von Gebäuden – Energetische Normungsinstitut, Wien.						
	"CEC5 Result l	Booklets - Key deliverables and benefits	of the CEC5 Project"						

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	PV-power pl	lant (kWh/a)						
ENV.En.22	PILLAR CATEGORY			LE	VEL	SCALE			
	Environmental		Energy	S		В			
GENERAL									
Description	Networked photovoltaic systems are considered in this indicator as a measure to enhance use of RES. No free installations are considered, but only installations connected with the building or with annexed buildings (Integrated in the roof, in the facades, on flat roofs). Scenario assumption is the design of the plant with the aid of a suitable calculation program. The points assignment is based on the annual performance of the plant								
Background	-								
References	This indictor was ex	perimer	nted in Project CEC5	5 [1] [2]					
LEVEL									
Derived from	Software tool	X	Operational d	ata	In situ	i measurements			
	Simple Calculations		Empirical/Lit	erature					
Details	The goal of this mea	sure is t	he increase in the p	ercentage o	f solar energ	y production			
Areas covered	buildings	buildings							
Barriers									
Rating	The minimum requirement is an annual output of 3.5 kWh of photovoltaic energy for sm This corresponds to a photovoltaic surface of approx. 0,035 sm of Effective energy related area in sm								
	The maximum score of 50 is assigned if an annual output of 14 kWh of photovoltaic energy is achieved at m2. This corresponds to a photovoltaic surface of approx. 0.14 sm of Effective energy related area in sm								
Dafarancas		lues les		polation.					
SCALE									
SCALE	This indicator can b		fon huildinge hut it		anted for hu	ilding alustana an			
Application	This indicator can be used for buildings but it can be adapted for building clusters or wider areas.								
Details	The interest of the indicator is to evaluate the capacity of buildings and areas to produce energy from RES.								
	Customer Documer	ntation							
	 Calculation of pho climatic data, taking 	otovolta g into a	aic efficiency with a ccount local shadir	a suitable p ng.	orogram con	taining regional			
	Module data shee	et / com	ponents selected						



	 Graphic design of the position and surface of the solar panels
Multiscale	
References	"CEC5 Tool – New Buildings" "CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"
Multiscale References	 "CEC5 Tool – New Buildings" "CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Water consumption & use of rainwater (-)									
ENV.Wa.16	PILLAR	CA	TEGORY	LEVI	EL	SCALE				
	Environmental		Water	S		В				
GENERAL										
Description	The goal is to reduce the drinking water consumption on the one hand and, on the other hand, in the event of heavy precipitation, to ensure water retention through specific measures.									
Background										
References	This indictor was expe	riment	ted in Project CEC5	[1] [2]						
LEVEL										
Derived from	Software tool	X	Operational d	ata	In situ	measurements	Х			
	Simple Calculations		Empirical/Lite	erature						
Details	Measures are taken to heavy rainfall, ensure	Measures are taken to reduce the consumption of drinking water and, in the event of heavy rainfall, ensure retention.								
Areas covered										
Barriers										
Rating	Projects are assigned value of 20 points.	points	s based on the per	formance pe	rformed b	elow to a maximum	1			
	Parameter		description		points					
	Use of taps that allows rational use of water		Reduction of w consumption by compared to st	ion of water 5 nption by at least 50% red to standard taps						
	Use taps with sensors		Using taps with sensor	infrared	5					
	Double water flush (2 stop buttons)		Maximum wate liters, or 3 liters	Maximum water quantity: 6 liters, or 3 liters for urinals						
	Use of waterless urinal	Exclusively use without water	of urinals	5						
	Use of rainwater in the outdoor areas	Use of rainwate tanks) for outde	er (eg through oor areas	5						
	Realization of a green	Creating a gree terracing at lea roof surface), n substrate thick	n roof (or st > 50% of the ninimum ness: 7 cm	10						
References			1		<u> </u>					



SCALE	
Application	This indicator can be used for buildings but it can be adapted for building clusters or wider areas .
Details	
Multiscale	
References	"CEC5 Tool – New Buildings"
	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Ecological q	ualit	y of the buil	ding si	te (-)			
ENV.Bi.01	PILLAR	CATEGORY		LE	EVEL		SCALE		
	Environmental	E	Biodiversity		S		В		
GENERAL									
Description	The goal is to encou ecologically stable.	The goal is to encourage the selection of sites that have low ecological value or that are ecologically stable.							
Background									
References	This indictor was exp	perime	nted in Project CEC5	5 [1] [2]					
LEVEL									
Derived from	Software tool		Operational d	ata	II	n situ	measurements	X	
	Simple Calculations		Empirical/Lit	erature					
Details	Assessment meth	od			11				
	2. For each k the relativ At each area it has table:	 Analysis of the pre-development range of nora existing on the site, For each kind of flora identified, it has to be defined the area occupied and the relative extension (m2); At each area it has to be assigned a code (from a1 to a6) on the base of the following table: 							
	Code Ecologic conditions			Т	ſypologi	es			
	a1 – area with zero ecological value	zero Autochthon flora destroyed. Natural e regenerative dynamics absent. No elements of the local potential flora.			R iı	Rubbles, nfrastru	buildings, ctures, road borders.		
	a2 – area with very low ecological value	Autochthon flora substituted. Natural regenerative dynamics absent.			A v (Agricultu vineries extensiv	ural fields, orchards, , grass lawns ve).		
	a3 – area with low ecological value	Autochthon flora degraded. Natural regenerative dynamics present.			A a la e	Artificial woods, abandoned agricultural fields and grass lawns, pasture land (low extensive)			
	a4 – area with medium ecological value	Autochthon flora - simple structure. Pasture lands, natural grassland Dominant presence of the local potential prairies, reforestation of flora. autochthon vegetation.				d			
	a5 – area with high ecological value	Auto	ochthon flora – seconda	ary character	r. S a	Structure and shru	ed secondary woods bs.		
	a6 – area with very high ecological value	y Stable autochthon flora, undisturbed. Primary woods grass lawns (he			woods and shrubs, vns (height).				
	 3. The overall extension (m2) of the areas with the same code (from a1 to a6) has to be calculated; 4. The Indicator's value is calculated as a weighted sum: s1×1+s2×2+s3×3+s4×5+s5×7+s6×10 								
	_		<i>s</i> 1+ <i>s</i> 2+ <i>s</i> 3+	-s4 + s5 -	+ \$6				
	Where: s1 = total extension of the areas with code a1 - zero ecological value [m2]								



	[m2] a3 = total extension of the areas with code a2 - very low ecological value a3 = total extension of the areas with code a3 - low ecological value [m2] a4 = total extension of the areas with code a4 - medium ecological value [m2] a5 = total extension of the areas with code a5 - high ecological value [m2] a6 = total extension of the areas with code a6 - very high ecological value [m2]							
	5.	On the base of the indicator's value , the performance score ranging from -1 up to 5 (interpolation must be applied) is calculated on the base of the following linear scale:						
Areas covered		0						
Barriers								
Rating		the performance score ranging from -1 applied) is calculated on the base of the the "Land ecological value calculato score up to 30 points.	up to 5 (interpolation must be following linear scale. By applying r" you calculate the performance					
	Perform	nance score	Calculated Ecological value of land					
	-1 – neg	gative	>5					
	0 – star	dard	5					
	3 – goo	d	2.6					
	5 - exce	llent	1					
References								
SCALE								
Application	This in or wide	dicator can be used for buildings but it o r areas .	can be adapted for building clusters					
Details								
Multiscale								
References	"CEC5 1	'ool – New Buildings"						
	"CEC5 R	esult Booklets - Key deliverables and benefit:	s of the CEC5 Project"					

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"



	Building materials and construction, OI3 index						
ENV.Ma.02	PILLAR	CA	ATEGORY	LEVEL		SCALE	
	Environmental	Materials		А		B / N	
GENERAL							
Description	The ecological production costs for a building at the current building standard are about equally high as the ecological costs for heating a passive house for 100 years. Therefore, the ecological optimization of the expenditures in the construction-phase is an important part of ecological building. Ecological optimization is defined by minimization of material flow, energy demand and						
Background	This indicator has b and Renewable Ene	een ador rgies in t	oted in a previous p he BUILDing Sector	roject called "l in the Alpine	ENERBUIL Space.	D - ENERgy Efficiency	
References	This indictor was ex	perimen	ted in Project CEC5				
LEVEL							
Derived from	Software tool	X	Operational d	ata	In situ	measurements	
	Simple Calculations		Empirical/Lite	erature			
Details	 This optimization process can be carried out using Ökoindex 3 which encompasses 3 environmental parameters: the non-renewable primary energy requirement, the global warming potential and the acidity potential. A score per square meter of constructive element is calculated from 0 to 100. The OI3 value of the building is lower if the use of non-renewable energies is reduced and if during the production of building materials and the construction of the building Less greenhouse gases or other substances are emitted. More use of reproducible raw materials and the use of ecological production processes parameters. 						
Areas covered							
Barriers							
Rating	maximum value of 200 points. The manufacturing ecological cost of a building results from the production process has an immediate effect, while ecological cost of exploitation arises only during use. Therefore, ecological manufacture optimization is directly relevant to environment protection (e.g. CO2 building industry certificates). Buildings are best valued if their manufacturing cost is in accordance with Ökoindex OI3. The points for evaluation are calculated using the following formula based on the OI3 Value between 38 and 295. $Pun \neq 2 \ll 000 \ \oplus \ OB_{T-G \oplus H_{G}}^2 = 0.62 \ll OB_{T-G \oplus H_{G}} + 1.2)$. to OI3. \leq 38 you assign 200 points; to OI3 \geq 295 you assign 0 points;						
References							



SCALE	
Application	This indicator can be used for buildings but it can be adapted for building clusters or wider areas
Details	
Multiscale	
References	"CEC5 Tool – New Buildings"
	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"

REFERENCES	
[1]	"CEC5 Tool – New Buildings"
[2]	"CEC5 Result Booklets - Key deliverables and benefits of the CEC5 Project"

FINAL D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5



A.4 – CLUE / ITACA





European Union

This Project is funded by the European Regional Development Fund through the INTERREG IVC programme

CLUE Climate Neutral Urban Districts in Europe



http://www.clue-project.eu/

The project Climate Neutral Urban Districts in Europe, CLUE, tackles the challenges modern sustainable cities are facing. A climate neutral urban district uses innovative new technology and building techniques to reduce its carbon footprint.

A consortium of local and regional authorities as well as universities from 9 European countries aims to increase the local and regional capacity in policy development, to facilitate the implementation and assessment of new solutions and technologies for a low carbon economy in urban areas. Working with climate neutral urban districts requires experimental attitudes, new business models, cooperation beyond administrative borders and the involvement of many stakeholders and sectors.



A.4 – CLUE / ITACA

Protocollo ITACA Scala Urbana



ISTITUTO PER L'INNOVAZIONE E TRASPARENZA DEGLI APPALTI E LA COMPATIBILITA' AMBIENTALE

http://www.itaca.org/valutazione_sostenibilita.asp

This protocol was approved by the Executive Council of ITACA (Institute for Innovation and transparency of procurement and environmental compatibility) and also technical body of the Conference of Regions and Autonomous Provinces, during the meeting of 21 December 2016.

The document was developed within the interregional working group "urban scale Protocol". It is a protocol dedicated to the transformation of urban areas, the concept of sustainability is increasingly considered as a complex set of "quality" able to respond to citizens' needs. It represent a new challenge for the development of an assessment system for urban areas. It's a multi scale tool applicable to the cluster, neighborhood, district and city. The protocol is targeted at whole life stages (design, construction and operation) and to new and existing urban areas. It's also a tool useful to support cities in their planning activities and target definition (performance based). Results achieving verification.

District retrofitting approach is frequently the most sustainable one: synergies among buildings, wasted energy exploitation, efficient use of renewable energy sources, cogeneration systems, economy scale factor.

Following the path marked by "Protocollo ITACA building scale", the urban scale ratings system followed a set of principles that have formed the basis for the identification of the most appropriate evaluation criteria to fully express the sustainability of urban interventions, in order that the protocol could represent a system:

- Complete, including all sustainability issues;
- Open, the use of open data from databases;
- Accessible, using clear and understandable metrics;
- Rigorous, use of scientific assessment methodologies;
- Performance based, the assessment of the performance not of the solutions;
- Flexible, the assessment at different urban scales;
- Contextualized, the use of local benchmarks and local priorities reflected.



	Development and integration of land parcels (%)							
SOC.Ac.22	ISSUE	C	ATEGORY	LEVI	EL	SCALE		
	Social	A	ccessibility	A		N		
GENERAL								
Description	The criterion calcula	tes the a	mount of cadastral	ots in the anal	yzed area and re	lates it to the		
	Value of the surroun	ding area	IS.	nment of the c	wisting blocks ar	ad also the		
	variety and inclusion	of new a	areas in the context	,				
	The subdivision is the fragmentation of land which is carried out in order to obtain individual							
	portions separated f	portions separated from each other: lots become separate units, in legal terms and therefore						
	with regard to the properties, and also in administrative one.							
	on the morphology a	and on th	e size of the buildin	gs; it is for this	reason that the	indicator has a		
	fundamental import	ance for	the morphological s	tructure.				
	In fact, a lot of small	lots will	constitute an obsta	cle to the realiz	zation of large iso	olated buildings		
	fabric.	u by an e	empty space, formin	ig on the contr	ary a continuous	and dense urban		
	This latter morpholo	gical type	ology it is typical of	our city, and m	nore generally of	the Italian cities,		
	especially with regar	d to the l	historic town. But w	e must not for	get that the size	of the buildings,		
	and therefore the lo	ts, goes t inking at	ogether with the fu	nction of these Jandmark built	e buildings, and s	o it is necessary		
	oversized and break	ng with t	he environment, su	ch as a museu	m, a university, a	hospital, etc.		
	The indicator that is	calculate	d is an intensity ind	icator, which n	neasures the con	centration of the		
	lots present in a cert	ain area.	Lots quantified are	then compare	d with the average	ge value of the		
Backaround	CLUE. Protocollo ITA	CA.						
References	[1], [2], [3], [4], [5]							
IEVEL								
Derived from	Software tool		Operational da	ata	In situ mea	surements		
	Simple Calculation	ons X	Empirical/Liter	ature				
Details	For the calculation o	f the per	formance indicator	proceeds as fo	llows:	I		
	1. Identify the cadas	tral lots i	n the area using a c	adastral map.				
	2. Calculate the tota	l number	of cadastral lots in	the area. Iastral lots and	the surface area	(A)		
	4. Calculate the perc	entage d	eviation between th	he value of the	area (A) and the	average of the		
	city or surrounding a	reas (B):			. ,	C		
	(A / B) -1 * 100.	.						
Areas covered	Iviain focus on neigh	bournoo	d scale.					
Barriers	-					aa da atua Llata in		
Rating	the analyzed than th	es the pe e city ave	ercentage deviation erage.	of the value fo	or the number of	cadastral lots in		
	The value obtained f	rom the	area considered is t	hen compared	with the average	e value of		
	reference of the city	or of the	adjacent areas, be	cause the urba	n area in which it	t is inserted is the		
	reference to be take	n into co benchm	nsideration. ark calibrated to th	e specific situa	tion in the evalua	ation phase: in		
	fact it would be inap	propriate	e to establish a refe	rence value in a	absolute terms, u	untied from the		
	context and undiffer	entiated.			-			
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the ne	ghbourh	ood scale.					
Details	The "Scale" characte	rization i	s that of the neighb	ourhood.				
Multiscale	-							
References	[1], [2], [3], [4], [5]							

REFERENCES



[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
()	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[0]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
[··]	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Homogeneity of the urban fabric (%)						
SOC.Ac.23	ISSUE	С	ATEGORY	LEVE	L	SCALE	
	Social	A	ccessibility	A		N	
GENERAL							
Description	The criterion evaluates the length of the perimeter of the area which is directly adjacent to urbanized areas. This value is divided by the total length of the perimeter of the area considered. The aim is to fill the voids of the urban fabric and at the same time to contain the peripheral expansion. The constitutive components of the urban form can be volumes and also open spaces, which are juxtaposed in the urban landscape, giving rise to forms of settlement that may present characters of unity or formal homogeneity, on the basis of their morphological characters. Urban sprawl, better known as diffuse city, it indicates a rapid and disorderly growth of a city. This phenomenon is often manifested in the recent expansion of peripheral areas and subjected to constant changes, having as a characteristic sign low population density and adverse effects such as the reduction of green spaces and soil consumption. Another consequence of urban sprawl is the dependence on cars because of the greater distance from services, from the workplace, the local public transport. In general, we note the lack of infrastructure for alternative mobility as cycle tracks, pavements or pedestrian crossings properly connected. The indicator, on the basis of the foregoing, has a fundamental importance to provide an understanding of the type of urban fabric with respect to which is conducted the analysis. An urban intervention in adjacency to already urbanized areas is considered more sustainable, as it avoids that we are going to affect free soil. At the same time it is essential to avoid the uncontrolled expansion peripheral and stimulate, on the contrary, the recovery of lots or large urban areas abandoned and discontinued.						
	percentage value.		•				
Background	CLUE, Protocollo ITACA.						
References	[1], [2], [3], [4], [5]						
LEVEL Derived from	Software tool	-	Operational da	at a	In citu	moasuromonts	
Derived from	Simple Calculations	×	Empirical/Liter	ald	msitu	measurements	
Details	 The intent is to fill the gaps in the urban fabric and contain the peripheral expansion. For the calculation of the performance indicator proceeds as follows: Quantify the total length of the perimeter of the area analyzed (A). Evaluate, by quantifying, the linear meters of urban fabric adjacent to urbanized areas (B). Calculate the percentage ratio between the length of the urban fabric perimeter adjacent to urbanized areas and the overall length of the perimeter of the area: 						
Areas covered	Main focus on neighbou	rhoo	d scale.				
Barriers	-						
Rating	The criterion evaluates the length of the perimeter of the area analyzed which is directly adjacent to urbanized areas. The higher the percentage is, the better the performance of the area will be.						
References	[1], [2], [3], [4], [5]						
SCALE	Applicable to the painty	ourt	and scale				
Application	The "Scale" characterize	tion	ouu stale.	ourbood			
Details							
	- [1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
[-]	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
[-]	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].



	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



Preservation of land (%)							
ENV.LU.02	ISSUE	C	ATEGORY	LE	VEL	SCALE	
	Environmental		Land Use		A	N	
GENERAL							
Description	The criterion evaluates the reuse of soil previously occupied and / or contaminated for the construction of new buildings and infrastructure, for this reason it is only calculable for new construction areas. The aim here is to contain and stop the consumption of soil. The ground is in fact a non-renewable resource, characterized by a very rapid potentially degradation and at the same time by the processes of formation and regeneration extremely slow. The importance of this indicator is therefore clear: the free soil and agricultural land, becoming more and more scarcer, due to urban sprawl and fragmentation events, are the key elements for safeguarding the ecological and environmental balance, and therefore they must be protected. The elements that are considered here are essentially two: the consumption of soil from infrastructured surface and the consumption of soil by urbanized surface. These lead to the loss of the natural character of the soil and, between the devastating environmental consequences, we can mention the progressive increase of impervious surface, with the consequent impediment to water absorption. This is why the currency policy positively preserved the soil surface. The theme is very timely: in this regard the Council of Ministers recently approved a draft law on						
	resource to protect and promote reuse and regeneration of already urbanized areas.						
Background	CLUE, Protocollo ITA	CA.					
References	[1], [2], [3], [4], [5]						
LEVEL	LEVEL						
Derived from	Software tool		Operational da	ita	In situ	measurements	
Derived from	Simple Calculation	ons X	Empirical/Liter	ature			
Details	The intent is to reduce soil consumption. To assess this criterion, assign to each homogeneous part of the cluster a weight as follows: - undisturbed land weight = -1 - agricultural land weight = 0 - occupied land weight = 3 - contaminated land weight = 5 Multiply each surface area by its weight and sum the weighted values.						
Areas covered	Main focus on neigh	bourhoo	d scale.				
Barriers	-						
Rating	The criterion evaluates the percentage of reused land out of the total. The benchmark here is represented by agricultural land, to which it is assigned a weight equal to 0. It is therefore necessary for the purposes of a sustainable design achieve superior performance to this.						
References	[1], [2], [3], [4], [5]						
SCALE							
Application	Applicable to the ne	ighbourh	ood scale.				
Details	The "Scale" characte	erization i	s that of the neighb	ourhood.			
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].



[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Conservation of built environment (%)						
ENV.LU.01	ISSUE	C	ATEGORY	LE	VEL	SCALE	
	Environmental		Land Use		A	N	
GENERAL							
Description	The criterion evaluates the existing built surface area (SLP, road surface, etc.) preserved compared to the total surface area, and therefore it is only calculable for new construction areas. The aim on one hand is to preserve, where possible, the existing urban morphology, on the other hand to reduce the consumption of soil and building materials. This allows a reduction of costs, especially as regards the construction materials, and a continuity of the existing urban forms, often crucial for the overall morphology of an area, that a limitation of consumption of soil, exhaustible resource to be protected. Must be excluded from the total surfaces that for different reasons are not preservable. It is important to emphasize how this indicator is applicable not only to the conserved and renovated buildings, but also to the road surface preserved: this aspect results to be critical to						
Backaround	CLUE, Protocollo ITA	ACA.		ig 01 30113.			
References	[1], [2], [3], [4], [5]						
LEVEL							
Derived from	Software tool		Operational da	ata	In situ	measurements	
	Simple Calculation	ons X	Empirical/Liter	ature			
Details	 For the calculation of the performance indicator proceeds as follows: 1. Identify the surfaces preserved in the analyzed area (SLP buildings, road surface, etc.). 2. Calculate the total area preserved (A), as the sum of all preserved surfaces. 3. Calculate the total area (B), excluding from this the surfaces do not preservable. 4. Divide the total area preserved compared to the total surface area and calculate the percentage: (A / B) * 100 						
Areas covered	Main focus on neigh	bourhoo	d scale.				
Barriers	-						
Rating	The criterion evaluates the percentage of existing surface preserved compared to the total. The higher this value is, the better the performance of the area will be.						
References	[1], [2], [3], [4], [5]						
SCALE	1						
Application	Applicable to the ne	ighbourh	ood scale.				
Details	The "Scale" characte	erization i	s that of the neighb	ourhood.			
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[-]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
[.]	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	PROTOCOLLO ITACA SCALA URBANA
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana 211216.pdf



	Availability of safe bicycle routes (m)						
SOC.Tr.01	ISSUE	C	ATEGORY	LE	VEL	SCALE	
	Social		Transport		A	Ν	
GENERAL							
Description	The criterion calculates the length of safe cycling routes in the area and relates it to the number of inhabitants of the area. The purpose is to encourage the use of bicycles as an alternative to the private car. This would lead to a decrease in congestion levels of roads, as well as a reduction in pollution, with a significant improvement in air quality. The criterion takes into account only the linear meters of safe cycle path, that is a protected path, exclusively reserved to bicycles or shared with pedestrians (pedestrian and cycle path), marked by special signs which indicate it, as well as strips that surround along its way. This is distinguished from the sidewalk and motorized traffic, to ensure road safety, in compliance with the different speeds that characterize them. This criterion evaluates, without distinctions, cycle paths on reserved lane and the shared with						
Background	CLUE, Protocollo ITAC	CA.					
References	[1], [2], [3], [4], [5]						
LEVEL							
Derived from	Software tool		Operational da	ata	In situ	measurements	
	Simple Calculatio	ns X	Empirical/Liter	ature			
Details	The intent is to ensure safe and continuous routes for cyclists. Calculate the length of safe cycle routes. For the calculation of the performance indicator proceeds as follows: 1. Identify safe cycle tracks in the area analyzed. 2. Calculate the linear meters of safe cycle tracks (m).						
Areas covered	Main focus on neighb	ourhoo	d scale.	0			
Barriers	-						
Rating	The criterion evaluates meters of cycle path per capita. The value obtained in the area in question must therefore be put in comparison with the average reference value of the city or with the surrounding urban areas, in order to assess whether the performance of the area are higher or lower than the average of the urban territory in which it is inserted.						
References	[1], [2], [3], [4], [5]						
SCALE							
Application	Applicable to the nei	ghbourh	ood scale.				
Details	The "Scale" character	ization	is that of the neighb	ourhood.			
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
(Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[0]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Contiguity of bicycle and car routes (%)						
SOC.Tr.05	ISSUE	C	ATEGORY LE	EVE	L	SCALE	
	Social		Transport	А		Ν	
GENERAL							
Description	The criterion calculates the percentage of vehicular traffic with adjacent cycle paths present in the area compared with to the total. The purpose in this case is to encourage the use of bicycles and it can be considered for all purposes as an alternative means of transport. The criterion above it considers the linear meters of cycle path per head without making distinctions, including then in the evaluation also cycling paths, for example, in public parks, etc. This criterion on the contrary wants to emphasize the importance of having bike paths associated with a vehicular route and contiguous to it, in order to actually use the bicycle for all the necessary movements, like the other means of transport. The requirement is to discourage the use of private cars: this would result in a decrease in traffic levels, as well as a decrease in the emission of polluting factors, with a significant improvement						
Background	CLUE, Protocollo ITACA.						
References	[1], [2], [3], [4], [5]						
LEVEL							
Derived from	Software tool		Operational data		In situ	measurements	
	Simple Calculations	Х	Empirical/Literature				
Details	 Allow the use of bicycles as an alternative option for transportation. Consider all car routes which have adjacent and safe bicycle routes which connect to the urban cycling network. To evaluate this criterion, are taken into account all the car routes to whom are adjacent safe bike paths connected to the urban cycle network. For the calculation of the performance indicator proceeds as follows: Identify the safe cycle tracks adjacent to vehicular routes in the area. Calculate the linear meters of vehicular traffic in adjacent to safe cycle tracks (A). Calculate the total linear meters of vehicular traffic relationship with adjacent to bike paths compared with to the total of unbicular paths A (P * 100) 						
Areas covered	Main focus on neighbour	hood	d scale.				
Barriers	-						
Rating	The criterion evaluates the percentage of road routes with cycle path adjacent compared to the total of the vehicular pathways. The value obtained must therefore be put in comparison with the average value of the city or of the surrounding urban areas, in order to evaluate if the performance are higher or lower than the average of the urban territory in which it is inserted.						
References	[1], [2], [3], [4], [5]						
SCALE							
Application	Applicable to the neighbo	burh	ood scale.				
Details	The "Scale" characterizat	ion i	s that of the neighbourhood.				
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
·	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[0]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
[··]	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana 211216.pdf



	Connectivity	of the	e street netw	/ork (num	ber /m ²	²)
SOC.Tr.20	ISSUE	C	ATEGORY	LEVE	L	SCALE
	Social		Transport	А		N
GENERAL						
Description	The criterion takes into account the number of intersections present in the analyzed area comparing them to the overall surface area itself. The purpose is to quantify the number of interconnections present in the area with the intent to intensify them in order to have a very urban connective tissue. This condition ensures a large number of possible paths in the city, it allows to reduce the distances and the traffic slowdowns, and promotes the pedestrian accessibility. The issue of network connectivity can be considered one of the key elements of urban sustainability, as the road syntax (defined as mobility) is an integral part of the urban syntax. The degree of network connectivity and transport services measures the territorial accessibility, an area will be much more accessible to people and things as far as dense will be the interconnection grid in the area itself. Streets are therefore among the basic components of the urban morphology and play a fundamental role in the definition of the same. The traditional city are very connective, having a large number of reduced amplitude paths, an average number of roadway of average size and a small number of wide streets with high sliding. In recent expansions, however, the grid is designed primarily for cars, and instead of the avenues we preferred to achieve higher-level roads which created a break with the historical city. The reduced average distance between the intersections and the high density of the same, are important elements for a sustainable mobility, as they reflect the concept of the city on a human scale, livable and also easily accessible on foot. Based on the above, the importance of considering the connectivity of the road network is relevant for an urban assessment. Within an urban fabric, connectivity ensures the vitality of the city itself, creates customizable alternative path, encourages walking and human interaction, and helps to make the city dynamic. The criterion can be calculated to evaluate an existing area, or a project one. In a simi					
	it to the total surfac	e area.				
Background		ACA.				
References	[1], [2], [3], [4], [5]					
	Cofficiente de el		Onerational de	te	lun aitu un	
Derived from	Sontware Looi		Empirical/Litor	aturo	in situ n	neasurements
Details	Simple Calculations A Empirical/Literature Generate interconnections to multiply the paths, reduce distances increasing the accessibility. Quantify the number of intersections in the area. For the calculation of the performance indicator proceeds as follows: 1. Calculate the total surface of the area analyzed (A) 2. Find in the area road intersections, quantifying them (B) 3. Relate the number of intersections, previously quantified, to the total area: B / A 4. Get the value related to describe of intersections in the area (1 / m2)					
Areas covered	Main focus on neigh	bourhoo	d scale.			
Barriers	-					
Rating	The criterion measure the connectivity of the road network by calculating the density of road interconnections. It is quantified by the number of intersections in the road by comparing this value to the mesh surface of the area considered in the analysis. The value obtained in the area is compared with the average value of the city or to the adjacent areas, because the urban area in which it is embedded is the reference to be taken into account. This allows to have a benchmark calibrated to the specific situation in the evaluation phase: in fact it would be inappropriate to establish a reference value in absolute terms, disconnected from the context and undifferentiated.					
References	[1], [2], [3], [4], [5]					
SCALE						
Application	Applicable to the ne	ighbourh	ood scale.			
Details	The "Scale" characte	erization i	s that of the neighb	ourhood.		



Multiscale	-
References	[1], [2], [3], [4], [5]

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
[-]	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[0]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
L · J	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Cyclomatic c	omple	exity of the s	treet net	twork (-			
SOC.Ac.21	ISSUE	C	ATEGORY	LE\	/EL	SCALE		
	Social	А	ccessibility	ļ	4	N		
GENERAL								
Description	The criterion takes in present in the analy	nto accou red area a	int the number of ro and the number of r	oad intersecti oad sides, or	ions, called n the segmen	odes, which are ts between two		
	consecutive intercor The purpose of this i	nections ndicator	is to quantify the nu	umber of pos	sible routes i	n the area. The more		
	will be the cyclomatic number, the better will be the performance of the area from the point of							
	view of road connec	view of road connectivity. The theme of the road network connectivity is considered one of the						
	key elements of urban sustainability, as the road syntax intended as mobility is an integral part of the urban syntax: the degree of network connectivity and transport services measures the spatial accessibility.							
	In the calculation of	the indic	ator, compared with	n the previou	s one, era als	so taken into account		
	the sections: the no	des of the	e road graph repres	ent interconn	nections of ro	ad arteries while		
	when a high number	of node:	s is associated with	a consequent	t large numb	er of sides.		
	Consequently, it can	reinforce	e the concept that a	reduced ave	erage distance	e between the		
	intersections and a h	nigh dens	ity of the same are	important ele	ements for a	sustainable mobility,		
	The criterion can be	calculate	d to evaluate an exi	isting area an	ie and also ea id for a proie	ct one.		
Background	CLUE, Protocollo ITA	CA.						
References	[1], [2], [3], [4], [5]							
LEVEL	_		-					
Derived from	Software tool		Operational da	ata	In situ	measurements		
Derived from	Simple Calculation	ons X	Empirical/Liter	ature				
Details	Create many possibl	e paths, a	allowing a more flui	d traffic.	links and sub	tract thom the		
	number of intersect	ons.	ecessary to add up	all the roads				
	Links - Nodes + 1							
	For the calculation o	f the per	formance indicator	proceeds as f	follows:			
	 Locate in the area Find in the area set 	of the in	tersections (nodes l sides I) between su	N), quantifyin Iccessive inte	ng them.	antified		
	3. Apply the formula	L - N + 1			i sections, qu	antineu.		
Areas covered	Main focus on neigh	bourhoo	d scale.					
Barriers	-							
Rating	The criterion measu	re the cyc	clomatic complexity	of the road r	network by ca	alculating the amount		
	of road interconnect	ions (noc subtracts	les) and the numbe	r of segments	s (sides) iden e nodes and	tified between two		
	to 1. The value obtai	ned in th	e area is compared	with the refe	erence value	of the city or of the		
	adjacent areas beca	use the u	rban area in which i	t is embedde	d is the refer	ence to be taken into		
	account. This allows	to have a	a benchmark calibra	ted to the sp	ecific situatio	on in the evaluation		
	disconnected from t	he contex	kt and undifferentia	ted.	ce value ili ac	Solute terms,		
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the ne	ighbourh	ood scale.					
Details	The "Scale" characte	rization i	s that of the neighb	ourhood.				
Multiscale	-							
References	[1], [2], [3], [4], [5]							

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
[-]	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
(=)	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf



	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[0]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
[··]	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Scale of the street network (m)							
SOC.Tr.22	ISSUE	C	ATEGORY	LEV	/EL	SCALE		
	Social		Transport	A	4	N		
GENERAL								
Description	The criterion takes into account the distance between successive intersections, then calculating an average value of reference. The objective of this indicator is to ensure the possibility of moving on foot or by bicycle for daily routes: if the distances between the major points of interest in the city are not high, people are encouraged to walk displacement. Reduced distances between successive intersections determine, as previously stated for the indicator on connectivity of the road network, an urban fabric very connective and consequently are guaranteed more alternative path. The importance of having small distances between successive intersections makes the cities more on a human scale, encouraging greater social interaction, more alternative route and even minor speed of traffic flow in transit. Studies conducted on the matter, found that, for distances up to 500 m, people are still encouraged to go walk in the places chosen placed at that distance: this discourages private car use for travel, resulting in a decrease in traffic and air pollution. In the calculation of the indicator are taken into consideration sides comprised between two							
	calculates the exact quantifies the avera	length of ge value o	each of these traits of reference for the	. They add up area based o	the values to the numbe	thus obtained and er of existing sides.		
Development	The criterion can be	calculate	d to evaluate an exi	isting area or	a project on	е.		
Background		CA.						
Rejerences	[1], [2], [3], [4], [3]							
Derived from	Software tool		Operational da	ata	In situ	measurements		
Derived from	Simple Calculatio	ons X	Empirical/Liter	ature	in situ	measurements		
Details	 The intent is to ensure the possibility to move using bicycle or walking for every day movements. Calculate the average distance between roads intersections. For the calculation of the performance indicator proceeds as follows: Locate in the area the segments (sides L) between successive intersections, quantifying them. Calculate the length of each of sides previously identified. Add together the relative lengths of the sides to obtain a total value. Divide the value obtained for the number of sides in the urban fabric analyzed obtaining an approximate the segment in the previously identified. 							
Areas covered	Main focus on neigh	bourhoo	d scale.					
Barriers	-							
Rating	The criterion measure the scale of the road network quantifying the number of segments (sides) identified between two successive nodes and their relative lengths. The resulting sum of the lengths is divided by the total number of sides, in order to obtain the average value of the distance between the intersections of the area. The optimum value of the scale reference of the road network can be a value between 80 and 200 meters, distances that conform to the size of a block type and at a very urban connective tissue.							
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the ne	ighbourh	ood scale.					
Details	The "Scale" characte	erization i	s that of the neighb	ourhood.				
Multiscale	-							
References	[1], [2], [3], [4], [5]							

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].



[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Access to public transport: bus, tram, metro (%)									
SOC.Tr.15	ISSUE	C	ATEGORY	LEVI	EL	SCALE				
	Social	•	Transport	А		N				
GENERAL										
Description	The criterion calculates the percentage of the resident population located at less than 300 meters from a public transport stop like tram, bus and metro, and at less than 1,000 meters in the case of a train station. The aim is discourage and reduce the use of private vehicles for transportation, on the contrary encouraging the use of public transport, more sustainable mobility. This can facilitate a decrease in traffic levels and levels of pollution, with a consequent improvement of air quality. This metric allows to see how much the population is effectively covered and served by public transportation: in fact some studies show that if you exceed a distance of 300 meters, the population has not stimulated to the use of public transport, preferring on the contrary to use their own private vehicle for travel. The distance between the transport node and the access of the building is not calculated on a linear distance, but considering the way actually walkable. In assessing this indicator it's important to identify four types of public transport nodes: tram,									
Backaround	CLUE, Protocollo ITACA.									
References	[1], [2], [3], [4], [5]									
LEVEL										
Derived from	Software tool		Operational da	ata	In situ	measurements				
	Simple Calculation	ns X	Empirical/Liter	ature						
Details	The intent is to reduce the use of private vehicles. The indicator has been calculated with the percentage of users located at less than 300 meters from a public transport node (tram, bus, rail). The distances have been measured as it would be walking (not in a straight line). For the calculation of the performance indicator proceeds as follows: 1. Identify the nodes of the network of public transport in the area, distinguishing between bus, tram, metro and railway. 2. Calculate the actual distance on foot between these nodes and access the buildings. 3. Calculate the percentage of the population that is located at less than 300 meters away from bus carried pades tram and metro and less than 1000 meters from these rail.									
Areas covered	Main focus on neighb	ourhood	d scale.							
Barriers	-									
Rating	The criterion evaluate nodes. The higher thi	es the pe s value i	ercentage of the pop s, the better the pe	pulation that is rformance of t	s close to th he area will	e public transport be.				
References	[1], [2], [3], [4], [5]									
SCALE										
Application	Applicable to the neig	shbourh	ood scale.							
Details	The "Scale" character	ization i	s that of the neighb	ourhood.						
Multiscale	-									
References	[1], [2], [3], [4], [5]									

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
r_1	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[-]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
L · J	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN
[0]	SCALEhttp://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Accessibility of pedestrian paths (%)									
SOC.Tr.07	ISSUE	(CATEGORY	LEVE	L	SCALE				
	Social		Transport	А		N				
GENERAL										
Description	The criterion takes into consideration the area of pedestrian paths that respect the principles of the Design for All and divides it by the total area of pedestrian routes in the area. The aim is make available to everyone, able and disabled, the use of the walking routes in the city. The importance of removing architectural barriers is an important and essential aspect in a city, because these components prevent, limit or make difficult travel and the use of services (especially by people with limited mobility or sensory impairment). Traditional examples of architectural barriers are steps, narrow doorways, excessively steep, narrow space, but there are countless others, all united from being obstacles and impediments, temporary or permanent basis, that prevent you to enjoy safely throughout that set of functions, equipment and services that man-made space should be guaranteed to all categories of users. These theoretical lines have been articulated in the first Italian framework law regulating the problem of accessibility, Law n°3 of January 9, 1989, "Regulations to facilitate the overcoming and removal of architectural barriers", which pays particular attention to public space, penetrating the technical part to identify the three different levels of quality of the built environment: Accessibility, Visitability, Adaptability. The human being is not standard, and consequently planning Design for All means designing environments, systems, usable products and services independently from people with different needs and skills involving human diversity in the design process. Regarding the calculation of the indicator, are quantified in terms of linear meters the paths that respect the principles of Design for All and relates them to the total meters of existing pedestrian									
Backaround	CLUE, Protocollo ITA	CA.								
References	[1], [2], [3], [4], [5]									
LEVEL										
Derived from	Software tool		Operational da	ata	In situ	measurements				
	Simple Calculation	ons X	Empirical/Liter	ature						
Details	The intent is to provide universal access to the population. For the calculation of the performance indicator proceeds as follows: 1. Identify and quantify linear meters of walking trails that follow the principles of Design for All in the area (A). 2. Calculate the total length of the pedestrian of the area paths (B). 3. Calculate the percentage value by dividing the total length of the pedestrian estimated routes to the length of the pedestrian paths designed according to the principles of Design for All: B / A * 100									
Areas covered	Main focus on neigh	bourhoo	od scale.							
Barriers	-									
Rating	The criterion measu compared to the tot The higher the perce	res the p al in the entage o	percentage of pedest area of the same f accessible routes is	rian paths that a , the better the	are directl performa	y accessible to all, nce of the area will be.				
References	[1], [2], [3], [4], [5]									
SCALE										
Application	Applicable to the ne	ighbourl	hood scale.							
Details	The "Scale" characte	erization	is that of the neighb	ourhood.						
Multiscale	-									
References	[1], [2], [3], [4], [5]									

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].



[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALEhttp://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Sharing Mobility (%)									
SOC.Tr.09	ISSUE	С	ATEGORY	LEVEL		L	SCALE			
	Social	cial Transport		А			N			
GENERAL										
Description	The criterion calculates the percentage of the resident population which is located less than 400 meters from a bike sharing station present in the area and in those immediately adjacent to it. The main objective is to discourage and reduce the use of private vehicles for transportation to encourage the use of sustainable shared displacement means. This metric allows you to see how much the population was effectively used and covered by the service: in fact, some studies show that for large distances, the population is not stimulated to walking and prefers to use his private vehicle. The distance is not calculated on a linear distance, but considering the way actually walkable.									
Background	Protocollo ITACA.									
References	[1]									
LEVEL										
Derived from	Software tool		Operational da	ta		In situ	measurements			
	Simple Calculations	Х	Empirical/Liter	ature						
Details	 I. Identify the bike sharing stations in the area and surrounding areas. Calculate the actual distance on foot between these nodes and access the buildings. Calculate the percentage of the population that is less than 400 meters from at least one station. In the case where it was not possible to calculate the distances actually traveled on foot, proceed as follows: Identify the bike sharing stations in the area being analyzed. Overlap graphically at each of these collection points a circle of radius 300m. Calculate the percentage of the population that is less than 300 meters from the stations, checking which buildings are included within the circle 									
Areas covered	Main focus on neighbour	hoo	d scale.							
Barriers	-									
Rating	The criterion evaluates the least one station. The hig	ne pe her	ercentage of the pop this value is, the bet	oulation tha ter the perf	t is l orm	ess than 4 ance of th	00 meters from at he area will be.			
References	[1]									
SCALE										
Application	Applicable to the neighbo	burh	ood scale.							
Details	The "Scale" characterizat	ion i	s that of the neighb	ourhood.						
Multiscale	-									
References	[1]									

REFERENCES	
[1]	ITACA'S PROTOCOL AT URBAN
[-]	SCALEhttp://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Access to a b	Access to a broadband communication network (%)										
SOC.Ac.01	ISSUE		C	ATEGORY	LE	VEL	SCALE					
	Social		Accessibility			A	N					
GENERAL												
Description	The criterion calcula	The criterion calculates the percentage of public spaces or for public use, from which you can										
	access the network	access the network with Wi-Fi mode. An easy accessibility to the network is an instrument to										
	competitiveness and	competitiveness and attractiveness of an urban context.										
Background	Protocollo ITACA.											
References	[1]											
LEVEL												
Derived from	Software tool			Operational da	ita	In situ	measurements					
	Simple Calculation	ons	Х	Empirical/Liter	ature							
Details	For the calculation of	of the I	perf	ormance indicator	proceeds as	follows:						
	1. Calculate the tota	il area	of t face	he gross floor area	of public spa	aces or public	c use in the area (A).					
	access Wi-Fi (B).	iui sui	lace	e gross or public spa	ces of public	L use covered	I by the network with					
	3. Calculate the per	centag	ge of	f AT covered by Wi-	Fi. Calculate	the percenta	age value through the	2				
	following formula:											
	X = A / B											
	A = gross surface of	public	spa	aces or public use in	the area [m	2].						
	B = gross surface of	public	spa	ices or public use co	overed by W	i-Fi network	with access [m2].					
Areas covered	Main focus on neigh	nbourh	1000	l scale.								
Barriers	-											
Rating	The criterion evalua	tes the	e pe	rcentage of public	spaces or for	r public use, f	rom which you can					
	access the network	with V	Vi-F	i mode. The higher	this value is,	the better th	ne performance of the	е				
References	[1]											
SCALE	[-]											
Application	Applicable to the ne	ighbo	urh	ood scale.								
Details	The "Scale" characte	erizatio	on i	s that of the neighb	ourhood.							
Multiscale	-											
References	[1]											
nejerences	1-1											

REFERENCES	
[1]	ITACA'S PROTOCOL AT URBAN
[-]	SCALEhttp://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Permeability of land (%)								
ENV.LU.04	ISSUE	C	ATEGORY	LE	VE	L SCALE			
	Environmental		Land Use		А	N			
GENERAL									
Description	The criterion calculates the percentage of permeable surfaces compared to the total. The permeability is the ability of a soil to be traversed by fluids; allowing the percolation of rainwater into the ground, this capacity contributes to the feeding of aquifers. The need for this metric is to minimize the interruption and contamination of natural water flows. The permeability is measured by the permeability index, it is expressed as a percentage, which defines the relationship between the permeable soil surface and the entire surface of the area object of study. The importance of this metric is evident if we consider the continuous and increasing waterproofing phenomenon of soil erosion, caused by a progressive decrease of agricultural areas, in favor of artificial areas, urbanized and intended to infrastructure. All this has generated destructive environmental impacts, such as the progressive loss of fertile land and strong natural value, increasingly higher values of pollution, the interruption of natural communication corridors, the impairment of the original habitats and natural biotopes. The inability of the sealed areas to absorb a part of water by filtration increases significantly the superficial flow, also favoring the contamination by chemicals. This sliding can cause obvious problems on the control of surface waters, in particular on the occasion of intense rain events, going to affect the charge capacity of the aquifers. Soil is a finite resource and therefore be protected. For the calculation of the indicator are taken into account all types of soil present in the area and to each of these is associated a permeability factor.								
Background	CLUE, Protocollo ITACA.								
References	[1], [2], [3], [4], [5]	_							
LEVEL				-		· •			
Derived from	Software tool		Operational da	ta		In situ measurements			
Details	The intent is to minimize Calculate the area of all t that are permeable and of permeable surfaces, appl For the calculation of the 1. Divide the total area for 2. Calculate the total area (A). 3. Add all areas each mul of the permeable surface 4. For the purposes of the - lawn in the gr - gravel, sand o - gratings elem - gratings / alve (medium / low - self-locking el (low level) $\alpha = 0$ 5. Calculate the percenta	the is the period of the perio	interruption and polermeable surfaces in the their overall area between a surfaces in the their overall area between a surfaces in the formance indicator progeneous areas, a each homogeneous areas, a homogeneous a	lution of na h the neight by the total o account for proceeds as according to area (m2) a y coefficien α refer to t hedium / hig with filling a laid dry with ottom in sa caled joints, on total B /	tura sour surf foll the nd c t (α) the f gh le of to n ve nd a laic	al water flows. rhood. Identify all of the surf- face of the area. For semi- ne reduction in performance ows: characteristics of the soil. calculate the total surface ar- b, obtaining the overall exter following: evel) $\alpha = 0.9$ opsoil (medium level) $\alpha = 0.8$ getable soil or gravel filling and gravel in the background d on the slab or wrought cls (Faces ea hsion		
Areas covered	Main focus on neighbour	hood	d scale.						
Barriers	-								
Rating	The criterion evaluates the disruption of the natural the area will be.	ne pe wate	ercentage of the tota er streams. The high	al permeabl er this value	e su e is,	rface, in order to minimize the better the performance	of		
References	[1], [2], [3], [4], [5]								
SCALE									



Application	Applicable to the neighbourhood scale.				
Details	The "Scale" characterization is that of the neighbourhood.				
Multiscale	-				
References	[1], [2], [3], [4], [5]				

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALEhttp://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Intensity of wasteater treatment (%)								
ENV.Wa.11	ISSUE	C	ATEGORY	LE	LEVEL		SCALE		
	Environmental		Water		А			Ν	
GENERAL									
Description	The criterion calculates the percentage of sewage collected and treated to be reused in the area. For wastewater we consider the wastewater, then all those waters whose quality has been affected by human action after their use in different types of activities, including domestic ones. This allows for a more sustainable management of water resources and a reduction of waste spilled into the sea. The aim is reuse these wastewater into drinking water replacement, when possible, after an appropriate treatment, which essentially consists in the purification of these by organic and inorganic contaminants.								
Background	CLUE, Protocollo ITACA.								
References	[1], [2], [3], [4], [5]								
LEVEL	_		_						
	Software tool		Operational da	ita		In situ	measur	ements	
Derived from	Simple	Х	Empirical/Liter	ature					
	Calculations								
Details	 The intent is to maximizing the potential of use of wastewater in place of drinking water whenever possible. For the indicator of performance calculation proceeds as follows: Calculate the volume of wastewater collected and treated to be reused in the area (A). Divide the volume for the total water consumption in the area (B). Calculate the percentage value of wastewater reused compared to the total A / B * 100 								
Areas covered	Main focus on neighbourhood scale.								
Barriers	-								
Rating	The criterion evaluates the percentage of sewage collected and treated compared to the total. The higher this value is, the better the performance of the area will be.								
References	[1], [2], [3], [4], [5]								
SCALE									
Application	Applicable to the neighbourhood scale.								
Details	The "Scale" characterization is that of the neighbourhood.								
Multiscale	-								
References	[1], [2], [3], [4], [5]								

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALEhttp://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Connectivity of green spaces (%)						
ENV.Bi.04	ISSUE	C	ATEGORY	LEVE	E	SCALE	
	Environment	В	iodiversity	A		Ν	
GENERAL							
Description	The criterion takes into account the related green areas, intended or actual, in the area relation to the total surface of green areas. The objective is to enhance and protect biodiversity. The urban green is a characterizing element of the environment built in fundamental relationship with the landscape, and a factor of great importance for improving the quality of life in cities. Today, however, many of these natural areas are subject to pressures and risk fragmentation. Habitat fragmentation is caused by a variety of factors related to growing urbanization and the intensification of transport infrastructure. This fragmentation undermines the functioning of ecosystems, which need space to prosper and continuity. For this purpose in the interventions of land management is increasingly highlighted the importance of issues such as "green corridors", or "green infrastructure", or "ecological network", which emphasized the importance of connectivity of these areas. Precisely for this reason, metric assesses only the interconnected green areas, which are also to be more accessible and usable by users of the area under analysis.						
Background	CLUE, Protocollo ITACA.						
References	[1], [2], [3], [4], [5]						
LEVEL							
Derived from	Software tool		Operational da	ita	In situ	measurements	
	Simple Calculation	ons X	Empirical/Liter	ature			
Details	 The intent is to protect and increment biodiversity. For the indicator of performance calculation proceeds as follows: Identify the green spaces connected. Calculate the total area of green spaces connected (A). Calculate the percentage ratio between the green surfaces connected (A) and the total green surface (B): A / B * 100. 						
Areas covered	Main focus on neighbourhood scale.						
Barriers	-						
Rating	The criterion evaluates the percentage of green areas interconnected present in the area compared to the total green areas. The higher this value is, the better the performance of the area will be.						
References	[1], [2], [3], [4], [5]						
SCALE	_						
Application	Applicable to the neighbourhood scale.						
Details	The "Scale" characterization is that of the neighbourhood.						
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[-]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
L · J	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[-]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf


	Use of local plants (%)								
ENV.Bi.07	ISSUE	С	ATEGORY	LEVE	L	SCALE			
	Environmental	В	iodiversity	A		N			
GENERAL									
Description	The criterion takes into account the percentage of planted native plants in the area analyzed								
-	compared to the total.								
	The purpose of this indicator is to protect and increase biodiversity, or the variety of life on								
	Earth, through the use of local tree species.								
	environment's biodi	ne importance of understationing the value of conservation in order to protect the environment's biodiversity is fundamental: highlight how each element is in connection with							
	others and understa	nd the in	portance of enhance	ing local enviro	onmental a	and cultural resources,			
	is the basis of the de	cision to	include this indicate	or for urban eva	aluation.				
	These theoretical lin	es were r	naterialized in diffe	rent actions at	the Europe	ean level promoting			
	conservation progra	ms which	result in a dense no	etwork of prote	ected areas	s, preserving the local			
	With regard to the c	alculation	of the indicator it	is essential to l	he in nosse	ession of a catalog that			
	identifies the plante	d tree sp	ecies. These are the	n compared wi	th the sche	edule of the local			
	species and from thi	s will be i	dentified and quant	ified those pre	sent in the	e test sample urban			
	area. It will then cal	culate the	e percentage ratio b	etween the nu	mber of na	tive species in the area			
	and that of the total trees planted.								
	The reference document for understanding the native species for urban green is processed by								
	The criterion can be	calculate	d to evaluate an exi	sting area and	a project i	nn. One			
Backaround	CLUE, Protocollo ITA	CA.			u project (
References	[1], [2], [3], [4], [5]								
LEVEL									
	Software tool		Operational da	ita	In situ	measurements			
Derived from	Simple Calculation	ons X	Empirical/Liter	ature					
Details	The intent is to prot	ect and ir	crement biodiversit	ty.					
2000.00	For the indicator of	performa	nce calculation prod	eeds as follow	s:				
	1. Locate and quant	fy the tre	e species present ir	the area (A).					
	2. Find, among these	e, the nur	nber of native ones	(B).					
	3. Expressing in perc	entage te	erms the relationshi	p between the	number 01 '	riocal tree species			
Areas covered	Main focus on neigh	bourhoo	d scale.	ies present. D7	A 100.				
Barriers	-								
Ratina	The criterion measu	res the pe	ercentage of local pl	ants planted in	the area u	urban related to the			
	total number of the	same.	0 1						
	The greater the num	ber of na	tive tree species pla	anted is, the be	tter the pe	erformance of the area			
	will be, as they purs	ue the ob	jective of preserving	g biodiversity.					
References	[1], [2], [3], [4], [5]								
SCALE									
Application	Applicable to the ne	ignbourh	ood scale.						
Details	The "Scale" characte	erization i	s that of the neighb	ourhood.					
Multiscale	-								
References	[1], [2], [3], [4], [5]								

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization



	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana 211216.pdf



	Wastewater management (%)							
ENV.Wa.14	ISSUE	С	ATEGORY	LEV	ΈL	SCALE		
	Environmental		Water	А		N		
GENERAL								
Description	The criterion calculates the percentage of wastewater for the treatment conferred outside the area compared to the total. For wastewater we consider the wastewater, then all those waters whose quality has been affected by human action after their use in different types of activities, including domestic ones. This allows for a more sustainable management of water resources and a reduction of waste spilled into the sea. The purpose is in fact minimize the interruption and contamination of natural water flows. The wastewater treatment allows to reuse these in place of drinking water, when possible, after an appropriate treatment, which essentially consists in the purification of these by organic and inorganic contaminants.							
Background	CLUE, Protocollo I	TACA.						
References	[1], [2], [3], [4], [5]							
LEVEL	_							
Dorived from	Software tool		Operational da	ta	In situ	measurements		
Derived from	Simple	Х	Empirical/Liter	ature				
	Calculations							
Details	 The intent is to minimize the interruption and contamination of natural water flows. For the indicator of performance calculation proceeds as follows: 1. Calculate the volume of wastewater for the treatment conferred outside the area (A). 2. Divide the volume for the total production of waste water in the area (B). 3. Calculate the percentage value of wastewater for the treatment conferred outside the area with respect to the total A (B * 100) 							
Areas covered	Main focus on neig	ghbourho	od scale.					
Barriers	-							
Rating	The criterion evaluates the percentage of wastewater conferred outside the area for the treatment compared to the total. The higher this value is, the better the performance of the area will be.							
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the neighbourhood scale.							
Details	The "Scale" characterization is that of the neighbourhood.							
Multiscale	-							
References	[1], [2], [3], [4], [5]	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
[-]	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide methodolog ique v6 euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[0]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
[··]	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Accessibility to differentiated waste collection (%)						
ENV.Im.25	ISSUE	C	ATEGORY	LE/	/EL	SCALE	
	Environmental		Impacts	A	١	N	
GENERAL							
Description	The criterion takes into account the percentage of the population in the area that is located at a distance greater than 50 meters from the areas intended for waste collection. The objective of this indicator is to identify the portion of the population not covered by the separate collection service with the intent of increasing the waste recycling rate, avoiding the landfilling. A proper waste management is crucial both to recover useful materials from waste, in order to reuse rather than dispose of them directly in landfills or incinerators, both for the reduction of the consumption of raw materials, use of energy and thus the emission of greenhouse gases associated. Of significant importance is in any case encouraging the population to the use of the differentiated collection bins; the proximity the same to the housing is critical for the success of the refusal differentiation. Precisely for this reason have been taken as a reference value 50 meters away, the path over which the load is no incentive to use such service. With regard to the calculation of the indicator, they are identified, by means of appropriate maps, the collection points (ecological areas) and any individual bins positioned on the road. Then it is calculated the amount of users who have access to collection points that do not attractive superior over 50 meters from the house. In this way it will be apparent to understand which part of the population is not covered by the differentiated waste collection system, obviously if present.						
Dealara	evaluate an existing	area and	a project one.				
Background		CA.					
Rejerences	[1], [2], [3], [4], [3]						
	Coftware tool		Operational de	at a	In citu	manuramenta	
Derived from	Simple Calculatio		Empirical/Litor	ald	III Situ	measurements	
Details	The intent is to incre For the indicator of 1. Identify the ecolo the area 2. Calculate the actu 3. Calculate the perc waste collection poi	al distance entage o nts, comp	ate of differentiated nce calculation proo s or individual bins ce on foot between f the population that pared to the main er	d collection, r ceeds as follo of differentia these nodes at is located n ntrances of th	educing lanc ws: ted collectio and access tl nore than 50 ne dwellings.	fill. n of waste present in he buildings. meters from the	
Areas covered	Main focus on neigh	bourhood	d scale.		~		
Barriers	-						
Rating	The criterion measures the percentage of the population that is more than 50 meters from the points collected separately, which therefore cannot easily take advantage of this service. The higher the percentage is, the better the performance of the studied area will be, since a majority of the population will have access to waste collection service.						
References	[1], [2], [3], [4], [5]						
SCALE							
Application	Applicable to the ne	ighbourh	ood scale.				
Details	The "Scale" characte	erization i	s that of the neighb	ourhood.			
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].



[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Intensity of GHG EMISSIONS (%)							
ENV.Im.12	ISSUE	C	ATEGORY	LE	VEL	SCALE		
	Environmental		Impacts		A N			
GENERAL								
Description	This criterion calculates the percentage of greenhouse gases emitted compared to the limit. For evaluation we calculate the need for energy and the total area is associated with each of the component needs a CO2 emission factor, dependent on the energy carrier. In this case, not having a specific data, it is assumed as an energy vector methane and has been considered for the calculation and the primary energy for heating.							
	To obtain the perform emissions limit) consi energy carriers. The l requirements corresp The goal is to reduce Protocol, an internati reduction of total em	To obtain the performance limit, it calculates the comparative value (i.e. the greenhouse gas emissions limit) considering as a requirement the legal limit, defining a standard scenario for energy carriers. The limit value is the amount of CO2 that the area would produce if its requirements correspond to the legal limits. The goal is to reduce CO2 emissions per capita, according to the targets set by the Kyoto Protocol, an international treaty of 1997 in which the signatory states commit themselves to a						
	1990 levels, and the 2 Union member count energy efficiency by 2	20-20-20 tries by 2 20% and	0 climate and energy 2020, a reduction of meeting 20% of Eur	package, pl 20% of gree rope's energ	lan that provie enhouse gas e ay needs with	des, by the European missions, increasing renewable energies.		
Background	CLUE, Protocollo ITAC	LA.						
References	[1], [2], [3], [4], [5]							
LEVEL								
Derived from	Software tool		Operational da	ita	In situ	measurements		
	Simple Calculatio	ns X	Empirical/Liter	ature				
Details	 For the indicator of performance calculation proceeds as follows: 1. Calculate the total demand of the energy sector 2. Associate each time the component requirement a CO2 emission factor, corresponding to an energy carrier. 3. Multiply the requirements for each component for the relevant emission factor, obtaining the total emissions for each component. 4. Sum the values obtained for the total value of the area (A). 5. Calculate the legal limit requirement of the area total energy. 6. Multiply the limit requirements for each component for the emission factor of the energy carrier type, obtaining the total emissions for each component. 7. Sum the values obtained for the CO2 emissions limit (B). 8. Divide the real value (A) for limit setting (B). 9. Multiply by 100 to get the percentage value of the emissions compared to the limit 							
Areas covered	Main focus on neight	ourhoo	d scale.					
Barriers Rating	 The criterion compares the CO2 emissions of the area to the CO2 emissions that would have in the area considering as requirement the legal limit. The benchmark is therefore the standard case set by the limits established by Italian legislation. The lower this value is, the best percentage of the area performance will be: the objective is indeed to have values below 100%, and therefore lower emissions at the statutory standard. 							
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the neig	ghbourh	ood scale.					
Details	The "Scale" characterization is that of the neighbourhood.							
Multiscale	-							
References	[1], [2], [3], [4], [5]							

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
[-]	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
L—J	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].



	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Intensity of acidifying emissions (%)							
ENV.Im.04	ISSUE CATEGORY LEVEL SCALE							
	Environmental		Impacts		A	N		
GENERAL								
Description	This criterion calculates the percentage of acidifying emissions compared to the limit. For							
	evaluation we calculate the energy requirement of the total area associating with each							
	component of this a	n SO2 and	NOx emission fact	or, depende	nt on the ene	ergy carrier. In this		
	case, will not have s	pecific da	ta, it is assumed as	an energy ve	ector methan	e and has been taken		
	To get the bonefit lir	calculatio	on only the primary	energy for n	eating. or limit omice	ions of acidifying)		
	Whereas requirement	nt as the l	egal limit, defining	a standard s	cenario for ei	nergy carriers. The		
	limit value is the pro	portion o	f acidifying emissio	ns that the a	rea would pro	oduce if its		
	requirements corres	pond to t	he legal limits.					
	The purpose is to rec	duce the e	emissions of SO2 (si	ulfur dioxide) and NOx (ni	trogen oxides),		
	polluting gases in lar	ge part d	erived from human	actions. The	effects of the	ese acid deposits are		
	heritage of our city (monume	er systems and nati	arai ecosyste	erris, Dut also	to the historical		
Backaround	CLUE, Protocollo ITA	CA.		-1•				
References	[1], [2], [3], [4], [5]	-						
LEVEL								
Derived from	Software tool		Operational da	ita	In situ	measurements		
Denved nom	Simple Calculatio	ns X	Empirical/Liter	ature	in situ			
Details	The intent is to redu	ce per ca	pitaSO2 and NOx er	nissions				
Detuiis	For the indicator of	performa	nce calculation prod	ceeds as follo	ows:			
	1. Calculate the tota	I needs of	the energy sector.					
	2. Associate each tin	ne the co	mponent needs an S	SO2 and NO	emission fac	ctor, corresponding to		
	an energy carrier.		с I			C		
	3. Multiply the requi	rements i	for each componen	t for the rele	evant emissio	n factor, obtaining the		
	4 Normalize the em	issions hy	multiplying each to	otal by a fact	or of 0 5 to 1	2 for SO2 and NOx		
	5. Sum the values of	tained fo	r the total value of	the area (A).				
	6. Calculate the lega	l limit req	uirement of the tot	al energy.				
	7. Multiply the limit	requirem	ents for each comp	onent for the	e emission fa	ctor of the energy		
	carrier type, obtainin	ng the tot	al emissions for each	ch componer	nt.			
	8. Normalize emissio	ons by mu	r the emissions of S	by a factor o	1 0.5 to 1.2 to limit (B)	or SO2 and NOX.		
	10. Divide the real va	alue (A) fo	or limit setting (B).					
	11. Multiply by 100 t	to get the	percentage value o	of the emission	ons compared	d to the limit.		
Areas covered	Main focus on neigh	bourhood	l scale.					
Barriers	-							
Rating	The criterion compa	res the SC	02 and NOx emissio	ns of the are	a to the SO2	and NOx emissions		
	that would have in t	he area co	onsidering as requir	ement the le	egal limit. The	e benchmark is		
	therefore the standa	ird case s	et by the limits esta	blished by It	alian legislati rmance will b	0n. e: the objective is		
	indeed to have value	es below :	100%, and therefore	e lower emis	sions at the s	tatutory standard.		
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the neighbourhood scale.							
Details	The "Scale" characterization is that of the neighbourhood.							
Multiscale	-							
References	[1], [2], [3], [4], [5]							
nejerences								

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
L-J	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
L=1	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].



	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Intensity of photo-oxidants emissions (%)						
ENV.Im.15	ISSUE	C	ATEGORY	LEVEL	SCALE		
	Environmental		Impacts	A	N		
GENERAL							
Description	This criterion calculates the percentage of photo-oxidants emissions than the limit. For evaluation we calculate the need for energy and the total area is associated with each component of this a CO emission factor, NO2 and NMVOC, dependent on the energy carrier. In this case, will not have specific data, it is assumed as an energy vector methane and has been taken into account for the calculation only the primary energy for heating. To get the benefit limit, we calculate the comparative value (i.e. the photo-oxidants limit emissions) Whereas requirement as the legal limit, defining a standard scenario for energy carriers. The limit value is the proportion of acidifying emissions that the area would produce if its requirements correspond to the limits of the law. The purpose is to reduce CO (carbon monoxide), NO2 (nitrogen dioxide) and NMVOC (non- methane volatile organic compounds). These polluting gases, largely the product of human activities, have harmful effects on human health and contribute to air pollution and photochemical.						
Background	CLUE, Protocollo IIA	ACA.					
References	[1], [2], [3], [4], [5]						
	Coff and tool						
Derived from	Software tool		Operational da	ita in situ	measurements		
	Simple Calculation	ons X	Empirical/Liter	ature			
Arage covered	 For the indicator of performance calculation proceeds as follows: 1. Calculate the total needs of the energy sector. 2. Associate each time the component needs an emission factor CO, NO2 and NMVOC, corresponding to an energy carrier. 3. Multiply the requirements for each component for the relevant emission factor, obtaining the total emissions for each component. 4. Normalize emissions by multiplying each total by a factor of 0.028 for CO, NO2 and of 0,027 to 0,416 for NMVOC. 5. Sum the values obtained for the total value of the area (A). 6. Calculate the total area requirement of energy considering the legal limit. 7. Multiply the limit requirements for each component for the emission factor of the energy carrier type, obtaining the total emissions for each component. 8. Normalize emissions by multiplying each total by a factor of 0.028 for CO, NO2 and of 0,027 to 0,416 for NMVOC. 9. Sum the values obtained for the limit emissions for each component. 8. Normalize emissions by multiplying each total by a factor of 0.028 for CO, NO2 and of 0,027 to 0,416 for NMVOC. 9. Sum the values obtained for the limit emissions of CO, NO2 and NMVOC (B). 10. Divide the real value (A) for limit setting (B). 11. Multiply by 100 to get the percentage value of the emissions compared to the limit. 						
Areas covered	Main focus on neigh	bourhoo	d scale.				
Barriers	-						
Rating	The criterion compares the CO, NO2 e NMVOC emissions of the area to the CO, NO2 e NMVOC emissions that would have in the area considering as requirement the legal limit. The benchmark is therefore the standard case set by the limits established by Italian legislation. The lower this value is, the best percentage of the area performance will be: the objective is indeed to have values below 100%, and therefore lower emissions at the statutory standard.						
References	[1], [2], [3], [4], [5]						
SCALE							
Application	Applicable to the ne	ighbourh	ood scale.				
Details	The "Scale" characte	erization	is that of the neight	ourhood.			
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and



	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Primary energy for heating (%)										
ENV.En.15	ISSU	IE		CATEGC	DRY		LEVI	L		SCAL	E
	Environn	nental		Energ	у		А			N	
GENERAL						÷					
Description	The criterion quantifies primary energy demand for heating of each building in the analyzed area. The objective is to reduce the primary energy requirement for heating in order to reduce energy consumption, encouraging increasing energy efficiency in construction and the production of thermal energy from renewable sources. A crucial importance is consequently having an appropriate legal body that invokes the need to reduce the heat dispersions, to obtain improved efficiency of technological systems and to enhance the utilization of renewable energy sources. On a national level (Italian) the normative reference is the Legislative Decree 19 August 2005, n. 192 (and subsequent amendments). With the enactment of Legislative Decree no. 311/2006 and regional industry laws, a number of related objectives have been set: - the containment of energy consumption of buildings through the refinement of the wrap- thermal plant system, in order of relative reduction, in particular for that of fossil origin (oil and gas); - the development of renewable energy sources; - the improvement of the security situation, living comfort and environmental compatibility. The determination of the primary energy requirement for heating is quantified through the procedure described in the UNI TS 11300 part 2, on the basis of the technical specification on the energy performance of buildings. Based on the numerous laws enacted on the subject of consumption of primary energy for heating, the importance of monitoring over time the improvements related to energy performance of buildings is also of fundamental interest for the purposes of urban evaluation. For a deeper analysis indicator in question we were consulted national and international										
	historical r	eference.	iueu uai	a un ene	igy consc	inption	JIOKEIIU	JWII UII L		oi the pe	
Dackaround	CLUE, Protocollo ITACA.										
вискугоини	CLUE, PIOU		ACA.								
References	[1], [2], [3]	, [4], [5]	ACA.								
References	[1], [2], [3]	, [4], [5]	ACA.								
References LEVEL Derived from	[1], [2], [3] Software	, [4], [5] tool		Oper	ational	data		In sit	u meas	ureme	nts
References LEVEL Derived from	(1), (2), (3) Software Simple C	, [4], [5] tool alculatio	ons)	Oper (Empi	ational irical/Li	data teraturo	e	In sit	u meas	ureme	nts
References LEVEL Derived from Details	Software Simple C The intent For the ind 1. Calculate with the pr 2. Calculate weighed of 3. Calculate the Decree 4. Calculate the Decree 5. Calculate the area to	(4), (5) (4), (5) (5) (5) (5) (5) (5) (5) (5) (5) (5)	Ons) Jice ener perform rgy perf describe an value vidual so ex limit v 5 and su rage value e. centage ated (EF	Oper C Empi gy consur ance calc ormance ed in the U of the en urfaces. value of e ubsequen ue of the ratio betw 21) and the	rational rical/Lin mption co culation p index for JNI TS 11 lergy per nergy per t amendr energy p ween the e limit va	data teraturo onsumed roceeds winter h 300-2. formance formance rformance enformar energy p lue (EPI.	e of the a e of the a e of the a e ach bu nce of the performa	In sit ing. s: PI) for al rea for th iter heati ilding. e limit for nce inde	u meas I building ne winter ng (EPI, r winter l x for win	uremen gs in acco r heating L) accord neating v ter heati	nts ordance g ling to weighed ing of
References LEVEL Derived from Details Areas covered	[1], [2], [3] Software Simple C The intent For the ind 1. Calculate with the pr 2. Calculate weighed of 3. Calculate the Decree 4. Calculate on the sing 5. Calculate the area to Main focus	, [4], [5] alculation is to reduce is to reduce is to reduce is to reduce the energy of the energy of the energy of the energy of the energy of the energy of the energy o	ons) uce ener perform rgy perf describe an value vidual si ex limit v 5 and su rage valu e. centage lated (EF bourho	Oper C Empi gy consur ance calc ormance ed in the C of the en urfaces. value of e ubsequen ue of the ratio betw 21) and the od scale.	rational rical/Lif mption co culation p index for JNI TS 11 hergy per nergy per t amendr energy p ween the e limit va	data teraturo onsumed roceeds winter h 300-2. formance cformance enformar energy p lue (EPI,	e for heat as follow eating (E e of the a e for wir r each bu ace of the berforma L).	In sit ing. s: PI) for al rea for tl iter heati ilding. e limit for nce inde	u meas I building ne winter ng (EPI, ⁻ winter l	uremen gs in acco r heating L) accord neating v ter heati	nts ordance g ding to weighed ing of
References LEVEL Derived from Details Areas covered Barriers	Software Simple C The intent For the ind 1. Calculate with the pr 2. Calculate weighed of 3. Calculate the Decree 4. Calculate the Decree 4. Calculate the area to Main focus	(4), [5] tool alculation is to redu- is to redu- icator of the ene rocedure the ene rocedure the ene the indice the indice the indice the indice the ave the surface the period be evalue son neight	ons) uce ener perform rgy perf describe an value vidual su ex limit v 5 and su rage valu e. centage lated (EF abourho	Oper C Empi ance calc ormance cd in the l of the en urfaces. value of e ubsequen ue of the ratio betw 21) and the od scale.	rational rical/Lin mption co culation p index for JNI TS 11 lergy pert nergy pert t amendr energy p ween the e limit va	data teraturo onsumed roceeds winter h 300-2. formance formance rformance energy p lue (EPI,	e of the a reach bu nee of the a reach bu nee of the nee of the nee of the nee of the nee of the	In sit ing. s: PI) for al rea for th iter heati ilding. e limit for nce inde	u meas I building ne winter ng (EPI, ⁻ winter l x for win	uremen gs in acco r heating L) accord neating v ter heati	nts ordance g ling to weighed ing of
Areas covered Barriers References LEVEL Derived from Details	Software Simple C The intent For the ind 1. Calculate with the pr 2. Calculate weighed of 3. Calculate the Decree 4. Calculate the Decree 4. Calculate the area to Main focus - The criteric In order to procedures (EPI, L) it is consumption	(4), [5] alculation is to redu- is to redu- e the ene or the ene or the ene or the indi- e the indi- e the indi- e the indi- e the ave a the ave a the surface e the perio- be evalua calculate is describe necessarion for he	ons) uce ener perform rgy perf describe an value vidual si ex limit v 5 and su rage value e. centage lated (EF bourho tes the j e the ind ed in the ry to tak ating lim	Oper C Empi gy consur ance calc ormance ed in the U of the en urfaces. value of e ubsequen ue of the ratio betw PI) and the od scale. primary e ex of perf UNI TS 1 e into cor hit (Legisla	rational rical/Lif mption co culation p index for JNI TS 11 hergy per t amendr energy de formance t ative Dec	data teraturo onsumed roceeds winter h 300-2. formance formance energy p lue (EPI, mand for value (E t 2. With on the cu ree 192/	e for heat as follow eating (E e of the a e for wir r each bu oce of the performa L). r heating PI) is nec regard t rrent legi 2005, as	In sit ing. s: PI) for al rea for tl iter heati ilding. e limit for nce inde (EPI). essary to o the prin slation ro amendeo	u meas	uremen gs in accord r heating v L) accord heating v ter heati ter heati the calcu rgy limit t the ene	nts prdance ding to weighed ing of lation value rgy
Areas covered Barriers References LEVEL Derived from Details	Software Simple C The intent For the ind 1. Calculate with the pr 2. Calculate weighed of 3. Calculate the Decree 4. Calculate the Decree 4. Calculate the area to Main focus - The criteric In order to procedures (EPI, L) it is consumption S/V - GG	[4], [5] alculation is to reduce is the index is the index is the performed is the performed </th <td>Ons) Jace ener perform rgy perf describe an value vidual si ex limit v 55 and su rage value centage ated (EF abourho tes the ind e the ind e the ind e the ind at ing lim B 601 85</td> <td>Oper C Empi gy consur- ance calc ormance ed in the l of the en- urfaces. value of e ubsequen- ue of the ratio betw P1) and the od scale. orimary e ex of perf UNI TS 1 e into cor- nit (Legisla 900 12.8</td> <td>ational rical/Lif mption co sulation p index for JNI TS 11 nergy per t amendr energy de formance ative Dec</td> <td>data teraturo onsumed roceeds winter h 300-2. formance formance energy p lue (EPI, energy p lue (EPI, wand for value (E t 2. With on the cu ree 192/ 1400 213</td> <td>e for heat as follow eating (E e of the a e of the a e for wir r each bu nce of the performa L). r heating PI) is nec regard t rrrent legi 2005, as D 1401 213</td> <td>In sit ing. s: PI) for al rea for tl iter heati ilding. e limit for nce inde (EPI). essary to o the prii slation re amendeo</td> <td>u meas</td> <td>ureme gs in acco r heating L) accord heating v ter heati enter heati the calcu ergy limit the ene</td> <td>nts ordance g ling to weighed ing of lation : value rgy F ≥3001 46.8</td>	Ons) Jace ener perform rgy perf describe an value vidual si ex limit v 55 and su rage value centage ated (EF abourho tes the ind e the ind e the ind e the ind at ing lim B 601 85	Oper C Empi gy consur- ance calc ormance ed in the l of the en- urfaces. value of e ubsequen- ue of the ratio betw P1) and the od scale. orimary e ex of perf UNI TS 1 e into cor- nit (Legisla 900 12.8	ational rical/Lif mption co sulation p index for JNI TS 11 nergy per t amendr energy de formance ative Dec	data teraturo onsumed roceeds winter h 300-2. formance formance energy p lue (EPI, energy p lue (EPI, wand for value (E t 2. With on the cu ree 192/ 1400 213	e for heat as follow eating (E e of the a e of the a e for wir r each bu nce of the performa L). r heating PI) is nec regard t rrrent legi 2005, as D 1401 213	In sit ing. s: PI) for al rea for tl iter heati ilding. e limit for nce inde (EPI). essary to o the prii slation re amendeo	u meas	ureme gs in acco r heating L) accord heating v ter heati enter heati the calcu ergy limit the ene	nts ordance g ling to weighed ing of lation : value rgy F ≥3001 46.8

Г

Т



	As you can see from the table indicated by the standard for the purposes of calculation of the indicator, the necessary data is the volumetric compactness (S / V) of each building present in the area analyzed. The EPI calculated value is then compared with the average value of the law, which is consequently taken as a benchmark to assess whether the performance of the buildings included in the area are above or below the limit.
References	[1], [2], [3], [4], [5]
SCALE	
Application	Applicable to the neighbourhood scale.
Details	The "Scale" characterization is that of the neighbourhood.
Multiscale	-
References	[1], [2], [3], [4], [5]

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
[-]	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
[Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[0]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Primary energy for public lighting (kWh/a)							
ENV.En.17	ISSUE	С	ATEGORY	LEVE	L	SCALE		
	Environmental		Energy	A		N		
GENERAL								
Description	The criterion quantifies the primary energy for public lighting in the analyzed area. In order to quantify the energy consumption is necessary to have a plan that identifies not only the points of light but also the installed power for each of these, in order to be able to sum the individual powers of the lighting bodies and to obtain the value of actual consumption. The goal is to reduce the energy consumption for public lighting. Fundamental importance is consequently having an appropriate legal body that invokes the need to reduce the energy consumption for public lighting, aiming at better efficiency of the plants and the types of installed light sources. On a national level there are different legal references. Of particular relevance is the UNI EN 13201-2 of 2004 relating to street lighting, which identifies the performance requirements and the uniformity of illumination to be respected. With regard to regional laws, in the Piedmont Region it enforces Regional Law of 24 March 2000 n. 31, "Provisions for the prevention and fight against light pollution and for the proper use of energy resources". The City of Turin has a Regulation of public lighting, decorative and private outdoor spaces: the Municipal Lighting Plan. In addition to providing explanatory reports, the Municipal Lighting Plan he categorizes punctually all light sources and attached equipment installed in the city. From these tabs contained in the Regulatory Plan Municipal Lighting, it is possible to obtain the specific data of the type of source installed and the relative potency, identified thanks to a municipal Lighting Plan identifying the type of apparatus and relative potencies, the Aumicipal Lighting Plan identifying the type of apparatus and relative potencies, the aading them up to obtain an actual total value of energy consumption for public lighting related to the analyze of the type of apparatus and relative potencies, the and the specific data of the type of apparatus and relative potencies.							
Packaround	The criterion can be cal	culate	d to evaluate an exi	isting area or a	project on	e.		
Bafarancas								
Rejerences	[1], [2], [3], [4], [3]							
LEVEL Dorived from	Software tool	1	Operational da	ata	In citu	moasuromonts		
Derived from	Simple Calculations	v	Empirical/Litor	ald	msitu	measurements		
Details	The intent is to reduce primary energy for public lighting. For the indicator of performance calculation proceeds as follows: 1. Identify on a reference mapping all the points of light present in the area and their installed power. 2. Add all the powers of the individual light fixtures present. 3. The value obtained is an expression of the actual consumption of all lighting devices present in the area and is reported to the hourly consumption (kWh). 4. The value refers to the hourly consumption is then multiplied by the number of hours of power a year of equipment (kWh (a) (Turin in 2012 way 4020 b)							
Areas covered	Main focus on neighbor	irhoo	d scale.		/			
Barriers	-							
Rating	The Municipal Lighting	Plan o	f the City of Turin.					
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the neigh	oourh	ood scale.					
Details	The "Scale" characteriz	ation i	s that of the neighb	ourhood.				
Multiscale	-							
References	[1], [2], [3], [4], [5]							

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf



	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[0]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
[··]	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Thermal comfort of outdoor areas (%)							
ENV.Im.23	ISSUE	CATEGORY	LEVEL	SCALE				
	Environment	Impacts	Α	N				
GENERAL								
Description	The policy takes into account the albedo of the external areas, so, the fraction of incident radiation that is reflected in all directions, thus indicating the reflectivity of a surface. The fundamental objective is to reduce the heat island effect, namely the hot microclimate that is generated in urban areas than the surrounding peripheral and rural areas, and thus minimize the impact on microclimate and human habitat. Among the main causes of the heat island we find the high incident radiation, the high absorption coefficient of the materials used outside, the heat accumulation result of widespread overbuilding and also the morphology itself which can prevent the wind to remove the excess heat by limiting the air is recirculated to the ground. Thanks to the use of clear colors applied to urban and architectural surfaces of roofs and roads, changing the reflectance factors of the same surfaces and it is possible thus increase the albedo. The criterion can be calculated to evaluate an existing area or a project one. In a similar way they are quantified and in either case the surface of each homogeneous zone in the area. At each surface is associated with a value of albedo, variable from 0 (fully absorbent) to 1 (green or chaded surfaces 12 to 21 lupp), then the surfaces are surmed weighted by the relative albedo.							
Destaurat	and are divided by th	he total area of the surfaces	sum					
Background		ACA.						
Rejerences	[1], [2], [3], [4], [3]							
Derived from	Software tool	Operational of	ata In situ	measurements				
Derived from	Simple Calculatio	ons X Empirical/Lite		measurements				
Details	The intent is to redu calculate the area of value. For the indicator of p 1. Calculate the tota 2. Calculate the area 3. Multiply each pre- 4. Sum the thus obta 5. Divide the total va coefficients for the u 6. The final figure th	ice the discomfort at ground f all the surfaces in the neig performance calculation pro- il area of the urban area a of each homogeneous surf viously identified surface fo ained weighed surfaces. alue of the sum of homoger urban area total area analyz ius derived is expressed in p	I level during summer. To abourhood and assign to e aceeds as follows: aces identified in the area r the relative reflection co eous areas weighted by th ed. ercentage terms.	assess this criterion, each surface an albedo efficients. ne relative reflection				
Areas covered	Main focus on neigh	bourhood scale.						
Barriers	-							
Rating	The criterion evaluat Higher are the value area.	tes the albedo of the outer es of albedo, better will be t	surfaces related to the and ne temperature-humidity	alyzed urban area. performance of the				
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the ne	ighbourhood scale.						
Details	The "Scale" characte	erization is that of the neigh	bourhood.					
Multiscale	-							
References	[1], [2], [3], [4], [5]							

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization



	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Monitoring of air quality (%)							
ENV.Im.22	ISSUE CATEGORY LEVEL SCALE							
	Environmental		Impacts	A		N		
GENERAL								
Description	The criterion takes into account the density of air quality monitoring stations in the area than the							
	average of the whole	average of the whole city, derived from ISTAT.						
	The aim is to ensure r	The aim is to ensure regular monitoring of air quality, in order to provide complete and updated						
	As pointed out by AR	Pulation PA Piedn	nont the chosen of	appropriate poil	ent should h	a pollution control.		
	the type of site identified.							
	A correct positioning	of the m	easuring points allo	ows to obtain ext	tremely rep	resentative		
	directions on air quali	ty. How	ever, it is essential	to have a data ad	cquisition co	enter that transmits		
	an hourly basis the re	sults of t	the measurements	carried out, allo	wing a cons	tant control of the		
	From a legal and legis	lative fro	n quailty.	environmental	law dates h	ack to 1966 when		
	the law was passed to	comba	t air pollution and v	vas called "law A	Antismog", i	ncreasing controls		
	and bans against othe	er major	sources of pollution	n.	-	_		
	More recently, the iss	ue of air	quality is governed	d by several legis	slative decre	ees, in particular by		
	Legislative Decree no.	. 152/06	(the so-called "unit	que environmen	ital text") w	ith regard to		
	with regard to ambier	nt air qu	ality and then by De	ecree 24 Deceml	ber 2012, n.	. 250.		
	The criterion can be c	alculate	d to evaluate an exi	isting area or a p	project one.	In a similar way in		
	both cases are quantified monitoring stations of air quality in the area analyzed and compared to							
	the surface area. The	value is	then compared wit	h the general tre	end of the c	ity.		
Background		<i>.</i> A.						
References	[1], [2], [3], [4], [5]							
LEVEL								
Derived from	Software tool		Operational da	ata	In situ m	easurements		
	Simple Calculation	ns X	Empirical/Liter	rature				
Details	For the indicator of p	e the col	nstant monitoring c	of air quality in tr	ne area.			
	1. Find the monitoring	g station	is, if they are preser	nt, in the area.				
	2. Divide the number	of statio	ons for the total sur	face area analyz	ed.			
	3. Calculate the densi	ty of mo	nitoring stations in	the whole city (ISTAT), by d	lividing the total		
	value for the urban ar	ea.	f doviation from the	moon dividing	the density	in the density in the		
	whole city, subtractin	g 1 and	multiplying by 100.	e mean, uiviumg	the density	In the density in the		
Areas covered	Main focus on neighb	ourhood	d scale.					
Barriers	-							
Ratina	The criterion evaluate	es the de	ensity of the air qua	lity monitoring s	stations in th	he area compared to		
nating	the average.		, ,	, 0				
	The benchmark for th	is indica	tor is consequently	the mean value	of the city,	obtained by reading		
	the ISTAT data. The va	alue obta	ained in the area ur	nder consideratio	on is compa so the urbar	ared with the average		
	inserted is the reference	nce to be	e taken into conside	eration. This allo	ws vou to h	ave a benchmark		
	calibrated to the spec	ific situa	tion in the evaluati	on phase: in fact	t it would b	e inappropriate to		
	establish a reference	value in	absolute terms, un	tied from the co	ntext and u	ndifferentiated.		
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the neighbourhood scale.							
Application	Applicable to the neig	hbourh	ood scale.					
Details	Applicable to the neig The "Scale" character	hbourho	bod scale. s that of the neighb	ourhood.				
Details Multiscale	Applicable to the neig The "Scale" character -	hbourho	ood scale. s that of the neighb	ourhood.				

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and



	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Light pollution (%)						
ENV.Im.17	ISSUE CATEGORY LEVEL SCALE						
	Environmental		Impacts	А		N	
GENERAL				1			
GENERAL Description	The criterion takes into account the percentage of luminous flux emitted upwards from the illumination devices installed in the urban area. The fundamental objective is to reduce the illuminance of the celestial vault during the night hours, in order to avoid unnecessary losses outside the area that should illuminate, because of light pollution. It thus takes into consideration not only the type of installed light source, but also the type of appliance. Light pollution is to all intents and purposes an alteration of the natural amount of light present in the environment caused by the introduction of night artificial light; the latter pollutes the moment should be to alter the amount of natural light in the environment. The inconvenience caused by this type of phenomenon are many, from the disturbance to wildlife and the local flora, the impediment to the vision of the stars and other celestial bodies, major problem especially near astronomical observatories. In all Italian regional laws have been enacted against the artificial light dispersion upwards, prepared starting from the provisions of Standard UNI 10819 on the requirements for the limitation of the upward dispersion of the luminous flux. In Piedmont Region refers to the Regional Law of 24 March 2000, n. 31 "Measures for the prevention and fight against light pollution and for the proper use of energy resources". The City of Turin has an additional regulation of public lighting, decorative and exterior private spaces, the Municipal Lighting Plan. In addition to providing explanatory reports, the Municipal Lighting Plan. Categorizes punctually all the lighting fixtures and attached sources installed in the city. From these tabs contained in the Regulatory Plan Municipal Lighting it is possible to obtain the data concerning the percentage of luminous flux upward dispersion of each unit present in the area under analysis, identified thanks to a municipal plan of support linked to the file the devices. It is important to point out that often the devices inst						
Background	CLUE, Protocollo ITA	ACA.					
References	[1], [2], [3], [4], [5]						
LEVEL							
Derived from	Software tool		Operational da	ata	In situ me	easurements	
Details	Simple Calculation	ons X	Empirical/Liter	phere at night			
Detuils	 For the indicator of performance calculation proceeds as follows: 1. Identify the lighting in the area using a specific technique card. 2. Obtain the technical data sheets of the devices installed in the area, taking care to locate the data concerning the percentage of luminous flux dispersed upwards of each present apparatus. 3. Count all the lighting in the area analyzed 4. Identify the luminaires that have a dispersion factor of the luminous flux upwards null, then equal to 0%. 5. Calculate the ratio between the number of apparatuses having bright dispersant upward flow zero and the total number of appliances installed in the area. 6. Multiply the value obtained by 100 to get the percentage value. 						
Areas covered	Main focus on neigh	bourhoo	d scale.	-			
Barriers	-						
Rating	The criterion evalua	tes the p	ercentage of lighting	g devices that do	not scatter l	light upward flow	in



	the urban area. The higher this value is, the better the performance of the area will be.				
References	[1], [2], [3], [4], [5]				
SCALE					
Application	Applicable to the neighbourhood scale.				
Details	The "Scale" characterization is that of the neighbourhood.				
Multiscale	-				
References	[1], [2], [3], [4], [5]				

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
[_]	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
[Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[-]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[-]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Affordability of housing property (m ²)						
ECO.Eq.01	ISSUE CATEGORY LEVEL SCALE						
	Economic		Equity	A		N	
GENERAL							
Description	This criterion calculates the economically accessible surface to the lowest quintile of income groups of the population present in the area. The goal is to reduce obstacles to the residential property for the highest possible number of people. The metric then assesses how many square meters can be purchased in a year with the salary of the lowest quintile of the population. To do this divide the average wage in the bottom quintile of the population, based on ISTAT data, the average price per square meter of residential area. Regarding the average sales prices can be referred to the Observatory Data Real Estate Town of Turin OICT (www.oict.polito.it). For the residential sector, the city is divided into 40 census micro-zones; to each of these values is associated with a card that shows the unit prices offered, expressed in € / m2. The statistical indicators present in the tabs (average value, minimum value, maximum value, standard deviation, median) are differentiated by the flea market and that of the new construction. Finally, it is graphically presented the historical trend of the average value. This metric is crucial for social sustainability: to provide a variety of housing choices for a number of inhabitants, owners, tenants, of a different composition and origin families, promotes so-						
	exclusion.	<u></u>					
Background	CLUE, Protocollo IIA	CA.					
References	[1], [2], [3], [4], [5]						
LEVEL					1	.	
Derived from	Software tool		Operational da	ita	In situ	measurements	
	Simple Calculatio	ns X	Empirical/Liter	ature			
Detuiis	 To assess this criterion, divide the average yearly salary of the lowest quintile of the population in the region by the average price per square meter of housing in the area. For the indicator of performance calculation proceeds as follows: Identify the average property values of the reference micro-zone (€ / m2). Identify the average annual wage of the lowest quintile of the population of the area under analysis (ISTAT). Divide the average annual salary of the lowest quintile of the population (A) by the average price per square meter of residential area (B): A / B. 						
Areas covered	Main focus on neigh	oourhood	l scale.				
Barriers	-						
Rating	The criterion evaluates the surface affordable to lower-income bracket of the population. The higher this value is, the better the performance of area will be, for the benefit of the social mix and cohesion.						
References	[1], [2], [3], [4], [5]						
SCALE							
Application	Applicable to the nei	ghbourh	ood scale.				
Details	The "Scale" characte	rization i	s that of the neighb	ourhood.			
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].



[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Affordability	of housing rental (%)					
ECO.Eq.02	ISSUE	CATEGORY	LEVEL	SCALE			
	Economic	Equity	А	N			
GENERAL							
Description	This criterion calculates the percentage of the annual salary of the lowest quintile of the population that is destined to be rented. The goal is to reduce the economic burden of the rent housing for as many people as possible. To calculate this percentage divides the average annual rent for residences in the area by the average annual salary of the lowest quintile of the population. As for the rental average prices can be referred to the Revenue Agency data, cataloged under "house price" of the database. For the residential sector, the City of Turin is subdivided into 40 micro-zones census; to each of these values is associated with a card which lists the market values (minimum and maximum), expressed in \notin / m2, and the rental values (minimum and maximum), expressed in \notin / m2 x month. It is also indicated whether these values refer to the net surface (N) or gross (L). This metric is crucial for social sustainability: to provide a variety of housing choices for a number of inhabitants, owners, tenants, of a different composition and origin families, promotes so-called						
Backaround	CLUE, Protocollo ITA	CA.					
References	[1], [2], [3], [4], [5]						
LEVEL							
Derived from	Software tool	Operational d	ata In situ	u measurements			
	Simple Calculatio	ns X Empirical/Lite	rature				
Details	 The intent is to reduce the financial load of housing. To assess this criterion, divide the average yearly rent for housing in the area by the average yearly salary of the lowest quintile of the population in the region. For the indicator of performance calculation proceeds as follows: Identify the average rental values of the reference micro-zone (€ / m2). Identify the average annual wage of the lowest quintile of the population of the area under analysis (ISTAT). Divide the average annual rent in the area analyzed (A) by the average annual salary of the lowest quintile of the population of the area general values of the average annual salary of the lowest quintile of the average a						
Areas covered	Main focus on neighl	oourhood scale.					
Barriers	-						
Rating	The criterion identifies the percentage of the annual salary value that is destined to be rented apartment. The smaller this value is, the better the performance of the area will be, for the benefit of the social mix and cohesion.						
References	[1], [2], [3], [4], [5]						
SCALE							
Application	Applicable to the nei	ghbourhood scale.					
Details	The "Scale" characte	rization is that of the neighl	oourhood.				
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
[-]	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[-]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Proximity to s	Proximity to services (%)								
SOC.Ac.18	ISSUE	C	ATEGORY	LE	VEL	SCALE				
	Social	A	ccessibility		A	N				
GENERAL										
Description	The criterion calculates the percentage of population that is less than 300 meters from the main facilities in the area and in those immediately adjacent to it. The main objective is to discourage and reduce the use of private vehicles for transportation to take advantage of these services, instead favoring walking and cycling. Additional positively evaluated areas with an appropriate mix of functions. This metric allows you to see how much people are actually served and covered the main services in the area: in fact, some studies show that if you exceed a distance of 300 meters, the population is not stimulated to walking and prefers instead to use their own private vehicle. The distance between the service and the access of the building is not calculated on a linear distance, but considering the way actually walkable. In assessing this indicator have identified two types of services: the trading facilities (home improvement stores, food products, newsagents, bars, restaurants, related) and service facilities (post offices, public or accredited health services, kindergartens d 'childhood, kindergartens, altower the approximation's party exceeds a barker pharmacing).									
Background	CLUE, Protocollo ITACA.									
References	[1], [2], [3], [4], [5]									
LEVEL										
Derived from	Software tool		Operational da	ata	In situ	measurements				
	Simple Calculation	is X	Empirical/Liter	ature						
Details	 The intent is to reduce the need for vehicular transport outside the area. To assess this criterion, it is necessary to identify all the main services located in the neighbourhood. Graphically, overlay to each of these services a circle with a 300m radius. Calculate how many users are served by these services, by verifying which buildings are included in the radius of all the services. For the indicator of performance calculation proceeds as follows: Identify the services in the area, distinguishing in service facilities and business facilities. Calculate the actual distance on foot between these nodes and access the buildings. Calculate the percentage of the population that is less than 300 meters from at least one service for each of the two categories. 									
Areas covered	Main focus on neighb	ourhoo	d scale.							
Barriers	-									
Rating	The criterion evaluate The higher this value i	s the pe s, the b	ercentage of the pop etter the performar	pulation that nce of the ar	t is located clo ea will be.	ose to major services.				
References	[1], [2], [3], [4], [5]	_								
SCALE			· ·							
Application	Applicable to the neig	hbourh	ood scale.							
Details	The "Scale" character	zation i	is that of the neighb	ourhood.						
Multiscale	-									
References	[1], [2], [3], [4], [5]									

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[-]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Flexibility use (%)					
SOC.Ac.04	ISSUE	C	ATEGORY	LEVE	L	SCALE
	Social	А	ccessibility	А		Ν
GENERAL						
Description	The criterion takes into account the percentage of hours operating, within a day, of non- residential buildings and public facilities in the analyzed area. The objective is to promote the prolonged and varied use of structures that can host different functions and activities, and then turning to a multiplicity of different users in relation to different opening hours. The flexibility use of these facilities has a dual objective: from one side, make the most vital area by encouraging integration and social cohesion on the other, maximizing the performance of the structures, reducing the cost of the life cycle. The criterion can only be calculated for new construction. Identify all non-residential and public facilities present in the area, and quantifies the number of operating hours provided over a typical day. It then calculates the percentage of hours of daily use					
Background	CLUE, Protocollo ITACA.					
References	[1], [2], [3], [4], [5]					
LEVEL						
Derived from	Software tool		Operational da	ita	In situ	measurements
Denved nom	Simple Calculation	ons X	Empirical/Liter	ature		
Details	For the indicator of p 1. Identify in the are 2. Quantify the avera 3. Expressing in term	performa a non-res age numb as of perc	nce calculation proc sidential and public ber of hours provide centage the proporti	zeeds as follows facilities. d for in the spac on of hours of ι	: ce of a typ ise compa	ical day. Ired to 24h.
Areas covered	Main focus on neigh	, bourhoo	d scale.			
Barriers	-					
Rating	The criterion measures the percentage of hours during one day of the buildings non-residential and public facilities. The longer hours of use of the facilities are, the better the performance of the area will be					
References	[1], [2], [3], [4], [5]					
SCALE						
Application	Applicable to the ne	ighbourh	ood scale.			
Details	The "Scale" characte	rization i	is that of the neighb	ourhood.		
Multiscale	-					
References	[1], [2], [3], [4], [5]					

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
· · · ·	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[0]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
[··]	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[9]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Potential Employment (%)						
ECO.Eq.08	ISSUE		CATEGORY	LE	VEL	SCALE	
	Economic		Equity		A	Ν	
GENERAL							
Description	The criterion evaluation in workin population in workin commuting, to ensu	The criterion evaluates the percentage of jobs in the area under consideration, in relation to the population in working age. A high number of jobs ensures to reduce the phenomenon of commuting, to ensure high mixité the area.					
Background	Protocollo ITACA.						
References	[1]						
LEVEL							
Derived from	Software tool		Operational da	ita	In situ	measurements	
	Simple Calculation	ons 🛛	K Empirical/Liter	ature			
Detans	 Calculate the number of jobs in the area (A). Calculate the number of people in working age in the area (B). Calculate the percentage of jobs than the population of working age in the area. Calculate the percentage value through the following formula: X = A / B where: A = the number of jobs in the area. B = number of people in working age in the area. 						
Areas covered	Main focus on neigh	bourho	od scale.				
Barriers	-						
Rating	-						
References	[1]						
SCALE							
Application	Applicable to the ne	ighbour	hood scale.				
Details	The "Scale" characte	erizatio	is that of the neighb	ourhood.			
Multiscale	-						
References	[1]						

[1] ITACA'S PROT	FOCOL AT URBAN SCALE
http://www.i	taca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Availability of green spaces (%)						
SOC.Ac.07	ISSUE	C.	ATEGORY	LE	VEL	SCALE	
	Social	A	ccessibility		A	N	
GENERAL	-						
Description	The criterion takes into account the green areas in the area, comparing them to the number of occupants. The goal is to increase the availability of green space for users, evaluating the distribution of these within the area considered over the entire city. The urban green is a characterizing element of the environment built on fundamental relationship with the landscape, and a very important factor in improving the quality of life in cities (the disclosure of which is also sought by the Aalborg Charter and Agenda 21). For this reason many cities have a Green Urban Plan, a document you can refer to the assessment, when present. The importance of the presence of green spaces within the area is remarkable: both from a point of view microclimate, both for biodiversity conservation, and finally as a place of relaxation, recreation and socialization to the residents or users of 'area. The criterion under analysis focuses more on the latter, in fact, going to identify the square meters of greenery per capita. In the definition of green spaces considered by the policy covered only public green areas, equipped and accessible, thus excluding the urban green furniture (eg. Medians) and private green (residential buildings, schools, etc.).						
Backaround	CLUE, Protocollo ITACA	.y.					
References	[1], [2], [3], [4], [5]						
LEVEL							
Derived from	Software tool		Operational da	ata	In situ	measurements	
	Simple Calculations	5 X	Empirical/Liter	ature			
Details	 To assess this criterion, calculate the surface of accessible green spaces per occupants. To assess this criterion, calculate the surface of accessible green spaces per occupant (m²/person) in the area and divide it by the per capita value of the city. Subtract one, and multiply the result by 100 to obtain a percentage. For the indicator of performance calculation proceeds as follows: 1. Identify the green spaces in the area, excluding the private green areas, street furniture, not accessible. 2. Calculate the total area of green spaces (m²). 3. Calculate the ratio between the green surface and the number of inhabitants (A). 4. Calculate the percentage deviation between the value of the area (A) and the average of the city (R): A (R) = 1 * 100 						
Areas covered	Main focus on neighbo	urhood	d scale.				
Barriers	-						
Rating	The criterion evaluates the percentage deviation of the relative value to the green spaces of the area compared to the average of the city. To make this comparison using the percentages identified by ISPRA (Institute for Environmental Protection and Research) on the basis of ISTAT (National Statistics Institute). The areas of urban furniture and private green should not be considered in total, and are deleted according to the percentages identified by ISPRA. The databases to which it refers are public and easily accessible to all, administration and citizens. The value obtained by the verification indicator is compared with the average value of reference of the city, in order to assess whether the performance of the area is higher or lower than the average of the urban territory in which it is inserted. This allows you to have a benchmark calibrated to the specific situation being assessed.						
References	[1], [2], [3], [4], [5]						
SCALE							
Application	Applicable to the neigh	bourh	pod scale.				
Details	The "Scale" characteriz	atıon i	s that of the neighb	ourhood.			
IVIUITISCAIe	- [1] [2] [2] [4] [5]						
кејегепсеs	[±], [∠], [ɔ], [4], [ɔ]						



REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
r_1	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[-]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
L · J	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Proximity to leis	ur	e facilities (%)				
SOC.Ac.17	ISSUE	C	ATEGORY LE	EVE	L	SCALE	
	Social	Accessibility A				N	
GENERAL							
Description	The criterion calculates the percentage of the resident population which is located less than 300 meters from the structures for the free time in the area and in those immediately adjacent to it. The main objective is to discourage and reduce the use of private vehicles for transportation to take advantage of these services and facilities, instead favoring walking and cycling. Additional positively evaluated areas with an appropriate mix of functions. This metric allows you to see how much the population was effectively served and covered by these facilities in the area: in fact, some studies show that if it exceeds a distance of 300 meters, the population is not stimulated to walking and prefers to use his private vehicle. The distance between the service and the access of the building is not calculated on a linear distance, but considering the way actually walkable. In assessing this indicator we have identified two types of facilities for leisure: sports facilities and cultural facilities (museums, theaters, libraries, cinemas).						
Background	CLUE, Protocollo ITACA.						
References	[1], [2], [3], [4], [5]						
LEVEL							
Derived from	Software tool		Operational data		In situ	measurements	
	Simple Calculations	Х	Empirical/Literature				
Details	The intent is to reduce the need for vehicular transport outside the area. To assess this criterion, it is necessary to identify all the main services located in the neighbourhood. Graphically, overlay to each of these services a circle with a 300m radius. Calculate how many users are served by these services, by verifying which buildings are included in the radius of all the services. For the indicator of performance calculation proceeds as follows: 1. Identify the facilities for leisure in the area, distinguishing in sports and cultural structures. 2. Calculate the actual distance on foot between these nodes and access the buildings. 3. Calculate the percentage of the population that is less than 300 meters from at least one service for each of the two categories.						
Areas covered	Main focus on neighbourl	1000	l scale.				
Barriers	-						
Rating	The criterion evaluates th The higher this value is, th	e pe ne be	rcentage of the population that etter the performance of the a	it is l rea v	located clo will be.	ose to major services.	
References	[1], [2], [3], [4], [5]						
SCALE							
Application	Applicable to the neighbo	urho	ood scale.				
Details	The "Scale" characterizati	on i	s that of the neighbourhood.				
Multiscale	-						
References	[1], [2], [3], [4], [5]						

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online]. Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf [Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online]. Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available: http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf



	Pedestrian safety paths (%)							
SOC.SS.03	ISSUE	С	ATEGORY	LE	VEL	SCALE		
	Social	Safe	ety & Security		A	N		
GENERAL								
Description	The criterion takes into account the percentage of pedestrian street illuminated at night in the analyzed area The purpose is to ensure the safety of pedestrians who enjoy pedestrian areas. The issue of urban security is a very broad field, because there are many factors that contribute to its definition. One of the keys is the public lighting, crucial for city life service because it gives a greater sense of calm both physical and psychological. Good lighting of pedestrian paths is for all purposes a deterrent to aggression and is extremely assist the work of public security forces. From a regulatory point of view, the Technical Regulations for the Implementation of the P.R.I.C. of Turin, state that the minimum illuminance to ensure for pedestrian areas during the night hours is 7.5 lux. The criterion can be calculated to evaluate an existing area, or for a project one. In a similar way in either case, it calculates the pedestrian area of the surface illuminated during night hours and							
Backaround	CLUE. Protocollo ITA	CA.	estriali surfaces pres	sent in the te	est sample or	Dall.		
References	[1], [2], [3], [4], [5]							
LEVEL								
Derived from	Software tool		Operational da	ita	In situ	measurements		
	Simple Calculation	ons X	Empirical/Liter	ature				
Details	 The intent is to ensure pedestrian security. For the indicator of performance calculation proceeds as follows: Calculate the surface intended to pedestrian areas in the area (A). On the basis of the types of installed equipment, evaluate pedestrian paths illuminated during night hours (B). Divide the surface of pedestrian areas illuminated during night hours for the overall pedestrian surface of the area analysis object. Expressing in terms of percentage the amount of pedestrian surfaces are lit at night compared to the total: P (A * 100) 							
Areas covered	Main focus on neigh	bourhoo	d scale.					
Barriers	-							
Rating	The criterion measures the percentage of the pedestrian area illuminated during night hours in the subject urban area analysis. The higher the percentage of illuminated walkways is, the better the performance of the area will be.							
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the nei	ghbourh	ood scale.					
Details	The "Scale" characte	rization i	s that of the neighb	ourhood.				
Multiscale	-							
References	[1], [2], [3], [4], [5]							

REFERENCES	
[1]	ADVISORY COMMITTEE ON OFFICIAL STATISTICS 2009. Good practice guidelines for the development and
	reporting of indicators. Statistics New Zealand: Wellington.
[2]	AGENCY FOR ENVIRONMENT AND ENERGY MANAGEMENT (ADEME). 2010. Bilan Carbone, Companies – Local
[~]	Authorities - Regions, Methodology guide - version 6.1 - objectives and accounting principles [Online].
	Available: http://www.associationbilancarbone.fr/sites/default/files/guide_methodolog ique_v6_euk-v.pdf
	[Accessed January 23 2014].
[3]	EUROPEAN COMISSION. not dated. The EU climate and energy package - European Commission. [Online].
[-]	Available: http://ec.europa.eu/clima/policies/package/ [Accessed November 30 2013].
[4]	ISO. 2006. ISO 14064-1:2006, Greenhouse gases Part 1: Specification with guidance at the organization
	level for quantification and reporting of greenhouse gas emissions and removals [Online]. Available:
	http://www.iso.org/iso/catalogue_detail?csnumber=38381
[5]	ITACA'S PROTOCOL AT URBAN SCALE
[0]	http://www.itaca.org/documenti/news/Protocollo%20ITACA%20Scala%20urbana_211216.pdf





A.5 - ENERBUILD



ENERBUILD Full project name

ENERBUIL

Project website : http://www.enerbuild.eu/

Period : 2009 - 2011

Source of funding: The initiative was co-financed by the EU Alpine Space Programme.

ENERBUILD focused on strengthening SMEs in the building sector and on developing tools relating to the energy production of buildings. The partners were cluster organizations from seven countries in the alps.

Craftsmen and architects received training on new techniques for ecological building. Developments have included the integration of photovoltaics in buildings, a participation model on green power plants for local supply and concepts for heat supply.

A transnational standardization initiative for the assessment of ecological construction started with the test of the Enerbuild Tool.

The ENERBUILD Tool is an "open-source-product". It is available for all European institutions as basis for appropriate adaptions and evaluations. The aim is not to implement the tool by 100% in all European countries. On the contrary, regional adaptions due to different climatic, legal and normative standards are required. But the classification scheme of the evaluation is supposed to be always the same.

The <u>ENERBUILD tool</u> has been tested and evaluated on 46 buildings in the Alpine Space. It is an interregional assessment tool to evaluate the environmental, social and economic performance of public buildings in the Alpine regions. The testing of the ENERBUILD Tool documents the operable structure of the tool. In particular the comprehension, usability, cost effectiveness, regional adaptability of the tool. This is supported by the positive feedback of the established advisory services and certification bodies. In addition the project partners made some suggestions for improvements on criteria level. The assessment criteria are listed below:

Issue/Category	criterion name	Indicator	
ENV-Bi 2	Ecological quality of the building site	weighted score based on type of flora	
ENV-En 2	Cooling Demand PHPP energy performance cooling demand		
ENV-En 8	Heating Demand PHPP energy performance thermal heat PHP		
ENV-En 10	Operational Primary Energy Demand	operational primary energy demand	
ENV-Im 12	Global Warming Potential total carbon-equivalent emissions		
		OI3 index (GWP, AP, non-renewable energy	
ENV-Ma 1	Building materials and construction	demand)	
	Low-pollutant and low-emission		
ENV-Ma 2	materials	point based assessment of procurement	



	Comfort ventilation - hygiene and	
SOC-AC 3	soundproofing	A-weighted sound pressure from ventilation
SOC-LC 1	Availability of Daylight daylight factor	
		cooling load or dynamic simulation of
SOC-TC 13	Thermal Comfort in Summer	indoor temperature
		amount of stops and frequency of public
SOC-Tr 1	Accessibility of public transport	transport
ECO-LCC 1	Life Cycle Costs	life cycle costs
ECO-Ma 5	User information	provision of manuals for building use
ECO-Qu 3	Energy Optimization during Planning	point based assessment of energy design
		points depending on planning activity
ECO-Qu 5	Process and planning quality	report
		amount of details in setting target
ECO-Qu 7	Setting verifiable environmental targets	performance scores



INDICATORS

	Ecological quality	of the building site (-)
ENV.Bi.01	ISSUE (CATEGORY LE	VEL SCALE
	Environmental I	Biodiversity	S B
GENERAL			
Description	Intent: To encourage the selection of sites that have low ecological value or that are ecologically stable. Indicator: Ecological value of land used for construction. Unit of measure: -		
Background	KGA Vorarlberg , Protocol	lo ITACA	
References	This indicator was experimented in Enerbuild project [1], [2]		
LEVEL		-	
Derived from	Software tool X	Operational data	In situ measurements
	Simple Calculations X	Empirical/Literature	Other (specify)
	 Analysis of the provide the provided to the provi	re-development range of flor flora identified, it has to be d n (m2); as to be assigned a code (fror	a existing on the site; efined the area occupied and the n a1 to a6) on the base of the
	Code	Ecologic conditions	Typologies
	a1 – area with zero ecological value	Autochthonous flora destroyed. Natural regenerative dynamics absent. No elements of the local potential flora.	Rubbles, buildings, infrastructure road borders.
	a2 – area with very low ecological value	Autochthonous flora substituted. Natural regenerative dynamics absent.	Agricultural fields, orchards, wineries, grass lawns (extensive).
	a3 – area with low ecological value	Autochthonous flora degraded. Natural regenerative dynamics present.	Artificial woods, abandoned agricultural fields and grass lawns pasture land (low extensive)
	a4 – area with medium ecological value	Autochthonous flora - simple structure. Dominant presence of the local potential flora.	Pasture lands, natural grassland prairies, reforestation of autochthonous vegetation.
	a5 – area with high ecological value	Autochthonous flora – secondary character.	Structured secondary woods and shrubs.
	a6 – area with very high ecological value	Stable autochthonous flora, undisturbed.	Primary woods and shrubs, grass lawns (height).
	4. The overall exter	nsion (m2) of the areas with t	he same code (from a1 to a6)



	has to be calculated.		
	5. The Indicator's value is calculated as a weighted sum:		
	5. The multator 5 value is calculated as a weighted suff.		
	$s1 \times 1 + s2 \times 2 + s3 \times 3 + s4 \times 5 + s5 \times 7 + s6 \times 10$		
	s1 + s2 + s3 + s4 + s5 + s6		
	Where:		
	s1 = total extension of the areas with code a1 - zero ecological value [m2]		
	a2 = total extension of the areas with code a2 - very low ecological value [m2]		
	a3 = total extension of the areas with code a3 - low ecological value [m2]		
	a4 = total extension of the areas with code a4 - medium ecological value [m2]		
	a5 = total extension of the areas with code a5 - high eco	logical value [m2]	
	a6 = total extension of the areas with code a6 - very high	n ecological value [m2]	
Areas covered	All types of building.		
Barriers	The biggest problem is to find the information about the state of	the surfaces before	
	the project.		
Rating	Rating was not in the scope of the Enerbuild project.		
	A scoring has been used just based on partners agreement		
	Score:		
	On the base of the indicator's value , the performance score rang	ing from -1 up to 5	
	(interpolation must be applied) is calculated on the base of the fo	llowing linear scale:	
	Performance score	Calculated Ecological v	
	-1 – negative	>5	
	0 – standard	5	
		5	
	3 – good	2.6	
	5 – excellent	1	
	The "Land ecological value calculator" can be used to calculate th	e performance score.	
References	This indicator was experimented in ENERBUILD project [1] and [2]]	
SCALE			
Application	This indicator is specific for building.		
Details	The indicator is calculated for each of the building.		
Multiscale	It's not possible to make a simple sum of the building scores to ev	aluate the building	
	cluster level but a global calculation concerning all the surfaces of the building cluster		
	can be made at building cluster level.		
References	This indicator was experimented in Enerbuild project [1], [2] and	in Protocollo ITACA	

REFERENCES		
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool	
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf	
[3]	Protocollo ITACA : http://www.proitaca.org/	


	Cooling Demand (kWh/m ²)							
ENV.En.06	ISSUE	С	ATEGORY	LE\	/EL	SCALE		
	Environmental		Energy		S	В		
GENERAL								
Description	Intent:							
	An active cooling s	ystem is	s more and more ι	used for ter	tiary buildin	igs but also for		
	housing and public	: buildin	gs.					
	To limit the energy	consun	nption, it is impor	tant to eval	uate the co	oling consumption.		
	Indicator: Energy	perform	ance cooling dema	and				
	Unit of measure:	Wh/m²	(PHPP calculation)				
Background	KGA Vorarlberg							
References	This indicator was	experim	nented in Enerbuil	d project [1], [2]			
LEVEL	1							
Derived from	Software tool	Х	Operational data	a	In situ r	neasurements		
Derived from	Simple Calculation	s	Empirical/Litera	ture	Other (s	specify)		
Details	The calculation of	the build	ding energy dema	nd has to b	e made with	n PHPP software.		
	The maximum terr	peratur	e without cooling	is 25°C in tl	ne file "Sum	imer".		
	Actions to increase	e summe	er comfort withou	t cooling lik	e reduction	of internal heat		
	production, windo	ws shad	ling are also to b	e taken into	o account w	ith the objectives of		
	:							
	- Max 10%	of temp	erature over 25°C					
	- Cooling d	emand «	$< 5 W/m^2$					
	cooning u	cinana	3 W /III					
Areas covered	All types of buildin	g.						
Barriers	The use of the PHF	P calcul	ation is a barrier (price, comp	lexity).			
Rating	Rating was not in t	he scop	e of the Enerbuild	project.				
5	A scoring has beer	used ju	st based on partn	ers agreem	ent			
	Score :	,	•	U				
	Assign the minimu	m score	of 10 points if the	e cooling ne	eds are und	ler 10 kWh/m ² and		
	the maximum of 1	00 point	ts if the cooling co	nsumption	is 0 kWh/m	2.		
	Determine the oth	er score	es proportionally.					
References	This indicator was	experim	nented in ENERBU	ILD project	[1] and [2]			
SCALE								
Application	This indicator is sp	ecific fo	r building.					
Details								
Multiscale	No							
References	This indicator was	experim	nented in Enerbuil	d project [1], [2]			

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02_ENERBUILD-result_6_2-4.pdf
[3]	PHPP calculation : http://passivehouse.com/04 phpp/04 http://passivehouse.com/04 phpp/04 phplit phplit phplit phitasivehouse.com/04 phitasivehouse.com/04 http://passiveho



	Heating Demand (kWh/m²)								
ENV.En.09	ISSUE	C	ATEGORY	LE	VEL	SCALE			
	Environmental		Energy		S	В			
GENERAL									
Description	Intent:								
	Reduction of heati	ng cons	umption is needed	d to reduce	e the GHG ei	missions. A good			
	insulation of the b	uilding	will also give more	comfort.					
	Indicator: Energy	perform	ance heating dem	and					
	Unit of measure: k	Unit of measure: kWh/m ² (PHPP calculation)							
Background	KGA Vorarlberg								
References	This indicator was	experin	nented in Enerbuil	d project [2	1], [2] and is	s used in KGA			
	komunalgebäudea	usweis	[4]						
LEVEL	-								
Derived from	Software tool	X	Operational dat	а	In situ	measurements			
	Simple Calculation	S .	Empirical/Litera	ture	Other (specify)			
Details	The calculation of	the buil	ding energy dema	nd has to b	e made wit	h PHPP software.			
Areas covered	All types of buildin	g .							
Barriers	The use of the PHF	P calcu	lation is a barrier (price, com	plexity) [3].			
Rating	Rating was not in t	he scop	e of the Enerbuild	l project.					
	A scoring has been	i used ju	ist based on partn	ers'agreen	nent				
	Score :		of 40 molimbolists if the						
	Assign the minimu	m score	of 10 points if the	e neating n	eeds are un	der the thermal			
	kWb/m ² Dotormir	u the m	ther scores prope	rtionally	leating cons	sumption is under 15			
	KWIIJIII . Deteriiiii	ie the o	the scores propo	rtionally.					
References	This indicator was	experim	nented in ENERBU	ILD project	[1] and [2]				
SCALE									
Application	This indicator is sp	ecific fo	r building.						
Details									
Multiscale	An average value a	it buildi	ng cluster level ca	n be compa	ared to the s	sum of each building			
	result but how to o	calculate	e this average valu	ie?					
References	This indicator was	experin	nented in Enerbuil	d project [2	1], [2] and is	s used in KGA			
	komunalgebäudea	usweis	[4]						

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf
[3]	http://www.passiv.de/de/04_phpp/04_phpp.htm
[4]	https://www.energieinstitut.at/unternehmen/bauen-und-sanieren-fuer-
	profis/gebaeudezertifizierung-und-evaluierung/der-kommunalgebaeudeausweis/



	Operational primary energy demand (kWh/m ²)								
ENV.En.13	ISSUE	C	ATEGORY	LE	VEL	SCALE			
	Environmental		Energy		S	В			
GENERAL									
Description	Intent:								
	Reduction of total energy consumption of buildings including all types of energy use.								
	This indicator is very important because for good insulated buildings, specific electricity								
	consumption is the	e higher	consumption.						
	Indicator: Operation	onal prir	nary energy dema						
	Unit of measure: H	Unit of measure: kWh/m ² (PHPP calculation), The primary energy consumption factors							
Packaround	Are those of the Pr	are those of the PHPP.							
Peferences	This indicator was	KGA Vorariberg							
Nejerences	Vorarlberg [4]								
LEVEL	Volumberg [4]								
Derived from	Software tool	X	Operational dat	a	In situ r	neasurements			
	Simple Calculation	s	Empirical/Litera	ture	Other (s	specify)			
Details	The calculation of	the build	ding energy dema	nd has to b	e made with	PHPP software.			
Areas covered	All types of buildin	g							
Barriers	The use of the PHF	P calcul	ation is a barrier (price, com	plexity) [3]	•			
Rating	Rating was not in t	he scop	e of the Enerbuild	project.					
	A scoring has beer	ı used ju	st based on partn	ers agreem	ient				
	Score :								
	Assign the minimu	m score	of 10 points if the	e heating no	eeds are und	der 160 kWh / m^2			
	and the maximum	of 100 p	oints if the heatir	ng consump	otion is unde	er 120 kWh/m².			
	Determine the oth	er score	s proportionally.						
References	This indicator was	experim	ented in ENERBU	ILD project	[1] and [2]				
SCALE		·							
Application	This indicator is sp	ecific fo	r building.						
Details									
Multiscale									
References	This indicator was	experim	ented in Enerbuil	d project [1	L], [2] , and i	s used in KGA in			
	Vorarlberg [4]								

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf
[3]	http://www.passiv.de/de/04_phpp/04_phpp.htm
[4]	https://www.energieinstitut.at/unternehmen/bauen-und-sanieren-fuer-
	profis/gebaeudezertifizierung-und-evaluierung/der-kommunalgebaeudeausweis/



	Global Warming Potential (kgCO2-eq/m ² yr)								
ENV.Im.11	ISSUE		CATEGORY	LEVE	ËL	SCALE			
	Environmental		Impact	S		В			
GENERAL									
Description	Intent:								
	Reduction of GHG	Reduction of GHG emissions to limit the global warming.							
	Indicator: Global V	Varmir	ng Potential						
	Unit of measure: k	gCO2-	eq/m ² yr (PHPP cal	culation), The	primary e	energy consumption			
	factors are those o	factors are those of the PHPP.							
Background	KGA Vorarlberg								
References	This indicator was	experi	mented in Enerbuil	d project [1],	[2], and is	used in KGA in			
	Vorarlberg [4]								
LEVEL					T				
Derived from	Software tool	2	C Operational data	a	In situ measurements				
	Simple Calculations	S	Empirical/Litera	ture	Other (specify)				
Details	The calculation of t	the glo	bal warming poten	tial has to be	made wit	h PHPP software.			
Areas covered	All types of building	g							
Barriers	The use of the PHP	P calc	ulation is a barrier (price, comple	exity) [3]				
Rating	Rating was not in t	he sco	pe of the Enerbuild	l project.					
	A scoring has been	used	just based on partn	ers agreemen	nt				
	Score :								
	Assign the minimu	m scor	e of 10 points if the	e heating need	ds are und	$\frac{1}{2}$ by kg/m ² and the			
	maximum of 100 p		t the heating consu	mption is und	der 30 kg/	m². Determine the			
	The emission facto	r cof o	lly. ach energy are tho	se of the DHDI	P calculati	on			
		13010	ach energy are tho.			011			
References	This indicator was	experi	mented in ENERBU	ILD project [1]] and [2] a	and is used in KGA in			
	Vorarlberg [4]								
SCALE	Γ								
Application	This indicator is spe	ecific f	or building.						
Details									
Multiscale	No								
References	This indicator was	experi	mented in Enerbuil	d project [1],	[2]				

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf
[3]	http://www.passiv.de/de/04_phpp/04_phpp.htm
[4]	https://www.energieinstitut.at/unternehmen/bauen-und-sanieren-fuer-
	profis/gebaeudezertifizierung-und-evaluierung/der-kommunalgebaeudeausweis/



	Building mate	Building material and construction, OI3 Index (-)						
ENV.Ma.02	ISSUE	C	ATEGORY	LE	VEL	SCALE		
	Environmental		Materials		A	В		
GENERAL								
Description	Intent: The environmental impact of the building construction is quite equal to the energy consumption of this building for 100 years. Thus, optimization of the ecological impact of the building construction is important and has to be taken into account. The Ökoindex3, used in Austria is composed of 3 impacts : - Non renewable primary energy consumption - Global Warming (GWP) - Acidification (AP) Indicator: OI3 Index Unit of measure: Index							
Background	KGA Vorarlberg , O	13 guide	e line IBO [3]					
References	This indicator was	experim	ented in Enerbuil	d project [1	L], [2] and is	used in KGA in		
	vorariberg [4]							
Derived from	Software tool	X	Operational dat	a	In situ r	neasurements		
Derived from	Simple Calculations	5	Empirical/Litera	ure	Other (specify)		
Details	The environmental impact of the construction has to be calculated with a specific software like: Ecotech, Archiphysik, GEQ; Ecosoft These 'Environmental impacts of the construction' on climate change are immediate and for this reason worse than the 'in-use' consumption impacts.							
Areas covered	All types of building	g						
Barriers	The use of a specifi barrier is that the r materials compara The IBO software is	ic softw esults o ble fron s availat	are for calculation of the different too on one to the othe ole in German but	n is a barrie ols used to r. : not in Engl	r (price, com calculate the ish.	plexity). Another global impact of		
Rating	Rating was not in the scope of the Enerbuild project. A scoring has been used just based on partners agreement Score : The lower the OI3 index is, the lower the impact on environment is, the better it is. Assign the minimum score of 10 points if the OI3 index is < 295 and the maximum of 100 points if the OI3 index is <38. Determine the other scores proportionally.							
References	This indicator was e Vorarlberg [4]	experim	ented in ENERBU	ILD project	[1] and [2] a	and is used in KGA in		
Application	This indicator is sp	acific fo	r building					
Details								
Multiscale	No							
References	This indicator was o Vorarlberg [4]	experim	ented in Enerbuil	d project [1	L], [2] and is	used in KGA in		

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf



[3]	http://www.ibo.at/de/oekokennzahlen.htm
[4]	https://www.energieinstitut.at/unternehmen/bauen-und-sanieren-fuer-
	profis/gebaeudezertifizierung-und-evaluierung/der-kommunalgebaeudeausweis/



	Low-pollutant and low-emission materials (-)							
ENV.Ma.01	ISSUE	C	ATEGORY	LE	VEL	SCALE		
	Environmental		Materials		S		В	
GENERAL								
Description	Intent: We spend 90% of our lives in buildings. The internal air quality is then very important for health care reasons. Construction materials and products are important sources of pollutant in internal air (like COV, formaldehydes, heavy metals) for months and years. With the selection of material with low pollutants and low emissions, by 50 to 90%. Good results can be obtain by including low pollutants criteria in the public tenders (maximum values, avoided chemicals, labels,), control of the used product during the construction phase (listing of the product before the work and 3 controls on site) and selection of cleaning products during the in use phase. These controls have to be made by experts and real measurement can also be done. Indicator: low-pollutant and low-emissions material. Unit of measure:							
Background	KGA Vorarlberg [4], Baubo	ook [3]					
References	This indicator was	experim	nented in Enerbuil	d project [1], [2]			
Derived from	Software tool		Operational dat	а	l li	n situ m	easurements	Х
	Simple Calculation	S	Empirical/Litera	ture	XC	Other (s	pecify)	
Details	The selection of lo and control the re	w pollu sults on	tant products nee site.	eds expertie	se to c	define t	he selection crite	eria
Areas covered	All types of buildir	ıg						
Barriers	Expertise and mea	sureme	nt capacity in this	field of int	ernala	air pollu	ition is in most	
Rating	Expertise and measurement capacity in this field of internal air pollution is in most countries quite rare and the cost is for the moment very high.Rating was not in the scope of the Enerbuild project.A scoring has been used just based on partners agreementScore :Evaluation criteriaPoints (max Total 60)Did the project include a specific document concerning low pollution materials?10What is the final part of low pollutant materials : 100% of Eco-materials3090% of Eco-materials2070% of Eco-materials10Products declaration: 100% of products have been declared?3090% of products have been declared?2070% of products have been declared?20							
References	This indicator was	experim	nented in ENERBU	ILD project	[1] ar	nd [2]		
SCALE								
Application	This indicator is sp	ecific fo	r building.					
Details								
Multiscale	NO							



References This indicator was experimented in Enerbuild project [1], [2]

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf
[3]	https://www.baubook.info/?SW=6&Ing=2
[4]	https://www.energieinstitut.at/unternehmen/bauen-und-sanieren-fuer-
	profis/gebaeudezertifizierung-und-evaluierung/der-kommunalgebaeudeausweis/



	Weighted so	und p	ressure from	ventil	ation (dE	BA)				
SOC.AC.02	ISSUE CATEGORY				EVEL	SCALE				
	Social	Aco	ustic Comfort		А	В				
GENERAL										
Description	Intent: Ventilation	n increas	es the comfort an	d internal	air quality in	the buildings but				
	must not create a	must not create acoustic discomfort.								
	Indicator: Weight	Indicator: Weighted sound pressure from ventilation								
	Unit of measure:	dBA								
Background	KGA Vorarlberg ,									
References	This indicator was	experim	ented in Enerbuil	d project	[1], [2]					
LEVEL	[r		T T					
Derived from	Software tool	Х	Operational dat	а	In situ	measurements X				
	Simple Calculation	IS	Empirical/Litera	ture	Other (specify)				
Details	The noise of the v comfort.	The noise of the ventilation system has to be very low (< 1db) to ensure an acoustic comfort.								
Areas covered	Office buildings									
Barriers	Acoustic measure equipment.	Acoustic measurement is quite complicated and needs specific expertise, software and equipment								
Rating	Rating was not in the scope of the Enerbuild project.									
5	A scoring has beer	A scoring has been used just based on partners agreement								
	Score :	-		•						
	Scores are assigned with the following table :									
	Points (maximum total 50)									
	Theoretical calcul	ation of	the acoustic level							
	L A, nT <30 dB et L c (50-4000), nT <50 dB 25					25				
	Measurement at the exposed working places					50				
	L _{A,nT} < 30 dB und L _{C(50-4000),nT} < 50 dB									
References	This indicator was experimented in ENERBUILD project [1] and [2]									
SCALE										
Application	This indicator is sp	ecific fo	r office buildings.							
Details										
Multiscale	No									
References	This indicator was experimented in Enerbuild project [1], [2]									

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02_ENERBUILD-result_6_2-4.pdf



	Daylight factor (%)								
SOC.VC.02	ISSUE	L	SCALE						
	Social	Vis	ual Comfort	A		В			
GENERAL									
Description	Intent: To decrease energy consumption of artificial lighting, the natural sun lighting								
	(daylight factor) has to be optimized. Indicator: Daylight factor Unit of measure: %								
Background	KGA Vorarlberg ,	<u> </u>			· - 1				
References	This indicator was	experim	ented in Enerbui	ld project [1],	[2]				
					1				
Derived from	Software tool	X	Operational da	ta	In situ r	measurements X			
Detaile	Simple Calculation	is the W	Empirical/Litera	ature	Other (specity)			
Detuiis	The daylight facto	r is the 7	o or the sun light D – F	used for intern	iai iigniin	g.			
	E _n light on the y	working	surface/m ²	p∕∟Hz					
	E Hz sun light ou	tside the	building /m ²						
	A daylight factor o	of 5% is a	n objective and a	daylight facto	or<2% is b	ad.			
Areas covered	Office buildings								
Barriers	Calculation of the software.	Calculation of the daylight factor is quite complicated and needs specific expertise and software							
Rating	Rating was not in the scope of the Enerbuild proiect.								
_	A scoring has been used just based on partners agreement								
	Score : Assign points with the following table :								
	D Points (max 50)								
	< 2 %			<u>በ Pt</u>					
	2-3 %			10 Pt					
	3-4 % 30 Pt 5 % 50 Pt. Day light factor is an average value of 5 measurements in different places of the building.								
References	This indicator was	experim	ented in ENERBL	JILD project [1] and [2]				
SCALE		161 6	<u> </u>						
Application	This indicator is sp	ecitic to	r office buildings.						
Details	No								
Poforoncos	This indicator was	ovnorim	ontod in Enorthi	Id project [1]	[2]				
Rejerences		This indicator was experimented in Enerbuild project [1], [2]							

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02_ENERBUILD-result_6_2-4.pdf



	Thermal Comfort in Summer (-)						
SOC.TC.03	ISSUE	С	ATEGORY	LEVE	L	SCALE	
	Social	The	rmal Comfort	A		В	
GENERAL							
Description	Intent: Internal temperature is very important for the feeling of thermal comfort especially in offices. Optimization of the building in terms of material, daylight factor, ventilation and heating/cooling systems contributes to the thermal comfort all year round. For summer comfort, night over ventilation, façade and windows shading can be used to avoid active systems of air conditioning and energy consumption. Thermal dynamic simulation can demonstrate the effectiveness of the summer comfort. Indicator: Static or dynamic simulation of indoor temperature						
	Unit of measure:						
Background	KGA Vorarlberg , Nor	m EN	15251				
References	This indicator was ex	perim	nented in Enerbuild	project [1],	[2]		_
LEVEL Demissional foreme	Coffware to al	V	One retional data				V
Derived from	Simple Calculations	^	Empirical/Literatu	ro	Other (sr		^
Details	For buildings with l	ass th	an 35% of the fac	ade surfaci	in winde	ws and a stan	lard
	Internal load (like offices, classrooms, gymnasium), a static calculation like PHPP is sufficient. For buildings with more than 35% of the facade surface in windows and a high internal load (museums, computer rooms), a dynamic calculation like PHPP is necessary to define if an active cooling is needed. Scorching temperature data must be used to simulate the future climate and ensure the comfort in the worst situations.						
Areas covered	Office buildings						
Barriers	Thermal comfort sim software.	Thermal comfort simulations and especially dynamic ones need specific expertise and software.					
Rating	Rating was not in the scope of the Enerbuild project. A scoring has been used just based on partners agreement Score :Assign points with the following table :						
						Points (max 15	0)
	Result of the calculation for critical parts of the building (last floor, west orientation)150Temperature over 26°C<5%, without active cooling system						
				t.	1 1 (0)		
References	This indicator was ex	perim	nented in ENERBUILI	D project [1] and [2]		
Application	This indicator is space	fic fo	r office buildings				
Application	This mulcator is spec	10	i onice bullulligs.				
Multiscala	No						
References	This indicator was ex	perim	nented in Enerbuild	project [1]	[2]		



REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02_ENERBUILD-result_6_2-4.pdf
[3]	EU Norm CEN EN 15251 : Indoor environmental Criteria



500 Tr 17	Accessibility of public transport, stops and frequency (-)							
300.11.17	ISSUE	С	ATEGORY	LE	VEL	SCALE		
	Social		Transport		S	В		
GENERAL								
Description	Intent: Reduce the use of private vehicles. To reach such objective, public buildings must have a good public transport connection. Indicator: Amount of stops and frequency of public transport							
Background	KGA Vorarlberg							
References	This indicator was exp	erim	iented in Enerbuild p	roject [1	.], [2]			
Derived from	Software tool		Operational data		In situ	measurements X		
Derived from	Simple Calculations	x	Empirical/Literatur	e	X Other	(specify)		
Details	This indicator evaluate	es th	e accessibility of pub	lic trans	port taking	into account the walk		
	distance to nodes and Assessment method: A	the Acce	frequency of the bus ssibility to public tra	ses/train	/tram. calculated	as follows.		
	 Step 1: Walking distance to public transport stops Determine the walking distance from the building's main entrance to each public transport stop served by rail, bus or tram. Use a notional walking speed of 80 meters per minute. Do not consider stops that are further than a 500 m radius of the building. Note: For stops within the radius that are served by the same service/route consider only the closest stop, i.e. do not consider multiple stops which are on the same route. The distance must be measured as it would be travelled on foot, i.e. do not measure in a straight line over inaccessible objects such as buildings or rivers. Step 2: Frequency of service at each stop For each stop that meets the requirements in step 1, determine the total number of services departing/arriving at each node in the following periods for a typical weekday: AM 08.00 – 10.00 PM 17.00 – 19.00 For domestic buildings, consider the number of services departing/arriving at each stop in the following periods for a typical weekday: AM 08.00 – 10.00 PM 17.00 – 19.00, Saturday: 08.00AM – 19.00PM 							
	 For stops that have route and not a collect It is likely that each the direction with the For trains consider of radius of the developm 	mul tive rout high only nent	tiple routes, determi nodal frequency. te at a stop will be bi- nest frequency of ser those routes that ha t (Including the stop n	ne the fr -directio vice. ve at lea nearest t	requency o nal, consid st two stop to the build	f service for each er only the route in os within a 20 km ling).		
Areas covered	All types of buildings							
Barriers								
Rating	Rating was not in the scope of the Enerbuild project. A scoring has been used just based on partners agreement Score : Assign points with the following table :							



		Points max. 50					
	For stops closer than 300 m with a frequency of more than 1 bus per hour	6 pts per route and per stop					
For stops closer than 300 m with a frequency of more than 1 10 pts per bus per ½ hour and per stop							
	For stops closer than 500 m with a frequency of more than 15 pts per rou and per stopbus per hourFor stops closer than 500 m with a frequency of more than 18 pts per rou and per stopbus per ½ hourand per stop						
References	This indicator was experimented in ENERBUILD project [1] and	[2]					
SCALE	_						
Application	This indicator is specific for buildings.						
Details							
Multiscale	The same indicator can be calculated at building cluster scale but it is not just a sum of each building result because each node must be considered only once and not for each building.						
References	This indicator was experimented in Enerbuild project [1], [2]						

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf



	Life Cycle Costs (-)							
ECO.LC.07	ISSUE	С	ATEGORY	LEV	EL	SCALE		
	Economic Life Cycle Costs A B							
GENERAL								
Description	Intent: The objective of this indicator is to ensure an economic optimization of the project. By calculating the costs on all the life time of the building, over investments are compensated by lower using costs. Mostly, saving measures are not realized because they need over investments and the cost-effectiveness of these over investment is not easy to demonstrate. Indicator: Life Cycle Costs Unit of measure: -							
Background	KGA Vorarlberg , <u>Nor</u>	<u>m</u> ISC) 15686-5					
References	This indicator was ex	perim	ented in Enerbuil	d project [1],	[2]			
LEVEL					T			
Derived from	Software tool	Х	Operational data	a	In situ r	neasurements		
	Simple Calculations		Empirical/Literat	ture	Other (s	specify)		
	 Points are given for Life Cycle Costs calculated following the official NORMS (ÖNORM M 7140 / VDI 2067 / ISO 15686-5). Two versions of the building have to be compared : one 'standard version' (minimum regulation level) and one 'improved version' and the following hypotheses : Life duration for structural measures (windows, walls, insulation) : 40 years Life duration for technical measures (heating system, ventilation system) 20 years Duration of a bank credit 20 years General inflation : 0% Increase of energy prices per year : 3% Interest rate : 3% Residual value of the systems at the end of the life time and all subsidies have to be taken into account 							
Areas covered	All types of buildings							
Barriers Rating	Rating was not in the scope of the Enerbuild project. A scoring has been used just based on partners agreement Score : Assign 40 points when a LCC calculation has been made.							
References	This indicator was ex	berim	ented in ENERBU	LD project [1	L] and [2]			
SCALE								
Application	This indicator is speci	fic fo	r buildings.					
Details								
Multiscale	LCC calculation can b calculation for each b	e mao uildir	de at building clus າg.	ter level but	the result	is not the sum of th	ne	
References	This indicator was experimented in Enerbuild project [1], [2]							

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf
[3}	https://www.iso.org/obp/ui/#iso:std:iso:15686:-5:ed-1:v1:en



ECO Ma 04	User Information (-)									
	ISSUE	C	ATEGORY	LE	VEL	SCALE				
	Economic	Μ	anagement		S	В				
GENERAL										
Description	Intent: Users have consumptions. Use without reducing t Indicator: Provisio Unit of measure:	Intent: Users have a great impact of the efficiency of the building use and energy consumptions. Users have to be informed and trained to an efficient use of the building without reducing their comfort Indicator: Provision of manuals for building use Unit of measure: -								
Background	KGA Vorarlberg ,	KGA Vorarlberg ,								
References	This indicator was	experin	nented in Enerbuil	d project [1], [2]					
LEVEL					r - 1					
Derived from	Software tool		Operational data	a	In situ	i measurements X				
	Simple Calculation	IS	Empirical/Litera	ture	X Other	(specify)				
	 A user manual has to be given to the users including information on : How to manage temperature in each room (heating regulation) Ventilation and windows opening Sun and shading Lighting Efficient use of electric devices and equipment 									
Areas covered	All types of buildir	ngs								
Barriers										
Rating	Rating was not in the scope of the Enerbuild project. A scoring has been used just based on partners agreement Score : Assign 25 points when a user manual has been given and explain in a meeting to the users.									
References	This indicator was	experin	nented in ENERBU	ILD project	[1] and [2]				
SCALE										
Application	This indicator is sp	ecific fo	r buildings.							
Details Multiscale	The addition of ea	ch build les in a	ing cannot be add	ed at build	ling cluster	level because the				
References	This indicator was	experin	nented in Enerbuil	d project [1], [2]					

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf



ECO 011 04	Energy Optimization during Planning (-)							
ECO.Qu.04	ISSUE	CATEGORY	LEVE	L	SCALE			
	Economic	Quality	S		В			
GENERAL								
Description	 Intent: Objective of this indicator is the energy optimization of the project. The real consumption of the building should be as close as possible as the calculated one. Following tools will be used : Energy optimization has to be taken into account at all steps of the project Energy calculation will be controlled by an independent body Calculation will be made on PHPP, software based on real consumptions of many buildings Indicator: Point based assessment of energy design 							
Backaround	KGA Vorarlberg							
References	This indicator was e	experimented in Enerbui	ild project [1] [2]				
LEVEL]				
Derived from	Software tool	Operational da	ta	In situ me	easurements			
	Simple Calculations	Empirical/Litera	ature X	Other (sp	ecify)			
Details	Assessment metho	d :						
	 Specific energy Management for each room and taking into account the real use Air flows equal to PHPP requirements Evaluation of internal thermal load Detailed analysis of thermal bridges Technical description and requirements of the energy systems in the tender (for example, U values for walls, windows efficiency of heat recovering systems, air flow and energy consumption for ventilation systems) Control of energy part of the offers and conformity with the requirements Conformity with local and/or national regulations Air tightness test results Verification of energy calculation after the construction by an independent 							
Areas covered	All types of building	gs						
Barriers Rating	Rating was not in the scope of the Enerbuild project. A scoring has been used just based on partners agreement Score : Assign 45 points max. Give 5 point for each document of the previous list.							
References	This indicator was e	experimented in ENERBL	JILD project [1]	and [2]				
SCALE								
Application	This indicator is spe	ecific for buildings.						
Details	The list of documer	nt is specific for building	S.					
Multiscale	No			-1				
References	This indicator was e	experimented in Enerbui	ild project [1], [2]				

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02_ENERBUILD-result_6_2-4.pdf



FCO 0:: 12	Process and planning quality (-)									
ECO.Qu.12	ISSUE	С	ATEGORY LE	EVEL		SCALE				
	Economic		Quality	S		В				
GENERAL			· ·							
Description										
	 Intent: Building has to be useful and build to answer a specific need. This adaptation to the needs has to be evaluated through : Adaptation to the use and users sustainability One efficient method is to launch competition to select the conception team. Indicator: Points depending on planning activity report Unit of measure: - 									
Background	KGA Vorarlberg									
References	This indicator was expe	rim	ented in Enerbuild project [1], [2]					
LEVEL										
Derived from	Software tool		Operational data		In situ me	easurements	Х			
	Simple Calculations		Empirical/Literature	X	Other (sp	ecify)				
Detuis	The most ecological building is the one that is not build! The comparison of different possibilities is important to select the one that fits better to the users' needs and to a sustainable global vision of the building use. Social aspects have to be taken into account as well as soil waterproofing, accessibility to public transport, energy efficiency									
Areas covered	All types of buildings									
Barriers	7 in types of buildings									
Rating	Rating was not in the scope of the Enerbuild project. A scoring has been used just based on partners agreement Score : Assign 25 points max.									
	Criteria					Points (maximur total 25)	n			
	Has a good document objectives?	atio	on be established to define	e the	e projects	10				
	Have different possibili	ities	been proposed?			5				
	Has a base situation be	en	established (without buildin	g pr	oject)?	5				
	For example if the nun be useful?	nbe	r of pupils decrease, will th	e bu	ilding still					
	Has an evaluation s different possibilities?	yste	em been established to	com	pare the	4				



	Are included in the evaluation	
	Urban planning	2
	 Accessibility with different transport modes 	2
	 Soil quality and impact on landscape 	2
	Energy efficiency	2
	Use of Eco materials	2
References	This indicator was experimented in ENERBUILD project [1] and [2]	
SCALE		
Application	This indicator is specific for buildings.	
Details		
Multiscale		
References	This indicator was experimented in Enerbuild project [1], [2]	

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf



ECO Ou 03	Setting verifiable environmental targets (-)								
LCO.QU.05	ISSUE	С	ATEGORY	LEVE	L	SCALE			
	Economic		Quality	S		В			
GENERAL									
Description	Intent: Ecological and energy quality of a building depends on its scheduling with clear and measurable objectives. These objectives have to be described in the planning documents. Indicator: Amount of details in setting target performance scores Unit of measure: -								
Background	KGA Vorarlberg								
References	This indicator was	experim	ented in Enerbuil	d project [1], [[2]				
LEVEL					1				
Derived from	Software tool		Operational dat	a	In situ n	neasurements X			
	Simple Calculations	5	Empirical/Litera	ture X	Other (s	specify)			
Details	Assessment method : 3 different methods can be used : 1 - Score = total of points for all criteria = this method gives the more possibilities for the conception team. 2 - Score = 1 specific score for each of the 5 evaluation categories 3 - Score = minimal requests for each of the 5 categories : this method gives less possibilities for the conception team as the technical solutions are given to have points Examples for method 3 : - For energy category : Minimum values for each criteria with PHPP calculation : heating demand, cooling demand, global primary energy consumption, air tightness measurement - For materials Avoid some products like PVC, ask for a proportion of local materials								
Areas covered	All types of building	gs							
Barriers Rating	Rating was not in the scope of the Enerbuild project. A scoring has been used just based on partners agreement Score : Assign 25 points max. The evaluation method (one of the three described previously) must be defined at the beginning with detailed criteria and points assignment. Example : 25 points for more than 500 points with the Enerbuild assessment tool								
References	This indicator was	experim	ented in ENERBU	ILD project [1]	and [2]				
SCALE									
Application	This indicator is spe	ecific fo	r buildings.						
Details									
Multiscale									
References	This indicator was experimented in Enerbuild project [1], [2]								

REFERENCES	
[1]	http://wiki.cesba.eu/wiki/ENERBUILD_tool
[2]	http://www.enerbuild.eu/publications/2012-02 ENERBUILD-result 6 2-4.pdf

FINAL D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5

A.6 - EPISCOPE





EPISCOPE

Energy Performance Indicator Tracking Schemes for the Continuous Optimisation of Refurbishment Processes in European Housing Stocks



www.episcope.eu

EPISCOPE (2013-16) was a multinational effort amongst 17 EU countries to develop a conceptual framework for assessing energy saving processes in the European housing sector in a transparent and effective way. The approach was applied through pilot studies in 16 European countries including large building portfolios, as well as building stocks on a regional and national level. Building stock models are developed based on the concept of national or regional building typologies developed in the framework of a predecessor IEE project TABULA [1]. The work facilitates realistic projections of heating energy use in dwellings and support national efforts for meeting energy savings or emissions targets. A concerted set of energy reformance indicators was elaborated aiming to enable key experts and non-experts to ensure a high quality of energy refurbishment plans, check compliance with regulations, track and steer the refurbishment processes in a costeffective way and compare the actual energy savings against targets.



INDICATORS

	Annual heat generation for space heating and DHW						
ENV En 05	(kWh/m ² ref area a	i)					
	ISSUE	C	ATEGORY L	EVE	L	SCALE	
	Environmental		Energy	S		B / N	
GENERAL							
Description	The total annual heat demand (q_{total}) per m ² floor area is equal to the total heat output of heat generators, solar systems and heat recovery divided by a "reference" area. It reflects the quality of the building envelope [2]. The EPISCOPE "reference" area (ref area) is the usable floor area inside the thermal envelope, determined on the basis of internal dimensions (measured from inside surface to inside surface of surrounding walls); considered are spaces with room height > 1.50 m; included are also footprints of stairwells and landings as well as storage and installation rooms, provided that they are located inside the thermal envelope. The reference floor area is equivalent to the conditioned gross floor area (measured at a room height of 1.50 m) minus the cross-section areas of all included constructions [3].						
Background							
References	[2], [3]						
LEVEL	1		-	-			
Derived from	Software tool	Χ	Operational data		In situ meas	urements	
Derived from	Simple Calculations		Empirical/Literature		Other (speci	fy)	
	(total heat demand for heating and DHW: sum of net heat need + storage losses + distribution and emission losses + heat recovered by ventilation systems). The total heat demand is a standard output of the tools that are used for the energy performance certification of buildings. Calculations can be based on existing National Standards or European Standards (EN13790) adapted to national technical guidelines. Higher complexity simulation models can also be used, but it would increase the computational effort and required level of expertise. For reasons of coherence, adaptation factors are used for deriving the EPISCOPE reference area from differently						
Areas covered	The main focus is on the cooking, lighting and ope	resid ratic	ential sector. Only space heat on of appliances are not consid	ing a ered	nd DHW are addı	ressed. Cooling,	
Barriers	Transnational applicabilit	ty red	quires a common reporting scl	neme	(i.e. EPISCOPE re	eference area)	
Rating	Rating was not in the sco regarding the goals to be effectiveness of difference	pe o achi ce of	f the EPISCOPE project. Bench eved in 2020, 2030 and beyon retrofit scenarios applied in th	mark d we ie res	s (EU-common a re used in order sidential building	nd National) to assess the s sector.	
References	[3]						
SCALE							
Application range	In EPISCOPE the focus wa regional/national scale); countries	as on the i	residential building stock scer ndicator was calculated in pilo	nario t stu	analysis (portfoli dies performed ir	ios, n 16 European	
Details	The indicator can be calculated for single buildings as well as building stocks (building portfolios, regional/national building stocks). To derive it for a building stock: First, the total heat demand is calculated individually for a small number of typical buildings representing the studied building stock. Next, in combination with statistical data (number or total reference area of represented buildings) the indicator for building portfolios or groups of buildings at regional/national level is derived.						
References	that belong to the same necessary. The TABULA t a case, multiplication of t of the studied stock subs	typol ypole the ir et pr	ogy. Thus, a typology of the in ogy concept for residential bui indicator derived for the single ovides the indicator value for	vesti Iding build a larg	gated building st s was used in EPI ing with the tota ger scale.	ock is SCOPE. In such I reference area	
Rejerences	[+], [+], [-]						



				. 1				
	Annual CO ₂ e	emissi	ons (kg/m ² ref	f _{area} a)				
ENV.Im.05	ISSUE	C	ATEGORY	LEVE	L	SCALE		
	Environmental		Impacts	S		B / N		
GENERAL								
Description	This indicator refere	s to the co	ontribution of the a	pplied heat sup	ply techno	ologies (supply side)	to	
	the total annual car	bon dioxi	de (CO ₂) emissions,	expressed in ki	lograms re	elated to the EPISCO	PE	
	reference area. On	-site CO ₂	emissions of heati	ing systems (fo	r space he	eating and hot wat	er,	
	including auxiliary	cluding auxiliary electric energy and ventilation) as well as the CO_2 emissions from district						
	CO ₂ equivalent emis	sions of c	iction (used for neither greenhouse ga	at supply and a	auxillary er	nergy) are considere	ea.	
	The EPISCOPE refer	ence are	a (ref area) is the	usable floor are	ea inside t	the thermal envelo	oe.	
	determined on the	basis of in	nternal dimensions	(measured fron	n inside su	rface to inside surfa	ace	
	of surrounding wal	ls); consi	dered are spaces v	, with room heig	ht > 1.50	m; included are a	lso	
	footprints of stairwe	ells and la	ndings as well as st	orage and instal	llation roo	ms, provided that th	ney	
	are located inside	the the	rmal envelope. Th	e reference fl	oor area	is equivalent to t	the	
	conditioned gross f	loor area	(measured at a ro	om height of 2	1.50 m) m	inus the cross-section	ion	
Backaround		construc	lions [5].					
Buckyrounu								
References	[2], [3]							
LEVEL							-	
Derived from	Software tool	X	Operational da	ita	In situ r	measurements	_	
	Simple Calculation	ons	Empirical/Liter	ature	Other (specify)		
Details	This indicator is de	rived by s	summing up the su	btotals of energy	gy demand	d covered by differe	ent	
	energy carriers divid	ded by the	e emission factors (of the respective	e heat gen	erators. The subtot	als	
	losses + distribution	and emi	ssion losses + heat i	recovered by ve	ntilation s	vstems) are calculat	ige ed	
	by tools that are us	ed for the	energy certification	n of buildings in	order to o	derive the total ener	rgy	
	demand. Calculatio	ns can b	e based on existir	ng National Sta	andards or	r European Standai	rds	
	(EN13790) adapted	to nation	al technical guidelin	es. For reasons	of coherer	nce, adaptation facto	ors	
	are used for derivir	ng the EP	SCOPE reference a	rea from differ	ently defir	ned national referer	ice	
Areas sourced	areas. Main focus on the r	ocidontial	sactor Only space	hosting and DU	W are add	rossed Cooling		
Areas coverea	cooking, lighting and	d operatio	on of appliances are	not considered	w are auur	resseu. Cooning,		
Barriers	Transnational applic	ability red	quires a common re	porting scheme	(i.e. EPISC	OPE reference area)	
Ratina	Rating was not in th	, e scope o	f the EPISCOPE proi	ect. Benchmark	s (EU-com	mon and National)		
nating	regarding the goals	to be achi	eved in 2020, 2030	and beyond we	re used in	order to assess the		
	effectiveness of diff	erence of	retrofit scenarios a	pplied in the res	sidential bu	uildings sector.		
References	[3]							
SCALE								
Application	In EPISCOPE the foc	us was on	residential building	stock scenario	analysis (p	ortfolios,		
range	regional/national sc	ale); the i	ndicator was calcula	ated in pilot stud	dies perfor	med in 16 Europear	۱	
- 0-	countries							
Details	The indicator can be	e calculate	ed for single building	gs as well as bui	lding stock	s (building portfolio	s,	
	To derive it for a b	uilding sto	CKS). ock: First the total	CO_{2} emissions	are calcul	ated individually fo	ra	
	small number of ty	oical build	lings representing t	he studied buil	ding stock	. Next. in combinati	on	
	with statistical data	(number	or total reference	area of represe	ented build	lings) the indicator	for	
	building portfolios c	r groups (of buildings at regio	nal/national lev	el is derive	ed.		
Multiscale	Extrapolation of res	ults from	a single building to	a group of build	ings is only	y possible for buildin	ngs	
	that belong to the s	ame typo	ogy. Thus, a typolog	gy of the investi	gated build	ding stock is		
	necessary. The TAB	JLA typol	ogy concept for resi	dential building	s was used	I IN EPISCOPE. In suc	h	
	a case, multiplicatio	subset or	inicator derived for	r value for a larg	ning with th per scale	le total reference ar	ea	
References	[1], [4], [5]	Junger hi			sei stale.			
nejerences								



	CO2 emission factor heat supply (kg/kWh)						
ENV.Im.06	ISSUE	C	ATEGORY	LE	VEL	SCALE	
	Environment		Impacts		В	B / N	
GENERAL							
Description	This indicator expresses the amount of CO_2 (kg) emitted per unit energy demand (kWh). It reflects the quality of the supply system including the processes for producing and transporting the energywares.						
Background							
References	[2]						
LEVEL							
Darived from	Software tool		Operational da	ita	In situ	measurements	
Derived from	Simple Calculatio	ns X	Empirical/Liter	ature	Other	(specify)	
Details	This indicator is derived by dividing the total CO2 emissions (indicator ENV.Im.05) by the total energy demand for space heating and hot water, including auxiliary electric energy and ventilation (indicator ENV.En.18).						
Areas covered	Main focus on the residential sector. Only space heating and DHW are addressed. Cooling, cooking, lighting and operation of appliances are not considered.						
Barriers							
Rating							
References	[2]						
SCALE							
Application range	In EPISCOPE the focu regional/national sca countries	s was or le); the i	n residential building indicator was calcula	stock scena ated in pilot	ario analysis (studies perfo	portfolios, rmed in 16 European	
Details	The indicator can be calculated for single buildings as well as building stocks (building portfolios, regional/national building stocks). To derive it for a building stock: First, the total heating energy demand and CO ₂ emissions are calculated individually for a small number of typical buildings representing the studied building stock. Next, in combination with statistical data (number of represented buildings) the calculated values are extrapolated for building portfolios or groups of buildings at regional/national level to derive the value of the indicator.						
Multiscale References	To derive the value o "Details" must be foll necessary. The TABU [1]. [4]. [5]	To derive the value of the indicator at a large scale, the methodology described in section "Details" must be followed. Accordingly a typology of the investigated building stock is necessary. The TABULA typology concept for residential buildings was used in EPISCOPE.					
nejerences	1-17 [17]						

REFERENCES	
[1]	Loga, T., Diefenbach, N. (ed.) (2010): Use of building typologies for energy performance assessment of national building stocks. Existent Experiences in European Countries and Common Approach. First TABULA Synthesis Report, Institut Wohnen und Umwelt, Darmstadt. Available at: <u>http://episcope.eu/fileadmin/tabula/public/docs/report/TABULA_SR1.pdf</u>
[2]	Diefenbach, N., Loga, T., Stein B. (ed.) (2016): Application of Energy Performance Indicators for Residential Building Stocks Experiences of the EPISCOPE project (Deliverable D4.1b). Available at: <u>http://episcope.eu/fileadmin/episcope/public/docs/reports/EPISCOPE_Indicators_ConceptAndExperiences.p</u> <u>df</u>
[3]	Loga, T., Diefenbach, N. (ed.) (2013): TABULA Calculation Method – Energy Use for Heating and Domestic Hot Water – Reference Calculation and Adaptation to the Typical Level of Measured Consumption (ISBN 978-3- 941140-31-8). Available at: <u>http://www.episcope.eu/fileadmin/tabula/public/docs/report/TABULA_CommonCalculationMethod.pdf</u>
[4]	Stein, B., Loga, T., Diefenbach, N. (ed.) (2016): Scenario Analyses Concerning Energy Efficiency and Climate Protection in Local Residential Building Stocks Examples from Eight European Countries - EPISCOPE Synthesis Report No. 2 - (Deliverable D3.4). Available at: <u>http://episcope.eu/fileadmin/episcope/public/docs/reports/EPISCOPE_SR2_LocalScenarios.pdf</u>

FINAL D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5



[5]	Stein, B., Loga, T., Diefenbach, N. (ed.) (2016): Scenario Analyses Concerning Energy Efficiency and Climate Protection in Regional and National Residential Building Stocks Examples from Eight European Countries -
	rotection in Regional and National Residential Building Stocks Examples from Eight European Countries
	EPISCOPE Synthesis Report No. 3 - (Deliverable D3.5). Available at:
	http://episcope.eu/fileadmin/episcope/public/docs/reports/EPISCOPE_SR3_RegionalNationalScenarios.pdf

FINAL D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5

A.7 - FADUSIR



FASUDIR

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 60322 Friendly and Affordable Sustainable Urban Districts Retrofitting



http://fasudir.eu/

The FASUDIR project was born to develop new business models and financial supporting tools, to support the necessary building-retrofitting market mobilization in Europe to fulfill EU-targets in 2020 and 2050.

The key instrument will be the Integrated Decision Support Tool (IDST), developed to help decision makers to select the best energy retrofitting strategy to increase the sustainability of the whole district. With stakeholder feedback loops and validation in three diverse urban areas, the IDST will ensure robustness and applicability in the entire value chain.

The traditional approach to the building energy efficient retrofitting brings poor results in relation to the urban sustainability, resource efficiency and economic return. Although the district retrofitting approach is frequently the most sustainable and cost-effective, the complexity of decision making grows exponentially when the intervention targets larger scale, even more when considering the fragmentation of the construction sector.



Deliverable D2.4 IDST Key Performance Indicators



V. 3.0, 10/7/2014 Delivered (To be approved by the EC)

ANNEX 4: ASSESSMENT GUIDELINE FOR FASUDIR KPIS ON DISTRICT LEVEL

	FASUDIR Ke	y Perf	
		Distric	t Level
Category	Indicator	Nr.	Sub-Indicator
	D.1.1 Energy Demand		
		D.1.1.1	Total Primary Energy Demand
		D.1.1.2	Operational Energy Use
		D.1.1.3	Energy Demand Embodied
		D.1.1.4	Share of Renewable Energy on site
	D.1.2 Impacts on the Environment	1	
1.		D.1.2.1	Global Warming Potential (GWP)
Environmental		D.1.2.2	Acidification Potential (AC)
Category		D.1.2.3	Ozone Depletion Potential (OCP)
		D.1.2.4	Eutrophication Potential (EP)
		D.1.2.5	Photochemical Ozone Creation Potential (POCP)
		D.1.2.6	Abiotic Depletion Potential Elements (ADPe)
	D.1.3 Water Use	1	
		D.1.3.1	Intensity of Water Treatment
	D.1.5 Land Use		
		D.1.5.1	Soil Sealing
	D.2.1 Motor Transport Infrastructure		
		D.2.1.1	Parking facilities
		D.2.1.2	Infrastructure for innovative concepts: car sharing, charging infrastructure
	D 2 2 Public Transport Infrastructure		
	D.2.2 Fublic Transport infrastructure	D 2 2 1	Internal Accessibility Rue Tram Subway stops Dailway station
	D 2 3 Bicycle and Pedestrian Infrastructure	0.2.2.1	Internal Accessionity. Dus, main, Subway stops, Nanway station
	D.2.0 Dicycle and I edesthan mindstructure	D 231	Ricycle facilities
		D.2.3.1	Biovole and Dedestrian network quality
2. Social	D 2 4 Accessibility	D.2.J.2	
Category	D.2.4 Accessionity	D 241	Barrier-free Accessibility of the District
		D242	Access to Services and Facilities
		D 24 2	Access to Parks and Open Spaces
	D 2 5 Noise Level	0.2.4.2	
	Bizio Noise Level	D 251	Percentage of building area over poise limit
	D 2 6 Thermal Comfort	D.2.J.1	
		D 261	Outdoor temperature / Heat island effect
	D 2 7 Gentrification	0.2.0.1	
	Bizir Centrincation	D 271	Contrification Index
	D 3.1 Life Cycle Costs Building & Energy Inf	rastruct	
d di	b.o.r Life Oycle Oosts Dunding & Lifergy in	D 3 1 1	Life Cycle Costs (LCC)
		D 3 1 2	Investment costs
3. Economic		D.3.1.2	Punning costs energy
Category		D.3.1.3	Punning costs non operativ
	D 3 2 Poturn on Investment Building 9 Ener	D.3.1.4	running costs non-energy
	D.3.2 Return on investment Building & Energ	gy iniras	Batum on Invootmont
		D.3.2.1	Return on investment

FASUDIR – GA no. 609222. Deliverable D2.4



INDICATORS

	Total Primary En	er	gy Demand (kWh/r	n²)		
ENV.En.18	ISSUE	C	ATEGORY LI	VE	L	SCALE
	Environmental		Energy	А		Ν
GENERAL						
Description	Total Primary Energy Dem	and	considering the whole buildin	g life	e cycle.	
Background	OPEN HOUSE, FASUDIR					
References	ISO 14040:2006, 10044:20)06,	EN 15978			
LEVEL						
Darived from	Software tool	Х	Operational data		In situ	measurements
Derived from	Simple Calculations		Empirical/Literature		Other ((specify)
Details	The indicator is calculated 15978.	асс	ording to the ISO 14040:2006	and :	14044:200	06 as well as the EN
Areas covered	The indicator considers th	e w in t	hole building life cycle with all	life c	cycle stage	s from A1 to D. In
	green the stages mended					
			BUILDING ASSESSMENT INFORMATIO	v		
	BUI	.DING	LIFE CYCLE INFORMATION			SUPPLEMENTARY INFORMATION BEYOND THE
						BUILDING LIFE CYCLE
	A 1-3 A 4-5 PRODUCT PRODUCT PRODUCT	ÓN	B 1-7 C 1	-4 = LIFE		D Benefits and loads beyond the
	A1 A2 A3 A4	A5	B1 B2 B3 B4 B5 C1 C2	ge C3	C4	system boundary
	upply upply insport insport	lation	Use lenance epair acement bishment bishment natruction notition	Vaste cessing	sposal	Reuse- Recovery- Recycling-
	AREA Scenario Sc	enario	scenario scenario scenario scenario	scenario	Sotrario	Potential
			B6 Operational energy use scenario			
			B7 Operational water use scenario			
Barriers	Availability of a LCA Data	Banl	k			
Rating	FASUDIR IDST Methodolo	gy				
References	[1],[2],[3],[4]					
SCALE						
Application	Neighbourhood scale.					
Details	Provide details to justify t	he "	Scale" characterization (buildir	ng / r	neighbour	hood) of the indicator
	given in the appointed spa	acea	above.			
Multiscale	Possible aggregated value	s at	neighbournood scale.			
References	[1],[2],[3],[4]	_				
REFERENCES			un a la d'actaur			
[1]	FASUDIR D2.4 IDST Key Pe	erfor	mance Indicators			
[2]	of buildings Calculation m	oility	y of construction works. Assess	men tand	it of enviro	onmental performance
[3]	Concerted Action EPBD, Ir	nple	ementing the Energy Performa	nce c	of Building	s Directive (EPBD).
[3]	Featuring Country Report	s 20	12, http://www.epbd-ca.eu/ca	-out	comes/20	11- 2015
[4]	OPEN HOUSE Assessment	Gui	deline, Version 1.2 New Office	Buil	dings July	2013



	Operational	Energy	y Use (kWh/	m²)		
ENV.En.13	ISSUE	C	ATEGORY	LE	VEL	SCALE
	Environmental		Energy		A	N
GENERAL						
Description	The indicator is a pa used for operating t but includes the ope	rtial resul he whole eration en	t of the Total Prima district. It is based c ergy used by the en	ry Energy De on the same ergy infrasti	emand to disp principals as ructure.	lay only the energy at the building scale
Background	OPEN HOUSE, FASU	DIR				
References	ISO 14040:2006, 10)44:2006,	EN 15978			
LEVEL						
Derived from	Software tool	X	Operational da	ita	In situ	measurements
	Simple Calculation	ons	Empirical/Liter	ature	Other	(specify)
Details	The Operational Energy stage component of standard.	ergy Use (the calcu	PE,op) is calculated lation of the overall	by consideri PE (Phase B	ing only the o 86), according	perational energy use to the EN 15978
Areas covered	The indicator consid	ers the us	se stage phase. In gr	een the stag	ges included i	n the calculation.
			BUILDING ASSESSM	ENT INFORMATION		
		BUILDING	LIFE CYCLE INFORMATION			SUPPLEMENTARY INFORMATION BEYOND THE BUILDING LIFE CYCLE
	A1 A2 A3 PRODUCT Stage A1 A2 A3 U constructions A1 Building A2 U constructions A2 A3 U constructions A4 Building A2 Scentral A3 Scentral	ONSTRUCTION PROCESS Shage V A A A A A A A A A A A A A A A A A A	USE STAGE USE STAGE B1 B2 B3 B2 B3 B4 B4 B5	C1 C2 UD D7 Stage C1 C2 UD D7 Stage C1 C2 UD D7 Stage St	C) C4 0 0 0 0 0 0 0 0 0 0 0 0 0	Benefits and loads beyond the system boundary Recuse Recovery- Recycling- Potential
Barriers	Availability of a LCA	Data Ban	k			
Rating	FASUDIR IDST Meth	odology				
References	[1],[2],[3],[4]					
SCALE						
Application	Neighbourhood scal	e.				
Details	Provide details to ju	stify the "	Scale" characterizat	ion (buildin	g / neighbour	hood) of the indicator
	given in the appoint	ed space	above.			
Multiscale	Possible aggregated	values at	neighbourhood sca	le.		
References	[1],[2],[3],[4]					
REFERENCES						
[1]	FASUDIR D2.4 IDST	Key Perfo	rmance Indicators			
[2]	EN 15978: 2011: Sus	stainability	y of construction wo	orks. Assessr	ment of enviro	onmental performance
	of buildings. Calcula	tion meth	od. European Comr	nittee for St	andardization	CEN.
[3]	Featuring Country B	PBD, Imple	12 http://www.eph	y Performan	CE OT BUILDINg	s טורפכנועפ (EPBD). 11- 2015
[4]	OPEN HOUSE Assess	sment Gui	ideline, Version 1.2	New Office I	Buildings July	2013



	Embodied energy demand (kWh/m ²)								
ENV.En.04	ISSUE	C	ATEGORY	LEVE	L	SCALE			
	Environmental		Energy	А		N			
GENERAL									
Description	The indicator is based the caused embodied construction of heat n aggregated embodied	The indicator is based on the same principals as the indicator at building scale. In order to assess the caused embodied energy demand for the energy infrastructure in the district (e.g. construction of heat networks, heat storages) the relevant values will be added to the aggregated embodied energy demand sum from building level.							
Background	OPEN HOUSE, FASUDII	R							
References	ISO 14040:2006, 1004	4:2006,	EN 15978						
LEVEL									
Derived from	Software tool	Х	Operational da	ita	In situ	measurements			
	Simple Calculation	IS	Empirical/Liter	ature	Other ((specify)			
Details	The indicator is calcula 15978.	ated acc	cording to the ISO 14	4040:2006 and	14044:200	06 as well as the EN			
Areas covered	The indicator consider in the calculation.	s the w	hole life cycle with a	all life cycle stag	ges. In gree	en the stages include	d		
			BUILDING ASSESS	MENT INFORMATION					
		BUILDIN	G LIFE CYCLE INFORMATION			SUPPLEMENTARY INFORMATION BEYOND THE BUILDING LIFE CYCLE	=		
	A 1-3 PRODUCT Stage A1 Product Stage U U Stage Product Stage A1 Product Stage A3 U O Stage Product Stage Sta	A 4-5 VSTRUCTION PROCESS Slage AS No e sport Voi e spo	B1-7 USE STAGE	C1-4 END OF LIFE Stage C1 C2 C3 Up up up up to the	C4 In the second	D Benefits and loads beyond the system boundary Recuse- Recovery- Potential]		
Barriers	Availability of a LCA Da	ata Banl	k						
Rating	FASUDIR IDST Method	ology							
References	[1],[2],[3],[4]								
SCALE									
Application	Neighbourhood scale.								
Details	Provide details to justi given in the appointed	fy the " I space a	Scale" characterizat above.	tion (building /	neighbour	hood) of the indicato	r		
Multiscale	Possible aggregated va	alues at	neighbourhood sca	le.					
References	[1],[2],[3],[4]								
REFERENCES							ĺ		
[1]	FASUDIR D2.4 IDST Key	y Perfor	rmance Indicators						
[2]	EN 15978: 2011: Susta of buildings. Calculatio	inability on meth	y of construction wo od. European Comr	orks. Assessmei nittee for Stand	nt of enviro lardization	onmental performano n CEN.	ce		
[3]	Concerted Action EPBI Featuring Country Rep	D, Imple orts 20	ementing the Energy 12, http://www.ept	y Performance	of Building comes/20	s Directive (EPBD). 11- 2015			
[4]	OPEN HOUSE Assessm	ent Gui	deline, Version 1.2	New Office Buil	dings July	2013			



	Share of Ren	ewab	le Energy on	Site (%)								
ENV.En.20	ISSUE	С	ATEGORY	LEVI	EL	SCALE						
	Environmental		Energy	А		N						
GENERAL												
Description	The value of the indi energy and the year	The value of the indicator is the ratio of the on-site yearly production of renewable primary energy and the yearly average of the total primary energy demand.										
Background	OPEN HOUSE, FASU	PEN HOUSE, FASUDIR										
References	ISO 14040:2006, 100	044:2006,	, EN 15978									
LEVEL												
Derived from	Software tool		Operational da	ata	In situ	measurements						
	Simple Calculation	ons	Empirical/Liter	rature	Energy	Simulation	X					
Details	The indicator is calcu	ulated by	the IDST according	to the EN 1597	'8 standard	and from the energy	/					
A	simulation for the or	n-site pro	duction of renewab	ole energy								
Areas coverea	Focus on neighbourn	Dete Der	e.									
Barriers	Availability of a LCA	Data Ban	к									
Rating	In order to calculate recommended.	In order to calculate the performance of the indicator, a linear interpolation method is recommended.										
	D.1.1.4 Share of I	Renewat	ole Energy on Site			Points						
	Share of renewal	ole energ	gy in the district =	20% h linear intern	olation)	100						
	Share of renewal	ole energ	v in the district=	0%	oracionij	0						
References	[1].[2].[3].[4]											
SCALE	[+])[=])[0])[1]											
Application	Neighbourhood scal	e.										
Details	Provide details to just	stify the '	'Scale" characteriza	tion (building /	neighbour	hood) of the indicato	r					
	given in the appoint	ed space	above.									
Multiscale	Possible aggregated	values at	neighbourhood sca	ale.								
References	[1],[2],[3],[4]						_					
REFERENCES												
[1]	FASUDIR D2.4 IDST H	Key Perfo	rmance Indicators									
[2]	EN 15978: 2011: Sus of buildings. Calculat	tainabilit tion meth	y of construction wand of construction was not complete the second second second second second second second se	orks. Assessme mittee for Stan	ent of enviro dardizatior	onmental performand 1 CEN.	ce					
[3]	Concerted Action EP	BD, Imple	ementing the Energ	y Performance	of Building	s Directive (EPBD).						
[4]	OPEN HOUSE Assess	ment Gu	ideline. Version 1-2	New Office Bu	ildings July	2013						
141	0. 1											



	Global Warmi	ng Po	otential (GW	′P) (-)			
ENV.Im.10	ISSUE	C	ATEGORY	LE\	/EL	SCALE	
	Environmental		Impacts	Å	4	N	
GENERAL							
Description	The Global Warming Potential is a substances potential contribution to the global warming of near-ground air layers, also named greenhouse effect. It is specified as the GWP value in relation to the global warming potential of carbon dioxide (CO2). For evaluation, GWP100 is used, meaning the averaged contribution of a material to the greenhouse effect over one hundred years. For the building assessment, CO2equivalents per area and year are calculated for the life cycle of the building. The lower the CO2-equivalent result is, the lower is the potential influence on global warming and the related impacts on the environment. The construction industry is a large contributor to CO2 emissions, with buildings responsible for 40% of the total European energy consumption and a third of CO2 emissions. At the same time, the construction industry provides work for over 12.7 million people in the EU and generates about one fifth (20.3 %) of the combined industrial and construction sectors value added. These circumstances form the basis for different targets and objectives formulated by the European Commission: For example, the 20/20 targets are to reduce energy consumption by 20%, reduce CO2 emissions by 20% compared to 1990s level and provide 20% of the total energy share with renewable energy by the year 2020. Therefore, this indicator, aiming at the reduction of buildings global warming performance, highly contributes to the achievement of the EU targets mentioned above.						
Background	OPEN HOUSE, FASUDI	R					
References	EN 15978						
LEVEL							
Derived from	Software tool	Х	Operational da	ita	In situ	measurements	
	Simple Calculation	IS	Empirical/Liter	ature	Other	(specify)	
Details	The indicator is calcula	ated acc	ording to the EN 15	5978.	<u> </u>		
	indicator is based on t caused impacts on the construction of heat n added to the aggregat Environmental impact neighbourhood level (currently not consider	he meth e environ etworks red envir s caused e.g. add red in th	nod of Life Cycle As ment for the energy s, heat storages, ligh ronmental impact s d by retrofitting me ling green spaces, in e district LCA due t	sessment (LC gy infrastruct nting of stree um from buil asures that a mproving the o poor data a	A), in order t cure in the ne ts) the releva lding level. are not relate barrier-free availability.	o assess also the eighbourhood (e.g. ant values will be d to energy on accessibility) are	
Barriers	Availability of a LCA Da	ata Banl	<				
Rating	FASUDIR IDST Method	lology					
References	[1],[2],[3],[4]						
SCALE							
Application	Neighbourhood scale.						
Details	Provide details to justi	ify the "	Scale" characteriza	tion (building	g / neighbour	hood) of the indicate	or
Multiscale	The values of the sub- with the sub-indicator infrastructure. Throug the neighbourhood.	indicato values h this ca	ors, calculated at the calculated for all ot alculation it is possi	e building lev her buildings ble to obtain	rel, are aggre in the area, an overall va	gated at district leve and with the value f alue of the indicator	l or for
References	[1],[2],[3],[4]						
REFERENCES							
[1]	FASUDIR D2.4 IDST Ke	y Perfor	mance Indicators				
[2]	EN 15978: 2011: Susta of buildings. Calculatio	ainability on meth	y of construction we od. European Com	orks. Assessm nittee for Sta	nent of enviro andardizatior	onmental performar n CEN.	се
[3]	Energy Country Factsh http://ec.europa.eu/e	neet, EU nergy/c	DG ENER: bservatory/countri	es/countries	_en.htm		
[4]	OPEN HOUSE Assessm	ent Gui	deline, Version 1.2	New Office B	Buildings July	2013	



	Acidification	Poter	ntial, AP (kg	SO2-eq/	m²yr)					
ENV.Im.03	ISSUE	C	ATEGORY	LE\	/EL	SCALE				
	Environmental		Impacts	Å	4	N				
GENERAL										
Description	Acidification is the in nitrogen compounds fall down as acid rain nutrients decompose released, which affec Another possible effe acidification aspects chemical buffer capa sandstone). The envi potential, which is sta H2S. For the assessm eqivalents per area a and the related envir Acidification Potentia supports the Europea and 60% for NOx by 2 natural environment	Acidification is the increase of the hydrogen ion concentration in air, water and soil. Sulfur and hitrogen compounds from anthropogenic emissions react to sulfuric acid or nitric acid in the air, all down as acid rain and cause damage to soil, water, organisms and buildings. In acidic soils hutrients decompose quickly and can easily be washed out. Furthermore, toxications may be eleased, which affect root systems and cause damage to the nutrient supply of organisms. Another possible effect is the disturbance of the water balance. All in all, the combination of acidification aspects contributes to forest decline. In addition, in surface water bodies with low chemical buffer capacity, fish decline occurs. Acid rain also affects historic buildings (e.g. sandstone). The environmental impacts described above are measured using the acidification potential, which is stated in SO2-equivalents. Acidification causing emissions are e.g. SO2, NOx or 12S. For the assessment of the Acidification Potential (AP) of a building life cycle, SO2- eqivalents per area and year are used. The lower the AP value, the lower is the risk of acid rain and the related environmental damage. The indicator aims at the reduction of buildings Acidification Potential, thus preventing the environmental impacts described above. This supports the European Commission target of emission reductions in the EU-25 of 82% for SO2, and 60% for NOx by 2020 compared to 1990s level. The objective is to reduce the threat to the natural environment from acidification by 55%. DPEN HOUSE, FASUDIR								
Backaround	OPEN HOUSE, FASUD	NR NR	uncation by 55%.							
References	EN 15978									
LEVEL										
	Software tool	Х	Operational da	ita	In situ	measurements				
Derived from	Simple Calculatio	ns	Empirical/Liter	ature	Other	(specify)				
Details	The indicator is calcu	lated acc	cording to the EN 15	5978.						
Areas covered	The Calculation of thi indicator is based on caused impacts on th construction of heat added to the aggrega Environmental impac neighbourhood level currently not conside	is indicat the mether e enviro network ated envi cts cause (e.g. ado ered in th	or is similar to the r hod of Life Cycle Ass nment for the energ s, heat storages, ligh ronmental impact s d by retrofitting me ding green spaces, in the district LCA due to	nethod used sessment (LC gy infrastruct nting of stree um from buil asures that a mproving the o poor data a	for the build (A), in order t cure in the ne (ts) the relevand Iding level. (the not relate (the barrier-free (the barrier-free (the barrier-free)	ing scale. The o assess also the ighbourhood (e.g. ant values will be d to energy on accessibility) are				
Barriers	Availability of a LCA [Data Ban	k	•						
Rating	FASUDIR IDST Metho	dology								
References	[1],[2],[3],[4]									
SCALE										
Application	Neighbourhood scale	2.								
Details	Provide details to jus given in the appointe	tify the " d space	'Scale" characterizat above.	tion (building	g / neighbour	hood) of the indicator				
Multiscale	The values of the sub with the sub-indicato infrastructure. Throu the neighbourhood.	p-indicato or values gh this ca	ors, calculated at the calculated for all ot alculated for all ot alculation it is possi	e building lev her buildings ble to obtain	el, are aggre in the area, an overall va	gated at district level and with the value for Ilue of the indicator for				
References	[1],[2],[3],[4]	-								
REFERENCES										
[1]	FASUDIR D2.4 IDST K	ey Perfo	rmance Indicators							
[2]	EN 15978: 2011: Sust of buildings. Calculat	ainabilit ion meth	y of construction we od. European Comr	orks. Assessm nitte <mark>e for Sta</mark>	nent of enviro andardizatior	onmental performance				
[3]	Concerted Action EPR	3D, Imple	ementing the Energy	y Performand	ce of Building	s Directive (EPBD).				
[1]	Featuring Country Re	ports 20	12, http://www.ept	od-ca.eu/ca-o	outcomes/20	11-2015				
[4]	OF LIVINOUSE ASSESSI	nent Gu	idenne, version 1.2	men Onice B	anangs july	2013				



	Ozone Deple	tion P	otential, OD	P (kgR1	1-eq/m²	yr)	
ENV.Im.13	ISSUE	C	ATEGORY	LE	VEL	SCALE	
	Environmental		Impacts		A	N	
GENERAL							
Description	Ozone, which is only existent in low concentration in the atmosphere, has a significant impact on life on earth. It is able to absorb short-wave UV-radiation and to release it, irrespective of direction, with longer wave length. In addition, the ozone layer protects the earth from a large proportion of UV-radiation and therefore prevents the earth surface of an excessive temperature rise and contributes to the protection of man and flora against UV-A and UV-B radiation. The accumulation of R11-equivalents in the atmosphere contributes to the destruction of the ozone layer. As a consequence, amongst others, men and animals can develop tumors as well as the photosynthesis may be disturbed. For the assessment of the ozone depletion potential of a building life cycle, Trichlorofluoromethane-equivalents (R11-eqivalents) per area and year are used. The indicator aims at the reduction of buildings Ozone Depletion Potential, thus preventing the environmental impacts described above. It supports the European Commission target of phasing out of Ozone Depletion Substances.						
Background	OPEN HOUSE, FASU	DIR					
References	EN 15978						
LEVEL							
Derived from	Software tool	X	Operational da	ata	In situ	measurements	
	Simple Calculation	ons	Empirical/Liter	ature	Other	(specify)	
Details	The indicator is calc	ulated acc	ording to the EN 15	5978.			
Areas covered	The Calculation of the indicator is based or caused impacts on t construction of heat added to the aggreg Environmental impa neighbourhood leve currently not consid	his indicat the metl he enviro network: ated envi cts cause I (e.g. adc ered in th	or is similar to the r nod of Life Cycle As: nment for the energ s, heat storages, ligh ronmental impact s d by retrofitting me ling green spaces, in e district LCA due to	nethod used sessment (LC gy infrastruc hting of stree um from bui asures that a mproving the o poor data a	l for the build CA), in order t ture in the ne ets) the releva ilding level. are not relate e barrier-free availability.	ling scale. The to assess also the eighbourhood (e.g. ant values will be ed to energy on accessibility) are	
Barriers	Availability of a LCA	Data Ban	k		· · · · · · · · · · · · · · · · · · ·		
Ratina	FASUDIR IDST Meth	odology					
References	[1].[2].[3].[4]						
SCALE							
Application	Neighbourhood scal	e.					
Details	Provide details to ju given in the appoint	stify the " ed space	Scale" characteriza above.	tion (building	g / neighbour	hood) of the indicator	
Multiscale	The values of the su with the sub-indicat infrastructure. Thro the neighbourhood.	b-indicato or values ugh this ca	ors, calculated at the calculated for all ot alculation it is possi	e building lev her building: ble to obtain	vel, are aggre s in the area, 1 an overall va	gated at district level and with the value for alue of the indicator for	
References	[1],[2],[3],[4]						
REFERENCES	Γ						
[1]	FASUDIR D2.4 IDST I	Key Perfo	mance Indicators				
[2]	EN 15978: 2011: Sus	tainabilit	y of construction we	orks. Assessr	nent of envir	onmental performance	
[2]	Concerted Action FF	BD. Imple	ementing the Energy	v Performan	ce of Building	s Directive (FPBD).	
[5]	Featuring Country R	eports 20	12, http://www.epl	bd-ca.eu/ca-	outcomes/20	11- 2015	
[4]	OPEN HOUSE Assess	ment Gui	deline, Version 1.2	New Office I	Buildings July	2013	



	Eutrophicati	on Pot	tential, EP (k	gPO4-eq	/m²yr)						
ENV.Im.08	ISSUE	C	ATEGORY	LEV	'EL	SCALE					
	Environmental		Impacts	А		N					
GENERAL											
Description	Over-fertilization (enutrient-rich state. compounds. The nut from the wash-out of supply manifests e.g cause fish decline. F PO4 equivalents pe potential of negative reduction of buildin described above. Th EU-25 of 27% for Ar level. The objective 55%.	Dver-fertilization (eutrophication) is the transition of water or soils from a nutrient-poor to a nutrient-rich state. This is caused by supply of nutrients, especially phosphor and nitrogen compounds. The nutrients can emerge from the manufacturing of building products, but mainly from the wash-out of emissions into the environment. The resulting changes in the nutrient supply manifests e.g. in water in the form of an increased algae appearance, which again may cause fish decline. For the assessment of the Eutrophication Potential (EP) of a building life cycle, PO4 equivalents per area and year are used . The lower the PO4-eqivalent value, the lower is the potential of negative side effects on men and the environment. The indicator aims at the reduction of buildings Eutrophication Potential, thus preventing the environmental impacts described above. This supports the European Commission target of emission reductions in the EU-25 of 27% for Ammonia NH3 (responsible for eutrophication) by 2020 compared to 1990s evel. The objective is to reduce the threat to the natural environment from eutrophication by 55%.									
Background	OPEN HOUSE, FASU	DIR									
References	EN 15978										
LEVEL											
Derived from	Software tool	Х	Operational da	ata	In situ	measurements					
	Simple Calculation	ons	Empirical/Liter	ature	Other	(specify)					
Details	The indicator is calc	ulated acc	cording to the EN 1	5978.	•						
Areas covered	The Calculation of the indicator is based of caused impacts on the construction of heat added to the aggrege Environmental impa- neighbourhood lever currently not conside	nis indicat n the met he enviro t network gated envi ncts cause el (e.g. add ered in th	or is similar to the r hod of Life Cycle As nment for the ener, s, heat storages, lig ronmental impact s d by retrofitting me ding green spaces, in the district LCA due t	method used sessment (LC/ gy infrastructu hting of streed sum from build asures that a mproving the o poor data a	for the build A), in order t ure in the ne ts) the releva ding level. re not relate barrier-free vailability.	ing scale. The o assess also the sighbourhood (e.g. ant values will be d to energy on accessibility) are					
Barriers	Availability of a LCA	Data Ban	k								
Rating	FASUDIR IDST Meth	odology									
References	[1],[2],[3],[4]										
SCALE											
Application	Neighbourhood sca	e.									
Details	Provide details to ju given in the appoint	stify the " ed space	'Scale" characteriza above.	tion (building	/ neighbour	hood) of the indicato	ir				
Multiscale	The values of the su with the sub-indicat infrastructure. Thro the neighbourhood.	b-indicato or values ugh this c	ors, calculated at th calculated for all ot alculation it is possi	e building leve her buildings ble to obtain	el are aggreg in the area, an overall va	gated at district level and with the value fo alue of the indicator f	or [:] or				
References	[1],[2],[3],[4]										
REFERENCES											
[1]	FASUDIR D2.4 IDST	Key Perfo	rmance Indicators								
[2]	EN 15978: 2011: Sus	stainabilit	y of construction w	orks. Assessm	ent of envir	onmental performan	ce				
[2]	Concerted Action F	BD. Imnle	ementing the Energ	v Performanc	e of Building	s Directive (FPBD)					
[5]	Featuring Country R	eports 20	12, http://www.ep	bd-ca.eu/ca-o	utcomes/20	11-2015					
[4]	OPEN HOUSE Assess	ment Gu	ideline, Version 1.2	New Office B	uildings July	2013					



	Photochemical	Ozo	one Creation	Potenti	al, POCP	• (kgC2H4-				
ENV/ Im 1/	eq/m²yr)									
	ISSUE	С	ATEGORY	LE	√EL	SCALE				
	Environmental		Impacts	/	4	N				
GENERAL										
Description	Radiation from the sun and the presence of nitrogen oxides and hydrocarbons incur different chemical reactions, producing aggressive reaction products, one of which is ozone. Such near- ground ozone also known as summer smog is suspected to damage vegetation and material. High concentrations of ozone are toxic to humans. A substance's contribution is indicated relatively to the Photochemical Ozone Creation Potential of C2H4. The indicator aims at the reduction of buildings Photochemical Ozone Creation Potential, thus preventing the environmental impacts described above. This supports the European Commission target of emission reductions in the EU-25 of 60% for NOx and 51% for VOCs (responsible for ozone creation) by 2020 compared to 1990s level.									
Background	OPEN HOUSE, FASUDIR									
References	EN 15978									
LEVEL										
Derived from	Software tool	Х	Operational dat	ta	In situ i	measurements				
	Simple Calculations		Empirical/Litera	ature	Other (specify)				
Details	The indicator is calculate	ed aco	cording to the EN 159	978.						
Areas covered	The Calculation of this in indicator is based on the caused impacts on the e construction of heat net added to the aggregated Environmental impacts of neighbourhood level (e., currently not considered	idicat met nviro work l envi cause g. ado l in th	or is similar to the m hod of Life Cycle Asso nment for the energ s, heat storages, light ronmental impact su d by retrofitting mea ding green spaces, im the district LCA due to	ethod used essment (LC y infrastruct ting of stree im from bui isures that a iproving the poor data a	for the build (A), in order to ture in the ne ets) the releva Iding level. are not relate barrier-free availability.	ing scale. The o assess also the ighbourhood (e.g. int values will be d to energy on accessibility) are				
Barriers	Availability of a LCA Data	a Ban	k	•						
Rating	FASUDIR IDST Methodol	ogy								
References	[1],[2],[3],[4]									
SCALE										
Application	Neighbourhood scale.									
Details	Provide details to justify given in the appointed s	the " pace	Scale" characterizati above.	on (building	g / neighbourl	hood) of the indicate	or			
Multiscale	The values of the sub-in- with the sub-indicator va- infrastructure. Through the neighbourhood.	dicato alues this c	ors, calculated at the calculated for all oth alculation it is possib	building lev er buildings le to obtain	vel, are aggreg in the area, a an overall va	gated at district leve and with the value fo lue of the indicator f	l or for			
References	[1],[2],[3],[4]									
REFERENCES										
[1]	FASUDIR D2.4 IDST Key I	Perfo	rmance Indicators							
[2]	EN 15978: 2011: Sustain	abilit	y of construction wo	rks. Assessn	nent of enviro	onmental performan	ce			
[2]	Or buildings. Calculation	Imply	ou. European Comm	Performant	andardization	CEN.				
[3]	Featuring Country Report	ts 20	12, http://www.epb	d-ca.eu/ca-	outcomes/20	11- 2015				
[4]	OPEN HOUSE Assessmen	nt Gu	deline, Version 1.2 N	lew Office E	Buildings July	2013				


	Abiotic Deplet	Abiotic Depletion Potential Elements, ADPe (kgSB-eq/m ² yr)										
ENV.Im.24	ISSUE	CA	ATEGORY	LEVE	L	SCALE						
	Environmental		Impacts	А		N						
GENERAL												
Description	Elements is used. For calculation of the ADPe the extraction rate of the resource is associated with its ultimate reserves and specified in kg of antimony equivalent. Ultimate reserves are defined as the amount of resources that are totally available in the earth's crust. For estimating ultimate reserves, the average natural concentration of the resource in the earth's crust is multiplied with the assumed volume of the earth's crust. Hence, the indicator allows comparing the geological scarcity of different resources. The higher the value of antimony equivalent, the higher the geological scarcity of the resource will be. Specifically, the indicator does not take into account fossil fuels. For expressing the aspect of raw material scarcity, the indicator ADPe is the best choice at this time according to the ILCD framework and CEN/TC 350 Standards. OPEN HOUSE, FASUDIR											
Background	OPEN HOUSE, FASUDII	R										
References	EN 15978											
LEVEL												
Derived from	Software tool	Х	Operational da	ta	In situ	measurements						
	Simple Calculation	itions Empirical/Literature Other (specify)										
Details	The indicator is calcula	The indicator is calculated according to the EN 15978.										
	indicator is based on the method of Life Cycle Assessment (LCA), in order to assess also the caused impacts on the environment for the energy infrastructure in the neighbourhood (e.g. construction of heat networks, heat storages, lighting of streets) the relevant values will be added to the aggregated environmental impact sum from building level. Environmental impacts caused by retrofitting measures that are not related to energy on neighbourhood level (e.g. adding green spaces, improving the barrier-free accessibility) are											
Barriers	Availability of a LCA Da	ata Bank	(
Rating	FASUDIR IDST Method	lology										
References	[1],[2],[3],[4]											
SCALE												
Application	Neighbourhood scale.											
Details	Provide details to justi given in the appointed	ify the "S d space a	Scale" characterizat above.	ion (building / I	neighbour	hood) of the indicate	or					
Multiscale	The values of the sub- with the sub-indicator infrastructure. Throug the neighbourhood.	indicato values (h this ca	rs, calculated at the calculated for all oth alculation it is possib	e building level, her buildings in ple to obtain an	are aggre the area, overall va	gated at district leve and with the value fo alue of the indicator f	l or for					
References	[1],[2],[3],[4]											
REFERENCES												
[1]	FASUDIR D2.4 IDST Ke	y Perfor	mance Indicators									
[2]	EN 15978: 2011: Susta of buildings. Calculatio	ainability on meth	of construction wo od. European Comn	orks. Assessmer nittee for Stand	nt of enviro lardizatior	วทmental performan า CEN.	ice					
[3]	Concerted Action EPBI Featuring Country Rep	D, Imple ports 20:	menting the Energy 12, http://www.epb	/ Performance o od-ca.eu/ca-out	of Building comes/20	s Directive (EPBD). 11- 2015						
[4]	OPEN HOUSE Assessm	nent Gui	deline, Version 1.2 I	New Office Buil	dings July	2013						



	Intensity of wa	te	r treatment (%)								
ENV.Wa.02	ISSUE	C	ATEGORY	LEVE	L	SCALE					
	Environmental		Water	Α		N					
GENERAL											
Description	Water use is widely con themes addressed by U EEA indicators, which ca following themes: agricu management, transport responsible for about 20 responsible for about 60 The indicator is calculat that is collected and tree district .	themes addressed by UN's Commission on Sustainable Development CSD is Freshwater. The EEA indicators, which can be considered to reflect areas of environmental concerns, cover the following themes: agriculture, air pollution, biodiversity, climate change, energy, fisheries, land management, transport, waste and water. Based on best available estimates, buildings are responsible for about 20% of global fresh water consumption. The domestic sector is responsible for about 60% of national drinking water consumption in Europe. The indicator is calculated by the IDST as the percentage ratio between the amount of water that is collected and treated in the district and the amount of water that is consumed in the district. Urban Morphology Lab, SuPerBuildings, FASUDIR									
Background	Urban Morphology Lab,	SuF	erBuildings, FASUDIR								
References	[1],[2]										
LEVEL											
	Software tool		Operational data		In situ	measurements					
Derived from	Simple	Х	Empirical/Literature		Other ((specify)					
	Calculations					,,,					
Details	The indicator is calculat in the district, and the c The amount of collected water that is collected in roofs, pavings, and all o use (from sinks, kitchen more tanks with approp The overall non-potable the aggregation of two 1. the non-potable need on the average liters of district data); 2. the irrigation requirer surface, as 0,4 m3/m2 f depending on the type of The indicator considers	ed t t onsi an the ther s, et oriat walu ds of wat men or th <u>of pl</u>	nrough the quantification of umption for non-potable use d treated water (W,t) is the t e area in an average year. Th surfaces in the area, and gre c), and is stocked and treate e filtering systems. ter consumption (WC) is an a es: buildings (which can be calc er used for toilet flushing per ts of green areas (which can he April-September months, ants and local irrigation peri-	the way s (for otal vo is inclu- sy wat d insic verag ulatec build be cal or thro od)	ater that is users and i olume of ra udes rainw er that is r le the distr e yearly vo l parametr ing occupa loulated pa ough speci	s collected and treate irrigation). ainwater and grey vater collected from ecovered after potab rict through one or olume calculated by rically, e.g. from data ant, or through specif arametrically by green fic district data	ed ble n				
Areas covered	The indicator considers	the	whole building life cycle with	all lit	e cycle sta	ges.					
Barriers		0~									
Rating		logy									
Rejerences	[1],[2]										
SCALE	Only at paighbourhood	ccal	<u>^</u>								
Application	Dravida dataila ta iustifi	scal	e. "Coolo" charactorization (h.	ilding	/ noighbou	urbaad) of the					
Details	indicator given in the ac	n the Dooi	ted space above.	nung	/ neighboi	urnood) of the					
Multiscale	indicator given in the appointed space above. While this indicator is only present at district scale, its value depends on the water use of the buildings and can vary significantly as water saving measures are introduced at building level, together with rainwater harvesting systems. Therefore, it will be possible to assess scenarios that include interventions at building retrofitting together with district water treatment, linking together the building and the district scale.										
References	[1],[2]										
REFERENCES	·										
[1]	Tarja Hkkinen (Ed.), Sust Final report, Espoo 2012	tain 2, V	ability and performance asse T Technology	ssmer	nt and bend	chmarking of building	g				
[2]	Serge Salat, Cities and F	orm	s: On Sustainable Urbanism,	Paris	2011, Editi	ons Hermann					



	Soil sealing - Permeability of site/land (%)											
ENV.LU.04	ISSUE	С	ATEGORY	LE	VEL	SCALE						
	Environmental		Land Use	/	4	N						
GENERAL												
Description	The ability of a soil to student and organic matter permeability of surface	ore w er cor in th	ater depends on a r ntent. The objective e district area .	ange of facto of this indica	ors including ator is to give	its texture, structure, information about the						
Background	FASUDIR											
References	[1],[2],[3],[4]											
LEVEL												
Darived from	Software tool	Х	Operational da	ita	In situ	measurements						
Derived Ironi	Simple Calculations		Empirical/Liter	ature	Other	(specify)						
Details	This indicator measures Soils compacted by urba artificial structures such covered by impenetrabl For the evaluation of the For example interface su processing and subsequ The analysis covers mea area [m2] using software The impervious surface	This indicator measures the ability of a district to store water. ioils compacted by urban development are highly impervious. Impervious surfaces are mainly irtificial structures such as pavements (roads, sidewalks, driveways and parking lots) that are inversed by impenetrable materials such as asphalt, concrete, brick, and stone-and rooftops. For the evaluation of the impervious surface, there is possibility to use software tools. For example interface surface can be determined using color infrared aerial photos. Image processing and subsequent data refinement within a GIS can be used to classify ground features. The analysis covers measurement of the impervious surface area [m2] and overall studied district area [m2] using software tool. The impervious surface range can be calculated from the formula below:										
Areas covered	The indicator considers the whole building life cycle stages. In order to calculate the											
	D.1.4.1 Soil Sealing Impervious surface 0-20 Impervious surface 20-4 Impervious surface 40-6 Impervious surface 60-8 Impervious surface 80-1	D.1.4.1 Soil SealingPointsImpervious surface 0-20 %100Impervious surface 20-40%75Impervious surface 40-60%50Impervious surface 60-80%25Impervious surface 80-100%1										
Barriers	Availability of data											
Rating	FASUDIR IDST Methodol	ogy										
References SCALE	[1],[2],[3],[4]											
Application	Only at neighbourhood	scale.										
Details	Provide details to justify given in the appointed s	the ' pace	'Scale" characteriza above.	tion (building	g / neighbour	hood) of the indicator						
Multiscale	The indicator is only use sealing on building level level are only related to buildings (adding new p retrofitting, the change	d on is no ener arking n soi	district level and ha t assessed in FASUD gy and no changes in g space) will arise. If I sealing in the distri	s no related l IR because t n the soil sea new building ict will be eva	KPI on buildi he retrofittin ling of the pi gs are built ir aluated by th	ng level. The soil g measures on building roperties of the single n the course of the le district KPI.						
References	[1],[2],[3],[4]	_										
REFERENCES												
[1]	EC COMMISSION STAFF compensate soil sealing	WOR Brus	KING DOCUMENT: (sels, 12.4.2012 SWI	Guidelines or D(2012) 101 f	n best practic final	e to limit, mitigate or						
[2]	Ewan M. Last; CITY WAT Management Options; A September 2010	ER BA	ALANCE: A New Sco is submitted to the	ping Tool For University of	Integrated L Birmingham	Jrban Water I for the degree of PhD						
[3]	Mark Dougherty et al; E Watershed; Photogram pp. 1275128	valua [.] netrio	tion of Impervious S c Engineering & Ren	Surface Estim note Sensing	ates in a Rap Vol. 70, No.	idly Urbanizing 11, November 2004,						
[4]	D. Lu, Q. Weng; Use of in Environment 102 (2006)	nper 146	vious surface in urba 160	an land-use c	lassification;	Remote Sensing of						



	Parking facilit	Parking facilities, off-street parking spaces (%)											
SOC.Tr.11	ISSUE	C	ATEGORY	LE	VEL	SCALE							
	Social	٦	Fransport		А	N							
GENERAL													
Description	The occupation of the reduces the availability The objective of this i space to release and infrastructure for inno	e street k ty to puk indicator recover t ovative c	by the private vehic olic spaces for citize is to achieve bette this space for pedes concepts is required	le is a probl ns. r planning a trians. Max	em in the mo nd control of imum amour	est of the cities. It Fparking in the public nt off-street parking and							
Background	OPEN HOUSE, FASUD	IR and a	so adapted from LE	ED.									
References	[1],[2],[3]	[1],[2],[3]											
LEVEL													
Denis e d'Énerre	Software tool	Software tool Operational data In situ measurer											
Derived from	Simple Calculation	ns X	Empirical/Liter	ature	Other	(specify)							
Details	The aim of this indica and give information The distribution of pa number of parking sp located outside (publ	ne aim of this indicator is to identify if parking facilities are appropriate for the expected users nd give information about their accessibilities in the district. 'he distribution of parking in the street and off the street shows the relationship between the number of parking spaces which are in the street and the number of parking spaces which are ocated outside (public parking, public-private parking)											
		arking facilities (%) = (off-street parking spaces / total parking spaces)											
	D.2.1.1 Parking fa	cilities				Points							
	More than 90% of parking facilities	the par	king spaces are a	located to	off-street	100							
	More than 80% of parking facilities More than 20% of	the par	king spaces are a	llocated to	off-street	50							
	parking facilities		d at ush a la life aval			7							
Areas covered	The indicator can be o	calculate	d at whole life cycle	e stages.									
Barriers		dology											
Rating		uology											
SCALE	[1],[2],[3]												
Application	Neighbourhood scale												
Details	Provide details to just	tify the "	Scale" characterizat	tion (buildin	g / neighbou	rhood) of the indicator							
Multiscale	This indicator is only	used on	neighbourhood leve	el.									
References	[1].[2].[3]		0	_									
REFERENCES	[-])[-])[0]												
[1]	Ministerio de Medio A	Ambient s v medi	e, y Medio Rural y N anas	Marino; Sist	ema de indic	adores y condiciones							
[2]	LEED Criterion Credit	4.3: Alte	rnative Transportat	ion: Low Er	nitting & Fue	l Efficient Vehicles							
[3]	OPEN HOUSE Sub-Ind scheme, car club sche lines	licator 6. eme, cha	3.3: Availability of r rging infrastructure	nodern low for electric	emission tra /hybrid vehio	nsport options: city bike cles, electric/hybrid bus							



	Parking place	es witl	h innovative	feature	s (%)						
SOC.Tr.12	ISSUE	C	ATEGORY	LE	VEL	SCALE					
	Social	-	Transport		A	N					
GENERAL											
Description	The evaluation of thi concepts: car sharing	s indicato g, chargin	or depends on the e ng infrastructure for	xistence of i electric / hy	nfrastructure fo brid vehicles ar	or innovative 1d car sharing.					
Background	OPEN HOUSE, FASUE	DIR and a	lso adapted from LE	ED.							
References	[1],[2],[3]										
LEVEL											
Darived from	Software tool		Operational da	ita	In situ m	leasurements					
Derived Itom	Simple Calculatio	ons X	Empirical/Liter	ature	Other (s	pecify)					
Details	This indicator can be Infrastructure for in electric and/or hybri	iis indicator can be calculated using formula below: ifrastructure for innovative concepts = Parking places to be dedicated to fuel efficiency ectric and/or hybrid vehicles + car sharing / Total parking places									
	D.2.1.2 Infrastruc infrastructure for	ture for electric	innovative concep / hybrid vehicles	ts: car shai	ring, charging	Points					
	5% of the site par / hybrid vehicles	king pla & car sh	ces to be dedicate aring	ed to fuel ef	ficiency electr	^{ric} 100					
	3% of the site par / hybrid vehicles	3% of the site parking places to be dedicated to fuel efficiency electric / hybrid vehicles & car sharing 50									
	< 3% of the site p electric / hybrid v	< 3% of the site parking places to be dedicated to fuel efficiency electric / hybrid vehicles & car sharing									
Areas covered	The indicator can be	calculate	ed at whole life cycle	e stages.							
Barriers	Availability of data										
Rating	FASUDIR IDST Metho	odology									
References	[1],[2],[3]										
SCALE											
Application	Neighbourhood scale	e.									
Details	Provide details to jus given in the appointe	tify the " ed space	'Scale" characterizat above.	tion (building	g / neighbourho	ood) of the indicator					
Multiscale	This indicator is only	used on	neighbourhood leve	el.							
References	[1],[2],[3]										
REFERENCES											
[1]	Ministerio de Medio para ciudades grande	Ambient es y medi	e, y Medio Rural y N ianas	/larino; Siste	ema de indicado	ores y condiciones					
[2]	LEED Criterion Credit	: 4.3: Alte	ernative Transportat	ion: Low Em	nitting & Fuel Ef	ficient Vehicles					
[3]	OPEN HOUSE Sub-Ind scheme, car club sch lines	dicator 6 eme, cha	.3.3: Availability of r Irging infrastructure	nodern low for electric/	emission transp /hybrid vehicles	oort options: city bike s, electric/hybrid bus					



	Access to pu	Access to public transport nodes (%)											
SOC.Tr.14	ISSUE		CAT	TEGORY	LE	VE	L		SCALE				
	Social		Tra	ansport		A			Ν				
GENERAL													
Description	Public Transport Infi their accessibility in and mobility options This indicator measu account distance to public transport net	rastruct district s (railwa ures the the trai work.	ture i s of t ay, b e acco nspo	indicator gives inf the city. This indic ous, tram or subwa essibility of citizer ort node. This met	formation al cator identif ay) can be a ns to the pu hod is a way	ies l vaila blic / of	: public tra now a vari able for cit transport measuring	ansport s ety of tr izens. network g the der	systems and ansportatior k, taking into nsity of the)			
Background	FASUDIR and adapt	ed from	n BRI	EEAM Communiti	es								
References	[1],[2]	1],[2]											
LEVEL													
Derived from	Software tool		Operational data In situ mea			measu	rements						
Denved nom	Simple Calculation	ons	X Empirical/Literature Other (spec				(specify	y)					
	is necessary to have calculation method Access to public tran transport node.	Is necessary to have an access to the public transport network for example via GIS map. The calculation method is presented below: Access to public transport nodes (%) = Living area / Area that is within a specific distance to a transport node.											
	Railway station	Railway station Points											
	Share of living transport node	area w is:≤1	/ithi 00%	n an aerial dist %	ance of 30)0m	to a		100				
	Share of living transport node	area w is:≤9	vithi 0%	n an aerial dist	ance of 30)0m	to a		60				
	Share of living transport node	area w is:≤8	vithi 0%	n an aerial dist	ance of 30)0m	to a		40				
	Share of living transport node	area w is:≤7	vithin '0%	n an aerial dist	ance of 30)0m	to a		20				
	Share of living transport node	area w is: 50-	/ithi -60%	n an aerial dist %	ance of 30)0m	to a		1				
Areas covered	The indicator can be	e calcula	ated	at whole life cycle	e stages.								
Barriers	Availability of data												
Rating	FASUDIR IDST Meth	odology	/										
References	[1],[2]												
SCALE													
Application	Neighbourhood scal	e.											
Details	Provide details to ju given in the appoint	stify the ed spac	e "Sc ce ab	cale" characterizat	tion (buildin	g / I	neighbour	hood) of	f the indicato	or			
Multiscale	This indicator is only	/ used o	on ne	eighbourhood leve	el.								
References	[1],[2]												
REFERENCES													
[1]	BREEAM Communit	ies, Tec	hnica	al Manual SD202	0.0:2012								
[2]	LEED for Neighbour	hood De	evelo	opment									



	Bicycle facilitie	icycle facilities (-)											
SOC.Tr.03	ISSUE	С	ATEGORY	LE	EVE	L	SCALE						
	Social		Transport		А		N						
GENERAL													
Description	The objective of this inc by providing a safe and The bicycle and pedest walking spaces for citiz	dicator efficie rian in ens, ar	r is to promote cycli ent mobility network frastructure are eva nd facilities for bicyc	ng and walk ks. Iuated by c list comfor	king onsi t.	as an alter dering ava	native to vehicle use						
Background	FASUDIR, adapted from	BREE	AM, DGNB, OPEN H	OUSE									
References	[1],[2]												
LEVEL		T				r							
Derived from	Software tool		Operational da	ita		In situ	measurements						
	Simple Calculations	S X	Empirical/Liter	ature		Other (specify)						
Details	 Facilities for bicycles: Bicycle parking place Bike paths Protection against th Protection against w) Bicycle parking places) Bike paths) Protection against theft .) Protection against weather											
	D.2.3.1 Bicycle facil 4 kinds of facilities 3 kinds of facilities 2 kinds of facilities 1 kinds of facilities 0 kinds of facilities	ities					Points 100 75 50 25 1						
Areas covered	The indicator can be ca	lculate	ed at whole life cycle	e stages.									
Barriers	Availability of data												
Rating	FASUDIR IDST Methodo	logy											
References	[1],[2]				_								
SCALE													
Application	Neighbourhood scale.		(
Details	Provide details to justif	y the ' space	'Scale" characterizat above.	tion (buildir	1g / 1	neighbourl	hood) of the indicator						
Multiscale	This indicator is only us	ed on	neighbourhood leve	el.									
References	[1],[2]												
REFERENCES													
[1]	DGNB International Cri	erion	30: Bicycle comfort										
[2]	BREEAM Criterion 3: Al	ternat	ive modes of transp	ort									



	Bicycle and Pede	Bicycle and Pedestrian network quality (-)											
SOC.Tr.02	ISSUE	C	ATEGORY	LE\	VEL		SCALE						
	Social	-	Transport	ŀ	4		Ν						
GENERAL													
Description	The objective of this indic by providing a safe and effective	ator	is to promote cycling ent mobility networks	g and walki	ng as an	alternat	ive to vehicle use	<u>}</u>					
	The bicycle and pedestria	n in	frastructure are evalu	uated by co	nsiderin	g availat	oility of bicycle and	d					
	walking spaces for citizen	s, ar	nd facilities for bicyclis	, st comfort.		0	, ,						
Background	FASUDIR, adapted from B	REE	AM, DGNB, OPEN HO	USE									
References	[1],[2]												
LEVEL													
Denis ed fuene	Software tool	Software tool Operational data In situ measuremer						Γ					
Derived from	Simple Calculations	tions X Empirical/Literature Oth				ner (sp	ecify)						
Details	This indicator is calculated according to the following formula:												
	Bicycle and pedestrian ne	etwo	orks = Number of inha	abitants / Si	ignal ligh	nts in the	district.						
	D.2.3.2 Bicycle and Pedestrian network quality Points												
	Number of inhabitants per signal light in the district: ≤ 800 100												
	Number of inhabitant	s pe	r signal light in the	district: ≤	1200		60						
	Number of inhabitant	s pe	r signal light in the	district: ≤	1400		40						
	Number of inhabitant	s pe s pe	r signal light in the	district: ≤	1800		1						
Areas covered	The indicator can be calcu	ulate	ed at whole life cycle s	stages.									
Barriers	Availability of data			-									
Rating	FASUDIR IDST Methodolo	gy											
References	[1],[2]												
SCALE													
Application	Neighbourhood scale.												
Details	Provide details to justify t given in the appointed sp	he " ace	Scale" characterizatio	on (building	g / neigh	bourhoc	d) of the indicato	or					
Multiscale	Possible aggregated value	es at	neighbourhood scale	2.									
References	[1],[2]												
REFERENCES	<u>, </u>				_	_							
[1]	DGNB International Criter	rion	30: Bicycle comfort										
[2]	BREEAM Criterion 3: Alter	rnati	ive modes of transpor	rt									



	Barrier-Free Acc	Barrier-Free Accessibility of the District (%)										
SOC.Ac.09	ISSUE	C	ATEGORY	LEVE	L	SCALE						
	Social	A	ccessibility	А		Ν						
GENERAL												
Description	The public accessibility of stimulate the district and the feel of safety will be e open spaces in the district building to the next. The a resources using spatial da evaluating, how buildings To determine the degree public open spaces (green for children, public square	stimulate the district and increase the communication. Also the acceptance of the building and the feel of safety will be enhanced. Especially the barrier-free accessibility of the buildings and open spaces in the district is a main sustainability issue. Accessibility thus varies greatly from one building to the next. The aims of this indicator are to evaluate the accessibility of various urban resources using spatial data analysis in geographical information systems. This indicator is evaluating, how buildings and open spaces are integrated in the community. To determine the degree of barrier-free accessibility of the district BFA the ratio between the public open spaces (green spaces, circulation areas, pavements and bicycle lanes, playgrounds for children, public squares) and the barrier-free accessible areas is calculated. FASUDIR, Adapted from DGNB Neighbourhood										
Background	FASUDIR, Adapted from D	GNE	3 Neighbourhood									
References	[1],[2],[3],[4]											
LEVEL												
Domissed from	Software tool		Operational da	ta	In situ me	asurements						
Derived from	Simple Calculations	Х	Empirical/Litera	ature	Other (spe	ecify)						
Detail	Public green spaces are bo disability to use them with Users of wheeld Blind persons Deaf persons Mobility impain Old persons Children, small a Calculation formula: BFA = Sum of barrier-free D.2.4.1 Barrier-Free Access Ratio ≥ 0,90 Ratio < 0,90 Ratio < 0,90 Ratio < 0,00 Ratio < 0,00 Ratio < 0,1	arrie h wh hair ed p and acce sibil	r-tree accessible if t eelchairs. Person w s ersons tall statured persons ssible public district a ity of the District	ne design of fo ith disabilities s area [m2] / Sum	n of entire publ Points 100 75 50 25 0	es person with follows: ic district area [m2]						
Areas covered	The indicator can be calcu	late	d at whole life cycle	stages.								
Barriers	Availability of data											
Rating	FASUDIR IDST Methodolo	gy										
References	[1],[2],[3],[4]											
SCALE	N											
Application	Neighbourhood scale.	. "	<u> </u>	• /1 •1 1• /								
Details	provide details to justify t given in the appointed sp	he " ace a	Scale" characterizat above.	ion (building /	neighbourhoo	d) of the indicator						
Multiscale	The indicator is only used	onı	neighbourhood leve	l to assess the	overall accessi	ibility of the area.						
References	[1],[2],[3],[4]											
REFERENCES												
[1]	OPEN HOUSE Assessment Measuring the accessibilit Philippe Apparicio and An	y of ne-l	deline, Version 1.2 f services and facilitie Marie Sèguin; Institu	es for residents t national de la	of public hou recherche sc	13 Ising in Montreal; ientifique, INRS						
[2]	Furopean Environmental	JCIE1 Agei	ncy Impact and India	ators: www.ee	a.eurona eu							
[3]	DGNB Rating Scheme for	new	ly-built districts Vers	sion 2012	opa.cu							



	Acce	ss to Serv	ices a	nd Facili	ties (%)						
SOC.Ac.14	IS	SUE	CAT	FEGORY	LE	VEL	SCALE				
	So	ocial	Acc	essibility		A	N				
GENERAL											
Description	The indi service	icator considers or facility in a s	s the pero pecific d	centage of bi istance.	uilding area in th	e district tha	t is able to reach the				
Background	FASUDI	R, Adapted fror	n DGNB N	Neighbourho	od						
References	[1],[2]	,[3],[4]									
LEVEL											
Derived from	Softwa	are tool		Operationa	al data	In situ	measurements X				
	Simple	e Calculation	s X I	Empirical/L	iterature	Other	(specify)				
Detuis	•	Health (publi Schools Kindergarten Supermarket	c health i	facilities, suc	h as doctors, hos	pital, clinic, fi	rst aid)				
	For the	 Ballis Restaurants Bars Sport facilities For the assessment the following tables have to be used: 									
	Perc with radiu	Percentage of building area within the specific distance radius around the service or facility									
		≤ 100 %			1						
		<u>≤ 75 %</u> ≤ 50 %		6	0,75						
		≤ 25 %			0,25						
	C.	0									
	18	Facility or service category	Distand specifi s	Assessment Points if any building in the district is within the service		oints in the n the the					
		School	1	300 m	10	inty					
		Playground	1	500 m	6						
		Supermarket	1	300 m	10						
		Health		700 m	18						
		Restaurant		700 m	14						
		Bar	1	700 m	12						
		facility (Sports Hall, Swimming bathes, etc.)	1	400 m	12						
	Calculat	ion of overall p	oints:								
	• The calc the dist	Overall point Percentage v facility or ser culation has to l rict.	s = sum c ralue of c rvice pe repeat	of specific po coverage x As ted for all cat	ints of each facili sessment Points egories in order	ity or service s of facility = to calculate t	Specific Points of he overall points of				
	D.2.4	.2 Access to S	ervices	& Facilities			Points				
	Overa	all Points ≥ 80					100				
	Overa	all Points ≥ 60					75				
	Overa	all Points ≥ 40	lb.				50				
	Overa	all Points ≥ 20					25				
	Overa	all Points > 20	i.				0				
Areas covered	The indi	icator can be ca	lculated	at whole life	cycle stages.						



Barriers	Availability of data
Rating	FASUDIR IDST Methodology
References	[1],[2],[3],[4]
SCALE	
Application	Neighbourhood scale.
Details	Provide details to justify the "Scale" characterization (building / neighbourhood) of the indicator given in the appointed space above.
Multiscale	The indicator is only used on neighbourhood level to assess the overall accessibility of the area.
References	[1],[2],[3],[4]
REFERENCES	
[1]	OPEN HOUSE Assessment Guideline, Version 1.2 New Office Buildings July 2013
[2]	Measuring the accessibility of services and facilities for residents of public housing in Montreal; Philippe Apparicio and Anne-Marie Sèguin; Institut national de la recherche scientifique, INRS Urbanisation Culture et Sociètè, Canada
[3]	European Environmental Agency Impact and Indicators; www.eea.europa.eu
[4]	DGNB Rating Scheme for newly-built districts Version 2012



	Access to Par	ks and	Ope	n Spac	es (-)						
SOC.Ac.05	ISSUE	CA	TEGOR	RY	LE	VEL	SCALE				
	Social	Acc	cessibili	ty		A	N				
GENERAL											
Description	Urban green spaces a viewed as the green lu absorbing rainwater a Urban green spaces c related stress, and inc	re quite si ung of the and pollut an also pr creasing p	ignificar e city, an ants, an ovide co roperty	nt in reduc nd typically d mitigatio onsiderabl values.	ing negative / performing ng urban he e socioecon	e effects of url g important fu at. omic benefits	panization. They are inctions, including , such reducing work-				
Background	FASUDIR, Adapted fro	om DGNB	Neighbo	ourhood							
References	[1],[2],[3],[4]										
LEVEL											
	Software tool		Opera	tional da	ata	In situ	measurements				
Derived from	Simple Calculation	ns X	Empiri	cal/Liter	ature	Other	(specify)				
Details	The calculation of the Facilities". Parks & Open Spaced Public garde Outdoor spaced For the assessment the	 he calculation of the indicator is similar to the method used in "Access to Services and acilities". Parks & Open Spaced are defined as: Public garden, green spaces, parks and other facilities for pedestrians and cyclists Outdoor sport facilities with freedom of access For the assessment the following tables have to be used: 									
	Percentage of k within the spec radiu	building tific dista us	area ance	Redu	ction Fact	or (Interpola	tion possible)				
	≤ 100 %					1					
	≤ 10 % < 50 %					0,75					
	≤ 25 %		à			0,00					
	0 %					0					
	Facility or servic	y or service		Distance radius for specific facility or service		Asses facilit availa	sment Points if y or service is ble within the radius				
	Public garden			1000 m			40				
	Open spaces whe citizens can meet Central Squares, e	re (e.g. etc.)		500	m		40				
	Outdoor sport faci (Soccer fields, bas court, etc.)	lities sketball		1300	m		20				
	D.2.4.3 Access to	Parks an	d Open	Spaces		<u>^</u>	Points				
	Overall Points ≥ 8	D					100				
	Overall Points ≥ 60	D					75				
	Overall Points ≥ 4	D					50				
	Overall Points ≥ 20	D					25				
	Overall Points > 2	0					0				
Areas covered	The indicator can be o	calculated	at who	le life cycle	e stages.						
Barriers	Availability of data				-						
Ratina	FASUDIR IDST Method	dology									
References	[1],[2],[3],[4]										



SCALE	
Application	Neighbourhood scale.
Details	Provide details to justify the "Scale" characterization (building / neighbourhood) of the indicator given in the appointed space above.
Multiscale	The indicator is only used on neighbourhood level to assess the overall accessibility of the area.
References	[1],[2],[3],[4]
REFERENCES	
[1]	OPEN HOUSE Assessment Guideline, Version 1.2 New Office Buildings July 2013
[2]	Measuring the accessibility of services and facilities for residents of public housing in Montreal; Philippe Apparicio and Anne-Marie Sèguin; Institut national de la recherche scientifique, INRS Urbanisation Culture et Sociètè, Canada
[3]	European Environmental Agency Impact and Indicators; www.eea.europa.eu
[4]	DGNB Rating Scheme for newly-built districts Version 2012



	Building area over noise limit (%)						
SOC.AC.03	ISSUE	СА	TEGORY	LE	VEL	SCALE	
	Social	Acous	stic Comfort		A	N	
GENERAL							
Description	The acoustic comfort is one of the most important factors for a healthy and safe environment. The aim is to achieve a percentage of buildings with low level interference and background noise to avoid affecting use, health and capability of the users. The lower the level of interference and background noises is, the less detraction and detriment to health and capability. About 8% of the urban population are exposed to outdoor noise at a level greater than 70 dB(A), while 11% are exposed at levels greater than 65 dB(A). The specific noise level of the district is created by various sources of noise. The main source is road traffic followed by neighbourhood and aircraft noise. Sources of ambient noise are emissions from road, rail and traffic, construction sites, industrial sites and recreational areas. Excessive noise seriously harms human health and interferes with people daily activities at school, at work, at home and during leisure time. It can disturb sleep, cause cardiovascular and psycho-physiological effects, reduce performance and provoke annoyance responses and changes in social behaviour. Traffic noise alone is harming the health of almost every third person in the WHO European Region. One in five Europeans is regularly exposed to sound levels at night that could significantly damage health. (World Health Organization- Regional office for Europe). Quality of living is affected by noise levels which can vary at different times of the day. Residential areas have a greater density of people living in proximity to each other than other areas. More people often means more noise. Some pockets of residential areas have local shops such as dairies, takeaways and hairdressers which create people and traffic noise. Likewise some residential areas are adjacent to recreational or industrial areas. Social events such as concerts, parties and associated music and people noise play a big part in noise complaints. Monitoring noise levels and noise complaints in the urban area highlights trends and issues that may need						
Backaround	FASUDIR, Adapted from	DGNB	Neighbourhood				
Peferences	[1] [2]						
I EV/EI	[1],[2]						
	Software tool	ΤT	Operational da	ata	In situ	measurements	
Derived from	Simple Calculations	x	Empirical/Liter	ature	Other	(specify)	
Details	The Decibel (dB) is a unit of measurement used to quantify the intensity or magnitude of sound. A 10 dB change is generally perceived by the human ear as a doubling of noise. The LDN (Level Day/Night) noise level averages the daytime and night-time noise levels (logarithmically) over a 24-hour period and includes a 10 dB (penalty) added to the night-time noise level (10 pm to 7 am). This indicator measures the percent of the population living in an area with a LDN of greater than a certain value of dB, which can vary according the national or regional regulation for each country. Sources of noise close to the site to be identified and their distance from the site to be measured. Noise maps where available- must to be used. The evaluation is based on the classification of the site location based on ambient noise levels						
	Level		Site charact	terization	N	loise level	
	1.1		rural		≤55dB 56-60 dB		
	2.1		provincial		61-65 dB		
	2.2		provincial		66-70 dB		
	3.2		metropolitan		76-80 dB		
	It is important to conside neighbourhood including hours throughout the da	er that g topog y and	multiple other fac graphy, wind patte night, the presenc	etors influence erns, the den e or lack of t	ce the levels on the levels of the second type the second type of the second type of type of the second type of	of noise in a of traffic at different parrier walls and other	



	D.2.5.1 Percentage of building area over noise limit (over level 1.2, 2.2 or 3.2 depending on location)	Points
	Percentage of building area over noise limit ≤ 10 %	100
	Percentage of building area over noise limit ≤ 20 %	75
	Percentage of building area over noise limit ≤ 40 %	50
	Percentage of building area over noise limit ≤ 50 %	25
	Percentage of building area over noise limit > 60 %	0
Areas covered	The indicator can be calculated at whole life cycle stages.	
Barriers	Availability of noise maps	
Rating	FASUDIR IDST Methodology	
References	[1],[2]	
SCALE		
Application	Neighbourhood scale.	
Details	Provide details to justify the "Scale" characterization (building / neighbourhood)) of the indicator
	given in the appointed space above.	
Multiscale	The indicator is only used on neighbourhood level in order to assess the noise le	evel of the whole
	district. On building level an application of the indicator is not useful because th	e individual noise
	protection of each building has to be considered.	
References	[1],[2]	
REFERENCES		
[1]	European Environmental Agency Impact and Indicators; www.eea.europa.eu	
[2]	WHO Night Noise guidelines for Europe;2009	



	Microclimate Index I (-)						
SOC.TC.07	ISSUE	C	ATEGORY	LE	VEL	SCALE	
	Social	The	rmal Comfort		A	N	
GENERAL							
Description	The main goal is to evaluate the thermal comfort within the district, in order to assess the urban heat island effect within a certain area. The FASUDIR tool will take into account the distribution of areas and types of surface materials in the district (Buildings, Streets, green spaces). In the calculation method different surfaces coefficients for streets, green spaces, buildings etc. are defined and weighted with their relevant district area. The higher the coefficient is the higher is the likeliness of contributing to produce heat islands. Within FASUDIR IDST tool, we will take into account these values according a specific index, called Microclimate Index I. It can be calculated through GIS database computation. As result a Microclimate Index I is calculated that represents the aggregated likeliness of heat islands in the district. The term "heat island" describes built up areas that are hotter than nearby rural areas. The annual mean air temperature of a city with 1 million people or more can be 13C warmer than its surroundings. In the evening, the difference can be as high as 12C. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air						
Declaration	FASURE Adapted fr	iouse gas	emissions, heat-rei	lated illness	and mortality	, and water quality.	
Background			BINEIgIIDOUITIOOU				
References	[1],[2],[3]						
LEVEL							-
Derived from	Software tool		Operational da	ata	In situ	measurements	
	Simple Calculation	ons X	Empirical/Liter	ature	Other	(specify)	
	 Microclimate Index I = (AreaA1 x F1 + AreaA2 x F2 + AreaA11 x F11) / Area heighbourhood Example for calculation. Overall District Area: 90000 m2 Area 1: Green Spaces with dense tree population 25000 m2 - Surface Coefficient F 1,7. Area 2: Roads, Streets and squares completely soiled 40000 m2- Surface Coefficient F 0. Area 3: Water Area 25000 m2- Surface Coefficient F 1,5. Microclimate Index I = (25000 m2* 1.7 + 0*40000 m2+ 25000 m2*1.5) / 90000 m2 = 0.89 						
	Area surface ty	pes				Surface coefficient F	
	Building areas 1. Small sing houses) 2. Apartmen	gle build t blocks	ings (detached ho and large building	uses, semi s	-detached	1,7	
	3. Large mu	and con	nouses			1,0	
	Circulation area	and con	auares			0,0	
	5. Railway s	ystem				0,5	
	6. Roads, St	reets ar	id squares comple	tely soiled		0	
	7. Squares a	and park	ing spaces with gr	een eleme	nts	0,5	
	8 Green Spaces	aces wit	h dense tree noni	Ilation		17	
	9. Green Sp	aces wit	h light tree popula	tion		2,0	
	10. Small gar	dens an	d green backyards	3		1,5	
	11. Grass fiel	d				1,0	
	12. Forest are	ea				2,0	
	13 Permaner	nt lakos	and nonds or river	s		15	
	Other areas	n lunco		3		1,0	
	14. Green roo	ofs				0,7	



co-financed	by the European	
I Developm	ent Fund	

	D.2.6.1 Outdoor temperature / Heat island effect	Points
	Microclimate Index I >1,2	100
	Microclimate Index I between 0,8 to 0,99	50
	Microclimate Index I between 0,6 to 0,79 (Compliant with minimum standards)	1
Areas covered	The indicator can be calculated at whole life cycle stages.	
Barriers	Availability of data	
Rating	FASUDIR IDST Methodology	
References	[1],[2],[3]	
SCALE		
Application	Neighbourhood scale.	
Details	Provide details to justify the "Scale" characterization (building / neighbo given in the appointed space above.	ourhood) of the indic
Multiscale	It is a specific neighbourhood-related indicator. The indicator cannot be	used on building lev
References	[1],[2],[3]	
REFERENCES		
[1]	Microclimatic variation of thermal comfort in a district of Lisbon (Telheir and MJ. Alcoforado, Centro de Estudos GeogrÆficos, Universidade de I Universidade, 1600-214 Lisboa, Portugal.	ras) at night; H. Andr Lisboa, Alameda da
[2]	DGNB.	
[3]	EPA United States Environmental Protection Agency.	



	Gentrificatio	Sentrification Index (-)						
ECO.Eq.06	ISSUE	C	ATEGORY	LE	VEL	SCALE		
	Economic		Equity		A	N		
GENERAL	_							
Description	Gentrification is the process by which the socioeconomic status of a neighbourhood populated mostly by lower-income households is substantially elevated by renewed interests and investments by higher-income households. Gentrification has emerged as a major issue in district retrofitting projects. Increased rental fees caused by the retrofitting measures often create or accelerate gentrification processes. Especially older neighbourhoods, once occupied exclusively by very-low income and low-income residents, are being re-inhabited by more affluent residents after an urban renewal. The objective of this indicator is to identify the likelihood of gentrification in districts, which would allow urban planners, policy-makers to be proactive in their approach to preventing many of the negative effects of gentrification. Therefore municipalities have instruments like social housing promotion or grants for retrofitting measures in district with high likelihood for gentrification. To estimate the likelihood of gentrification in the district in the assessment method the Gentrification Index is calculated considering the following criteria: • Percentage of Housing Built Pre-1960 • Average change in purchase prices of residential buildings • Change in rental fees of residential buildings (average of last 3 years) • Change in rental fees of residential buildings (average of last 3 years)							
	 Share of ir 	habitants	s older than 60 year	's in the dist	rict			
Background	FASUDIR, adapted fr	om NESB	ITT 2005					
References	[1]							
LEVEL								
Derived from	Software tool Simple Calculation	ons X	Operational da Empirical/Liter	ata ature	In situ Other	measurements (specify)		
Details	Gentrification Index G = Points A + Points B + Points C + Points D + Points E + Points F A: Percentage of Housing Built Pre-1960. The percentages of houses with construction date before 1960 in the district is calculated according to the following formula: Number of residential buildings built before 1960 / Number of all residential buildings in the district = A [%]							
	Percentage of He	ousing B	uilt Pre-1960			Points		
	A < 20 %					1		
	A > 20 %					0		
	B: Average change in The average of the y calculated according Change of purchase residential buildings = C [%]	n purchas yearly cha g to the fo prices of year 2 [%	e prices of resident nges in purchase pr Illowing formula: residential building 5] + Change of purch	ial buildings. ices of resid s year 1 [%] nase prices c	ential buildin + Change pur of residential b	gs in the district B is chase prices of buildings year 3 [%] / 3		
	Average change	in purcha	ase prices of resid	dential build	dings	Points		
	B < 126 %					1		
	B ≥ 126 %					0		
	C: Yearly change in rental fees of residential buildings (average of last 3 years in percent). The average of the yearly changes in rental fees in the district C is calculated according to the following formula: Change of rental fees year 1 [%] + Change of rental fees year 2 [%] + Change of rental fees year 3 [%] / $3 = C$ [%]							
	Yearly change in	rental fe	es of residential b	ouildings		Points		
	C < 5 % C ≥ 5%					1 0		



	D: Change in area median income (average of last 3 years in percent). The average of the yearly changes in area median income in the district D is calcuted to the following formula: Change in area median income year 1 [%] + Change in area median income year 2 area median income year 3 [%] / 3 = D [%]	ulated according [%] + Change in
	Change in area median income	Points
	D < 10 %	1
	D ≥ 10 %	0
	E: Unemployment rate in district (average of last 3 years in percent). The average unemployment rate in the district is calculated according to the foll Unemployment rate year 1 [%] + Unemployment rate year 2 [%] + Unemployment / 3 = E [%]	owing formula: nt rate year 3 [%]
	Unemployment rate	Points
	E < 10 %	1
	E ≥ 10 %	0
	F: Yearly change in district population (average of last 3 years in percent). The average yearly change in district population in the district is calculated according formula: Change in district population year 1 [%] + Change in district population year 2 [% district population year 3 [%] / 3 = F [%]	rding to the] + Change in
	Yearly change in district population	Points
	F < 4 %	1
	F ≥ 4 %	0
	G: Share of inhabitants older than 60 years in the district. The share of inhabitants that is older than 60 years is calculated according to the formula: Number of inhabitants older than 60 years / Number of all inhabitants in the dist	following rict = G [%]
	Share of inhabitants older than 60 years	Points
	G ≥ 30,0 %	1
	G < 30,0 %	0
		_
	D.2.7.1 Gentrification Index	Points
	Gentrification Index = 6	100
	Gentrification Index =3	50
Areas covered	The indicator can be calculated at whole life cycle stages.	
Barriers	Availability of data	
Rating	FASUDIR IDST Methodology	
References	[1]	
SCALE		
Application	Neighbourhood scale.	
Details	Provide details to justify the "Scale" characterization (building / neighbourhood)	of the indicator
Multiscale	It is a specific neighbourhood-related indicator. The indicator cannot be used on	building level.
References	[1]	~
REFERENCES		
[1]	Nesbitt, A: A Model of Gentrification Monitoring Community Change in selected	Neighbourhoods
[1]	of St. Petersburg, Florida using the Analytical Hierarchy Process	



	.ife cycle costs aggregated (€)							
ECO.LC.09	ISSUE	CA	ATEGORY	LEV	EL	SCALE		
	Economic	Life	Cycle costs	A		N		
GENERAL			·	l.				
Description	Life Cycle costing on district level will help decision makers to select the best solutions for the whole district. Therefore all life cycle costs from building level will be aggregated and life cycle costs for energy infrastructure will be added. The Life cycle costs calculation on district level includes the sum of all building life cycle costs in the district as well as all life cycle costs concerning the energy infrastructure in the district over a period of 50 years. The Life cycle costs calculation for districts is based on the same calculation method used for single building Life cycle cost calculations. In order to assess all buildings in the whole district the Life Cycle costs of each building will be summed up to an aggregated Building Life cycle costs value. Furthermore the Life cycle costs arising from the energy infrastructure in the whole district are summed up to an aggregated Energy Infrastructure Life cycle cost value. The whole district Life cycle costs then are aggregated from the building and energy infrastructure Life cycle cost values to an overall Life cycle cost value for the whole district.							
Background	FASUDIR							
References	[1],[2],[3],[4],[5]							
LEVEL					-			
Derived from	Software tool		Operational da	nta	In situ	measurements		
Derived Hom	Simple Calculations	Х	Empirical/Liter	ature	Other ((specify)		
Detuis	The Building Life cycle cost The Building Life cycle cost Life cycle cost calculatio 2. Energy Infrastructure The Energy Infrastructure running costs of all energing energy infrastructure (a availability. For the determination of repair, maintenance and between two main case Existing energy Existing energy Existing energy The costs arising from reference Costs for decord Repair, mainten Construction of course of the energy infrastructure is Costs for decord Repair, mainten Costs f	stand stand stand Life cy re Life gy infra trepla s: y infra trepla s: y infra trepla s: y infra trepla s: y infra trepla s: y infra trepla s: trofitt nstruct enance rosts for energy ocess) fitting nstruct enance rating power the cy fitting nstruct enance rating power tetc.)	alue is calculated by inducted in Building, ycle cost value. cycle cost value. cycle cost value inc astructure facilities y energy etc.) are n truction costs and n incement of energy in structure with retri- structure with retri- structure without n ting measures shall ction and disposal co e and replacement or all new energy in y retrofitting measures are exect to and disposal co e and replacement construction and disposal co e and replacement or all new energy in y retrofitting measures to and replacement construction and insposal co e and replacement constructure costs, but a	y summing up cludes the inves is in the district ot considered non-energy op nfrastructure ofitting measu retrofitting measu retrofitting measu retrofitting measu of eliminated e costs for energe include: of eliminated e costs for energe frastructure b ures (investme cuted the costs of remaining er costs for rema stallation proc e are executed e energy to mo l heat and pow at and electric trict heating tr re considered	all Life cycle estment cos a Running c in FASUDIR erational co it is necessa asures asures asures orought to the nt costs for s shall include nergy infras- ining energy ess shall be d. re than one ver units, so ity grids) us ransmission in the buildi	e cost values from the ts and non-energy osts energy for the due to poor data osts arising from my to differentiate structure ture he district in the construction and de: tructure y infrastructure set to zero if no building in the district lar powered plants, ed in the district station) are not ing Life cycle costs.		
Rarriers	Availability of data							
Burriers	Benchmark for the Life (vcleic	ost indicator on ne	ighhourhood I	evel is not c	lefined		
References	[1],[2],[3],[4],[5]	.,						



SCALE	
Application	Neighbourhood scale.
Details	Provide details to justify the "Scale" characterization (building / neighbourhood) of the indicator given in the appointed space above.
Multiscale	The indicator will be used concurrently on building and district level and can be defined as multiscale KPI.
References	[1],[2],[3],[4],[5]
REFERENCES	
[1]	VDI 2067 : Economic efficiency of building installations Fundamentals for economic calculation
[2]	EN 15459 : Energy performance of buildings Economic evaluation procedure for energy systems in buildings
[3]	EN ISO 15686-5 : Buildings and constructed assets Service life planning - Part 5: Life cycle costing
[4]	EN ISO 15686-9 Buildings and constructed assets Part 8 Reference service life and service life information
[5]	Bayerisches Staatsministerium fr Umwelt und Gesundheit (StMUG): Leitfaden Energienutzungsplan, 2011



	Investment costs aggregated (€)								
ECO.IC.03	ISSUE	С	ATEGORY	LE	VEL	SCALE			
	Economic	Inve	estment Costs		A	N			
GENERAL						-			
Description	Life Cycle costing on a for the whole area. Th cycle costs for energy The Life cycle costs ca costs in the neighbout the district over a per The Life cycle costs ca used for single buildin area the Life Cycle co costs value. Furtherm	The cycle costing of neighbourhood level will neighbourhood level will neighbourhood level will be aggregated and life cycle costs for energy infrastructure will be added. The Life cycle costs calculation on neighbourhood level includes the sum of all building life cycle costs in the neighbourhood as well as all life cycle costs concerning the energy infrastructure in the district over a period of 50 years. The Life cycle costs calculation for neighbourhoods is based on the same calculation method used for single building Life cycle cost calculations. In order to assess all buildings in the whole area the Life Cycle costs of each building will be summed up to an aggregated Building Life cycle costs value. Furthermore the Life cycle costs arising from the energy infrastructure in the whole neighbourhood are summed up to an aggregated Energy Infrastructure Life cycle cost value.							
	The whole neighbour	ie whole neighbourhood Life cycle costs then are aggregated from the building and energy							
Backaround	FASUDIR				Teignbourne				
Peferences									
	[1],[2],[3],[4],[3]								
LEVEL	Software tool		Operational da	ta	In citu	maasuramants	Г		
Derived from	Simple Calculatio				Othor	Other (anality)			
Details	The calculation of the	e aggreg	ated investment cos	ts of all ener	rgy infrastruc	ture facilities in the			
Areas covered	-								
Barriers	Availability of data								
Ratina	Benchmark is not ava	ailable, d	ue to poor data ava	ilability.					
References	[1].[2].[3].[4].[5]		•	•					
SCALE	[-]/[-]/[0]/[1]/[0]								
Application	Neighbourhood scale	2.							
Details	Provide details to just given in the appointe	tify the ' ed space	'Scale" characterizat above.	tion (buildin	g / neighbour	hood) of the indicato	r		
Multiscale	The indicator will be multiscale KPI.	used cor	ncurrently on buildir	ng and distrie	ct level and ca	an be defined as			
References	[1],[2],[3],[4],[5]								
REFERENCES	-								
[1]	FASUDIR D2.4 IDST Ke	ey Perfo	rmance Indicators						
[2]	EN 15459 : Energy pe in buildings	erformar	ice of buildings Ecor	nomic evalua	ation procedu	ire for energy system	S		
[3]	EN ISO 15686-5 : Buil	ldings an	d constructed asset	s Service life	e planning - P	art 5: Life cycle costir	ng		
[4]	EN ISO 15686-9 Build information	dings and	d constructed assets	Part 8 Refe	erence service	life and service life			
[5]	Bayerisches Staatsmi Energienutzungsplan,	nisteriur , 2011	n fr Umwelt und Ge	sundheit (St	MUG): Leitfa	den			



	Operational Energy Costs aggregated (€)						
ECO.LC.04	ISSUE	С	ATEGORY	LE\	/EL	SCALE	
	Economic	Life	e Cycle costs	A	4	N	
GENERAL							
Description	Life Cycle costing on district level will help decision makers to select the best solutions for the whole district. Therefore all life cycle costs from building level will be aggregated and life cycle costs for energy infrastructure will be added. The Life cycle costs calculation on district level includes the sum of all building life cycle costs in the district as well as all life cycle costs concerning the energy infrastructure in the district over a period of 50 years. The Life cycle costs calculation for districts is based on the same calculation method used for single building Life cycle cost calculations. In order to assess all buildings in the whole district the Life Cycle costs of each building will be summed up to an aggregated Building Life cycle costs value. Furthermore the Life cycle costs arising from the energy infrastructure in the whole district are summed up to an aggregated Energy Infrastructure Life cycle cost value.						
	The whole district Life cycle contract of the cycle contract of th	cle c ost v	osts then are aggregated values to an overall Life o	ed from th cycle cos	ne building ar t value for th	nd energy ne whole district.	
Background	FASUDIR						
References	[1],[2],[3],[4],[5]						
LEVEL							
Derived from	Software tool		Operational data		In situ	measurements	
	Simple Calculations	Х	Empirical/Literatu	ire	Other	specify)	
Details	used for the Life cycle cos Therefore the running cos Running costs energy for the aggregation due to po	st ag sts e the	ated running costs energ gregation in D.3.1.1. nergy for all buildings (r energy infrastructure (au lata availability	results fr auxiliary e	om Building F energy etc.) a	VS the same principle (PI) are summed up. re not considered in	25
Areas covered	-						
Barriers	Availability of data						
Rating	Benchmark is not availabl	e, d	ue to poor data availabil	ility.			
References	[1],[2],[3],[4],[5]						
SCALE							
Application	Neighbourhood scale.						
Details	Provide details to justify t given in the appointed sp	he " ace	Scale" characterization ((building	g / neighbour	hood) of the indicato	or
Multiscale	The indicator will be used multiscale KPI.	cor	currently on building an	nd distric	t level and ca	in be defined as	
References	[1],[2],[3],[4],[5]						
REFERENCES							
[1]	FASUDIR D2.4 IDST Key Pe	erfo	rmance Indicators				
[2]	EN 15459 : Energy perfor in buildings	man	ce of buildings Economi	nic evalua	ntion procedu	ire for energy system	IS
[3]	EN ISO 15686-5 : Building	s an	d constructed assets Se	ervice life	e planning - Pa	art 5: Life cycle costir	ng
[4]	EN ISO 15686-9 Buildings information	and	constructed assets Par	art 8 Refe	rence service	life and service life	
[5]	Bayerisches Staatsministe	eriur	n fr Umwelt und Gesund	dheit (Stl	MUG): Leitfad	den	
[0]	Energienutzungsplan, 201	.1					



	Operational non-energy costs aggregated (€)						
ECO.LC.05	ISSUE	CATEGORY LEVEL		SCALE			
	Economic	Economic Life Cycle costs A		N			
GENERAL							
Description	Life Cycle costing on whole district. There costs for energy infra The Life cycle costs of the district as well as period of 50 years. The Life cycle costs of single building Life c Life Cycle costs of ea value. Furthermore to district are summed The whole district Life infrastructure Life cy	Life Cycle costing on district level will help decision makers to select the best solutions for the whole district. Therefore all life cycle costs from building level will be aggregated and life cycle costs for energy infrastructure will be added. The Life cycle costs calculation on district level includes the sum of all building life cycle costs in the district as well as all life cycle costs concerning the energy infrastructure in the district over a period of 50 years. The Life cycle costs calculation for districts is based on the same calculation method used for single building Life cycle cost calculations. In order to assess all buildings in the whole district the Life Cycle costs of each building will be summed up to an aggregated Building Life cycle costs value. Furthermore the Life cycle costs arising from the energy infrastructure in the whole district are summed up to an aggregated Energy Infrastructure Life cycle cost value. The whole district Life cycle costs then are aggregated from the building and energy infrastructure Life cycle cost values to an overall Life cycle cost value for the whole district.					
Background	FASUDIR						
References	[1],[2],[3],[4],[5]						
LEVEL							1
Derived from	Software tool		Operational da	ita	In situ	measurements	
(Check – X - as appropriate)	Simple Calculation	ons X	Empirical/Liter	ature	Other	(specify)	
Details	Ine calculation of the aggregated running costs non-energy in the district follows the same principles used for the Life cycle cost aggregation in D.3.1.1. Therefore the running costs non-energy for all buildings (results from Building KPI) and the energy infrastructure facilities are summed up to an aggregated value. If no data is available for calculation of the running costs non-energy for the energy infrastructure they can be neglected						
Areas covered	-	8					
Barriers	Availability of data						
Rating	Benchmark is not av	ailable, d	ue to poor data ava	ilability.			
References	[1],[2],[3],[4],[5]						
SCALE							
Application	Neighbourhood scal	e.					
Details	Provide details to just given in the appoint	stify the " ed space	Scale" characterizat above.	tion (buildin	g / neighbou	rhood) of the indicato	or
Multiscale	The indicator will be multiscale KPI.	used con	currently on buildir	ng and distrie	ct level and c	an be defined as	
References	[1],[2],[3],[4],[5]						
REFERENCES							
[1]	FASUDIR D2.4 IDST K	(ey Perfo	mance Indicators				
[2]	EN 15459 : Energy po in buildings	erforman	ce of buildings Ecor	nomic evalu	ation proced	ure for energy system	IS
[3]	EN ISO 15686-5 : Bui	ildings an	d constructed asset	s Service life	e planning - F	Part 5: Life cycle costi	ng
[4]	EN ISO 15686-9 Buil information	dings and	l constructed assets	Part 8 Refe	erence servic	e life and service life	
[5]	Bayerisches Staatsm Energienutzungsplar	inisteriun n, 2011	n fr Umwelt und Ge	sundheit (St	:MUG): Leitfa	den	



	Return on Investment (%)								
ECO.IC.05	ISSUE	C	ATEGORY	LEVEL		SCALE			
	Economic	Inve	stment Costs	A		N			
GENERAL									
Description	Energy retrofitting measures for districts are economic efficient if the energy savings caused by the retrofitting measures over the whole life cycle exceed the total investment costs for the measures. The Return on Investment is a very important issue for decision-makers in retrofitting projects to evaluate the economic efficiency of retrofitting measures on district level. The indicator assesses the Return on Investment of energy retrofitting measures for the whole district by using the overall investment costs and the savings in running costs energy. The indicator only relies on the costs and savings from measures that are directly affecting the energy demand of the district								
Background	FASUDIR								
References	[1]								
LEVEL	-		-						
Dariyad from	Software tool		Operational da	ita	In situ	measurements			
Derived Irolli	Simple Calculations	Х	Empirical/Liter	ature	Other	(specify)			
Aroas covered	1: The yearly savings in running costs energy (S) have to be calculated by subtracting the running costs energy of all buildings (aggregation) in the retrofitted district from the aggregated running costs energy of the original district (Building KPI). S: Yearly savings in running costs energy [€] = District running costs energy _{original} - District running costs energy _{retrofitted} 2: INVEST: The total investment costs for the energy retrofitting measures have to be calculated (take over from District KPI) [€] 3: Determination of discount rate i 4: Determination of energy price changing rate z 5: Determination of period of consideration t 6: Calculation of ROI ROI = [$S * \sum_{j=0}^{t} (1+z)^{t}$] / [INVEST *(1+i) ^t] * 100%								
Areas covered	-								
Barriers	Availability of data								
Rating	Benchmark is not availa	ole, d	ue to poor data ava	ilability.					
References	[1]	_							
SCALE	Najah bawaka ada sada								
Application Details Multiscale	Provide details to justify given in the appointed s The indicator will be use	Neighbourhood scale. Provide details to justify the "Scale" characterization (building / neighbourhood) of the indicator given in the appointed space above. The indicator will be used concurrently on building and neighbourhood level and can be defined							
	as multiscale KPI.								
References	[1]								
REFERENCES		_							
[1]	FASUDIR D2.4 IDST Key	Perfo	rmance Indicators						

FINAL D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5



A.8 – IRH MED



IRH - MED Guidelines for Innovative Responsible Housing http://www.irh-med.eu/



IRH-Med stands for Innovative Residential Housing for the Mediterranean. Within the IRH-Med project, 10 partners from South European countries jointly work on the topic of innovative housing. The partners from Spain, Italy, France, Greece and Hungary are willing to jointly advance paths and solutions for innovative housing. By focusing on a comprehensive and sustainable RH concept, which optimally fits into the socio-economic & cultural surroundings & actively preserves environment, the partnership intends to bolster the market and increase the competitiveness for innovative models of RH in the Med Space.



INDICATORS

	Site quality							
ENV.LU.03	ISSUE	C	ATEGORY	LEVEL		SCA	LE	
	Environmental		Land Use		В		N	
GENERAL								
Description	The site of the housing building brings assets related to the user' health and comfort. The air quality, the ambient noise level, the existence of sources of pollution on the land (due for instance to past industrial uses), the electromagnetic fields (due to the presence of high-tension cables, buried cables, transformers) and the presence of radon (depending on the geologic nature of the land) are important parameters ot assess the sustainability of the site.							
Background								
References								
LEVEL								
Derived from	Software tool		Operational da	ita		In situ	measurem	ents
	Simple Calculation	ons	Empirical/Liter	ature	X			
Details								
Areas covered								
Barriers								
Rating								
References								
SCALE								
Application								
Details								
Multiscale								
References								

REFERENCES	
[1]	
[2]	



	Urban conte	xt							
ENV.LU.14	ISSUE		C	ATEGORY	LE	LEVEL		SCALE	
	Environmental			Land Use		В		N	
GENERAL									
Description	The urban character of equipment, infras Isolated situation, fa	istics structu ar fron	of tl ures n th	he site (density of ir proximity and qual e equipment and se	ihabitants, ı ity) will m rvices, are ı	prox odel not s	imity to th the beha sustainabl	ne urban centre, leve viour of its inhabitar e for housing.	el nts.
Background									
References									
LEVEL									
Derived from	Software tool			Operational data			In situ	measurements	
	Simple Calculation	ons		Empirical/Liter	ature	x			
Details									
Areas covered									
Barriers									
Rating									
References									
SCALE	_								
Application									
Details									
Multiscale									
References									

REFERENCES	
[1]	
[2]	



	Outdoor space (-)									
ENV.LU.10	ISSUE	(CATEGORY	LE	VEL		SCALE			
	Environmental		Land Use		В		N			
GENERAL										
Description	It outdoor spaces ar existing treatment s their improvement. runoff and the main	It outdoor spaces are available, their treatment should be sustainable either keeping their existing treatment should be sustainable, either keeping their existing conditions or anticipation their improvement. This includes the treatment of soil and topography, the management of runoff and the maintenance or introduction of native plants adapted to the local climate.								
Background		· ·								
References										
LEVEL	-		_							
Derived from	Software tool		Operational da	ata		In situ measuremer		5		
	Simple Calculation	ons	Empirical/Liter	ature	X					
Details										
Areas covered										
Barriers										
Rating										
References										
SCALE										
Application										
Details										
Multiscale										
References										

REFERENCES	
[1]	
[2]	



	Light pollution	on							
ENV.Im.18	ISSUE	C	ATEGORY	LEVEL			SCALE		
	Environment		Impacts		В		N		
GENERAL									
Description	Darkness is being in in many places, it al nocturnal animals a endocrine systems o qualities of the natu spill.	in many places, it also makes clear observation of the right sky impossible and the habitants of nocturnal animals are adversely affected. Furthermore, negative effects on the circadian and endocrine systems of man and animals alike has been reported, the human senses to the visual qualities of the naturally intact nocturnal landscape are dulled and energy is wasted due to light spill.							
Background									
References									
LEVEL									
Derived from	Software tool		Operational da	ata In situ		measurements			
Denved from	Simple Calculation	ons	Empirical/Liter	ature	X				
Details									
Areas covered									
Barriers									
Rating									
References									
SCALE									
Application									
Details									
Multiccalo									
wuitiscule									

REFERENCES	
[1]	
[2]	



	Heat Island effect							
SOC.TC.05	ISSUE	C	ATEGORY	LE	EVEL		SCALE	
	Social	The	rmal Comfort		В		Ν	
GENERAL	-							
Description	Urban areas cause c transportation and l increasing the reflec especially roofs and	Urban areas cause overheating around themselves due to the dissipation of internal loads, transportation and less presence of vegetation. Part of this "heat island" can be limited by increasing the reflectivity of the surfaces exposed to the ground, vertical and horizontal – especially roofs and paved public spaces – by shading and using vegetation.						
Background								
References								
LEVEL	-							
Derived from	Software tool		Operational data			In situ	measurements	
Denved from	Simple Calculation	ons	Empirical/Liter	ature	X			
Details								
Areas covered								
Barriers								
Rating								
References								
SCALE								
Application								
Details								
Multiscale								
References								

REFERENCES	
[1]	
[2]	



	Peak Energy	dem	and					
ENV.En.10	ISSUE		CATEGORY	L	EVEL		SCALE	
	Environment Energy				В		B / N	
GENERAL								
Description	The reduction of the electrical peak demand for building operations contributes to a more efficient electricity network management.							
Background								
References								
LEVEL								
Dariyad from	Software tool		Operational data			In situ	measurements	х
Derived from	Simple Calculations		Empirical/Liter	rature				
Details								
Areas covered								
Barriers								
Rating								
References								
SCALE								
Application								
Details								
Multiscale								
References								

REFERENCES	
[1]	
[2]	



	Future evolu	tion a	nd modulari	ty					
ECO.Eq.05	ISSUE	C	ATEGORY	LE	EVE	L	SCALE		
	Economic Equity B			N					
GENERAL									
Description	Dwellings and facilit needs evolve (size o devoted to other fu made with minimal	Dwellings and facilities should be adaptable to other future needs, either because individual needs evolve (size of family, age and ability, etc.) or because part or all of the building can be devoted to other functions. By anticipating the future needs, the necessary evolutions can be made with minimal extra works (and extra environmental and economic costs).							
Background									
References									
LEVEL	-								
Derived from	Software tool		Operational data		In situ r		measurements		
	Simple Calculation	ons	Empirical/Liter	ature	X				
Details									
Areas covered									
Barriers									
Rating									
References									
SCALE									
Application									
Details									
Multiscale									
References									

REFERENCES	
[1]	
[2]	



	Prevention o	of pre	ejudice						
ECO.Eq.04	ISSUE	SSUE CATEGORY LEV		VE	L	SCALE			
	Economic	Economic Equity B					N		
GENERAL									
Description	All potential prejudices along the building life must be identified and corrected through a preliminary audit, an appropriate follow-up and careful dialogue with stakeholders 'neighbourhood, design team and building crew, owner and users.								
Background									
References									
LEVEL									
Derived from	Software tool		Operational d	Operational data		In situ measuremen			
	Simple Calculation	imple Calculations Empirical/Literature			X				
Details									
Areas covered									
Barriers									
Rating									
References									
SCALE	_								
Application									
Details									
Multiscale									
References									

REFERENCES	
[1]	
[2]	



	Competent professional team								
ECO.Va.04	ISSUE	C	ATEGORY	LE	VE	L	SCALE		
	Economic		Value	В			N		
GENERAL									
Description	All the participants i must have assessed proper training thro building market, tra building process see the sustainable build	All the participants in the different stages of the project (including monitoring and maintenance) nust have assessed know-how in sustainable building. This can be replaced or corrected by proper training through the project process. At this stage of the development of the sustainable building market, training the designing, building and maintenance teams during the whole building process seems quite crucial to help develop and raise the awareness and know-how of the sustainable building industry.							
Background									
References									
LEVEL	-		_						
Derived from	Software tool		Operational da	ita		In situ	measurement	s	
	Simple Calculation	ons	Empirical/Liter	ature	X				
Details									
Areas covered									
Barriers									
Rating									
References									
SCALE									
Application									
Details									
Multiscale									
References									

REFERENCES	
[1]	
[2]	



	Social mixing	g and	solidarity bas	sed eco	no	my			
FIN.Eq.10	ISSUE		CATEGORY	LE	VE	L	SCALE		
Economic Equity		Equity	В			Ν			
GENERAL									
Description	Claiming sustainabil promoting social mi	Claiming sustainability further means that, at all stages, the project must contribute to promoting social mixing and equal opportunities for all (unemployed, genders, disabled),.							
Background									
References									
LEVEL	-								
Derived from	Software tool		Operational data		In situ		measurements		
	Simple Calculation	ons	Empirical/Liter	ature	X				
Details									
Areas covered									
Barriers									
Rating									
References									
SCALE									
Application									
Details									
Multiscale									
References									

REFERENCES	
[1]	
[2]	


	Equipment a	nd se	rvices poolin	g				
ECO.Va.06	ISSUE	C	ATEGORY	LE	LEVEL		SCALE	
	Economic		Value		В		N	
GENERAL								
Description	Natural resources co functionality and se projects should inclu composting, hospita citizenship and frien	onservati rvices app ude colled ility room idlier com	on additionally impli proach, rather than ctive equipment, roc is, etc.). Moreover, t imunities.	ies promoti on individua oms or servi hese share	ng a al ov ices d eq	n econom vnership o (laundry, s uipment h	y based on a of goods. Thus housir sports, restaurant, nelp promote better	ng
Background								
References								
LEVEL								
Derived from	Software tool		Operational da	ita		In situ	measurements	
	Simple Calculation	ons	Empirical/Liter	ature	X			
Details								
Areas covered								
Barriers								
Rating								
References								
SCALE	-							
Application								
Details								
Multiscale								
References								

REFERENCES	
[1]	
[2]	



	Cost benefit analysis focused on sustainability							
ECO.LC.02	ISSUE	C	ATEGORY	LEVEL			SCALE	
	Economic	Life Cycle costs			В		B / N	
GENERAL								
Description	Economic sustainab feasibility of housing the costs due to the including in-use and "extra "costs that ar	Economic sustainability of the measures implemented is essential in order to ensure the feasibility of housing sustainability concept. The project must be designated so as to minimize the costs due to the implementation of the sustainable measures. A cost/benefit analysis tool, including in-use and externalities costs, may help put into perspective and mitigate the allegedly "extra "costs that are often emphasized.						
Background								
References								
LEVEL								
Derived from	Software tool		Operational da	ita		In situ	measurements	
	Simple Calculation	ons	Empirical/Liter	ature	X			
Details								
Areas covered								
Barriers								
Rating								
References								
SCALE	_							
Application								
Details								
Multiscale								
References								

REFERENCES	
[1]	
[2]	



	Verifiable su	staina	ble targets					
ECO.LC.01	ISSUE	C	ATEGORY	LEVEL			SCALE	
	Economic	Life	e Cycle costs		В		B/N	
GENERAL								
Description	From the start, the p criterion. This incluc measurements (ene necessary for measu	project de les using rgy, wate iring and	esign formulates and advanced calculation er…). It further impli controlling the mair	I determine n/optimizat es that the n sustainabi	es su tion f mor lity c	stainable t tools for th nitoring to criteria are	targets for each hose subject to a ols and equipme e installed.	ctual nt
Background								
References								
LEVEL								
Derived from	Software tool		Operational da	ita	In situ		situ measurements	
	Simple Calculation	ons	Empirical/Liter	ature	X			
Details								
Areas covered								
Barriers								
Rating								
References								
SCALE								
Application								
Details								
Multiscale								
References								

REFERENCES	
[1]	
[2]	



	Building wor	<mark>ks զ</mark> ւ	ality control					
ECO.Qu.06	ISSUE		CATEGORY	LE	VE	L	SCALE	
	Economic		Quality	В			В	
GENERAL								
Description	In order to ensure the the constructor mus includes good monit consumption, optim wages and safe wor	ne actua it adopt coring o izing m king cor	al and correct implem measurement and do f the construction sta aterial use, reducing a aditions for constructi	entation of ocumentatio ge itself (mi and recyclin on crews.	sust on sy inim g wa	ainable m ystems for izing wate aste). In ac	easures and criteria, r quality control. It er and energy ddition, it includes fa	ir
Background								
References								
LEVEL								
Derived from	Software tool		Operational da	Il data In situ			measurements	
Denved from	Simple Calculation	ons	Empirical/Liter	rature X				
Details								
Areas covered								
Barriers								
Rating								
References								
SCALE								
Application								
Details								
Multiscale								
References								

REFERENCES	
[1]	
[2]	



	Information	and p	articipation	of users	5			
ECO.Ma.02	ISSUE	(CATEGORY	LE	LEVEL		SCALE	
	Economic	Ν	lanagement		В		B/N	
GENERAL								
Description	Sustainability furthe as the initial design	r depend stage (as	ds on the final users' was shown above).	behaviou The monito	r, so ring	they shou system m	uld be involved as ust provide useful	early data
	for managing sustain to inform building u	nability t sers and	hrough the operative help them adjust the	e life of the eir behaviou	buil ur an	ding. Ther Id control	efore, it is further the operating cos	used ts.
Background								
References								
LEVEL	-		_					
Derived from	Software tool		Operational da	ita	In situ		u measurements	
	Simple Calculation	ons	Empirical/Liter	ature	X			
Details								
Areas covered								
Barriers								
Rating								
References								
SCALE								
Application								
Details								
Multiscale								
References								

REFERENCES	
[1]	
[2]	



A.9 - NewTREND

NewTREND

This project has received funding from the European Union fortune or programme under grant agreement no. 693474. New integrated methodology and Tools for Retrofit design towards a next generation of ENergy efficient and sustainable buildings and Districts



http://newtrend-project.eu/

NewTREND seeks to improve the energy efficiency of the existing European building stock and to improve the current renovation rate by developing a new participatory integrated design methodology targeted to the energy retrofit of buildings and neighbourhoods, establishing energy performance as a key component of refurbishments. The methodology will foster collaboration among stakeholders in the value chain, engaging occupants and building users and supporting all the refurbishment phases through the whole life cycle of the renovation. The methodology will be supported by an online platform to ease collaborative design, which will play the role of exchanging information and facilitating dialogue between the different stakeholders involved in the retrofit process. It will store all the information useful to the design of the retrofit intervention in a cloud based interoperable data exchange server, i.e. the District Information Model server, which has the ability to and export multiple file formats thanks to semantic web technologies.

A Data Manager tool will be developed to guide the designers in the data collection phase, which might be a complex task for retrofit projects where information and drawings are scattered or even not available.

The NewTREND platform will be a tool for collaborative design allowing evaluation of different design options at both building and district level through dynamic simulations via a Simulation & Design Hub. Design options, including district schemes and shared renewables will be presented to the design team, together with available financing schemes and applicable business models, in a library which will build on lessons from past and ongoing R&D projects. The NewTREND methodology and tools will be validated in three real refurbishment projects in Hungary, Finland and Spain where the involvement of all the stakeholders in the design .process, will be evaluated and specific activities will be dedicated to inhabitants and users.



INDICATORS

	Operational Pri	ma	ry Energy De	mand (l	kW	/h/m² y	/r)	
ENV.En.13	ISSUE	C	ATEGORY	LE	VEL		SCALE	
Environmental Energy /					Ą		B / N	
GENERAL								
Description	Primary energy is energy found in nature that has not been subjected to any conversion or transformation process. It is energy contained in raw fuels as well as other forms of energy received as input to a system. The indicator Energy Demand aims at the reduction of the Total Primary Energy Demand. The indicator is in line with the EU's 40-27-27 targets for 2030 compared to 1990 which aim to reduce the greenhouse gas emissions compared to 1990 levels up to 40%, to increase the share of renewable energy consumption by at least 27% and to save at least 27% of energy compared with the business-as-usual scenario. Considering the quantitative improvement of the Operational Primary energy demand of buildings before and after retrofitting took place it is possible to use the results for the selection of the most primary energy efficient retrofitting measures in building retrofitting projects. The indicator is based on the method of TPEF (EN 15603). The indicator uses primary energy factors defined for different fuels in order to calculate the primary energy demand based on the delivered energy demand, which is obtained either through a simulation in basic and advanced mode, or from metered data in premium mode. As the indicator is focussed on the operational primary energy demand only the life cycle Assessment calculation needs to be performed.							
Backaround	NewTREND, OPEN HOU	SE Ass	sessment Guideline,	Version 1.2	New	v Office Bu	ildings – July 2013	
References	[1], [2], [3], [4], [5], [6],	[7]	,				σ,	
	Software tool	Т	Operational da	ta		In situ m		—
Derived from)	Simple Calculations		Empirical/Liter	ature		Simulati Hub	on and Design	x
Details	15603 Standard). As the considers only the life cy Assessment is not perfo The indicator is calculate TPEF (EN 15603)) for dif simulated total delivere fuel types are not availa engine will be used for p electrical energy deman demand calculation, wil • Heating • Cooling • Hot water • Cooking • Lighting • Power • Solar thermal • Auxiliary energi	indic vcle st rmed. ed by feren d ene ble a oerfor d of t l cons	ator is based only of age according to the using defined prima t fuel types in the di rgy demand of the b default set will form ming the calculation he building, which is ider all sources and	n the buildin e EN 15978 s fferent coun puilding. If da n the core of ns. The simul s the input fo uses, such a	ctor tries ata fi the latec or th s:	operational e dard. There is (total prin s which are or primary Simulation d total deliv e operatio	energy demand it efore a Life Cycle mary energy facto e multiplied with tl energy factors of and Design Hub vered thermal and nal primary energ	rs he the J y
Areas covered	Main focus on neighbou	rhood	d scale.					
Barriers	-							
Rating	In order to calculate the recommended, with the • Best performa • Minimum performa	perfo follo nce: (ormance of the indic wing thresholds as c 50 kWh/m2 yr nce: 450 kWh/m2 y	ator, a linea defined by th r	r int ne Ol	erpolation PEN HOUS	method is E EU FP7 project:	
References	[1], [2] ,[3], [4], [5], [6],	[7]						
SCALE								



_		
	Application	Applicable to the small (building) or large (neighbourhood) scale.
	Details	The "Scale" characterization is that of the building and of the neighbourhood.
ſ	Multiscale	The indicator is used by an aggregation of each building on district mode and therefore can be
		described as a multiscale KPI.
	References	[1], [2] ,[3], [4], [5], [6], [7]

REFERENCES	
[1]	European Commission- EU 2030 targets: http://ec.europa.eu/energy/en/topics/energy-strategy/2030- energy-strategy (29.03.2016)
[2]	BS EN 15603:2008: Energy performance of buildings. Overall energy use and definition of energy ratings
[3]	EN 15978: 2011: Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method. European Committee for Standardization CEN.
[4]	FprCEN/TR 15615:2014: Energy Performance of buildings — Module M1-x — Accompanying Technical Report on draft Overarching standard EPBD (prEN 15603)
[5]	prEN ISO/DIS 52000-1:2015, draft prEN 15603:2015: Energy performance of buildings — Overarching EPB assessment – Part 1: General framework and procedures
[6]	Draft ISO-TR 52000-2 - Overarching EPB assessment - Part 2: Explanation and justification of ISO 52000-1
[7]	Concerted Action EPBD, Implementing the Energy Performance of Buildings Directive (EPBD) – Featuring Country Reports 2012, http://www.epbd-ca.eu/ca-outcomes/2011-2015
[8]	OPEN HOUSE Assessment Guideline, Version 1.2 New Office Buildings – July 2013



	Delivered Energy Demand (kWh/m ² yr)							
ENV.En.07	ISSUE CATEGORY LEVEL SCALE							
	Environmental Energy A B / N							
GENERAL	-							
Description	The delivered energy den buildings within the distri energy demand in a build conversion of oil into elec of the primary energy wh demand shows the buildi energy bill. Therefore the and to calculate energy c calculations like Total Car making and design in retr For all modes, the values with the indicator results is possible to obtain an or	buildings within the district. Delivered energy demand is defined as the part of the primary energy demand in a building after subtracting the different conversion and transport losses (e.g. conversion of oil into electricity in a power plant) for providing the energy. This means the part of the primary energy which passes finally the system boundary of the building. Delivered energy demand shows the building operators the demand of energy which needs to be paid on the energy bill. Therefore the figure is useful to demonstrate measurable energy saving in the district and to calculate energy cost savings. Hence, the KPI results are used as basis for further KPIs calculations like Total Carbon Emissions, Return of Investment which are important in decision- making and design in retrofitting projects on district scale. For all modes, the values of the indicator on building level B1.2 are aggregated at district level with the indicator results calculated for all other buildings in the area. Through this calculation it is possible to obtain an overall value of the indicator for the district.						
Background	NewTREND, the results o	f epe	3D-CA.					
References	[1], [2], [3], [4], [5]							
LEVEL			-					
	Software tool		Operational da	ta	In situ	measurements		
Derived from	Simple Calculations	Х	Empirical/Litera	ature	Simula	tion and Design	x	
					Hub			
	delivered energy demand building, will be aggregat will be divided by the sum The delivered energy is o from metered data in pre The indicator shall be cald building in the Simulation input for the operational • Heating • Cooling • Hot water • Cooking • Lighting • Power • Solar thermal c • Auxiliary energy The KPI will be presented way of a relative value of sum utilizing the data ent	I (kW ed to n of t btair culat culat n anc prim ontri y in tl kWH cereo	/h) for each single bid to a total figure for the the reference floor a med either through a mode. ed by using the simulation of the the end of the the simulation of the the project in the Color/m2.yr (m ² total floot of the building).	uilding within he neighbourh areas of each simulation ir ulated total d hergy demand calculation, w ce heating or laborative De or area of all	the district, nood and aft building in t basic and a elivered ene d of the build will consider processes esign Platforn buildings in	, calculated for the ter this aggregation it the neighbourhood. advanced mode, or ergy demand of the dings, which is the r all sources, such as: m to the users in the the neighbourhood a	35	
Areas covered	Main focus on neighbour	Main focus on neighbourhood scale.						
Barriers	-		6.1 • •					
Rating	 In order to calculate the performance of the indicator a linear interpolation method is recommended, with the following thresholds as defined by the results of EPBD-CA: Best performance: 40 kWh/m2 yr Minimum performance: 300 kWh/m2 yr 							
References	[1], [2], [3], [4], [5]							
SCALE								
Application	Applicable to the small (b	uildi	ng) or large (neighb	ourhood) sca	le.			
Details	-							



Multiscale	The indicator is calculated based on an aggregation of each building delivered energy demand to a total neighbourhood figure and therefore can be described as a multiscale indicator.
References	[1], [2], [3], [4], [5]

REFERENCES	
[1]	FprCEN/TR 15615:2014: Energy Performance of buildings — Module M1-x — Accompanying Technical Report on draft Overarching standard EPBD (prEN 15603)
[2]	prEN ISO/DIS 52000-1:2015, draft prEN 15603:2015: Energy performance of buildings — Overarching EPB assessment – Part 1: General framework and procedures
[3]	Draft ISO-TR 52000-2 - Overarching EPB assessment - Part 2: Explanation and justification of ISO 52000-1
[4]	European Commission- EU 2030 targets: http://ec.europa.eu/energy/en/topics/energy-strategy/2030- energy-strategy (29.03.2016)
[5]	Concerted Action EPBD, Implementing the Energy Performance of Buildings Directive (EPBD) – Featuring Country Reports 2012, http://www.epbd-ca.eu/ca-outcomes/2011-2015



	Renewable Energy on Site (%)						
ENV.En.20	ISSUE	ISSUE CATEGORY LEVEL SCALE					
	Environmental		Energy	S		B / N	
GENERAL							
Description	One main sustainability ta energy consumption on t EU from fossil energy sou energy sources. This KPI t in a building on the total targets for 2030 compare to 1990 levels up to 40%, and to save at least 27% of important as additional in share of renewable energy active energy production energy consumed in the b also to assess the active of The values of the indicato encompassing the entired are added. The indicator assesses the the total final energy den	anergy consumption on the total energy consumption in order to lower the dependency of the EU from fossil energy sources and to reduce the greenhouse gas emissions caused by fossil energy sources. This KPI therefore aims to measure the share of renewable energy consumption n a building on the total final energy consumption. The KPI is in line with the EU's 40-27-27 cargets for 2030 compared to 1990 which aim to reduce the greenhouse gas emissions compared to 1990 levels up to 40%, to increase the share of renewable energy consumption by at least 27% and to save at least 27% of energy compared with the business-as-usual scenario. The KPI is mportant as additional information for decision-making processes in retrofitting projects as the share of renewable energy produced on-site shows in detail how a building performs in terms of active energy production. Hence, by using this KPI it is not only possible to assess the primary energy consumed in the building as well as the carbon emission during building operation, but also to assess the active contribution of the building to a decentralized energy production. The values of the indicator on building level are aggregated at neighbourhood level encompassing the entirety of all buildings in the neighbourhood, and urban production sources are added. The indicator assesses the share of renewable produced energy in a neighbourhood compared to the total final energy demand of all buildings in the area.					
Background	NewTREND						
References	[4], [5]						
LEVEL							
	Software tool		Operational data		In situ	measurements	
Derived from	Simple Calculations		Empirical/Literature	e	Simula Hub	tion and Design	x
Details	renewable primary energy on site by the total primary energy demand of the buildings. Both renewable and non-renewable primary energies are obtained either through a simulation in basic and advanced mode, or from metered data in premium mode. The indicator is calculated by using the total renewable produced energy on site (defined as sum of PV, wind & solar thermal) and dividing it by the simulated total primary energy demand of the building as calculated for indicator in basic mode. The calculation formula is as follows: RER [%] = $(E_{(Pren;RER) [kWh]})/(E_{Ptot [kWh]})*100$ Where: EP _{tot} is the total primary energy calculated according to EN 15603; EP _{ren;RER} is the renewable primary energy, calculated according to EN 15603 within the on-site perimeter						
Areas covered	Main focus on neighbourhood scale.						
Barriers	-						
Rating	 In order to calculate the performance of the indicator, a linear interpolation method is recommended, with the following thresholds as defined by the EU 2030 targets: Best performance: 20% Minimum performance: 0% 						
SCALE							
Application	Applicable to the small (b	uild	ng) or large (neighbourho	ood) scale	2.		
Details	The indicator is calculated district figure which represented the second	d for	each building in the districts the total share of renew	rict and ca wable en	an be aggre ergy produ	egated to a total ction in a district.	
Multiscale	The indicator is based on an aggregation for each building in the neighbourhood which						



	represents the total share of renewable energy production in a neighbourhood. Therefore the KPI can be described as multiscale KPI.
References	[1], [2] ,[3], [4], [5]

REFERENCES	
[1]	FprCEN/TR 15615:2014: Energy Performance of buildings — Module M1-x — Accompanying Technical Report on draft Overarching standard EPBD (prEN 15603)
[2]	prEN ISO/DIS 52000-1:2015, draft prEN 15603:2015: Energy performance of buildings — Overarching EPB assessment – Part 1: General framework and procedures
[3]	Draft ISO-TR 52000-2 - Overarching EPB assessment - Part 2: Explanation and justification of ISO 52000-1
[4]	European Commission- EU 2030 targets: http://ec.europa.eu/energy/en/topics/energy-strategy/2030- energy-strategy (29.03.2016)
[5]	Concerted Action EPBD, Implementing the Energy Performance of Buildings Directive (EPBD) – Featuring Country Reports 2012, http://www.epbd-ca.eu/ca-outcomes/2011-2015



	Global Warming Potential (kgCO2-eq/m2 yr)							
ENV.Im.09	ISSUE CATEGORY LEVEL SCALE							
	Environmental		Impacts		S/A	4	B / N	
GENERAL								
Description	caused by used fuels with the EU's 40-27-2 gas emissions compa consumption by at le usual scenario. The K in decision-making an not only in terms of e contribution to the G retrofitting measures Operational Primary For all modes, the va with the indicator res is possible to obtain a In order to get a resu carbon emissions (kg to a total figure for the the reference floor a	caused by used fuels of all the buildings in a district during their operation stage. The KPI is in line with the EU's 40-27-27 targets for 2030 compared to 1990 which aim to reduce the greenhouse gas emissions compared to 1990 levels up to 40%, to increase the share of renewable energy consumption by at least 27% and to save at least 27% of energy compared with the business-as- usual scenario. The KPI supports planners in the selection of retrofitting measures in the district in decision-making and design as it quantifies the operational energy consumption of the district not only in terms of energy but shows the impact of the consumed energy also in terms of a contribution to the Green House Gas Effect. This opens new views on the suitability of retrofitting measures on district level which cannot be provided by the sole use of the KPIs Operational Primary Energy Demand and Delivered Operational Energy Demand in the district. For all modes, the values of the indicator on building level are aggregated at neighbourhood level with the indicator results calculated for all other buildings in the area. Through this calculation it is possible to obtain an overall value of the indicator for the neighbourhood. In order to get a result for the whole district in the unit kgCO2/m2.yr the results of the total carbon emissions (kgCO2) for each single building within the neighbourhood will be aggregated to a total figure for the neighbourhood and after this aggregation it will be divided by the sum of the reference floor areas of each building in the area.						
Backaround	NewTREND, OPEN HOUSE EU FP7 project							
References	[1], [2] ,[3], [4], [5] ,[6	[1], [2] ,[3], [4], [5] ,[6], [7], [8]						
LEVEL								
	Software tool		Operational da	ata		In situ m	easurements	\square
Derived from	Simple Calculatio	ns	Empirical/Liter	ature		Simulatio Hub	on and Design	x
Details	relative value of kgCO2/m2.yr (m ² total reference floor area of all buildings in the neighbourhood as sum). The user will be able to enter reference floor areas of the buildings as attributes which can be summed up to a total neighbourhood reference floor area for the Indicator calculation. In order to get a result for the whole district in the unit kgCO2/m2.yr, the emissions calculated from metered annual data of the total delivered energy demand (kWh) for each single building within the neighbourhood will be aggregated to a total figure for the neighbourhood and after this aggregation it will be divided by the sum of the reference floor areas of each building in the district. The indicator will be presented in the Collaborative Design Platform to the users in the way of a relative value of kgCO2/m2.yr (m ² total floor area of all buildings in the district as sum utilizing the data entered for the indicator shall be calculated by the Simulation and Design Hub according to the EN 15603 Standard. As the indicator is based only on the carbon emissions for							
	standard: hence, a Li The indicator is calcu types in the different demand per fuel per development of the S types are not availab The simulated delive the total carbon emis In order to get a resu be divided by the Ref Instead of using the s a user entered value	lated by countrie year of t simulatic le, a defa red ener sions ca It in the erence F imulated (attribut	Assessment is not p using defined carbo es which are multipl the building. The der on and Design Hub. ault set will be used gy demand per fuel lculation, shall be a unit kWh/m2.yr the Floor Area of the bu d Total final energy the in the front-end	erformed. on emission lied with th finition of the for perfor per year of coquired by e result of the ilding. demand of for which the	n fac ne si thos carb min of th the the a	ctors (EN 15 mulated de se factors wi oon emission g the calcula e building, v results of th above descr	603)) for different fu livered energy ill be done within th n factors of the fuel ations. which is the input fo he indicator. ibed simulation shal the calculations will uses for each used fuel	uel e r il



	 type in the building the total annual consumption value (values from the energy bill or meters) Oil (excluding fuel used for CHP electricity generation) LPG Natural Gas Electricity Biofuel Biogas Coal Peat Waste Heat The KPI will be presented in the Collaborative Design Platform to the users in the way of a relative value of kgC02/m ² .yr by dividing the result of the total annual value by the Reference Floor Area of the building.
Areas covered	Main focus on neighbourhood scale.
Barriers	-
Rating	 In order to calculate the performance of the indicator, a linear interpolation method is recommended, with the following thresholds as defined by the OPEN HOUSE EU FP7 project: Best performance: 10 kgCO2/m2 yr Minimum performance: 100 kgCO2/m2 yr
References	[1], [2],[3], [4], [5],[6], [7], [8]
SCALE	
Application	Applicable to the small (building) or large (neighbourhood) scale.
Details	-
Multiscale	The indicator is used by an aggregation of each building on neighbourhood mode and therefore can be described as a multiscale indicator.
References	[1], [2] ,[3], [4], [5] ,[6], [7], [8]

REFERENCES	
[1]	European Commission- EU 2030 targets: http://ec.europa.eu/energy/en/topics/energy-strategy/2030-
[2]	BS EN 15603:2008: Energy performance of buildings. Overall energy use and definition of energy ratings
[3]	EN 15978: 2011: Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method. European Committee for Standardization CEN
[4]	FprCEN/TR 15615:2014: Energy Performance of buildings — Module M1-x — Accompanying Technical Report on draft Overarching standard EPBD (prEN 15603)
[5]	prEN ISO/DIS 52000-1:2015, draft prEN 15603:2015: Energy performance of buildings — Overarching EPB assessment – Part 1: General framework and procedures
[6]	Draft ISO-TR 52000-2 - Overarching EPB assessment - Part 2: Explanation and justification of ISO 52000-1
[7]	Concerted Action EPBD, Implementing the Energy Performance of Buildings Directive (EPBD) – Featuring Country Reports 2012, http://www.epbd-ca.eu/ca-outcomes/2011-2015
[8]	OPEN HOUSE Assessment Guideline, Version 1.2 New Office Buildings – July 2013



	Soil Sealing, Permeability of site/land (%)						
ENV.LU.04	ISSUE CATEGORY LEVEL SCALE						
	Environmental Land Use			S		Ν	
GENERAL							
Description	Urban spaces are increasingly less permeable, with roofing and concrete paving that interrupt the natural flow of storm water and the replenishment of ground reservoirs. The increase of soil sealing leads to collection and funnelling of storm water in sewers, reducing the onsite usage of the water and increasing the pressure on wastewater systems. Counteracting the soil sealing tendency can lead to a reduction in the use of potable water for irrigation and improve water management in the district. Soil sealing is assessed in the same way in all three modes, by assigning a surface permeability coefficient to each homogeneous area in the district and aggregating the coefficient values through a weighted average on the area surfaces						
Background	NewTREND						
References	[1]						
LEVEL							
Darived from	Software tool		Operational data		In situ	measurements	
Derived Itolii	Simple Calculations	Х	Empirical/Literature		Other (specify)	
Details	[%] according to the product data sheet if available or according to the following reference values: Natural / uninterrupted ground, or water collection for in situ subirrigation: $\alpha i = 100\%$ Gravel, sand, or other loose aggregate: $\alpha i = 90\%$ Plastic grid elements filled with grass soil: $\alpha i = 80\%$ Concrete grid elements filled with grass soil: $\alpha i = 60\%$ Interlocking pavement on a sand or gravel base: $\alpha i = 30\%$ Continuous / sealed paving, concrete slabs: $\alpha i = 0\%$ Calculate the overall permeability coefficient α [%] as follows: $\frac{\sum_{i=1}^{n} \alpha_i * S_i}{\sum_{i=1}^{n} S_i}$ [%]						
Areas covered	Main focus on neighbourhood scale.						
Barriers							
Rating	As there are no reference values in standards and laws for permeability, the minimum value 0% can be considered the minimum performance, and the maximum value 100% can be considered the best performance.						
References	[1]						
SCALE							
Application	Applicable only to the lar	ge (r	eighbourhood) scale.				
Details	This indicator is assessed	only	at neighbourhood scale.				
Multiscale	-						
References	[1]						

REFERENCES	
[1]	Protocollo ITACA: UNI/PdR 13:2015 "Sostenibilità ambientale nelle costruzioni - Strumenti operativi per la
[-]	valutazione della sostenibilità"



	Access to public transport nodes (%)						
SOC.Tr.15	ISSUE	CATEGORY	LEVEL	SCALE			
	Social	Transport	S	N			
GENERAL							
Description	Public transportation plays an important role in sustainability as public transportation can improve air quality, reduce greenhouse gas emissions, save energy and resources and support higher density land development. The internal accessibility indicator gives a good indication on the public transport amenities in the neighbourhood. The stakeholders in the retrofitting project from the municipality side can decide to upgrade the public transport access of the area based on the results. Stakeholder should also consider the city scale energy saving and reduction of CO2 emissions potential when deciding upon developing the public transport infrastructure. The assessment methodology is simple for the basic mode, and a complex indicator with more variables is available for the Advanced and premium modes. The accessibility of the neighbourhood depends on the presence of public transport in the neighbourhood. Its efficiency is high when users can reach the line connection points in a short time and have to wait only a short time for the arrival of the vehicle. Therefore, for the basic mode the indicator measures the accessibility of citizens to the public transport network, taking into account distance to the transport node. For advanced and premium mode, the indicator also takes into account the running frequency and the reliability of						
Backaround	NewTREND	UIIS.					
References	[1], [2] ,[3]						
IFVFI							
	Software tool	Operational da	ata In situ	measurements			
Derived from	Simple Calculations	X Empirical/Lite	rature Other	(specify)			
Details	A public transport network plan is needed to evaluate the accessibility of public transport nodes in the neighbourhood. 1. Identify the number of all users (O) in the district by adding up all residents and non- residential users 2. Calculate the number of users that are within 400 m walking distance from public transport nodes (Ot,400). Walking distance is measured between the building entrance and the public transport stop. 3. Calculate the share of users who are within walking distance from public transport nodes with the following formula: $IA_b = \frac{O_{t,400}}{O}$						
Areas covered	Main focus on neighbor	urhood scale.					
Barriers	-						
Rating	Minimum, good and best practice performance levels are differentiated by the share of users that have access to public transport. The benchmarks for the measurement are: Performance level Measure Minimum performance 50 % of users are within 400m walking distance from a public transport node Transport diversity is at least 1. Good practice 75% of users are within 400m walking distance from a public transport node 100% of users are within 400m walking distance from a public transport node						
References	[1], [2] ,[3]						
SCALE							
Application	Applicable only to the la	arge (neighbourhood) sca	lle.				
Details	The "Scale" characterization is that of the neighbourhood.						
Multiscale	This indicator is only us	ed on neighbourhood lev	el.				
References	[1], [2] ,[3]						

REFERENCES



[1]	BREEAM Communities, 2012. Technical Manual, BRE Global.
[2]	LEED v4 Neighborhood Development, LEED Reference Guide for Neighborhood Development, USGBC, U.S.A., 2014.
[3]	UNI/PdR 13.1:2015 Sostenibilità ambientale nelle costruzioni - Strumenti operativi per la valutazione della sostenibilità Edifici residenziali



Access to pu	olic tr	ansport, Dist	rict Acce	essibility	/ Index (-)	
ISSUE CATEGORY LEVEL SCALE						
Social		Transport	9	5	N	
Public transportation plays an important role in sustainability as public transportation can improve air quality, reduce greenhouse gas emissions, save energy and resources and support higher density land development. The internal accessibility indicator gives a good indication on the public transport amenities in the district. The stakeholders in the retrofitting project from the municipality side can decide to upgrade the public transport access of the area based on the results. Stakeholder should also consider the city scale energy saving and reduction of CO2 emissions potential when deciding upon developing the public transport infrastructure. The assessment methodology is simple for the basic mode, and a complex indicator with more variables is available for the Advanced and premium modes. The accessibility of the district depends on the presence of public transport in the neighbourhood. Its efficiency is high when users can reach the line connection points in a short time and have to wait only a short time for the arrival of the vehicle. Therefore, for the basic mode the indicator measures the accessibility of citizens to the public transport network, taking						
takes into account th	ie runnin	ig frequency and the	e reliability of	f different tra	ansport options.	
[1], [2] ,[3]						
Software tool		Operational da	ta	In situ	measurements	
Simple Calculatio	nc V	Empirical/Litor	aturo	Othor	(cpocify)	
A public transport ne	twork n	an is needed to eva	diure	essibility of r	Specify)	
in the neighbourhoo 1. Determine buses and metro stat and the rai 2. For each n services (n weekday: AM 08.00 - Consider o at least on 3. Calculate t following f $Wt = \frac{dn}{v}$ dn = the di trams from v = notiona 4. Determine $S_{wt} = 0.5$ Rf= reliabil n= No. of s 5. Determine At = Wt + 6. Calculate t	d. the dista trams fro ion that a lway ser- ode that) departi - 10.00 P nly the n e stops w he walk to ormula: stance o the buil I walk sp the serv $\left(\frac{60 * 4}{n}\right)$ ity factor ervices d total acc Swt he Equiv	ance of the public tr om the building entr are within a radial d vices that are within meets the requirem ng/arriving at each n M 17.00 – 19.00 earest node for eac vithin 20 km-s of the time for each transpond ding entrances (m); beed (80 m/min) ice waiting time (Sw $\frac{1}{2}$) + R _f r to the service waiting luring peak time cess time (At): valent Building Entra	ansport netw ances. Only o istance of 50 n 1000 meters nents in step node in the for h line, only o e district. ort line and i rt network no rt): ing time: Bus noce (EBE) free	vork nodes (d consider the l 0 meters from s. 1, determine ollowing peri- ne direction f ts selected n odes served k /trams=2,Tra	I) served by trains, bus, tram stops and m the main entrance the total number of ods for a typical for a line and that have ode according to the by trains, buses and	
$FI = \frac{33}{At}$ 7. Calculate t	he public	transport Accessib	ility index:			
	Access to putISUESocialPublic transportatioimprove air quality,higher density land ofThe internal accessitethe district. The stakeupgrade the public ofconsider the city scaupon developing theThe assessment metvariables is availableThe ascessibility orneighbourhood. Its attime and have to waymode the indicator orinto account distancetakes into account theNewTREND[1], [2], [3]Software toolSimple CalculationA public transport nein the neighbourhood1.Determinebuses and metro statiand the rai2.For each nein the neighbourhood1.Determinebuses and metro statiand the rai2.For each nein the neighbourhood1.DetermineSweekday:AM 08.00 -Consider onat least one3.Calcu	Access to public transportationISSUESocialPublic transportation playsimprove air quality, reduce a higher density land developmThe internal accessibility ind the district. The stakeholdersupgrade the public transport consider the city scale energing upon developing the public transport consider the city scale energing upon developing the public transport accessibility of the d neighbourhood. Its efficiency time and have to wait only a mode the indicator measures into account distance to the t takes into account the running NewTREND[1], [2], [3]Software toolSimple CalculationsXA public transport network pli in the neighbourhood.1.Determine the distance buses and trans from metro station that a and the railway series 2.X2.For each node that services (n) departi weekday: AM 08.00 - 10.00 P Consider only the not at least one stops of 3.X3.Calculate the walk for following formula: weekday: AM 08.00 - 10.00 P Consider only the not at least one stops of 4.S4.Determine the services (n) depart we notional walk spS5.Determine the services of a At = Wt + Swt6.Calculate the Equiv FI = $\frac{30}{At}$ 7.Calculate the public following formula: m = No. of services of at m = No. of services of	Access to public transport, DistISSUECATEGORYSocialTransportSocialTransportPublic transportation plays an important role improve air quality, reduce greenhouse gas emhigher density land development.Internal accessibility indicator gives a good the district. The stakeholders in the retrofitting luggrade the public transport access of the area consider the city scale energy saving and reduce upon developing the public transport infrastruct.The accessibility of the district depends on neighbourhood. Its efficiency is high when users time and have to wait only a short time for the mode the indicator measures the accessibility of into account distance to the transport node. For takes into account the running frequency and the MewTREND[1], [2], [3]Software toolOperational data Simple CalculationsXEmpirical/LiterA public transport network plan is needed to evaluate the neighbourhood.1.Determine the distance of the public transport metwork plan is needed to evaluate the railway services that are within a radial data and the railway services that are within a radial data the railway services that are within a clacuate the walk time for each at least one stops within 20 km-s of the gallity is following formula:Wt = $\frac{dn}{v}$ dn = the distance of the public transport following formula:Wt = $\frac{dn}{v}$ dn = the distance of the service waiting time (swittin a not all access time (At)): At = Wt + Switting the calculate the service waiting time (switting from the service waiting from the service waiting from the service waiting from	Access to public transport, District AccordISSUECATEGORYLEVSocialTransportImportantPublic transportation plays an important role in sustainal improve air quality, reduce greenhouse gas emissions, save higher density land development.ImportantThe internal accessibility indicator gives a good indication of the district. The stakeholders in the retrofitting project from upgrade the public transport infrastructure.ImportantThe assessment methodology is simple for the basic mode, variables is available for the Advanced and premium modes.ImportantThe assessment methodology is simple for the basic mode, variables is available for the Advanced and premium modes.ImportantThe assessment methodology is simple for the arrival of the mode the indicator measures the accessibility of citizens to t into account distance to the transport node. For advanced and transport account the running frequency and the reliability of NewTREND[1], [2], [3]Important account the distance of the public transport network plan is needed to evaluate the acc in the neighbourhood.1.Determine the distance of the public transport network buses and trans from the building entrances. Only ometro at the railway services that are within 1000 meter2.For each node that meets the requirements in step services (n) departing/arriving at each node in the for weekday: AM 08.00 - 10.00 PM 17.00 - 19.00 Consider only the nearest node for each line, only o at least one stops within 20 km-s of the district.3.Calculate the walk time for each transport network not transform the building entrances (m); v = notional walk speed (80 m/min)4.	Access to public transport, District Accessibility ISSUE CATEGORY LEVEL Social Transport S Public transportation plays an important role in sustainability as publimprove air quality, reduce greenhouse gas emissions, save energy and higher density land development. The internal accessibility indicator gives a good indication on the public the district. The stakeholders in the retrofitting project from the municipupgrade the public transport access of the area based on the results. S7 consider the city scale energy saving and reduction of CO2 emissions proportion developing the public transport infrastructure. The accessibility of the district depends on the presence of pulneighbourhood. Its efficiency is high when users can reach the line conne time and have to wait only a short time for the arrival of the vehicle. T mode the indicator measures the accessibility of citizens to the public transport node. For advanced and premium m takes into account distance to the transport node. For advanced and premium m takes into account distance to the transport node. For advanced and premium m takes into account distance to the public transport network nodes (c buses and trams from the building entrances. Only consider the imetro station that are within a radial distance of S00 meters from and the railway services that are within 1000 meters. 1. Determine the distance of the public transport network nodes (c buses and trams from the building entrances. (m); consider the immort sat read at the requirements in step 1, determine services (n) departing/arriving at each node in the following perive weekday: AM 08.00 - 10.00 PM 17.00 - 19.00 Consider only the nearest node for	



	$\begin{split} IA_i &= FI_{i,max} + 0.5 \big(\Sigma FI_i - FI_{i,max} \big) \\ 8. & Summarize the accessibility index of all public transport types (IA) for each building. \\ 9. & Calculate the District Accessibility Index (DAI) that is the average of the accessibility indexes of all buildings in the district weighted by the number of users in each building DAI = \frac{IA_1 * O_1 + IA_2 * O_1 + \dots + IA_n * O_n}{O} \\ Oi = number of occupants in a building \\ O = number of all users in the district \\ \end{split}$							
Areas covered	Main focus on ne	ighbourhood scale.						
Rarriers	-	.8						
Ratina	The benchmarks	for the measurement	are differentiated by t	the location type of th	e			
	neighbourhood:							
	Performance Requirements by district location							
		Capital / regional Capital / regional Small / medium Rural center or inner city city district center of town or city suburb district town / city						
	Minimum	2,5	1,5	1	0,5			
	Good practice	13	7,8	5,2	2,6			
	Best practice	20	12	8	4			
References	[1], [2] ,[3]							
SCALE								
Application	Applicable only to	o the large (neighbou	rhood) scale.					
Details	The "Scale" chara	ecterization is that of	the neighbourhood.					
Multiscale	-							
References	[1], [2] ,[3]							

REFERENCES	
[1]	BREEAM Communities, 2012. Technical Manual, BRE Global.
[2]	LEED v4 Neighborhood Development, LEED Reference Guide for Neighborhood Development, USGBC, U.S.A., 2014.
[3]	UNI/PdR 13.1:2015 Sostenibilità ambientale nelle costruzioni - Strumenti operativi per la valutazione della sostenibilità Edifici residenziali



	Microclimate Index I (-)						
SOC.TC.07	ISSUE	CATEGORY	LEVEL	SCALE			
	Social	Thermal Comfort	S	N			
GENERAL							
Description	In urban communities, heat island effect adds another layer to the temperature increases caused by climate change and associated drought. Heat island effect causes increased summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and deteriorated water quality. The microclimate index influences the outdoor comfort of the neighbourhood users. Heat island effect can also contribute to the external heating and cooling loads of the buildings in the neighbourhood. Therefore, the indicator can be used to optimize the outdoor surface area retrofitting for the benefit of outdoor comfort and energy use reduction. The indicator shows the contribution of surface to the Heat Island Effect. The different type of surfaces are grouped then the related surface coefficient is determined. The microclimatic Index is calculated as the average surface coefficient weighted by the surface						
Background	NewTREND, FASUDIR.						
References	[1]						
LEVEL							
Derived frame	Software tool	Operational da	ata In situ	i measurements			
Derived from	Simple Calculations	X Empirical/Liter	rature Other	(specify)			
Areas covered	Microclimate I area Microclimate I area The Surface Coefficient ' area: Area surface types Building areas 1. Small single build houses) 2. Apartment blocks 3. Large multi-store 4. Industrial and coo Circulation areas and 5. Railway system 6. Roads, Streets a 7. Squares and part Green Spaces 8. Green Spaces with 9. Green Spaces with 10. Small gardens art 11. Grass field 12. Forest area Water areas 13. Permanent lakes Other areas 14. Green roofs Main focus on neighbout	ndex = (Area 1 x F1 + Are F' is to be selected from lings (detached houses, se and large buildings y houses mmercial areas squares nd squares completely soi king spaces with green ele th dense tree population th light tree population and green backyards and ponds or rivers rhood scale.	the following table base sa 2 x F2 + Area 11 x F2 the following table base surfac coeffic emi-detached 1	(1) / neighbourhood d on the type of the eeient F ,7 ,4 ,0 ,5 ,5 ,7 ,0 ,5 ,5 ,7 ,0 ,5 ,5 ,7 ,0 ,5 ,5 ,7 ,7			
Areas covered		mood scale.					
Rating	The benchmarks for the	measurement are as foll	lows:				
	Performance level	Measure					
	Minimum performance	Microclimate Inc	dex is between 0,6 to 0,79				
	Good practice	Microclimate Inc	dex is between 0,8 to 0,99				
	Best practice	Microclimate Inc	dex > 1,2				
References	[1]						



SCALE				
Application	Applicable to the large (neighbourhood) scale.			
Details	The "Scale" characterization is that of the neighbourhood.			
Multiscale	This indicator is only used on neighbourhood level.			
References	[1]			

REFERENCES	
[1]	Zukowska et al. (2014) FASUDIR Friendly and Affordable Sustainable Urban Districts Retrofitting Deliverable
[_]	D2.4 IDST Key Performance Indicators. Available at: http://fasudir.eu/documents/



	Indoor A-weighted sound pressure level (dBA)						
SOC.AC.01	ISSUE CATEGORY LEVEL SCALE						
	Social	Αсοι	ustic Comfort	S		B/ N	
GENERAL							
Description	High levels of noise inside buildings have a direct effect on the comfort of inhabitants and users, with possible impacts on their well-being, productivity and health. Acoustic comfort can be assessed through the indoor A-weighted sound pressure level [dB(A)]. The value of indoor A- weighted sound pressure level can be evaluated either from computation or from measurement (at the assessment position) of the outdoor sound pressure level, by using the sound level difference of the façade. The aim of the indicator is to guide the designer throughout the selection of the renovation work of the façades in the neighbourhood and increase the overall comfort and well-being of its inhabitants. Acoustic comfort is assessed only in Advanced and Premium modes, as it requires room scale evaluations. In both modes, the indoor sound pressure levels are assessed against a set limit in order to identify how far they are from the acceptable comfort value; then the room values are aggregated through a floor-area weighted average. In Advanced mode, the indoor noise values are obtained from simulations, while in Premium mode, the indoor noise values are acquired from on-site measurements.						
Background	NewTREND						
References	[1],						
LEVEL							
Derived from	Software tool		Operational da	ata	In situ r	neasurements	Х
Derived from	Simple Calculation	าร	Empirical/Liter	rature	Simulat	ion	Х
	1. For each ro sound press advanced m 2. Calculate the classificatio 3. Determine to weighted at neighbourh Where: $BS_i = \text{score}$ $S_i = \text{refere}$ $S_{tot} = \text{total}$ Note: only consider m classrooms). Do not co small storage areas).	e assign ne final v nof eac the final v the final v th	The building in the left of $L_{2,nT,w}$ by using some value of the whole left room, as shown in a shown in a shown in a shown in a shown in the score of each built of the score of each $DS =$ $DS =$ of the each builting of area of each builting for area of each builting that are occupied short-term occupants of the score of each builting for the score of each builting for area	building, makin in building, makin in building scale lding of the nei ive for the neig building on the $\left(\frac{\sum_{i=1}^{n} BS_i * S}{S_{tot}}\right)$ <i>i</i> [-] the buildings in the buildings in ed for several h incy and transit	the neighbours (e.g. be areas (e.g. b	ne indoor A-weighte vels (as in B.8.1 acoustic method; d; calculating the building in the building in the building so the building in the	2a
Areas covered	Main focus on neighbo	ourhood	d scale.				
Barriers	-				- h - 1		
Rating	Neighbourhood scale benchmarks are the same as building scale benchmarks.						
Keferences	[1], [2], [3], [4], [5], [6]					
Application	Applicable to the small	ll (buildi	ing) or large (neight	ourhood) scale	<u>م</u>		
Netails	The "Scale" characteri	ization i	s that of the neighb	ourhood.			_
Multiscale	At neighbourhood level level of indoor noise fo	el, the r or the e	oom values for all k ntire district.	ouildings are ag	gregated to	provide an average	



References [1], [2], [3], [4], [5]

REFERENCES	
[1]	EN ISO Building acoustics - Estimation of acoustic performance of buildings from the performance of
	elements - Part 3: Airborne sound insulation against outdoor sound.
[2]	EN ISO 16283-3 Acoustics - Field measurement of sound insulation in buildings and of building elements -
	Part 3: Façade sound insulation.
[3]	EN 15251- Indoor environmental input parameters for design and assessment of energy performance of
[0]	buildings addressing indoor air quality, thermal environment, lighting and acoustics.
[4]	EN 717-1 - Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne
	sound insulation.
[5]	Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the
[0]	assessment and management of environmental noise.
[6]	World Health Organization (WHO).



	Operational Energy Costs (€/m2)						
ECO.LC.03	ISSUE	C	ATEGORY	LE\	/EL	SCALE	
	Economic	Life	Cycle costs	0,	S	B/ N	
GENERAL							
Description	After a building is constructed or deep retrofitted, it enters the operational phase. The energy used during building operation is a multiple of the energy used during construction. A similar issue motivates the <i>operational</i> certification administered by BRE (Building Research Establishment). The BRE briefing refers to research findings that 80 – 90% of a building's emissions occur during its operational phase. The performance of new buildings after this transition from construction to full operation is prone to performance degradation . The objective of this indicator is identification of performance degradation and buildings or neighbourhood suffering from performance gaps. A building/energy manager can subsequently prioritise and implement remedial action. The indicator is beneficial to the developers, the operator and the users of the building as well. It can influence the decision making by allowing comparison between the current state and the retrofitting variants. It can show the financial benefits of the energy use reduction measures in the refurbishment. The operational energy cost of the neighbourhood is the sum of the individual costs of its buildings. Energy accounts for the largest cost during a commercial building operation, excluding the salaries of the building occupants. An average financial ratio of initial costs, operational costs and salary costs of 1:10:200, is applicable to commercial buildings. Since this is an economic indicator, energy costs refers to final energy consumed by the building. The aspects of primary energy conversion to final energy are excluded. This indicator result is improved by use of locally generated renewable energy, which is not billed by usage, for example per kWh or per KJ. Thus renewable energy and storage that reduces						
Backaround	NewTREND						
Peferences							
I EV/EI	[1], [1], [3]						
	Software tool		Operational da	ita	In situ	measurements	Γ
Derived from	Simple Calculations	х	Empirical/Liter	ature	Other	(specify)	
Details	Calculation method:	~	Empirical, Liter	uture	ounci	(0)000177	1
	1- Determine the delivered energy demand as described in the related mode of the indicator "Delivered energy demand [kWh/m ² yr]". The simulated total final energy demand of the building will include the Energy end use breakdown by fuel type. 2- Calculate the yearly operational energy costs by multiplying the energy demands and the energy price by fuel types. 3- Calculate the operational energy costs (normalised) for the neighbourhood based on the reference floor area as follows: $Operational energy cost (annual, normalised) = \frac{\sum_{1}^{nb} Annual operational energy costs}{\sum_{1}^{nb} Refernce floor area}$				ts		
Areas covered	Main focus on neighbourh	1000	l scale.				
Barriers	-						
Rating	The reference values for the NewTREND KPI will be determined taking into account the results of WP5 - Innovative financial instruments and business models of the project (http://newtrend-project.eu/).					of	
References	[1], [2], [3]						
SCALE	Applicable to the small (h	نام:	ng) or large (neighb	ourboad) ca			
Application	The "Scale" characterizet		that of the neighb		aie.		
Details	The invoctment secto (is that of the heighb	ournood.		of the proposed	
iviuitiscale	retrofit. For example: sing	le o	r multiple buildings	or a block of	f multiple un	its. All inputs must	

[3]

2004.



	match the specified scale.
References	[1], [2], [3]
REFERENCES	
[1]	BRE. (2009). BREEAM In-Use: Driving sustainability through existing buildings. Available: http://www.breeam.org/filelibrary/BREEAM In Use/KN5686BREEAM-In-Use-White-Paper_dft2.pdf
[2]	M. Deru, K. Field, and S. Punjabi. (2014). ISO 50001 for Commercial Buildings: Lessons Learned From U.S. DOE Pilot Project: Preprint - 61496.pdf. Available: http://www.nrel.gov/docs/fy14osti/61496.pdf
[3]	D. Clements-Croome, Intelligent buildings : design, management and operation. London: Thomas Telford,



	Investment Cos	sts (€/m2)			
ECO.IC.02	ISSUE	С	ATEGORY	LE	VEL	SCALE
	Economic	Inve	stment Costs		S	B/ N
GENERAL	-					
Description	The NewTREND tools an retrofit of equivalent bu new constructions. A sir compare the cost effect computed. This indicator is an analy prioritise retrofits at mu on the cost of developm The total retrofit costs in material and disposal of internal floor space, is so The retrofit cost of the r	alyse ilding nilar o vene vsis m ltiple ent. ncurre disca umme neight	building retrofits. T s almost always off conclusion is reache ss of different retro etric that enables a locations, or differe ed in the financial your orded elements. Sub ed in m ² . pourhood is the sun	This is consist fers environmed at a campu fit options a landlord or n ent retrofit o ear 0 are init psequently the n of the indiv	ent with rese nental savings us/neighbour normalised in municipality f ptions at the ially summed e building(s) idual costs or	earch findings that the s over demolition and hood level. In order to nvestment cost is to compare and same location based I. Costs include all area, in terms of f its building.
Background	NewTREND					
References	[1], [2], [3], [4], [5], [6],	[7]				
LEVEL						
Derived from	Software tool		Operational da	ata	In situ	measurements
	Simple Calculations	Х	Empirical/Liter	rature	Other	(specify)
Details	Calculate the investmen gross floor area as follow	nt cos vs: Int	sts (normalised) for vestment costs (nor	r the buildin $(malised) = \frac{1}{F}$	gs of the ne Investment Reference flo	ighbourhood based on <u>costs</u> ior area
Areas covered	Main focus on neighbou	rhoo	d scale.			
Barriers	-					
Rating	The reference values for results of WP5 - Innovat (http://newtrend-project A collection of current b following. Five cases of thermal ret The median retrofit case Curtin surveys building r €8,000 approx. per dwe The project called SERVI between 2007 – 2011 w SERVE project indicate a The experimental Retrof per deep retrofit of 150, "supplied and fitted" co Examples are insulation, and photovoltaics (PV). recommendations to ret	the I ive fin enchi crofits cost etrof lling it for 000 (Chis r duce o	NewTREND indicator nancial instruments). marks in different p s to German dwellin s 122 €/m² . The five its, referring to an I in 2012. tainable Energy for -funded by the EU C nalised investment the Future (RfF) pri GBP , that includes d ndividual RfF measu low replacement, m etrofit cost analysis costs for a scaled re	or will be dete and business rojects and c ags are analys e retrofit case rish deep ret the Rural Vil CONCERTO Pic cost of 50.3 (ogramme in lesign and me ures, normali nechanical ve includes a co trofit.	ermined takir s models of t ountries can sed by Galvin es range in co rofit project o lage Environr rogramme. Fu E/m ² . Britain has a ponitoring. De sed by area, intilation and ost planning t	ng into account the he project be found in the and Sunikka-Blank. ost from 36 - 314 €/m² . of "average" cost ment), carried out urther figures on the high maximum cost tails of the average are available online. I heat recovery (MVHR) tool and
References	[1], [2], [3], [4], [5], [6],	7]				
SCALE						
Application	Applicable to the small (build	ing) or large (neight	oourhood) sc	ale.	
Details Multiscale	The investment costs (n example: single or multi specified scale.	ormal ple bi	s that of the heighb lised) is applicable a uildings or a block o	across all or p of multiple un	part of the pro its. All inputs	oposed retrofit. For s must match the
References	[1], [2], [3], [4], [5], [6],	7]				



REFERENCES	
[1]	Preservation Green Lab. (2011). The Greenest Building: Quantifying the Environmental Value of Building Reuse. Available: http://www.preservationnation.org/information-center/sustainable-communities/green- lab/lca/The_Greenest_Building_lowres.pdf
[2]	C. Reinhart. (2014). Managing Building Energy Efficiency at the Neighborhood/Campus Level. Available: http://mitei.mit.edu/system/files/2014-MITEI-Reinhart-Managing-Building-Energy-Efficiency-at-the- Neighborhood-Campus.pdf
[3]	R. Galvin and M. Sunikka-Blank, "Including fuel price elasticity of demand in net present value and payback time calculations of thermal retrofits: Case study of German dwellings," Energy and Buildings, vol. 50, pp. 219-228, 2012.
[4]	J. Curtin. (2013). From Grants to Finance: How to Unlock Home Retrofit Investment. Available: http://www.publicpolicy.ie/wp-content/uploads/From-Grants-to-Finance1.pdf
[5]	S. Hoyne and P. Kenny, "SERVING the nation – applying lessons from the SERVE CONCERTO project to Ireland," in European Council for Energy Efficient Council, Belambra Les Criques, Toulon/Hyères, France, 2013.
[6]	R. Gupta, M. Gregg, S. Passmore, and G. Stevens, "Intent and outcomes from the Retrofit for the Future programme: key lessons," Building Research and Information, vol. 43, pp. 435-451, Jul 2015.
[7]	I. Meikle. (2014). Retrofit for the Future: analysis of cost data. Available: http://retrofit.innovateuk.org/documents/1524978/1866952/Retrofit for the Future - analysis of cost data report 2014



	Return on Investment (%)					
ECO.IC.05	ISSUE	C/	ATEGORY	LE	VEL	SCALE
	Economic	Inve	stment Costs		S	B/ N
GENERAL						
Description	The audience for risk r investment (ROI) is the meaningful indicator for retrofits. A desirable ROI depen or value oriented) and of study (n) in years. The indicator is the more refurbishment as it sho owner and the user of the energy use costs a represent the marketin Generally there is no us the NewTREND calculat for the calculation. The value of future inco savings is needed for t Ireland (SCSI) describe One calculation is the for recurring costs, that ar In NewTREND the stude present value. With th to the retrofit costs an The equations discussed	eturn ra e most i or this f ds on th the tim ost bene ows the the bui re usual ng value niversa ations u ome or he Rol o s differe modifie nually ly perior e UPV* d a ROI ed for th	atios are investors, mportant of the re- inancial audience, a ne investor attitude he horizon (short, m eficial for the devel- return of investme lding and neighbou lly not financed by e and environmenta I standard for ROI. ise the annual ener- savings is affected calculations. A puble ent present value c d uniform present increase at a consta d is post retrofit an factor the present is computable. nis ROI do not measure	fund manag turn ratios. T and make th towards risl hedium, long oper and the ent from an e the same pe al benefits of gy savings, L by time. The ication by th alculations. value (UPV* ant escalation d associated value of ener-	ers and their The objective e case for inv k, their invest g-term). Time e financial par- energy use po- t the same the energy use po- t the same the f the refurbish JPV factor and us the presen- the Society of C). UPV* conve- on rate (e). d energy savings o- al depreciation	agents. Return on is to compute a restment in building ment strategy (growth horizon is the period rtners of the bint of view. When the e investment costs and indicator can hment. d the investment costs t value (PV) of future Chartered Surveyors erts to present value ngs are converted to ver time is comparable n or residual value.
Deckersund						
Background	[1] [2] [3] [4] [5] [6]					
IEVEL	[1], [2], [3], [4], [3], [0]					
	Software tool		Operational da	ata	In situ	measurements
Derived from	Simple Calculation	s X	Empirical/Liter	ature	Other	(specify)
Details	Calculation method: 1. Calculate the modified uniform present value (UPV*) with the following equation. $UPV^* factor = \frac{1 - \left[\frac{1+e}{1+d}\right]^n}{\left[\frac{1+d}{1+e}\right] - 1}$ The UPV* equation depends on inputs: discount rate (d), escalation (e) and study period (n) is years. Any degradation in energy efficiency or improvements health and comfort are not accounted for.		ollowing equation. and study period (n) in and comfort are not			
	The retrofits discussed least 50 years. Galvin a of payback periods of a The ROI period of stud Information/Attribut Discount rate (d) Escalation rate of end Number of years for	I by Coy & Sunik over 10 y must te ergy cos study (r he total	yle, Audenaert and ka-Blank do not sp 0 years. naturally be shorte sts (e) 1)	Reinhart as: ecify a build r than the b Coyle 4% (109 4% (159 30 (100	sume a futuro ing lifespan, l uilding lifespa % max.) % max)) max) zed) form the	e building lifespan of at but calculate a minority an. Audenaert et al Not Applied 0 – 25% 20
	2. Determine t costs". 3. Determine t with the calc	he Deli	vered energy _{original}	and the De	livered energ	gy _{retrofitted} in accordance



	4. Determine the annual energy savings in financial terms:				
	Yearly savings in delivered energy $[\in] = Delivered energy_{original} - Delivered energy_{retrofitted}$				
	5. Calculate the Return of Investment with the following formula:				
	investment Term ROI (%) = $\left[\frac{annual energy saving \times UPV^* factor}{investment cost} - 1\right] \times 100$				
	An ROI of a negative percentage is caused by the PV of annual energy savings over the period of study, not exceeding the initial retrofit costs.				
Areas covered	Main focus on neighbourhood scale.				
Barriers	-				
Rating	The reference values for the NewTREND KPI will be determined taking into account the results of WP5 - Innovative financial instruments and business models of the project (http://newtrend-project.eu/). The indicator in Premium mode is based on the same principles like the basic mode. However, the data source for the operational energy demand is not the simulated data but a user entered value. Based on this data the same calculation as in basic mode will be performed in order to calculate the indicator in premium mode.				
References	[1], [2], [3], [4], [5], [6]				
SCALE					
Application	Applicable to the small (building) or large (neighbourhood) scale.				
Details	The "Scale" characterization is that of the neighbourhood.				
Multiscale	The return in investment indicator is applicable across all or part of the proposed retrofit. For example: single or multiple buildings or a block of multiple units. All inputs must match the specified scale.				
References	[1], [2], [3], [4], [5], [6]				

REFERENCES	
[1]	C. Lowe and A. Ponce. (2009). UNEP - FI / SBCI's Financial & Sustainability Metrics Report. Available:
	http://www.unepfi.org/fileadmin/documents/metrics_report_01.pdf
[2]	D. Kehily. (2011). Life Cycle Cost Guidance Notes. Available:
r_1	http://arrow.dit.ie/cgi/viewcontent.cgi?article=1002&context=beschrecrep
[3]	D. Coyle. (2015). A Life Cycle Cost Analysis of an Irish Dwelling Retrofitted to Passive House Standard: Can
[-]	Passive House Become a Cost-Optimal Low-Energy Retrofit Standard? Available:
	http://www.dit.ie/media/built/documents/architecture/springboard2015/nZEB15 Session 2 05 Daniel
	Coyle.pdf
[4]	A. Audenaert, S. H. De Cleyn, and B. Vankerckhove, "Economic analysis of passive houses and low-energy
[·]	houses compared with standard houses," Energy Policy, vol. 36, pp. 47-55, 1// 2008.
[5]	C. Reinhart, "Managing Building Energy Efficiency at the Neighborhood/Campus Level," ed, 2014.
[6]	R. Galvin and M. Sunikka-Blank, "Including fuel price elasticity of demand in net present value and payback
[0]	time calculations of thermal retrofits: Case study of German dwellings," Energy and Buildings, vol. 50, pp.
	219228, 2012.



A.10 – Open House Assessment Guidelines (AG)



Open House

Open House Assessment Guidelines (AG) Version 1.2 New office Buildings – July 2013 http://www.openhouse-fp7.eu/



The overall objective of OPEN HOUSE was to develop and to implement a common European transparent building assessment methodology, complementing the existing ones, for planning and constructing sustainable buildings by means of an open approach and technical platform. The method is based on existing standards (CEN/TC 350 and ISO TC59/SC17), the EPBD Directive and its national transpositions and methodologies for assessing building sustainability at international, European and national level. The core assumption of the approach is that for any assessment methodology to become the mainstream and to reach the "label" level, it needs to be developed in a transparent, collective way. Therefore EU wide discussion towards a common approach produced an EU wide assessment methodology for sustainable buildings contributing to current activities on standardisation of assessment methodologies at European level and also to a potential European standard. The OPEN HOUSE European Project was established under the framework of a FP7 R&D programme by a European consortium of 19 partners from research institutions, the building industry and the political sector. The project was active from February 2010 to July 2013, with the overall objective of merging existing methodologies for sustainability assessment of buildings towards a common methodology.



INDICATORS

	Global Warm	ning P	otential, GW	'P (kg CC	02 equiv.	./m²)	
	ISSUE	C	ATEGORY	LE	/EL	SCALE	
(1.1)	Environmental		Impacts		5	В	
GENERAL							
Description	The Global Warming Potential is a substance's potential contribution to the global warming of near-ground air layers, also named greenhouse effect. It is specified as the GWP value in relation to the global warming potential of carbon dioxide (CO2). For evaluation, GWP100 is used, meaning the averaged contribution of a material to the greenhouse effect over one hundred years. For the building assessment, CO2-equivalents per area and year are calculated for the life cycle of the building (construction and operation). The lower the CO2-equivalent result is, the lower is the potential influence on global warming and the related impacts on the environment. This indicator, aiming at the reduction of buildings' global warming performance, highly contributes to the						
Background	Core Indicator a	dapted	from: DGNB/BN	В			
References	[1], [2], [3], [4], [5], [6],	[7], [8], [9], [10]				
LEVEL							
Derived from	Software tool		Operational da	ata	In situ	measurements	
Derived from	Simple Calculation	ons X	Empirical/Liter	ature	Other ((specify)	
	LCA results of th way and evaluat quantitative indi According to the Assessment gene study, inventory 1.1-1.5, 1.9 and definitions for ge	e buildi ed agai cator. standa erally co analysi 1.10 are bal and	ng to be assesse nst benchmarks. Irds EN ISO 1404 onsists of four st s, impact assess e based on LCAs scope and for th	d will be ca Thus Glob 0 and 1404 eps: Defini ment and i and for all e inventor	44, the met tion of goa nterpretat these indic y analysis o	h a standardized g Potential is a thod of Life-Cycle I and scope of the ion. The indicator cators the same do apply.	e ·s
Areas covered	When calculation When calculation calculation rules Global Warming Generally, the G by the building of GWPLC = GWPC + where GWPLC global wa GWPc building's building systems potential over th GWPo predicted building as const national implem NFA Net Floor At Based on the mo	g the gl must b Potent WP for onstruc GWPo rming p constru techno e time annual ructed, entatio rea of th dules a	obal warming po e followed: tial for "Designe the building life ction and of the f (1) botential of the li forction, maintena blogy as an avera reference study global warming derived from er n of EPBD direct he building.	otential for d Building cycle is cor GWP cause ife cycle of nce, disma ge annual period tair potential f nd energy o ive in [kg C	the buildir mposed of ed during o the entire ntling, and value of glanning n [kg CO2 eco for the ope demand ac CO2 equiv./(alue for co	ng, the following the GWP caused peration. building, disposal includin obal warming quiv./(m ² NFA *a)], ration of the cording to [m ² NFA *a)], nstruction GWPc	g
	calculated as fol	ows:					



Regional Development Fund
GWPc = (GWPMA + GWPMc) / td + GWPMB1,4 (2)
where
GWP _{MA} predicted value of global warming potential created during the
modules A1-48, including office building's manufacture (construction and
building systems technology) and transports to construction site in[kg CO ₂
equiv./(m² _{NFA})],
GWP _{MC} predicted value of global warming potential created during module C3
and C4 ₉ , the office building's end-of-life (design and building systems
technology) in [kg CO2 equiv./(m² _{NFA})],
GWP _{MB1,4} predicted value of global warming potential created during modules
B1 and B410 on a yearly basis, the office building's use and replacement
(construction and building systems technology) in[kg CO2 equiv./(m ² NFA *a)],
t_d time period for the reference study period for certification in [a]. This time
period is set at 50 years.
The average annual value for use GWPo generally consists of the GWP caused
by the building's electricity and heating demand during operation:
GWPo = GWPмв6, E + GWPмв6, H (3)
where
GWP _{MB6,E} global warming potential for module B6, electricity demand during
use, calculated with the national implementation of the EPBD directive,
multiplied by the GWP factor for electricity of the ESUCO database in [kg CO ₂
equiv./(m² _{NFA} *a)],
GWP _{MB6,H} global warming potential for module B7, heating demand during use,
calculated with the national implementation of the EPBD directive, multiplied
by the GWP factor of the specific energy sources in the ESUCO database in [kg
CO ₂ equiv./(m ² NFA *a)].
Rating Method
The "designed building" is rated against a case-specific reference building.
Global Warming Potential for Reference Building
R _{GWP} = GWP _{LCref} = GWP _{Cref} + GWP _{Oref} (4)
where
GWP _{LCref} reference value for the global warming potential of the life cycle of the
reference building,
GWPcref reference value for the average annual value of global warming
potential for the building's construction, maintenance, dismantling, and
disposal including building systems technology over the reference study period
t _d , calculated from an average office building in $[kg CO_2 equiv./(m^2_{NFA}*a)]_{11}$
GWPoref reference value for the annual global warming potential created by
building operations, derived from the reference value according to the national
implementation of the EPBD directive in [kg CO ₂ equiv./(m^2_{NFA} *a)].
The reference value for construction GWPcref is calculated as follows:
GWPcref = (GWPMAref + GWPMCref) / td + GWPMB1,4ref (5)
where
GWP _{MA ref} reference value for global warming potential created during the
modules A1-412, including office building's manufacture (construction and
building systems technology) and transports to construction site in kg CO ₂
equiv./(m ² _{NFA})],
GWP _{Mc ref} reference value for global warming potential created during module
C3 and C4 ₁₃ , the office building's end-of-life (design and building systems



	technology) in [kg CO2 equiv./(m ² NFA)],
	GWPMB1,4ref reference value for annual global warming potential created during
	modules B1 and B414 on a yearly basis, the office building's use and
	replacement (construction and building systems technology) in [kg CO ₂
	equiv./(m ² _{NFA} *a)]
	td reference study period in [a]. This time period is set to 50 years.
	The reference value for use GWPoref is calculated as follows
	GWPoref = GWPMB6,Eref + GWPMB6,Href (6)
	where
	GWP _{MB6,Eref} global warming potential for the national reference value for building's annual electricity demand (end energy) according to the national
	Implementation of the EPBD directive in [kg CO2 equiv./m=NFA * a],
	building's annual heating demand (end energy) according to the national
	Implementation of the EPBD directive in [kg $CO2$ equiv./III NFA 'a].
	For the GWP0ref reference values for the building s fielding and electricity
	directive in $[kWh/(m^2_{NFA} * a)]$ should be used as basis when possible.
	The reference values for GWP _{Gref} can be extracted from Table1 and Table2.
	These tables show reference values for both assessment types – "Quick and
	Basic" assessment and "Complete" assessment.
	Evaluation
	The evaluation consists of a simultaneous optimization of carbon equivalent for
	design and operation over the entire lifecycle.
Barriers	-
Ratina	Sub Indicator Weighting 4
References	References provided in the References Section Below
SCALE	
Application	The Indicator can be applied at the building scale but can also be applied at the
	neighbourhood scale for more buildings.
Details	-
Multiscale	It is possible to apply the indicator for the single building scale and also to a
	group of buildings of similar function.
References	References provided in the References Section Below
-	
DEFEDENCES	

REFERENCES	
[1]	ISO 14040: 2009-11: Environmental management – Life cycle assessment – Principles and framework. International Organization for Standardization.
[2]	ISO 14044: 2006-10: Environmental management – Life cycle assessment – Requirements and guidelines. International Organization for Standardization.
[3]	FprEN 15978: 2011: Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method. European Committee for Standardization CEN.
[4]	prEN 15804: 2010: Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction



	products. European Committee for Standardization CEN.
[5]	Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
[6]	Kreißig, J., Binder, M. (2007): Methodische Grundlagen- Ökobilanzbasierte Umweltindikatoren im Bauwesen. Methodenbericht zum BMVBS-Projekt "Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das nachhaltige Bauen" (AZ 10.06.03 – 06.119) Mai 2007, www.baufachinformation.de/literatur.isp.
[7]	United Nations (1998): Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1998, http://unfccc.int/resource/docs/convkp/kpeng.pdf.
[8]	Bundesministerium für Verkehr, Bau- und Wohnungswesen: Guideline for Sustainable Building. Eigenverlag, 2001.
[9]	Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
[10]	VDI 2067: Economic efficiency of building installations – Fundamentals and economic calculation. Verein Deutscher Ingenieure, 2000.



	Ozone Depletion Potential, ODP (kg R11 equiv./(m ²)			
EINV.IM.13	ISSUE	CATEGORY	LEVEL	SCALE
(1.2.)	Environmental	Impacts	S	В
GENERAL				
Description	Ozone, which is a significant impact and to release it, the ozone layer p therefore prever contributes to the radiation. The accumulation destruction of the animals can dever For the assessment (construction and eqivalents) per a The indicator ain thus preventing to It supports the E	only existent in low con t on life on earth. It is a irrespective of directic protects the earth from its the earth surface of e protection of man an n of R11-equivalents in e ozone layer. As a con elop tumors as well as t ent of the ozone deplet d operation), Trichlorof rea and year are used. hs at the reduction of b the environmental impu- uropean Commission ta	centration in the ati- ble to absorb short- on, with longer wave a large proportion of an excessive temper d flora against UV-A the atmosphere con- sequence, amongst he photosynthesis n ion potential of a bu- fluoromethane-equiv- uildings' Ozone Dep acts described above arget of phasing out	mosphere, has a wave UV-radiation length. In addition, of UV-radiation and rature rise and and UV-B htributes to the others, men and hay be disturbed. ilding life cycle valents (R11- letion Potential, e. of Ozone Depletion
Deckensund	Substances1.	lanted from DCND /DNI		
Buckground			5	
Rejerences	[1], [2], [3], [4], [5], [6], [7], [8], [9], [10]		
	Software tool	Operational d	ata In situ	
Derived from	Simple Calculatio	ons X Empirical/Liter	rature Other	(specify)
Details	The indicator is r LCA results of the way and evaluate quantitative india According to the Assessment gene study, inventory 1.1-1.5, 1.9, 1.10 same definitions	nainly based on the me e building to be assesse ed against benchmarks cator standards EN ISO 1404 erally consists of four st analysis, impact assess and 1.15 are based on for goal and scope and	thod of Life Cycle As d will be calculated Thus Ozone Deplet 0 and 14044, the me eps: Definition of go ment and interpreta LCAs and for all the for the inventory ar	ethod of Life-Cycle bal and scope of the se indicators bal and scope of the stion. The indicators se indicators the nalysis do apply.
Areas covered	Calculation When calculating calculation rules Ozone Depletion Generally, the Ol the building cons ODPLC = ODPC + O where ODPLC ozone dep ODPC building's of building systems potential over th ODPo predicted a	g the ozone depletion p must be followed: Potential for "Designe DP for the building life of truction and of the OD DDP o (1) letion potential of the l onstruction, maintenant technology as an avera- e time reference study annual ozone depletion	otential for the build ed Building" cycle is composed of P caused during ope ife cycle of the entir nce, dismantling, and ge annual value of c period tain [kg R11 e potential for the op	ding, the following f the ODP caused by gration. The building, d disposal including poone depletion equiv./ $(m^2_{NFA} * a)]$, the reation of the



building as constructed, derived from end energy demand according to
national implementation of EPBD directive in [kg R_{11} equiv./($m^2 NFA^*a$)],
NFA NEL FIOOF Area of the building. Based on the modules as defined in Figure 1, the value for construction ODPois
calculated as follows:
$ODP_{c} = (ODP_{MA} + ODP_{Mc}) / t_{d} + ODP_{MB1,4} (2)$
where
ODPMA predicted value of ozone depletion potential created during the
modules A1-44, including office building's manufacture (construction and
building systems technology) and transports to construction site in[kg R11
equiv./(m ² NFA)],
ODP _{Mc} predicted value of ozone depletion potential created during module C3
and C45, the office building s end-of-life (design and building systems technology) in [kg Recognity $/(m^2)$ [shows]]
ODP_{MP14} predicted value of ozone depletion potential created during modules
B1 and $B4_6$ on a yearly basis, the office building's use and replacement
(construction and building systems technology) in [kg R ₁₁ equiv./(m^2_{NFA} *a)].
td time period for the reference study period for certification in [a]. This time
period is set at 50 years.
The average annual value for use ODP_0 generally consists of the ODP caused by
the building's electricity and heating demand during operation:
ODPo = ODPмв6, E + ODPмв6, H (3)
Where ODDurge graphs deplotion not ontial for module R6, electricity demand during
Use, calculated with the national implementation of the EPBD directive
multiplied by the ODP factor for electricity of the ESUCO database in $[kg B_{11}]$
equiv./ $(m^2_{NFA}*a)$].
ODP _{MB6,H} ozone depletion potential for module B7, heating demand during use,
calculated with the national implementation of the EPBD directive, multiplied
by the ODP factor of the specific energy sources in the ESUCO database in [kg
R_{11} equiv./(m ² NFA *a)].
Rating Method
The "designed building" is rated against a case-specific reference building.
Ozone Depletion Potential for Reference Building
$R_{ODP} = ODP_{LCref} = ODP_{Cref} + ODP_{Oref} (4)$
where
ODPLcref reference value for the ozone depletion potential of the life cycle of
the reference building,
potential for the building's construction maintenance dismantling and
disposal including building systems technology over the reference study period
t _d . calculated from an average office building in [kg R ₁₁ equiv./(m^2_{NFa} *a)] ₇ .
ODPoref reference value for the annual ozone depletion potential created by
building operations, derived from the reference value according to the national
implementation of the EPBD directive in [kg R_{11} equiv./(m^2_{NFA} *a)].
The reference value for construction ODPcref is calculated as follows:
ODP _{Cref} = (ODP _{MAref} + ODP _{MCref}) / t _d + ODP _{MB1,4ref} (5)
where
UDPMA ref reference value for ozone depletion potential created during the
modules A1-48, including office building s manufacture (construction and


	building systems technology) and transports to construction site in [kg R11 equiv./(m ² NFA)].
	ODP _{MC ref} reference value for ozone depletion potential created during module C3 and C49, the office building's end-of-life (design and building systems
	technology) in [kg R11 equiv./(m²NFA)],
	ODP _{MB1,4ref} reference value for annual ozone depletion potential created during
	modules B1 and B410 on a yearly basis, the office building's use and
	replacement (construction and building systems technology) in [kg R ₁₁ equiv./(m ² _{NFA} *a)]
	td reference study period in [a]. This time period is set to 50 years.
	The reference value for use ODPoref is calculated as follows
	ODP _{Oref} = ODP _{MB6,Eref} + ODP _{MB6,Href} (6) where
	ODP _{MB6 Fref} ozone depletion potential for the national reference value for
	building's annual electricity demand (end energy) according to the national implementation of the EPBD directive in [kg R_{11} equiv./m ² NFA *a],
	ODP _{MB6,Href} ozone depletion potential for the national reference value for the
	building's annual heating demand (end energy) according to the national
	implementation of the EPBD directive in [kg R_{11} equiv./m ² NFA *a].
	For the ODPoref reference values for the building's heating and electricity
	demand (end energy) according to the national implementation of the EPBD
	directive in $[kWh/(m^2_{NFA}*a)]$ should be used as basis when possible.
	The reference values for ODP _{Cref} can be extracted from Table1 and Table2.
	These tables show reference values for both assessment types – "Quick and
	Basic" assessment and "Complete" assessment.
	Evaluation
	The evaluation consists of a simultaneous reduction of buildings' Ozone
	Depletion Potential for design and operation over the entire lifecycle.
Barriers	
Rating	Sub Indicator Weighting 4
References	Reterences provided in the Reterences Section Below.
SCALE	
Application	The Indicator can be applied at the building scale but can also be applied at the
	neighbourhood scale for more buildings.
Details	-
Multiscale	It is possible to apply the indicator for the single building scale and also to a
	group of buildings of similar function.
References	References provided in the References Section Below

REFERENCES	
[1]	ISO 14040: 2009-11: Environmental management – Life cycle assessment –
	Principles and framework. International Organization for Standardization.
[2]	ISO 14044: 2006-10: Environmental management – Life cycle assessment –
	Requirements and guidelines. International Organization for Standardization.
[3]	FprEN 15978: 2011: Sustainability of construction works — Assessment of
	environmental performance of buildings — Calculation method. European
	Committee for Standardization CEN.



[4]	prEN 15804: 2010: Sustainability of construction works — Environmental
	product declarations — Core rules for the product category of construction
	products. European Committee for Standardization CEN.
[5]	Directive 2009/28/EC of the European Parliament and of the Council of 23 April
	2009 on the promotion of the use of energy from renewable sources and
	amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
[6]	Kreißig, J., Binder, M. (2007): Methodische Grundlagen- Ökobilanzbasierte
	Umweltindikatoren im Bauwesen. Methodenbericht zum BMVBS-Projekt
	"Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das
	nachhaltige Bauen" (AZ 10.06.03 – 06.119) Mai 2007,
	www.baufachinformation.de/literatur.isp.
[7]	United Nations (1998): Kyoto Protocol to the United Nations Framework
	Convention on Climate Change, 1998,
	http://unfccc.int/resource/docs/convkp/kpeng.pdf.
[8]	Bundesministerium für Verkehr, Bau- und Wohnungswesen: Guideline for
	Sustainable Building. Eigenverlag, 2001.
[9]	Directive 2002/91/EC of the European Parliament and of the Council of 16
	December 2002 on the energy performance of buildings.
[10]	VDI 2067: Economic efficiency of building installations – Fundamentals and
	economic calculation. Verein Deutscher Ingenieure, 2000.



	Acidification Potential, AP (kg SO2 equiv./(m ²)					
(1, 2)	ISSUE	С	ATEGORY	LEV	EL	SCALE
(1.5)	Environmental		Impacts	S		В
GENERAL						
Description	Acidification is the increase of the hydrogen ion concentration in air, water and soil. Sulfur and nitrogen compounds from anthropogenic emissions react to sulfuric acid or nitric acid in the air, fall down as "acid rain" and cause damage to soil, water, organisms and buildings. In acidic soils nutrients decompose quickly and can easily be washed out. Furthermore, toxic cations may be released, which affect root systems and cause damage to the nutrient supply of organisms. Another possible effect is the disturbance of the water balance. All in all, the combination of acidification aspects contributes to forest decline. In addition, in surface water bodies with low chemical buffer capacity, fish decline occurs. Acid rain also affects historic buildings (e.g. sandstone). The environmental impacts described above are measured using the acidification potential, which is stated in SO ₂ -equivalents. Acidification causing emissions are e.g. SO ₂ , NO _x or H ₂ S. For the assessment of the Acidification Potential (AP) of a building life cycle (construction and operation), SO ₂ -eqivalents per area and year are used. The lower the AP value, the lower is the risk of acid rain and the related environmental damage. The indicator aims at the reduction of buildings' Acidification Potential, thus preventing the environmental impacts described above. This supports the European Commission target of emission reductions in the EU-25 of 82% for SO ₂ , and 60% for NO _x by 2020 compared to 1990s level ₁ . The objective is to reduce the threat to the natural environment from acidification					
	by 55%2.					
Background	Core indicator a	daj	oted from DO	SNB/BNB)	
References	[1], [2], [3], [4], [5], [6],	[7], [8], [9], [10].			
LEVEL			Γ			
Derived from	Software tool		Operational da	ata	In situ	measurements
(Check – X - as appropriate)	Simple Calculations	Х	Empirical/Liter	ature	Other	(specify)
Details	The indicator is mair LCA results of the bu- way and evaluated a quantitative indicato According to the star Assessment generall study, inventory and 1.1-1.5, 1.9, 1.10 and same definitions for	nly b nildi gain or. nda y co lysi d 1. goa	based on the me ng to be assesse nst benchmarks. rds EN ISO 1404 onsists of four st s, impact assess 15 are based on Il and scope and	thod of Life d will be ca Thus Acidif 0 and 14044 eps: Definit ment and in LCAs and fo for the inve	Cycle Ass lculated in fication Po 4, the me ion of goa iterpretat or all these entory and	sessment (LCA): in a standardized otential is a thod of Life-Cycle al and scope of the ion. The indicators e indicators the alysis do apply.
Areas covered	Calculation When calculating the calculation rules must Acidification Potent Generally, the AP for the building construct APLC = APC + APO (2)	e ac st b ial f r the ctio L)	idification poter e followed: for "Designed Bu e building life cy n and of the AP	ntial for the uilding" cle is compo caused duri	building, osed of th ng operat	the following he AP caused by tion.



where APLC acidification potential of the life cycle of the entire building, APC building's construction, maintenance, dismantling, and disposal including building systems technology as an average annual value of acidification potential over the time reference study period td in [kg SO ₂ equiv./(m^2_{NFA} *a)], APo predicted annual acidification potential for the operation of the building as constructed, derived from end energy demand according to national implementation of EPBD directive in [kg SO ₂ equiv./(m^2_{NFA} *a)], NFA Net Floor Area of the building. Based on the modules as defined in Figure 1, the value for construction APc is calculated as follows: APc = (APMA + APMc) / td + APMB1,4 (2) where
AP _{MA} predicted value of acidification potential created during the modules A1- 4 ₅ , including office building's manufacture (construction and building systems technology) and transports to construction site in[kg SO ₂ equiv./(m ² _{NFA})], AP _{MC} predicted value of acidification potential created during module C3 and C4 ₆ , the office building's end-of-life (design and building systems technology) in [kg SO ₂ equiv./(m ² _{NFA})].
AP _{MB1,4} predicted value of acidification potential created during modules B1 and B47 on a yearly basis, the office building's use and replacement (construction and building systems technology) in[kg SO ₂ equiv./(m^2_{NFA} *a)], t _d time period for the reference study period for certification in [a]. This time period is set at 50 years.
The average annual value for use APo generally consists of the AP caused by the building's electricity and heating demand during operation: APO = APMB6,E + APMB6,H (3) where
AP _{MB6,E} acidification potential for module B6, electricity demand during use, calculated with the national implementation of the EPBD directive, multiplied by the AP factor for electricity of the ESUCO database in [kg SO ₂ equiv./(m^2_{NFA} *a)].
AP _{MB6,H} acidification potential for module B7, heating demand during use, calculated with the national implementation of the EPBD directive, multiplied by the AP factor of the specific energy sources in the ESUCO database in [kg SO_2 equiv./(m^2_{NFA} *a)]
Rating Method The "designed building" is rated against a case-specific reference building. Acidification Potential for Reference Building RAP = APLCref = APCref + APOref (4) where
AP _{LCref} reference value for the acidification potential of the life cycle of the reference building, AP _{Cref} reference value for the average annual value of acidification potential for the building's construction maintenance disconting and dis
building s construction, maintenance, dismantling, and disposal including building systems technology over the reference study period t _d , calculated from an average office building in [kg SO ₂ equiv./(m^2_{NFa} *a)] ₈ APoref reference value for the annual acidification potential created by building
operations, derived from the reference value according to the national



	implementation of the EDBD directive in $[kg SO_{2} aguiy //m^{2} + s_{2}]$
	Implementation of the EPBD directive in [kg SO2 equiv./(m ⁻ NFA ⁺ a)].
	The reference value for construction APcrefits calculated as follows:
	APCref = (APMAref + APMCref) / td + APMB1,4ref (5)
	Where ADue preference value for acidification notantial created during the modules
	APMA, refreierence value for acidincation potential created during the modules
	A1-49, including office building's manufacture (construction and building
	systems technology) and transports to construction site in[kg SO2 equiv./(m=NFA
)], AD
	APMC, ref reference value for acidification potential created during module C3
	and C410, the office building s end-of-life (design and building systems technology) in $[lig SO - aguin (lim2) = 1]$
	(eciliology) III [kg 502 equiv./(III NFA)],
	modulos P1 and P4on a yearly basis, the office building's use and
	replacement (construction and huilding systems technology) in [kg COs
	replacement (construction and building systems technology) in [kg 30^2
	equiv./(III NFA 'd)]
	the reference value for use ABe, ris calculated as follows
	$\Delta \mathbf{P}_{oref} = \Delta \mathbf{P}_{oref} + \Delta \mathbf{P}_{oref} + (6)$
	AFOrer - AFMB6,Erer + AFMB6,Href (0)
	APMonstration potential for the national reference value for building's
	annual electricity demand (end energy) according to the national
	implementation of the EPBD directive in $[kg SO_2 equiv /m^2_{NEA} *a]$
	ΔP_{MRG} Heref acidification potential for the national reference value for the
	huilding's annual heating demand (end energy) according to the national
	implementation of the EPBD directive in $[kg SO_2 equiv /m^2_{NEA} *a]$
	For the AP _{0ref} reference values for the building's heating and electricity demand
	(end energy) according to the national implementation of the EPBD directive in
	$[kWh/(m^2_{NEA}*a)]$ should be used as basis when possible
	The reference values for APcref can be extracted from Table1 and Table2. These
	tables show reference values for both assessment types – "Quick and Basic"
	assessment and "Complete" assessment.
	Evaluation
	The evaluation consists of a simultaneous reduction of buildings' Acidification
	Potential for design and operation over the entire lifecycle.
Barriers	-
Rating	Sub Indicator Weighting 4
References	References provided in the References Section Below.
SCALE	The indicator can be applied at the building cashs but are also be explicitly the
Application	The indicator can be applied at the building scale but can also be applied at the
Deteile	neignbournood scale for more buildings.
	-
iviuitiscale	it is possible to apply the indicator for the single building scale and also to a
Deferences	Beforences provided in the Deferences Section Delaw
Rejerences	
DEEEDENICES	
ILFLILENCES	

S



[1]	ISO 14040: 2009-11: Environmental management – Life cycle assessment – Principles and framework. International Organization for Standardization.
[2]	ISO 14044: 2006-10: Environmental management – Life cycle assessment – Requirements and guidelines. International Organization for Standardization.
[3]	FprEN 15978: 2011: Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method. European Committee for Standardization CEN.
[4]	prEN 15804: 2010: Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products. European Committee for Standardization CEN.
[5]	Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
[6]	Kreißig, J., Binder, M. (2007): Methodische Grundlagen- Ökobilanzbasierte Umweltindikatoren im Bauwesen. Methodenbericht zum BMVBS-Projekt "Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das nachhaltige Bauen" (AZ 10.06.03 – 06.119) Mai 2007, www.baufachinformation.de/literatur.isp.
[7]	United Nations (1998): Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1998, http://unfccc.int/resource/docs/convkp/kpeng.pdf.
[8]	Bundesministerium für Verkehr, Bau- und Wohnungswesen: Guideline for Sustainable Building. Eigenverlag, 2001.
[9]	Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
[10]	VDI 2067: Economic efficiency of building installations – Fundamentals and economic calculation. Verein Deutscher Ingenieure, 2000.



	Eutrophication Potential, EP (kg PO4 equiv./(m ²)				
(1.4)	ISSUE	CATEGORY	LEVEL	SCALE	
(1.4)	Environmental	Impacts	S	В	
GENERAL					
	nutrient-poor to a r especially phosphor the manufacturing of emissions into the e manifests e.g. in wa again may cause fis For the assessment (construction and o lower the PO ₄ -eqiva effects on men and The indicator aims a preventing the envi This supports the Eu EU-25 of 27% for Ar compared to 1990s environment from e	and opinication, is the patrient-rich state. The and nitrogen compo- of building products, environment. The res- ter in the form of ar h decline. of the Eutrophicatio peration), PO4 equiv- ilent value, the lowe the environment. at the reduction of b ronmental impacts of uropean Commission nmonia NH3 (respon level1. The objective eutrophication by 55	his is caused by ounds. The nut but mainly fro sulting changes increased alga on Potential (EP alents per area r is the potenti uildings` Eutrop described above n target of emis sible for eutrop e is to reduce th %2	y supply of nutrients, rients can emerge from m the wash-out of in the nutrient supply ae appearance, which f) of a building life cycle and year are used. The al of negative side phication Potential, thus e. ssion reductions in the phication) by 2020 he threat to the natural	
Background	Core Indicator a	adapted from D	GNB/BNB.		
References	[1], [2], [3], [4], [5],	[6], [7], [8], [9], [10],			
LEVEL					
Denis end franse	Software tool	Operational da	ata I	n situ measurements	
Derived from	Simple Calculations	X Empirical/Liter	rature (Other (specify)	
Details	The indicator is mai LCA results of the b way and evaluated quantitative indicat According to the sta Assessment genera study, inventory and 1.1-1.5, 1.9 and 1.10 definitions for goal	nly based on the me uilding to be assesse against benchmarks. or. andards EN ISO 1404 Ily consists of four st alysis, impact assess D are based on LCAs and scope and for th	thod of Life Cy d will be calcul Thus Eutrophi 0 and 14044, th eps: Definition ment and inter and for all thes in inventory an	cle Assessment (LCA): ated in a standardized cation Potential is a he method of Life-Cycle of goal and scope of the pretation. The indicators se indicators the same alysis do apply.	
Areas covered	Calculation the following calcul Eutrophication Pote Generally, the EP for building construction EPLC = EPC + EPO (1 where EPLC eutrophication EPc building's constru- building systems ter potential over the t EPo predicted annua as constructed, deri	ation rules must be f ential for "Designed r the building life cyon on and of the EP cause) potential of the life ruction, maintenance chnology as an avera ime reference study al eutrophication pot yed from end energy	Followed: Building" cle is composed sed during oper cycle of the ent e, dismantling, ge annual valu period tain [kg tential for the c	d of the EP caused by the ration. tire building, and disposal including te of eutrophication $pO_4 = quiv./(m^2_{NFA} *a)],$ operation of the building ording to national	



implementation of EPBD directive in [kg PO4 equiv./(m ² NFA *a)],
NFA Net Floor Area of the building.
Based on the modules as defined in Figure 1, the value for construction EPc is
calculated as follows: $ED_{a} = (ED_{a} + ED_{a})/(1 + ED_{a} + (2))$
EPC = (EPMA + EPMC) / Ld + EPMB1,4 (2) where
EP _{MA} predicted value of eutrophication potential created during the modules A1-4 ₅ , including office building's manufacture (construction and building systems technology) and transports to construction site in [kg PO ₄ equiv./(m ² _{NFA}
)],
EP _{Mc} predicted value of eutrophication potential created during module C3 and C4 ₆ , the office building's end-of-life (design and building systems technology) in [kg PO4 equiv./(m^2_{NFA}]].
$EP_{MB1,4}$ predicted value of eutrophication potential created during modules B1 and B47 on a yearly basis, the office building's use and replacement (construction and building systems technology) in [kg PO ₄ equiv./(m ² _{NFA} *a)],
ta time period for the reference study period for certification in [a]. This time
The average annual value for use EPo generally consists of the EP caused by the building's electricity and heating demand during operation: EPO = EPMB6,E + EPMB6,H (3)
where
$EP_{MB6,E}$ eutrophication potential for module B6, electricity demand during use, calculated with the national implementation of the EPBD directive, multiplied by the EP factor for electricity of the ESUCO database in [kg PO ₄ equiv./(m ² NFA * a)]
EP _{MB6,H} eutrophication potential for module B7, heating demand during use, calculated with the national implementation of the EPBD directive, multiplied by the EP factor of the specific energy sources in the ESUCO database in [kg PO_4 equiv./(m^2_{NFA} *a)].
Rating Method
The "designed building" is rated against a case-specific reference building. Eutrophication Potential for Reference Building REP = EPLCref = EPCref + EPoref (4) where
EPLCref reference value for the eutrophication potential of the life cycle of the reference building
EP _{cref} reference value for the average annual value of eutrophication potential for the building's construction, maintenance, dismantling, and disposal including building systems technology over the reference study period td, calculated from an average office building in [kg PO ₄ equiv./(m ² _{NFA} *a)] ₈ , EP _{cref} reference value for the annual eutrophication potential created by
building operations, derived from the reference value according to the national implementation of the EPBD directive in [kg PO ₄ equiv./($m^2_{NFA}*a$)]. The reference value for construction EPcref is calculated as follows: EPcref = (EPMAref + EPMCref) / td + EPMB1,4ref (5) where
EP _{MA ref} reference value for eutrophication potential created during the modules A1-4 ₉ , including office building's manufacture (construction and



	building systems technology) and transports to construction site in[kg PO4 equiv./(m ² NFA)].
	EPMC ref reference value for eutrophication potential created during module C3 and C410, the office building's end-of-life (design and building systems technology) in [kg PO4 equiv./(m^2_{NFA})],
	EPMB1,4ref reference value for annual eutrophication potential created during
	modules B1 and B411 on a yearly basis, the office building's use and replacement (construction and building systems technology) in [kg PO4
	equiv./(m ² _{NFA} *a)]
	to reference study period in [a]. This time period is set to 50 years. The reference value for use EPorefis calculated as follows
	EPoref = EPMB6,Eref + EPMB6,Href (6)
	EP _{MB6,Eref} eutrophication potential for the national reference value for building's annual electricity demand (end energy) according to the national implementation of the EPBD directive in [kg PO ₄ equiv./m ² _{NFA} *a], EP _{MB6,Href} eutrophication potential for the national reference value for the building's annual heating demand (end energy) according to the national implementation of the EPBD directive in [kg PO ₄ equiv./m ² _{NFA} *a]. For the EPoref reference values for the building's heating and electricity demand (end energy) according to the national implementation of the EPBD directive in [kWh/(m ² _{NFA} *a)] should be used as basis when possible.
	The reference values for EP _{Cref} can be extracted from Table1 and Table2. These tables show reference values for both assessment types – "Quick and Basic" assessment and "Complete" assessment.
	Evaluation
	The evaluation consists of a simultaneous reduction of buildings'
	Eutrophication Potential for design and operation over the entire lifecycle.
Barriers	-
Rating	Sub Indicator Weighting 4
References	References provided in the References Section Below.
SCALE	
Application	The Indicator can be applied at the building scale but can also be applied at the
	neighbourhood scale for more buildings.
Details	-
Multiscale	It is possible to apply the indicator for the single building scale and also to a
	group of buildings of similar function.
References	References provided in the References Section Below

REFERENCES	
[1]	ISO 14040: 2009-11: Environmental management – Life cycle assessment – Principles and framework. International Organization for Standardization.
[2]	ISO 14044: 2006-10: Environmental management – Life cycle assessment – Requirements and guidelines. International Organization for Standardization.
[3]	FprEN 15978: 2011: Sustainability of construction works — Assessment of



	environmental performance of buildings — Calculation method. European Committee for Standardization CEN.
[4]	prEN 15804: 2010: Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products. European Committee for Standardization CEN.
[5]	Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
[6]	Kreißig, J., Binder, M. (2007): Methodische Grundlagen- Ökobilanzbasierte Umweltindikatoren im Bauwesen. Methodenbericht zum BMVBS-Projekt "Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das nachhaltige Bauen" (AZ 10.06.03 – 06.119) Mai 2007, www.baufachinformation.de/literatur.isp.
[7]	United Nations (1998): Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1998, http://unfccc.int/resource/docs/convkp/kpeng.pdf.
[8]	Bundesministerium für Verkehr, Bau- und Wohnungswesen: Guideline for Sustainable Building. Eigenverlag, 2001.
[9]	Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
[10]	VDI 2067: Economic efficiency of building installations – Fundamentals and economic calculation. Verein Deutscher Ingenieure, 2000.



Photochemical Ozone Creation Potential, POCP (kg C2H4								
equiv./(m²)								
ISSUE	CA	TEGORY	LE	VEL		SCALE		
Environmental		mpacts		S		В		
Radiation from the sun and the presence of nitrogen oxides and hydrocarbons incur different chemical reactions, producing aggressive reaction products, one of which is ozone. Such near-ground ozone also known as summer smog is suspected to damage								
A substance's contribution is indicated relatively to the Photochemical Ozone Creation Potential of C ₂ H ₄ .								
Core Indicator ada	apted fr	om DGNB/BNE	3					
[1], [2], [3], [4], [5]], [6], [7	7], [8], [9], [10].						
Software tool		Operational da	ata		In situ me	asurements		
Simple Calculation	ns X	Empirical/Liter	rature	-	Other (spe	ecify)		
The indicator is mainly based on the method of Life Cycle Assessment (LCA): LCA results of the building to be assessed will be calculated in a standardized way and evaluated against benchmarks. Thus Photochemical Ozone Creation Potential is a quantitative indicator. According to the standards EN ISO 14040 and 14044, the method of Life-Cycle Assessment generally consists of four steps: Definition of goal and scope of the study, inventory analysis, impact assessment and interpretation. The indicators 1.1-1.5, 1.9 and 1.10 are based on LCAs and for all these indicators the same definitions for goal and scope and for the inventory analysis do apply.							e he ors	
The following calc Photochemical Oz Generally, the POO by the building co POCPLC = POCPc+ where POCPLC photochem building, POCPc building's c including building photochemical oze td in [kg C2H4 equiv POCPo predicted a operation of the b according to natio equiv./(m ² NFA *a)], NFA Net Floor Are Based on the mod is calculated as fol POCPc = (POCPMA	culation zone Cr CP for t nstruct POCPo nical oz construct system one cre v./(m ² NF annual p puilding ponal imp a of the lules as llows: + POCP	rules must be eation Potenti he building life ion and of the l (1) one creation po- ction, maintena is technology a ration potential (A *a)], bhotochemical as constructed olementation o e building. defined in Figu MC) / ta + POCP	followed: al for "De cycle is co POCP caus otential of nce, dism s an avera l over the ozone cre l, derived f EPBD dir ure 1, the v	signe omposed d f the antli ge an time atior from rectiv	ed Building osed of the luring ope life cycle of ng, and di nnual valu reference n potentia end ener ve in [kg C2 e for const	g" e POCP cause ration. of the entire sposal e of e study period l for the gy demand eH4	ed d	
	Photochemica equiv./(m ²) ISSUE Environmental Radiation from the incur different che of which is ozone. Such near-ground vegetation and ma A substance's con Creation Potentia Core Indicator ada [1], [2], [3], [4], [5] Software tool Simple Calculation The indicator is m LCA results of the way and evaluate Potential is a quar According to the s Assessment gener study, inventory a 1.1-1.5, 1.9 and 1. definitions for goa Calculation The following calcu Photochemical O Generally, the PO by the building co POCPLC photocher building, POCPc building's co including building photochemical oz td in [kg C2H4 equiv POCPo predicted a operation of the b according to natic equiv./(m ² NFA *a)]. NFA Net Floor Are Based on the mod is calculated as fo POCPc = (POCPMA	Photochemical Ozoequiv./(m²)ISSUECAEnvironmentalIRadiation from the sun at incur different chemical ro of which is ozone.Such near-ground ozonevegetation and material.A substance's contributionCore Indicator adapted fr[1], [2], [3], [4], [5], [6], [7]Software toolSoftware toolSoftware toolSimple CalculationsNPotential is a quantitativeAccording to the standardAssessment generally cording to the standardAccording to the standardAssessment generally cording to the standardAccording to the standardPOCPLc POCPLc POCPc for tby the building systemphotochemical ozone creding to national imp </td <td>Photochemical Ozone Creation equiv./(m²)ISSUECATEGORYEnvironmentalImpactsRadiation from the sun and the presence incur different chemical reactions, prod of which is ozone.Such near-ground ozone also known as vegetation and material. High concentra A substance's contribution is indicated of Creation Potential of C2H4.Core Indicator adapted from DGNB/BNE [1], [2], [3], [4], [5], [6], [7], [8], [9], [10].Software toolOperational da Simple CalculationsXEmpirical/LiterThe indicator is mainly based on the me LCA results of the building to be assesse way and evaluated against benchmarks. Potential is a quantitative indicator.According to the standards EN ISO 1404 Assessment generally consists of four st study, inventory analysis, impact assess 1.1-1.5, 1.9 and 1.10 are based on LCAs definitions for goal and scope and for the Potochemical Ozone Creation Potentii Generally, the POCP for the building life by the building construction and of the D POCPLc = POCPc + POCPo (1) where POCPc building's construction, maintena including building systems technology a photochemical ozone creation potential id in [kg C2H4 equiv./(m²NFA *a)], POCPo predicted annual photochemical operation of the building as constructed according to national implementation o equiv./(m²NFA *a)], NFA Net Floor Area of the building. Based on the modules as defined in Figure is calculated sciollaws: POCPc c (POCPMA + POCPMC) / td + POCP</td> <td>Photochemical Ozone Creation Potent equiv./(m²)ISSUECATEGORYLEImpactsRadiation from the sun and the presence of nitrog incur different chemical reactions, producing aggreed of which is ozone.Such near-ground ozone also known as summer s vegetation and material. High concentrations of or A substance's contribution is indicated relatively to Creation Potential of C2H4.Core Indicator adapted from DGNB/BNB[1], [2], [3], [4], [5], [6], [7], [8], [9], [10].Software toolOperational dataSimple CalculationsXEmpirical/LiteratureThe indicator is mainly based on the method of LiLCA results of the building to be assessed will be or way and evaluated against benchmarks. Thus Pho Potential is a quantitative indicator.According to the standards EN ISO 14040 and 1400 Assessment generally consists of four steps: Defini study, inventory analysis, impact assessment and 1.1-1.5, 1.9 and 1.10 are based on LCAs and for al definitions for goal and scope and for the inventorCalculationThe following calculation rules must be followed: Photochemical Ozone Creation Potential for "De Generally, the POCP for the building life cycle is co by the building systems technology as an avera photochemical ozone creation potential or peration of the building. POCPic photochemical ozone creation potential or peration of the building. Based on the modules as defined in Figure 1, the tain [kg C2H4 equiv./(m²NFA *a)], POCPo predicted annual photochemical ozone cre</td> <td>Photochemical Ozone Creation Potential, equiv./(m²) ISSUE CATEGORY LEVEL Environmental Impacts S Radiation from the sun and the presence of nitrogen of incur different chemical reactions, producing aggressis of which is ozone. Such near-ground ozone also known as summer smog vegetation and material. High concentrations of ozone A substance's contribution is indicated relatively to the Creation Potential of C2H4. Core Indicator adapted from DGNB/BNB [1], [2], [3], [4], [5], [6], [7], [8], [9], [10]. Software tool Operational data Simple Calculations Software tool Operational data Simple Calculations X Empirical/Literature The indicator is mainly based on the method of Life CyLCA results of the building to be assessed will be calcut way and evaluated against benchmarks. Thus Photocher Potential is a quantitative indicator. According to the standards EN ISO 14040 and 14044, the Assessment generally consists of four steps: Definition study, inventory analysis, impact assessment and inter 1.1-1.5, 1.9 and 1.10 are based on LCAs and for all the definitions for goal and scope and for the inventory and the polyne polyne building construction and of the POCP caused of POCPic photochemical ozone c</td> <th>Photochemical Ozone Creation Potential, POCP (I equiv./(m²) ISSUE CATEGORY LEVEL Environmental Impacts 5 Radiation from the sun and the presence of nitrogen oxides and incur different chemical reactions, producing aggressive reaction of which is ozone. Such near-ground ozone also known as summer smog is suspect vegetation and material. High concentrations of ozone are toxic A substance's contribution is indicated relatively to the Photoch Creation Potential of C2H4. Core Indicator adapted from DGNB/BNB [1], [2], [3], [4], [5], [6], [7], [8], [9], [10]. Software tool Operational data In situ me Simple Calculations X Empirical/Literature Other (spi) The indicator is mainly based on the method of Life Cycle Assess LCA results of the building to be assessed will be calculated in a way and evaluated against benchmarks. Thus Photochemical OZ Potential is a quantitative indicator. According to the standards EN ISO 14040 and 14044, the method Assessment generally consists of four steps: Definition of goal at study, inventory analysis, impact assessment and interpretation 1.1-1.5, 1.9 and 1.10 are based on LCAs and for all these indicate definitions for goal and scope and for the inventory analysis do a study, inventory analysis, impact assessment and interpretation f. Photochemical ozone Creation Potential for "Designed Building including building systems technology as an average annual valu photochemical ozone creation potential of the life</th> <td>Photochemical Ozone Creation Potential, POCP (kg C2H4 equiv./(m²) ISSUE CATEGORY LEVEL SCALE Environmental Impacts S B Radiation from the sun and the presence of nitrogen oxides and hydrocarbor incur different chemical reactions, producing aggressive reaction products, o of which is ozone. B Such near-ground ozone also known as summer smog is suspected to damag vegetation and material. High concentrations of ozone are toxic to humans. I A substance's contribution is indicated relatively to the Photochemical Ozone Creation Potential of C2H4. Core Indicator adapted from DGNB/BNB [1], [2], [3], [4], [5], [6], [7], [8], [9], [10]. In situ measurements Simple Calculations X Empirical/Literature Other (specify) The indicator is mainly based on the method of Life Cycle Assessment (LCA): LCA results of the building to be assessed will be calculated in a standardized way and evaluated against benchmarks. Thus Photochemical Ozone Creation Potential is a quantitative indicator. According to the standards EN ISO 14040 and 14044, the method of Life-Cycl Assessment generally consists of four steps: Definition of goal and scope of ti study, inventory analysis, impact assessment and interpretation. The indicator 1.1-1.5, 1.9 and 1.10 are based on LCAs and for all these indicators the same definitions for goal and scope and for the inventory analysis do apply. Calculation The following calculation rules must be followed: Photochemical Ozone Creation Potential for "De</td>	Photochemical Ozone Creation equiv./(m²)ISSUECATEGORYEnvironmentalImpactsRadiation from the sun and the presence incur different chemical reactions, prod of which is ozone.Such near-ground ozone also known as vegetation and material. High concentra A substance's contribution is indicated of Creation Potential of C2H4.Core Indicator adapted from DGNB/BNE [1], [2], [3], [4], [5], [6], [7], [8], [9], [10].Software toolOperational da Simple CalculationsXEmpirical/LiterThe indicator is mainly based on the me LCA results of the building to be assesse way and evaluated against benchmarks. Potential is a quantitative indicator.According to the standards EN ISO 1404 Assessment generally consists of four st study, inventory analysis, impact assess 1.1-1.5, 1.9 and 1.10 are based on LCAs definitions for goal and scope and for the Potochemical Ozone Creation Potentii Generally, the POCP for the building life by the building construction and of the D POCPLc = POCPc + POCPo (1) where POCPc building's construction, maintena including building systems technology a photochemical ozone creation potential id in [kg C2H4 equiv./(m ² NFA *a)], POCPo predicted annual photochemical operation of the building as constructed according to national implementation o equiv./(m ² NFA *a)], NFA Net Floor Area of the building. Based on the modules as defined in Figure is calculated sciollaws: POCPc c (POCPMA + POCPMC) / td + POCP	Photochemical Ozone Creation Potent equiv./(m²)ISSUECATEGORYLEImpactsRadiation from the sun and the presence of nitrog incur different chemical reactions, producing aggreed of which is ozone.Such near-ground ozone also known as summer s vegetation and material. High concentrations of or A substance's contribution is indicated relatively to Creation Potential of C2H4.Core Indicator adapted from DGNB/BNB[1], [2], [3], [4], [5], [6], [7], [8], [9], [10].Software toolOperational dataSimple CalculationsXEmpirical/LiteratureThe indicator is mainly based on the method of LiLCA results of the building to be assessed will be or way and evaluated against benchmarks. Thus Pho Potential is a quantitative indicator.According to the standards EN ISO 14040 and 1400 Assessment generally consists of four steps: Defini study, inventory analysis, impact assessment and 1.1-1.5, 1.9 and 1.10 are based on LCAs and for al definitions for goal and scope and for the inventorCalculationThe following calculation rules must be followed: Photochemical Ozone Creation Potential for "De Generally, the POCP for the building life cycle is co by the building systems technology as an avera photochemical ozone creation potential or peration of the building. POCPic photochemical ozone creation potential or peration of the building. Based on the modules as defined in Figure 1, the tain [kg C2H4 equiv./(m ² NFA *a)], POCPo predicted annual photochemical ozone cre	Photochemical Ozone Creation Potential, equiv./(m²) ISSUE CATEGORY LEVEL Environmental Impacts S Radiation from the sun and the presence of nitrogen of incur different chemical reactions, producing aggressis of which is ozone. Such near-ground ozone also known as summer smog vegetation and material. High concentrations of ozone A substance's contribution is indicated relatively to the Creation Potential of C2H4. Core Indicator adapted from DGNB/BNB [1], [2], [3], [4], [5], [6], [7], [8], [9], [10]. Software tool Operational data Simple Calculations Software tool Operational data Simple Calculations X Empirical/Literature The indicator is mainly based on the method of Life CyLCA results of the building to be assessed will be calcut way and evaluated against benchmarks. Thus Photocher Potential is a quantitative indicator. According to the standards EN ISO 14040 and 14044, the Assessment generally consists of four steps: Definition study, inventory analysis, impact assessment and inter 1.1-1.5, 1.9 and 1.10 are based on LCAs and for all the definitions for goal and scope and for the inventory and the polyne polyne building construction and of the POCP caused of POCPic photochemical ozone c	Photochemical Ozone Creation Potential, POCP (I equiv./(m²) ISSUE CATEGORY LEVEL Environmental Impacts 5 Radiation from the sun and the presence of nitrogen oxides and incur different chemical reactions, producing aggressive reaction of which is ozone. Such near-ground ozone also known as summer smog is suspect vegetation and material. High concentrations of ozone are toxic A substance's contribution is indicated relatively to the Photoch Creation Potential of C2H4. Core Indicator adapted from DGNB/BNB [1], [2], [3], [4], [5], [6], [7], [8], [9], [10]. Software tool Operational data In situ me Simple Calculations X Empirical/Literature Other (spi) The indicator is mainly based on the method of Life Cycle Assess LCA results of the building to be assessed will be calculated in a way and evaluated against benchmarks. Thus Photochemical OZ Potential is a quantitative indicator. According to the standards EN ISO 14040 and 14044, the method Assessment generally consists of four steps: Definition of goal at study, inventory analysis, impact assessment and interpretation 1.1-1.5, 1.9 and 1.10 are based on LCAs and for all these indicate definitions for goal and scope and for the inventory analysis do a study, inventory analysis, impact assessment and interpretation f. Photochemical ozone Creation Potential for "Designed Building including building systems technology as an average annual valu photochemical ozone creation potential of the life	Photochemical Ozone Creation Potential, POCP (kg C2H4 equiv./(m ²) ISSUE CATEGORY LEVEL SCALE Environmental Impacts S B Radiation from the sun and the presence of nitrogen oxides and hydrocarbor incur different chemical reactions, producing aggressive reaction products, o of which is ozone. B Such near-ground ozone also known as summer smog is suspected to damag vegetation and material. High concentrations of ozone are toxic to humans. I A substance's contribution is indicated relatively to the Photochemical Ozone Creation Potential of C2H4. Core Indicator adapted from DGNB/BNB [1], [2], [3], [4], [5], [6], [7], [8], [9], [10]. In situ measurements Simple Calculations X Empirical/Literature Other (specify) The indicator is mainly based on the method of Life Cycle Assessment (LCA): LCA results of the building to be assessed will be calculated in a standardized way and evaluated against benchmarks. Thus Photochemical Ozone Creation Potential is a quantitative indicator. According to the standards EN ISO 14040 and 14044, the method of Life-Cycl Assessment generally consists of four steps: Definition of goal and scope of ti study, inventory analysis, impact assessment and interpretation. The indicator 1.1-1.5, 1.9 and 1.10 are based on LCAs and for all these indicators the same definitions for goal and scope and for the inventory analysis do apply. Calculation The following calculation rules must be followed: Photochemical Ozone Creation Potential for "De	



POCPMA predicted value of photochemical ozone creation potential created
during the modules A1-45, including office building's manufacture (construction
and building systems technology) and transports to construction site in[kg C ₂ H ₄
equiv./(III-NFA)],
during module C3 and C4 ₆ the office building's end-of-life (design and building)
systems technology) in [kg C ₂ H ₄ equiv./(m^2_{NFA})].
POCP _{MB1,4} predicted value of photochemical ozone creation potential created
during modules B1 and B47 on a yearly basis, the office building's use and
replacement (construction and building systems technology) in[kg C ₂ H ₄
equiv./(m² _{NFA} *a)],
t_d time period for the reference study period for certification in [a]. This time
period is set at 50 years.
The average annual value for use POCPogenerally consists of the POCP caused
by the building s electricity and heating demand during operation:
POCPO = POCPMB6,E + POCPMB6,H (3)
POCPMBGE photochemical ozone creation potential for module B6 electricity
demand during use, calculated with the national implementation of the EPBD
directive, multiplied by the POCP factor for electricity of the ESUCO database in
$[kg C_2H_4 equiv./(m^2_{NFA}*a)],$
POCP _{MB6,H} photochemical ozone creation potential for module B7, heating
demand during use, calculated with the national implementation of the EPBD
directive, multiplied by the POCP factor of the specific energy sources in the
ESUCO database in [kg C2H4 equiv./(m²NFA *a)].
Rating Method
The "designed building" is rated against a case-specific reference building.
Photochemical Ozone Creation Potential for Reference Building
RPOCP = POCP _{LCref} = POCP _{Cref} + POCP _{Oref} (4)
where
POCP _{LCref} reference value for the photochemical ozone creation potential of the
life cycle of the reference building,
POCPcref reference value for the average annual value of photochemical ozone
creation potential for the building s construction, maintenance, dismantling,
neriod t _d calculated from an average office building in [kg C ₂ H ₄ equiv / (m^2_{NEA})
POCPoref reference value for the annual photochemical ozone creation potential
created by building operations, derived from the reference value according to
the national implementation of the EPBD directive in [kg C ₂ H ₄ equiv./(m^{2}_{NFA}
*a)].
The reference value for construction POCP _{cref} is calculated as follows:
POCPcref = (POCPMAref + POCPMcref) / td + POCPMB1,4ref (5)
Where POCPuse reference value for photochamical arong creation potontial created
during the modules A1-A ₀ including office building's manufacture (construction
and huilding systems technology) and transports to construction site in $[k\sigma C_2H_4]$
equiv./ (m^2_{NFA})],
POCP _{MCref} reference value for photochemical ozone creation potential created



	during module C3 and C410, the office building's end-of-life (design and building							
	systems technology) in [kg C ₂ H ₄ equiv./(m ² _{NFA})],							
	POCP _{MB1,4ref} reference value for annual photochemical ozone creation potential							
	created during modules B1 and B411 on a yearly basis, the office building's use							
	and replacement (construction and building systems technology) in [kg C_2H_4							
	equiv./(m ² NFA *a)]							
	td reference study period in [a]. This time period is set to 50 years.							
	The reference value for use POCPoref is calculated as follows							
	POCPoref = POCPMB6,Eref + POCPMB6,Href (6)							
	where							
	POCPMB6,Eref photochemical ozone creation potential for the national reference							
	value for building`s annual electricity demand (end energy) according to the							
	national implementation of the EPBD directive in [kg C_2H_4 equiv./m ² _{NFA} *a],							
	POCP _{MB6,Href} photochemical ozone creation potential vfor the national reference							
	value for the building's annual heating demand (end energy) according to the							
	national implementation of the EPBD directive in [kg C_2H_4 equiv./m ² NFA *a].							
	For the POCPoref reference values for the building's heating and electricity							
	demand (end energy) according to the national implementation of the EPBD							
	directive in $[kWh/(m^2_{NFA}*a)]$ should be used as basis when possible.							
	The reference values for POCP _{Gref} can be extracted from Table1 and Table2.							
	These tables show reference values for both assessment types – "Quick and							
	Basic" assessment and "Complete" assessment.							
	·							
	Evaluation							
	The evaluation consists of a simultaneous reduction of buildings'							
	Photochemical Ozone Creation Potential for design and operation over the							
	entire lifecycle.							
Barriers	-							
Rating	Sub Indicator Weighting 4							
References	References provided in the References Section Below.							
SCALE								
Application	The Indicator can be applied at the building scale but can also be applied at the							
	neighbourhood scale for more buildings.							
Details	-							
Multiscale	It is possible to apply the indicator for the single building scale and also to a							
	group of buildings of similar function.							
References	References provided in the References Section Below							

REFERENCES	
[1]	ISO 14040: 2009-11: Environmental management – Life cycle assessment – Principles and framework. International Organization for Standardization.
[2]	ISO 14044: 2006-10: Environmental management – Life cycle assessment – Requirements and guidelines. International Organization for Standardization.
[3]	FprEN 15978: 2011: Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method. European Committee for Standardization CEN.



[4]	prEN 15804: 2010: Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products. European Committee for Standardization CEN.
[5]	Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
[6]	Kreißig, J., Binder, M. (2007): Methodische Grundlagen- Ökobilanzbasierte Umweltindikatoren im Bauwesen. Methodenbericht zum BMVBS-Projekt "Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das nachhaltige Bauen" (AZ 10.06.03 – 06.119) Mai 2007, www.baufachinformation.de/literatur.isp.
[7]	United Nations (1998): Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1998, http://unfccc.int/resource/docs/convkp/kpeng.pdf.
[8]	Bundesministerium für Verkehr, Bau- und Wohnungswesen: Guideline for Sustainable Building. Eigenverlag, 2001.
[9]	Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
[10]	VDI 2067: Economic efficiency of building installations – Fundamentals and economic calculation. Verein Deutscher Ingenieure, 2000.



	Change in Ecological Value of the Site, Species (-)									
ENV.BI.03	ISSUE CATEGORY LEVEL SCA									
(1.7)	Environmental	Bio	odiversity		S B/N					
GENERAL										
Description	The goal is to assess the ecological value of the site prior to and after the development of the case-study building in order to minimize the impact of the building development on existing site ecology enhancing the ecological value of the site and increasing biodiversity. This indicator supports the European Commission headline target of halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss1.									
Background	Indicator Adapted fro	om E	BREEAM							
References	[1]									
LEVEL										
Derived from	Software tool		Operational dat	ta	Х	In situ n	neasurements			
Denved from	Simple Calculations		Empirical/Litera	ature		Other (s	specify)			
	biodiversity This sub-indicator assesses the ecological characteristics of the site immediately prior to and after the development of the case-study building. The amount and type of vegetation retained or introduced into the development is a critical part of the preservation, restoration and maintenance of site ecology.									
	 Calculation of char A suitably qualified execution and protection and enhare The SQE provides a protection and enhare The report is based commencement of in c. The general recommender of site ecore The suitably qualified in ecological value of ecological value can be cological v	nge colc otec an E ncer d on hitia mer blog t ecc the ped ly de e sit lon	in ecological val ogist (SQE) has to ction of the biod cology Report w ment of the site's a site visit/surve l site preparation ndations of the E y have been, or v ologist (SQE) con e site. An example ound in Annex 1 sites eveloped (buildir e area), the desi g as a biodiversit	lue by su be appoint iversity o ith appro- secology ey by the n works. Ecology R will be, in firms that e of the c ngs or lar gn team ty manag	ital pint of th pri s. SO epc npli at th calc	bly qualif ed to rep he site. ate recor E prior to brt for en emented his will re ulation o capes suc concose n ent plan	fied ecologist Fort on the Immendations for the hancement and sult in a change f the change in the change in the sparking on not to use a has been			
	3. Biodiversity Mana	gen	nent Plan							



	A biodiversity plan has been developed by the design team without the help of a Suitably Qualified Ecologist in order to minimize the impact of the construction on the existing ecosystems. In particular, measures should be taken to preserve part of the existing ecosystems and to create habitats to maintain the biodiversity of the site.
Barriers	-
Rating	Sub Indicator Weighting 4
References	References provided in the References Section Below.
SCALE	
Application	The Indicator can be applied at the building scale but can also be applied at the neighbourhood scale for more buildings.
Details	-
Multiscale	It is possible to apply the indicator to the site - for the single building scale and also to a group of buildings of similar function.
References	References provided in the References Section Below

REFERENCES	
[1]	BREEAM: LE 4 Mitigating Ecological Impact



	Light on propert	Light on properties, Ev (lx)							
ENV.Im.16	ISSUE	С	ATEGORY	LE\	VEL		SCALE		
	Environmental		Impacts	9	S		N		
GENERAL									
Description	 Although outdoor lighting is imperative to illuminate sidewalks, parking lots and driveways for safety and convenience reasons, it can alter a site's nocturnal ecosystem and limit sky observations. The objectives of this indicator are listed below: To design only the strict necessary external lighting and to ensure that external lighting is concentrated in the appropriate areas, To avoid disturbance on animal and human health and psychology, To reduce sky glow and glare, To improve nocturnal sky observations (effects on astronomy). 								
Background	Indicator adapte	d f	rom LEED, BREE	AM,	H	QE, EN 1	.2464-2)		
References	[1], [2], [3], [4], [5], [6	6],	[7]						
LEVEL									
Derived from	Software tool		Operational data		Х	In situ me	easurements		
	Simple Calculations		Empirical/Literature	e		Other (sp	ecify)		
	Projects should illum provide only the light efficient fixtures usin the site while minimi lighting power densit acceptable values. High illuminance at a and impact surround the emitted light with illuminance values at Light sources pointin terms of night-time s observations. The go the sky cover and thi lumens emitted at 90 directly below a part The assessment is ba EN 12464-2. The following sub-ine 1.8.1 Light on prope 1.8.2 Luminaire inten 1.8.3 Upward light 1.8.4 Luminance Indicator 1.8.1 refers	ina t lev g e zin ties s it g d ky al is s is o cul sec sicul sec cul to	te areas only as requivels necessary to mee fficient sources to me glight pollution (LEEI including emergency e boundary can affect ecosystems or neigh the site boundaries a e site boundary are the irectly towards the sk glow and glare, thus is s to limit the amount assessed with the per r higher from nadir (n ar point). I on the guidance pro- stors are assessed: P Light on properties	ired fo et the eet th D, SSc y light ct neig bourh and th hus as ky cov limitir c of lig ercent nadir	or selection of selection of selection of selection of the selection of th	safety and ssign intent ghting req Therefore, is compar ouring area ods. The go norizontal a ssed. have a crit che potenti pointing di e of lumina he directio the Europ	comfort, t, and select quirements of e, the installed red to maximal eas and buildings bal is to retain and vertical tical impact in tial for night sky irectly towards aries with on pointing bean standard		
Areas covered	The location has to b	e c	assified in one of the	e four	env	vironment	al zones defined		



	in EN 12464-2:
	 1.8.1. Light on properties The maximum value of vertical illuminance on properties Ev given in EN 12464- 2 should be respected:
Barriers	-
Rating	-
References	Refer to the References Section
SCALE	
Application	Large neighbourhood scale - High illuminance at a site boundary can affect neighbouring areas and buildings and impact surrounding ecosystems or neighbourhoods. The goal is to retain the emitted light within the site boundaries and the horizontal and vertical illuminance values at the site boundary are thus assessed.
Details	Lighting on properties – spaces surrounding buildings.
Multiscale	Neighbourhood scale – spaces surrounding buildings.
References	Refer to the References Section

REFERENCES	
[1]	BREEAM 2009: Pol4 Reduction of night time light pollution
[2]	LEED 2009: Site 8 Light Pollution Reduction
[3]	HQE 2012: 1.3. Impacts of the building on the local residents
[4]	ANSI/ASHRAE/IESNA Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Lighting, Section 9 (without amendments)
[5]	<i>Lighting for Exterior Environments RP-33-99,</i> by the Outdoor Environment Lighting Committee of Illuminating Engineering Society of North America (www.iesna.org) (IESNA, 1999)
[6]	International Dark-Sky Association (www.darksky.org)
[7]	EN 12464-2, Light and lighting — Lighting of work places — Part 2 : Outdoor work places.



	Luminaire Inte	nsit	y (cd)					
ENV.Im.19	ISSUE	С	ATEGORY	LE	VE	L SCALE		
	Environmental		Impacts		S	N		
GENERAL								
Description	 Aitnougn outdoor lighting is imperative to illuminate sidewalks, parking lots and driveways for safety and convenience reasons, it can alter a site's nocturnal ecosystem and limit sky observations. The objectives of this indicator are listed below: To design only the strict necessary external lighting and to ensure that external lighting is concentrated in the appropriate areas, To avoid disturbance on animal and human health and psychology, To reduce sky glow and glare, To improve nocturnal sky observations (effects on astronomy). 							
Background	Indicator adap	ted f	rom LEED, B	REEAM	, H	QE, EN 12464-2)		
References	[1], [2], [3], [4], [5]	, [6],	[7]			· · · · · ·		
LEVEL								
Derived from	Software tool		Operational da	ata	Х	In situ measurements		
Derived Ironi	Simple Calculation	s	Empirical/Liter	ature		Other (specify)		
	Projects should illu provide only the li- efficient fixtures u the site while mini- lighting power der acceptable values. High illuminance a and impact surrou the emitted light v illuminance values Light sources poin- terms of night-tim observations. The the sky cover and lumens emitted at directly below a pa The assessment is EN 12464-2. The following sub- 1.8.1 Light on pro 1.8.2 Luminaire in 1.8.3 Upward light 1.8.4 Luminance	imina ght le sing e mizin sities t a sit nding vithin at the ing d e sky goal is chis is 90° o inticul basec indica pertio	te areas only as vels necessary to fficient sources a g light pollution including emerge e boundary can ecosystems or r the site boundary e site boundary a irectly towards t glow and glare, t s to limit the am assessed with th r higher from na ar point). d on the guidanc stors are assesse es ary	required to meet the (LEED, SSo gency ligh affect nei neighbour ries and t are thus a the sky co thus limiti ount of lighe percen adir (nadir e provide	for e de he l c8). ting ghb ho he l isse ver tag t tag t tag t d in	safety and comfort, esign intent, and select ighting requirements of Therefore, the installed g is compared to maximal oouring areas and building ods. The goal is to retain horizontal and vertical ssed. have a critical impact in the potential for night sky pointing directly towards e of luminaries with the direction pointing the European standard	y S	
Areas covered	The location has to in EN 12464-2:	be c	lassified in one c	of the four	r en	vironmental zones define	ed	



	1.8.2. Luminaire intensity The light intensity of each source in the potentially obtrusive direction given in EN 12464-2 should be respected:
Barriers	-
Rating	Sub Indicator Weighting 4
References	Refer to the References Section
SCALE	
Application	Large neighbourhood scale - High illuminance at a site boundary can affect neighbouring areas and buildings and impact surrounding ecosystems or neighbourhoods. The goal is to retain the emitted light within the site boundaries and the horizontal and vertical illuminance values at the site boundary are thus assessed.
Details	Luminaire intensity – spaces surrounding buildings.
Multiscale	Neighbourhood scale – spaces surrounding buildings.
References	Refer to the References Section

REFERENCES	
[1]	BREEAM 2009: Pol4 Reduction of night time light pollution
[2]	LEED 2009: Site 8 Light Pollution Reduction
[3]	HQE 2012: 1.3. Impacts of the building on the local residents
[4]	ANSI/ASHRAE/IESNA Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Lighting, Section 9 (without amendments)
[5]	<i>Lighting for Exterior Environments RP-33-99,</i> by the Outdoor Environment Lighting Committee of Illuminating Engineering Society of North America (www.iesna.org) (IESNA, 1999)
[6]	International Dark-Sky Association (www.darksky.org)
[7]	EN 12464-2, Light and lighting — Lighting of work places — Part 2 : Outdoor work places.



	Upward Light						
ENV.Im.21	ISSUE CATEGORY LEVEL SCALE						
	Environmental Impacts S N						
GENERAL							
Description	 Although outdoor lighting is imperative to illuminate sidewalks, parking lots and driveways for safety and convenience reasons, it can alter a site's nocturnal ecosystem and limit sky observations. The objectives of this indicator are listed below: To design only the strict necessary external lighting and to ensure that external lighting is concentrated in the appropriate areas, To avoid disturbance on animal and human health and psychology, To reduce sky glow and glare, To improve nocturnal sky observations (effects on astronomy). 						
Background	Indicator adapt	ed f	rom LEED, BREEA	М, Н	IQE, EN	12464-2)	
References	[1], [2], [3], [4], [5],	[6],	[7]				
LEVEL							
Derived from	Software tool	Х	Operational data		In situ r	measurements	
Derived Irolli	Simple Calculations		Empirical/Literature		Other (specify)	
Details	Projects should illur provide only the light efficient fixtures usi the site while minim lighting power dense acceptable values. High illuminance at and impact surroun the emitted light wi illuminance values at Light sources pointi terms of night-time observations. The g the sky cover and the lumens emitted at 9 directly below a pare The assessment is b EN 12464-2. The following sub-ir 1.8.1. Light on prop 1.8.2 Luminaire inter 1.8.3 Upward light 1.8.4 Luminance Indicator 1.8.3 Upw	nina nt le ng e iizin; ities a sit ding thin t tho ng d sky ; is is o° o ticul asec adica ertic ensit	te areas only as require vels necessary to meet fficient sources to mee g light pollution (LEED, including emergency li e boundary can affect n ecosystems or neighbo the site boundaries an e site boundary are thu frectly towards the sky glow and glare, thus line is to limit the amount of assessed with the peror r higher from nadir (na ar point). I on the guidance provisitors are assessed: y Light	ed for the d t the SSc8) ghtin heighl burho d the s asse cover hiting f light entag dir is ded in	safety ar esign inte lighting ru . Therefo g is comp bouring a ods. The horizonta essed. the pote pointing ge of lumi the direc n the Euro	nd comfort, ent, and select equirements of re, the installed pared to maximal reas and buildings goal is to retain al and vertical ritical impact in ntial for night sky directly towards inaries with tion pointing opean standard	
Areas covered	The location has to	oe c	assified in one of the f	our er	nvironme	ntal zones defined	
	III EN 12464-2:						



	1.8.3. Upward light The requirements for the angle of light emission depend of the classification of the building location. The upward light should be limited.
Barriers	-
Rating	Sub Indicator Weighting 4
References	Refer to the References Section
SCALE	
Application	Large neighbourhood scale - High illuminance at a site boundary can affect neighbouring areas and buildings and impact surrounding ecosystems or neighbourhoods. The goal is to retain the emitted light within the site boundaries and the horizontal and vertical illuminance values at the site boundary are thus assessed.
Details	Upward Lighting – spaces surrounding buildings.
Multiscale	Neighbourhood scale – spaces surrounding buildings.
References	Refer to the References Section

REFERENCES	
[1]	BREEAM 2009: Pol4 Reduction of night time light pollution
[2]	LEED 2009: Site 8 Light Pollution Reduction
[3]	HQE 2012: 1.3. Impacts of the building on the local residents
[4]	ANSI/ASHRAE/IESNA Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Lighting, Section 9 (without amendments)
[5]	<i>Lighting for Exterior Environments RP-33-99,</i> by the Outdoor Environment Lighting Committee of Illuminating Engineering Society of North America (www.iesna.org) (IESNA, 1999)
[6]	International Dark-Sky Association (www.darksky.org)
[7]	EN 12464-2, Light and lighting — Lighting of work places — Part 2: Outdoor work places.



	Luminance (cd/m ²)								
ENV.Im.20	ISSUE CATEGORY LEVEL SCALE								
	Environmental Impacts S N								
GENERAL									
Description	 Although outdoor lighting is imperative to illuminate sidewalks, parking lots and driveways for safety and convenience reasons, it can alter a site's nocturnal ecosystem and limit sky observations. The objectives of this indicator are listed below: To design only the strict necessary external lighting and to ensure that external lighting is concentrated in the appropriate areas, To avoid disturbance on animal and human health and psychology, To reduce sky glow and glare, To improve nocturnal sky observations (effects on astronomy). 								
Background	Indicator adapted	from	LEED, BREEAM,	HQE, EN 1	2464-2)				
References	[1], [2], [3], [4], [5]	, [6],	[7]						
LEVEL									
Derived from	Software tool	_	Operational da	ita	X In situ	measurements			
Details	Software toolOperational dataXIn situ measurementsSimple CalculationsEmpirical/LiteratureOther (specify)Light Pollution.Projects should illuminate areas only as required for safety and comfort, provide only the light levels necessary to meet the design intent, and select efficient fixtures using efficient sources to meet the lighting requirements of the site while minimizing light pollution (LEED, SSc8). Therefore, the installed lighting power densities including emergency lighting is compared to maximal acceptable values.High illuminance at a site boundary can affect neighbouring areas and buildings and impact surrounding ecosystems or neighbourhoods. The goal is to retain the emitted light within the site boundary are thus assessed. Light sources pointing directly towards the sky cover have a critical impact in terms of night-time sky glow and glare, thus limiting the potential for night sky observations. The goal is to limit the amount of light pointing directly towards the sky cover and this is assessed with the percentage of luminaries with lumens emitted at 90° or higher from nadir (nadir is the direction pointing directly below a particular point).The assessment is based on the guidance provided in the European standard EN 12464-2.The following sub-indicators are assessed: 1.8.1 Light on properties 1.8.2 Luminaire intensity 1.8.3 Upward light 1.8.4 Luminance								
Areas covered	Indicator 1.8.4 Lur	ninan	ce	of the four	environme	ental zones defined			
AIEUS LUVEIEU	in EN 12464-2:	שפינ		n the four	envirunni				



	1.8.4 Luminance The maximum average luminance of the signs and of the facade of a building given in EN 12464-2 should be respected.
Barriers	-
Rating	Sub Indicator Weighting 4
References	Refer to the References Section
SCALE	
Application	Large neighbourhood scale - High illuminance at a site boundary can affect neighbouring areas and buildings and impact surrounding ecosystems or neighbourhoods. The goal is to retain the emitted light within the site boundaries and the horizontal and vertical illuminance values at the site boundary are thus assessed.
Details	Luminance – spaces surrounding buildings.
Multiscale	Neighbourhood scale – spaces surrounding buildings.
References	Refer to the References Section

REFERENCES	
[1]	BREEAM 2009: Pol4 Reduction of night time light pollution
[2]	LEED 2009: Site 8 Light Pollution Reduction
[3]	HQE 2012: 1.3. Impacts of the building on the local residents
[4]	ANSI/ASHRAE/IESNA Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Lighting, Section 9 (without amendments)
[5]	Lighting for Exterior Environments RP-33-99, by the Outdoor Environment Lighting Committee of Illuminating Engineering Society of North America (www.iesna.org) (IESNA, 1999)
[6]	International Dark-Sky Association (www.darksky.org)
[7]	EN 12464-2, Light and lighting — Lighting of work places — Part 2: Outdoor work places.



ENIV/ Jpp 11	Abiotic Depletion Potential, ADP_Enr (kWh/(m²) ISSUE CATEGORY					Vh/(m²)	
(1.0)						L SCALE	
(1.9)	Environmental Energy S B						
GENERAL							
Description	Primary energy is energy found in nature that has not been subjected to any conversion or transformation process. It is energy contained in raw fuels as well as other forms of energy received as input to a system. The indicator Non-Renewable Primary Energy Demand aims at the reduction of the share of primary energy demand provided by fossil and therefore limited fuels.						
Background	Core Indicator adapt	ed f	from EN 15978.				
References	[1], [2], [3], [4], [5], [6], [7], [8], [9], [10]		_		
LEVEL	-						
Derived from	Software tool		Operational dat	a		In situ measurements	
	Simple Calculations	Х	Empirical/Litera	ture		Other (specify)	
	LCA results of the building to be assessed will be calculated in a standardized way and evaluated against benchmarks. Thus Non-Renewable Primary Energy Demand is a quantitative indicator. According to the standards EN ISO 14040 and 14044, the method of Life-Cycle Assessment generally consists of four steps: Definition of goal and scope of the study, inventory analysis, impact assessment and interpretation. The indicators 1.1-1.5, 1.9 and 1.10 are based on LCAs and for all these indicators the same definitions for goal and scope and for the inventory analysis do apply.						
	When calculating the renewable energy de be followed and base Non-Renewable Ene Generally, the Enr for building construction carrier Ei. ADP_Enr,Lc = i ADP_Ei x (Enr,Lc,Ei + En where ADP_Ei Abiotic Deple Enr,Lc,Ei non-renewable the entire building, Enr,c,Ei building's const building systems tech energy demand over the time referent Enr,O,Ei predicted annu- building as	e Aberna ed co rgy the n an etion e er truc nno nce ial r	biotic Resource De and for the buildir on the value for an Demand for "De e building life cycle d of the Enr cause a) (1) In Potential for ref hergy demand for ction, maintenance logy as an average study period to in hon-renewable er	epletion f ng, the fo ny energy signed B e is comp d during ference e energy o ce, disma ge annual n [kWh/(n nergy der	for Illov y ca oos op ene cari no nai	fossil fuels related to non- wing calculation rules must arrier: Jing" ed of the Enr caused by the eration for any energy rgy carrier Ei, , rier Ei of the life cycle of ing, and disposal including on-renewable primary FA *a)], nd for the operation of the	
	constructed, derived implementation of EPBD in [kWh /(m ² NF.	fro ₄*a	m end energy de)] for any energy	mand aco	cor i,	ding to national	



NFA Net Floor Area of the building. Based on the modules as defined in Figure 1, the value for construction
ADP_Enr,c,Ei IS Calculated as follows:
$ADP_{Enr,C,Ei} = [1]_i$
Where
ADP_Ei Abiotic Depletion Potential for reference energy carrier Ei Enr,MA,Ei predicted value of non-renewable energy demand created during the modules A1-44, including office building's manufacture (construction and building systems technology) and transports to construction site in [kWh/(m ² NEA)] for energy carrier Ei.
$E_{nr,Mc,Ei}$ predicted value of non-renewable energy demand created during module C3 and C4 ₅ , the office building's end-of-life (design and building systems technology) in [kWh /(m ² yrs)] for energy carrier Ei
Enr,MB1,4,Ei predicted value of non-renewable energy demand for any energy carrier Ei created during modules B1 and B46 on a yearly basis, the office building's use and replacement (construction and building systems technology) in[kWh/(m ² NFA *a)], td time period for the reference study period for certification in [a]. This time period is set at 50 years
certification in [u]. This time period is set at 50 years.
The average annual value for use $E_{nr,O,Ei}$ generally consists of the $E_{nr,Ei}$ caused by the building's electricity and heating demand during operation for any energy carrier Ei:
Enr,O,Ei = Enr,MB6,EI + ?;
ADP_Ei х Елг,Мвб,Н,Еі (3) where
ADP_Ei Abiotic Depletion Potential for reference energy carrier E_i $E_{nr,MB6,EI}$ non-renewable energy demand for module B6, electricity demand during use, calculated with the national implementation of the EPBD directive, multiplied by the PE _{nr} factor for energy carrier electricity of the ESUCO database in [kWh/(m ² NFA *a)],
$E_{nr,MB6,H}$ non-renewable energy demand for module B6, heating demand during use, calculated with the national implementation of the EPBD, [kWh/(m ² _{NFA} *a)] for energy carrier Ei.
Rating Method The "designed building" is rated against a case-specific reference building.
Contribution to depletion of non-renewable energy resources Reference Building
RADP_Enr = ADP_Eref x Enr,LCref = ADP_Eref (Enr,Cref + Enr,Oref) (4)
Where ADP Eref Abiotic Depletion Potential for reference energy carrier E _{ref} E _{nr,LCref} reference value for the non-renewable energy demand of the life cycle of the reference building.
E _{nr,Cref} reference value for the average annual value of non-renewable energy demand for the
building's construction, maintenance, dismantling, and disposal including building



	systems technology over the reference study period td, calculated from an average office building in [kWh/(m ² NFA *a)]7, Enr,Oref reference value for the annual non-renewable energy demand created by building operations, derived from the reference value according to the national implementation of the EPBD directive in [kWh/(m ² NFA *a)]. The reference value for construction ADP_Enr,Cref is calculated as follows: ADP_Enr,Cref = (ADP_Eref x Enr,MAref + ADP Eref x PEnr,MCref) / td + ADP Eref * Enr,MB1,4ref (5) where ADP Eref Abiotic Depletion Potential for reference energy carrier Eref Enr,MAref reference value for non-renewable energy demand using reference
	energy carrier created during the modules A1-48, including office building's manufacture (construction and building systems technology) and transports to construction site in[kWh/(m^2_{NFA})], Enr,MCref reference value for non-renewable energy demand created during
	module C3 and C4 ₉ , the office building's end-of-life (design and building systems technology) in $[kWh/(m^2_{NEA})]$
	Enr,MB1,4ref reference value for annual non-renewable energy demand created during modules B1 and B410 on a yearly basis, the office building's use and replacement (construction and building systems technology) in [kWh/(m ² NFA *a)]
	td reference study period in [a]. This time period is set to 50 years.
	The reference value for use Enr, Oref is calculated as follows
	ADP_Enr,Oref = ADP_EI x Enr,MB6,Eref,EI + ?
	ADP_EI X Enr,MB6,Href,Ei (6) Where
	ADP_El Abiotic Depletion Potential for electrical energy ADP_Ei Abiotic Depletion Potential for energy carrier Ei Enr,MB6,Eref,El non-renewable energy demand for the national reference value for building`s annual electricity demand (end energy) according to the national implementation of the EPBDin
	[kWh/m ² _{NFA} *a], E _{nr,MB6,Href,Ei} non-renewable energy demand for the national reference value for the building's annual heating demand (end energy) according to the national implementation of the EDD in [kWh (m ² ₁ m, *a] for fossil fuel 5i
	The reference values for ADP_Ene,Href be extracted from Table1 and Table2 using the respective ADP factor for the reference fuels. These tables show reference values for both assessment types – "Quick and Basic" assessment and "Complete" assessment.
Barriers	-
Rating	
References	Refer to the References Section
Application	The Indicator can be applied at the building scale but can also be applied at the neighbourhood scale for more buildings.
Details	-
Multiscale	It is possible to apply the indicator for the single building scale and also to a group of buildings of similar function.
References	References provided in the References Section Below



REFERENCES	
[1]	ISO 14040: 2009-11: Environmental management – Life cycle assessment – Principles and framework. International Organization for Standardization.
[2]	ISO 14044: 2006-10: Environmental management – Life cycle assessment – Requirements and guidelines. International Organization for Standardization.
[3]	FprEN 15978: 2011: Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method. European Committee for Standardization CEN.
[4]	prEN 15804: 2010: Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products. European Committee for Standardization CEN.
[5]	Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
[6]	Kreißig, J., Binder, M. (2007): Methodische Grundlagen- Ökobilanzbasierte Umweltindikatoren im Bauwesen. Methodenbericht zum BMVBS-Projekt "Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das nachhaltige Bauen" (AZ 10.06.03 – 06.119) Mai 2007, www.baufachinformation.de/literatur.isp.
[7]	United Nations (1998): Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1998, http://unfccc.int/resource/docs/convkp/kpeng.pdf.
[8]	Bundesministerium für Verkehr, Bau- und Wohnungswesen: Guideline for Sustainable Building. Eigenverlag, 2001.
[9]	Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
[10]	VDI 2067: Economic efficiency of building installations – Fundamentals and economic calculation. Verein Deutscher Ingenieure, 2000.



	Total primary Energy Demand (kWh/m ²)					
	ISSUE	C	ATEGORY	LE	VEL	SCALE
(1.10)	Environmental		Energy		S	В
GENERAL						
Description	Primary energy is energy found in nature that has not been subjected to any conversion or transformation process. It is energy contained in raw fuels as well as other forms of energy received as input to a system. The indicator Total Primary Energy Demand and Share of renewable Primary Energy aims at the reduction of the Total Primary Energy Demand and at the increase of the share of renewable Primary Energy Demand. The following sub-indicator is assessed: 1.10.1 Total Primary Energy Demand					
Backaround	Core Indicator ad	anted	from DGNB/BNB	2)		
References				<i>'</i>		
IFVFI	[<u>[+]</u> , [-], [-], [-], [-	יני וויני	,], [0], [9], [10]			
	Software tool		Operational da	ata	In situ r	measurements
Derived from	Simple Calculatio	ns X	Empirical/Liter	ature	Other (specify)
Details	The indicator is n	hainly h	ased on the me	thod of Lif		essment (ICA).
	LCA results of the building to be assessed will be calculated in a standardized way and evaluated against benchmarks. Thus Total Primary Energy demand and Share of renewable Primary Energy is a quantitative indicator. According to the standards EN ISO 14040 and 14044, the method of Life-Cycle Assessment generally consists of four steps: Definition of goal and scope of the study, inventory analysis, impact assessment and interpretation. The indicators					
	1.1-1.5, 1.9-1.10	and 1.1	5 are based on	LCAs and f	or all these	indicators the
	same definitions	for goa	I and scope and	for the in	ventory ana	alysis do apply.
Areas covered	Calculation The total primary calculated as follo PEtot, LC = PEnr, LC + where PEnr, LC result from Renewable Prima building as an avo [kWh/(m ² NFA*a)], PEren, LC renewable building as an avo [kWh/(m ² NFA*a)]; renewable Prima primary energy d To assess the sub PEren, LC / PEnr, LC m 1.10.1 Total Pu Rating Method	e energy ows: PE ren, LC indica ory Ener erage a also ca ry Ener emand -indica of rene ust be imary	y demand over t tor Non-renewa rgy Demand of t nnual value ove nry energy dema nnual value ove lculated accord gy Demand but tor "Share of renewable primary presented as a p	the buildin ble Prima he entire l r the time ing to the using the newable P energy to percent. and	g life cycle, ry Energy D life cycle of reference s equations g ESUCO data rimary Ener total prima	PEtot, LC, is emand: Non- the entire study period td in ycle of the entire study period td in given for Non- aset for renewable rgy Demand ry energy use
	The "designed bu	ilding"	is rated against	a case-spe	ecific refere	nce building.
	Total Primary En PEtot,LC,ref = PEtot,Cre	ergy De f + PEtot	emand for Refer ;,Oref (4)	rence Buil	ding	



	regional de coop nen i una
	where PEtotLCref Reference value for the for the total primary energy demand of the life cycle of the reference building in [kWh/(m ² NFA*a)], PEtotLCref reference value for the average annual value of total primary energy demand for the building's construction, maintenance, dismantling, and disposal including building systems technology over the reference study period td, calculated from an average office building in [kWh/(m ² NFA*a)]4, PEtotLOref reference value for the annual total primary energy demand created by building operations, derived from the reference value according to the national implementation of the EPBD directive in [kWh/(m ² NFA*a)]. The reference value for construction PEtotLoref is calculated as follows: PEtotLAR ref reference value for total primary energy demand created during the modules A1-45, including office building's manufacture (construction and building systems technology) and transports to construction site in [kWh/(m ² NFA*a)], PEtotLCref reference value for total primary energy demand created during module C3 and C46, the office building's end-of-life (design and building systems technology) in [kWh/(m ² NFA*a)], PEtotLMB14ref reference value for total primary energy demand created during modules B1 and B47 on a yearly basis, the office building's use and replacement (construction and building systems technology) in [kWh/(m ² NFA*a)]. ta reference study period in [a]. This time period is set to 50 years. The reference value for use PEtotLOref is calculated as follows PEtotLMB6,Eref total primary energy demand for the national reference value for building's annual electricity demand (end energy) according to the national implementation of the EPBD directive in [kWh/(m ² NFA*a)], PEtotLMB6,Eref total primary energy demand for the national reference value for building's annual heating demand (end energy) according to the national implementation of the EPBD directive in [kWh/(m ² NFA*a)],
	the building's annual heating demand (end energy) according to the national implementation of the EPBD directive in $[kWh/(m^2_{NFA}*a)]$. For the PE _{tot,Oref} reference values for the building's heating and electricity demand (end energy) according to the national implementation of the EPBD directive in $[kWh/(m^2_{NFA}*a)]$ should be used as basis when possible. The reference values for PE _{tot,Cref} can be extracted from Table1 and Table2. These tables show reference values for both assessment types – "Quick and Basic" assessment and "Complete" assessment.
	Evaluation For the final evaluation of the sub-indicator "Total Primary Energy", the values L, R _{local} , R _{global} and T are depicted in a diagram. The allocation of points for limit, reference and target values can be found in the table 1.10.1.
Barriers	-
Rating	Sub Indicator Weighting 4
References	Refer to the References Section
SCALE	



Application	The Indicator can be applied at the building scale but can also be applied at the
	neighbourhood scale for more buildings.
Details	-
Multiscale	It is possible to apply the indicator for the single building scale and also to a
	group of buildings of similar function.
References	References provided in the References Section Below

REFERENCES	
[1]	ISO 14040: 2009-11: Environmental management – Life cycle assessment – Principles and framework. International Organization for Standardization.
[2]	ISO 14044: 2006-10: Environmental management – Life cycle assessment – Requirements and guidelines. International Organization for Standardization.
[3]	FprEN 15978: 2011: Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method. European Committee for Standardization CEN.
[4]	prEN 15804: 2010: Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products. European Committee for Standardization CEN.
[5]	Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
[6]	Kreißig, J., Binder, M. (2007): Methodische Grundlagen- Ökobilanzbasierte Umweltindikatoren im Bauwesen. Methodenbericht zum BMVBS-Projekt "Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das nachhaltige Bauen" (AZ 10.06.03 – 06.119) Mai 2007, www.baufachinformation.de/literatur.isp.
[7]	United Nations (1998): Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1998, http://unfccc.int/resource/docs/convkp/kpeng.pdf.
[8]	Bundesministerium für Verkehr, Bau- und Wohnungswesen: Guideline for Sustainable Building. Eigenverlag, 2001.
[9]	Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
[10]	VDI 2067: Economic efficiency of building installations – Fundamentals and economic calculation. Verein Deutscher Ingenieure, 2000.



	Share of Ren	ewable Primary Er	nergy in Total P	rimary Energy	
ENV.En.21	Demand (kWh/m ²)				
(1.10)	ISSUE	CATEGORY	LEVEL	SCALE	
	Environmental	Energy	S	В	
GENERAL	l				
Description	Primary energy i	s energy found in nature	e that has not been	subjected to any	
	conversion or tra	ansformation process. It	is energy containe	d in raw fuels as	
	Well as other for	ms of energy received a	s input to a system.	Novyabla Drimary	
	Energy aims at t	he reduction of the Tota	l Primary Energy De	emewable Primary	
	increase of the s	hare of renewable Prima	ary Energy Demand		
			,		
	The following su	b-indicator is assessed:			
	1.10.2 Share of	renewable Primary Ener	gy in Total Primary	y Energy Demand	
Dackaround					
Buckyrounu	Core Indicato	or adapted from De	NB/BNB)		
References	[[1], [2], [3], [4], [5], [6], [7], [8], [9], [10]			
LEVEL	Software tool	Operational da	ta la citu	u moasuromonts	
Derived from	Simple Calculatio	ons X Empirical/Liter	ature Othe	r (specify)	
Details	The indicator is	mainly based on the met	thod of Life Cycle A	ssessment (LCA):	
	LCA results of th	e building to be assessed	d will be calculated	in a standardized	
	way and evaluat	ed against benchmarks.	Thus Total Primary	Energy demand	
	and Share of ren	newable Primary Energy	is a quantitative inc	dicator.	
	According to the	standards EN ISO 1404) and 14044, the m	ethod of Life-Cycle	
	Assessment generally consists of four steps: Definition of goal and scope of the				
	study, inventory analysis, impact assessment and interpretation. The indicators				
	1.1-1.5, 1.9-1.10 and 1.15 are based on LCAS and for all these indicators the same definitions for goal and scope and for the inventory analysis do apply				
Areas covered	Calculation				
	The total primar	y energy demand over t	he building life cycl	e, PEtot, LC, is	
	calculated as follows:				
	PEtot, LC = PEnr, LC +	- PE ren, LC			
	PFor ic result from	n indicator Non-renewa	ble Primary Energy	Demand: Non-	
	Renewable Prim	ary Energy Demand of t	he entire life cycle o	of the entire	
	building as an av	verage annual value over	the time reference	e study period t₀ in	
	[kWh/(m² _{NFA} *a)]	,			
	PEren, LC renewab	le primary energy demai	nd of the entire life	cycle of the entire	
	building as an av	verage annual value over	the time reference	e study period tain	
	[KWN/(m ⁻ NFA [*] a)]	; also calculated accordi	ng to the equations	s given for Non-	
	nrimary energy (demand	using the ESOCO ua		
	To assess the su	b-indicator "Share of rer	newable Primary En	ergy Demand	
	PEren,LC", the ratio	o of renewable primary e	energy to total prim	nary energy use	
	PEren, LC / PEnr, LC N	nust be presented as a p	ercent.		



	1.10.2 Share of renewable Primary Energy in Total Primary Energy Demand
	Energy in Total Primary Energy demand", the achieved percent must be compared to the values in table 1.10.2.
Barriers	-
Rating	Sub Indicator Weighting -
References	Refer to the References Section
SCALE	
Application	The Indicator can be applied at the building scale but can also be applied at the neighbourhood scale for more buildings.
Details	-
Multiscale	It is possible to apply the indicator for the single building scale and also to a group of buildings of similar function.
References	References provided in the References Section Below

REFERENCES	
[1]	ISO 14040: 2009-11: Environmental management – Life cycle assessment –
	Principles and framework. International Organization for Standardization.
[2]	ISO 14044: 2006-10: Environmental management – Life cycle assessment –
	Requirements and guidelines. International Organization for Standardization.
[3]	FprEN 15978: 2011: Sustainability of construction works — Assessment of
	environmental performance of buildings — Calculation method. European
	Committee for Standardization CEN.
[4]	prEN 15804: 2010: Sustainability of construction works — Environmental
	product declarations — Core rules for the product category of construction
	products. European Committee for Standardization CEN.
[5]	Directive 2009/28/EC of the European Parliament and of the Council of 23 April
	2009 on the promotion of the use of energy from renewable sources and
	amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
[6]	Kreißig, J., Binder, M. (2007): Methodische Grundlagen- Ökobilanzbasierte
	Umweltindikatoren im Bauwesen. Methodenbericht zum BMVBS-Projekt
	"Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das
	nachhaltige Bauen" (AZ 10.06.03 – 06.119) Mai 2007,
	www.baufachinformation.de/literatur.isp.
[7]	United Nations (1998): Kyoto Protocol to the United Nations Framework
	Convention on Climate Change, 1998,
	http://unfccc.int/resource/docs/convkp/kpeng.pdf.
[8]	Bundesministerium für Verkehr, Bau- und Wohnungswesen: Guideline for
	Sustainable Building. Eigenverlag, 2001.
[0]	Directive 2002/04/EC of the Evenence Devicement and of the Council of AC
[9]	Directive 2002/91/EC of the European Parliament and of the Council of 16
	December 2002 on the energy performance of buildings.
[10]	VDI 2067: Economic efficiency of building installations – Fundamentals and
	economic calculation. Verein Deutscher Ingenieure, 2000.



	Operation Water use and Waste Water (m ³)					
	ISSUE	(CATEGORY	LEV	/EL	SCALE
(1.11)	Environmental		Water	S	5	B / N
GENERAL						
Description	Potable water consumption and sewage generation shall be reduced within the Life Cycle of a building. Aspects to be regarded are water embodied in building materials in the Product stage, water used in the Construction and Deconstruction Processes and operational water use during the Use stage. A further objective is to limit disruption and pollution of natural water flows by managing storm-water runoff. This indicator aims at the reduction of consumption of freshwater and supports the European Commission objective to make water saving measures and increasing water efficiency a priority ₁ , in order to ensure that water is available in sufficient quantities in European countries					
Background	Core Indicator	r ada	apted from D	GNB/BN	IB	
References	[1]		•			
-						
	Software tool		Operational dat	ta	In situ	measurements
Derived from	Simple Calculations	Х	Empirical/Litera	ature	Other ((specify)
	the freshwater de 1.11.1 Embodied 1.11.2 Embodied 1.11.3 Operation However, due to construction and will be assessed in	eman wate wate al Wa data deco n this	d over the whole er in building mater ater Use and Was issues in materia nstruction process version of the O	life cycle terials and deco ste Water ls product sses, only PEN HOUS	of the buil onstruction ion as well the operat	ding: n processes I as building tional water use ology.
	 1.11.3 Operation: Operational Water takes into conside water. For the cal Potable w urinals, sh washers a Potable w washable Potable w using rain intelligen system, w not include Rainwater technical rainwater from the 	al Wa er Use eratic culat vater nowe and w vater floor vater water t wat vater drain c's lov build	ater Use and Was e is assessed usin on the potable was ion, the following consumed by sta- rs and kitchen sin vashing machines consumed for cla rs and glass, and consumed for was er, plants that are ering systems. In ing plants is not co but this may be cla t is not drained in n system is consic w degree of pollu- ing, a corrective	ste Water g the »wa ater demai g items are off for bath hks and re care not in eaning, ba respective atering pla the curre calculated, hanged in to the soi lered as w tion comp reduction	ter use val nd and the e taken int nrooms, sin spective w ncluded. sed on the e waste wa ants. This c bited to the nt state of since out future ver l but is div vaste water bared to ot factor is u	ue« Wuv, which e volume of waste o consideration: hks, toilets, vaste water. Dish e surfaces of ter. an be reduced by e location, or the assessment door facilities are sions. erted to the r. Due to ther waste water sed. If rainwater



	1.11.1 Embodied water in building materials
	Therefore the following where not considered:
Barriers	Due to data issues in materials production as well as building construction and deconstruction processes, only the operational water use will be assessed in the 2013 version of the OPEN HOUSE methodology.
	Pww planned on-site purification of waste water
	Low planned gray water use
	SRW planned rainwater seepage
	hcsharvest coefficient for sealed surfaces
	As sealed surface area
	In some case, the following values may also needed to be considered:
	SRW site-specific annual precipitation
	hcR harvest coefficient for roof surface
	Ar roof surface area
	Aw⊧area of washable floor
	NFA net floor area
	cy consumption value of installations (flow classes / flushing volume)
	The following information is needed to calculate the water use value:
	* Factor based on costs of a split sewage fee
	fr corrective reduction factor of 0,5*
	WW _{RW} share of rainwater diverted to the drain system in $[m^3/a]$
	in [m³/a]
	WWc volume of waste water from cleaning
	in [m³/a]
	WDc potable water needed for cleaning
	in [m³/a]
	WW₅emplovee waste water volume
	in [m ³ /a]
	IN [M [*] /a] WDr employee notable water demand
	Wuv water use value
	where
	$W_{UV} = (WD_E + WW_E) + (WD_C + WW_C) + (WW_{RW} * f_r)$ (1)
	The water use value Wuv is calculated as follows:
	Water use value
	Method description
	water. Waste water purified on site is subtracted from the volume of waste water.
	reused, it both replaces potable water and is no longer considered waste
	If gray water from the building is not led directly to the drain system but is
	water demand, but not from the volume of waste water.
	water demond by the officer the set of the set



	Regarding a complete water use of a building's Life Cycle, embodied water
	from building materials and construction / deconstruction processes should
	be considered. The sub indicators 1.11.1 and 1.11.2 should be included into
	calculations as soon as respective data is available.
	1.11.1 Embodied water in building materials (NOT ASSESSED)
	To calculate the embodied water in building materials, the same system
	boundaries as in the LCA-based indicators do apply. As far as possible,
	respective data provided by LCA databases is used. The indicator should be
	expressed in $[m^3/(m^2_{NFA}*a)]$. Due to these data issues, assessment and rating
	can not be determined at this stage.
	1.11.2 Embodied water in construction and deconstruction processes (NOT
	ASSESSED)
	As far as possible, embodied water in construction and deconstruction
	processes should be collected and summed up. The indicator should be
	expressed in $[m^3/(m^2_{NFA}*a)]$. Due to data issues, assessment and rating
	cannot be determined at this stage.
Rating	Sub Indicator Weighting 4
References	Refer to the References Section
SCALE	
Application	The Indicator can be applied at the building scale but can also be applied at
	the neighbourhood scale for more buildings.
Details	-
Multiscale	It is possible to apply the indicator for the single building scale and also to a
	group of buildings of similar function.
References	References provided in the References Section Below

REFERENCES					
[1]	DGNB 14 – Freshwater Demand				


	Site Location - Change of land use (n/a)								
	ISSUE CATEGORY LEVEL SC								
(1.12)	Environmental Land Use S N								
GENERAL									
Description	The constant increase in traffic and settlement areas shall be reduced. Preferably, areas shall be used that are already assigned as traffic or settlement areas or that are allocated for the recovery of contaminated locations. This indicator supports the European Commission target to achieve a more rational use of soil, requiring Member States to take appropriate measures to limit sealing by rehabilitating brownfield sites and to mitigate its effects by using construction techniques that allow maintaining as many soil functions as possible.								
Background	Core Indicator a	da	pted from LEE	D, BREE	AM, DG	NB/BNB			
References	[1], [2], [3], [4], [5]								
LEVEL									
	Software tool		Operational dat	a	In situ ı	measurements			
Derived from	Simple Calculations		Empirical/Litera	iture	Other (Verifica	specify) Site	x		
Details									
	 (remediation of brownfield) to a negative change (depletion of prime farmland or greenfield) Increasing the imperviousness of the site can have major repercussions on the site and its surroundings through the increase of water run-off. Strategies such as green roofs, pervious surfaces and reduction of hardscapes can be used to minimize the volume and rates of storm water run-off from the site. The overall permeability of the site can be determined by weighting the permeability of each area on the site. The following sub-indicator is assessed: 1.12.1: Site location 						ıd e :h		
Areas covered	1.12.1: Site locat	ion							
	 This sub-indicator evaluates in which degree and in which sense the type of land use is changed by the construction project. Area is not "consumed", but a usage-change of the area takes place. 1. The previous use of the area can be determined from the certificates of title or extracts from the land survey register. 2. The previous contamination (i.e. the initial level of pollution) of the property by contaminated sites, munitions, etc. can be determined based on available survey reports. 3. The implementation of compensatory measures can be identified based on available documents. 4. Based on the planning documents, it is checked if a green roof is planned, and can be approved as a compensation measure. 5. The type, extent, and direction of change of the actual use of the area are provended and use for the actual use of the area are 						a e ty		



	near-natural toward built-up = negative, respectively change from contaminated area toward built-up = positive). The actual type of use accordin to the land survey register is decisive for the evaluation.				
Barriers	-				
Rating	Sub Indicator Weighting 4				
References	References provided in the References Section Below				
SCALE					
Application	The Indicator can be applied at the neighbourhood scale.				
Details					
Multiscale	The Indicator can be applied at the neighbourhood scale.				
References	References provided in the References Section Below				

REFERENCES	
[1]	LEED 2009: Site 1 Site Selection and Site 3 Brownfield Redevelopment
[2]	BREEAM 2011: LE6 Reuse of land and LE7 Contaminated land
[3]	DGNB 2009: 15 Space Demand
[4]	BNB 2011: 1.2.4 Demand of Space
[5]	http://www.nachhaltigesbauen.de/fileadmin/pdf/BNB_Steckbriefe_Buero_Ne
	ubau/aktuell/BNB_BN_124.pdf



	Imperviousness Change, Imperviousness coefficient (-)								
ENV.LU.06	ISSUE CATEGORY LEVEL SCALE								
(1.12)	Environmental	Land Use	S		N				
GENERAL									
Description	The constant increase in traffic and settlement areas shall be reduced. Preferably, areas shall be used that are already assigned as traffic or settlement areas or that are allocated for the recovery of contaminated locations. This indicator supports the European Commission target to achieve a more rational use of soil, requiring Member States to take appropriate measures to limit sealing by rehabilitating brownfield sites and to mitigate its effects by using construction techniques that allow maintaining as many soil functions as possible.								
Background	Core Indicator a	dapted from LE	ED, BREEA	M, DGNB	/BNB				
References	[1], [2], [3], [4], [5]	-							
LEVEL									
Derived from	Software tool Simple Calculations	Operational da X Empirical/Liter	ata ature	In situ meas Other (spec	surements ify)				
Details		· ·	·						
	the project has on the environment can vary from a positive change (remediation of brownfield) to a negative change (depletion of prime farmland or greenfield) Increasing the imperviousness of the site can have major repercussions on the site and its surroundings through the increase of water run-off. Strategies such as green roofs, pervious surfaces and reduction of hardscapes can be used to minimize the volume and rates of storm water run-off from the site. The overall permeability of the site can be determined by weighting the permeability of each area on the site. The following sub-indicator is assessed: 1.12.2: Imperviousness changes								
Areas coverea	 1.12.2: Permeability changes Note 1.12.2: Imperviousness changes - Calculation of existing site and developed site imperviousness coefficient - Site plan indicating each type of surface's area and imperviousness coefficient 								
Barriers	-								
Rating	Sub Indicator Weight	ting 2							
References	References provided	in the References S	Section Below	V					
SCALE									
Application	The Indicator can be	applied at the neig	hbourhood s	cale.					
Details	-								
Multiscale	The Indicator can be	applied at the neig	hbourhood s	cale.					
References	References provided in the References Section Below								



REFERENCES	
[1]	LEED 2009: Site 1 Site Selection and Site 3 Brownfield Redevelopment
[2]	BREEAM 2011: LE6 Reuse of land and LE7 Contaminated land
[3]	DGNB 2009: 15 Space Demand
[4]	BNB 2011: 1.2.4 Demand of Space
[5]	http://www.nachhaltigesbauen.de/fileadmin/pdf/BNB_Steckbriefe_Buero_Ne
	ubau/aktuell/BNB_BN_124.pdf



	Recyclable Waste Storage (m ²)								
EINV.IIII.29	ISSUE CATEGORY LEVEL SCALE								
(1.13)	Environmental		Impacts		S	В			
GENERAL									
Description	operational-related recyclable waste streams, so that such waste is diverted from landfill or incineration. To encourage the provision of facilities that help facilitate the reduction in volume of compostable organic waste going directly to landfill during the building's operation. This supports the objectives of current EU waste policy: to prevent waste and promote re-use, recycling and recovery so as to reduce the negative environmental impact ₁ . The targets for the recycling of waste are: 50% of household waste and 70% for construction and demolition waste recycled by 2020								
Background	Core Indicato	r ao	dapted fron	n BREE	AM, LEE	ED, HQE			
References	[1], [2], [3]		-						
LEVEL				T					
	Software tool		Operational da	ta	In situ	measurements			
Derived from	Simple Calculations		Empirical/Liter	ature	Other (Verifica	specify) Site x			
Areas covered	 wastes within the case-study building, which will likely affect the success of waste-minimization programs during operation. The following sub-indicators is assessed: 1.13.1 Recyclable Waste Storage. Calculation and Rating 1.13.1 Recyclable Waste Storage Requirements 								
	 A dedicated storage space to cater for recyclable materials generated by the building during occupation, compliant with the following: Clearly labelled for recycling Placed within accessible reach of the building In a location with good vehicular access to facilitate collections. The size of the space allocated must be adequate to store the likely volume of recyclable materials generated by the building's occupants/operation. The following must be complied with as a minimum: At least 2 m₂ per 1000 m₂ of net floor area for buildings <5000 m₂ A minimum of 10 m₂ for buildings ≥5000 m₂ An additional 2 m₂ per 1000 m₂ of net floor area where catering is provided (with an additional minimum of 10 m₂ for buildings ≥5000 m₂). 								
Barriers	-								
Rating	Sub Indicator Weig	nting	<u>,</u> 4						
References	References provided in the References Section Below								



SCALE	
Application	The Indicator can be applied at the building scale but can also be applied at the neighbourhood scale for more buildings.
Details	-
Multiscale	It is possible to apply the indicator for the single building scale and also to a group of buildings of similar function.
References	References provided in the References Section Below

REFERENCES	
[1]	BREEAM 2011: Wst 3 - Recyclable Waste Storage and Wst 5 – Composting
[2]	LEED 2009: Materials Pre 1 Storage and Collection of Recyclables
[3]	HQE 2012: 6.1. Optimising the recycling of operational waste and 6.2. Quality of the operational waste management system



ENIX/ Imp 27	Composting (n/a)							
$\mathbf{EINV.IIII.Z/}$	ISSUE CATEGORY LEVEL SCALE							
(1.13)	Environmental		Impacts		S	В		
GENERAL								
Description	To recognize the provision of dedicated storage facilities for a building's operational-related recyclable waste streams, so that such waste is diverted from landfill or incineration. To encourage the provision of facilities that help facilitate the reduction in volume of compostable organic waste going directly to landfill during the building's operation. This supports the objectives of current EU waste policy: to prevent waste and promote re-use, recycling and recovery so as to reduce the negative environmental impact ₁ . The targets for the recycling of waste are: 50% of household waste and 70% for construction and demolition waste recycled by 2020.							
Background	Core indicator adap	tea	Trom BREEAIVI, L	EED, HQE				
References	[1], [2], [3]							
LEVEL	Software tool	Т	Operational da	**	In citu	maasuramants		
Derived from	Simple Calculations		Empirical/Liter	ature	Other Verific	(specify) Site	x	
	 wastes within the case-study building, which will likely affect the success of waste-minimization programs during operation. The following sub-indicators is assessed: 1.13.2 Composting 							
Areas covered	 1.13.2 Composting When no compostable waste is produced within the building, this sub-indicator is not evaluated. In that case, the score achieved for this indicator is the score achieved for the sub-indicator 1.13.1 The compliance with one of the two following options is evaluated: Option 1: onsite composting 1. A vessel is installed on site for composting suitable food waste resulting from the building's daily operation and use. 2. There is adequate space for storing segregated food waste and composted organic material. 3. At least one water outlet is provided for cleaning in and around the facility. OR Option 2: offsite composting 1. There is a dedicated segregated space for storing compostable food waste prior to collection and delivery to an alternative composting facility. 							
Barriers	-		•			, 		
Rating	Sub Indicator Weig	nting	<u>3</u> 4					
References	References provide	d in ⁻	the References S	Section Be	low			
SCALE								
Application	The Indicator can be applied at the building scale but can also be applied at the neighbourhood scale for more buildings.							



Details	
Multiscale	It is possible to apply the indicator for the single building scale and also to a
	group of buildings of similar function.
References	References provided in the References Section Below

REFERENCES	
[1]	BREEAM 2011: Wst 3 - Recyclable Waste Storage and Wst 5 – Composting
[2]	LEED 2009: Materials Pre 1 Storage and Collection of Recyclables
[3]	HQE 2012: 6.1. Optimising the recycling of operational waste and 6.2. Quality
	of the operational waste management system



ENV En 02 Stairs and Ramps Planning (n/a)								
(1, 14)	ISSUE CATEGORY LEVEL SCALE							
(1.14)	Environmental Energy S B							
GENERAL								
Description	There is already about 4,8 million lifts, as well as about 75 thousand escalators and moving walks installed in the EU-27. Their energy consumption adds up to 3 to 5 % of the overall consumption of a building. The objective is to reduce the energy consumption of the vertical transportation systems through: - encouraging the use of stairs and ramps in preference to lifts, escalators and moving walks - encouraging the specification of energy efficient lifts, escalators and moving walks							
Background	Indicator adapted	from	BREEAM, EN ISC	25745				
References	[1], [2]	-	,					
LEVEL								
	Software tool		Operational da	ita	In situ n	neasurements		
Derived from	Simple Calculation	าร	Empirical/Liter	ature	Other (s Verifica	specify) Site x		
	 walks. Buildings where none of these systems are present meet the requirements of this indicator by default as there is no energy consumption associated with them. If no lifts or escalators are present then this indicator is not assessed and full points are given. The following sub-indicator is assessed: 1.14.1 Stairs and ramps planning 					et the consumption sessed and full		
Areas covered	 1.14.1 Stairs and ramps planning Calculation and Rating The points achieved in 1.14.2 and 1.14.3 are calculated only for those systems present in the building. Systems not present in the building are excluded from the calculation. For example, if the building has only one of these systems (e.g. lifts are present but no escalators nor moving walks), then only the points achieved for the lifts are taken into account. If more than one of these is present, then the number of points for these systems which are present is awarded. If none of these systems are present, there will be no energy consumption associated with them. Therefore full points for the indicator 1.14 will be achieved. 1.14.1 Stairs and ramps planning This sub-indicator assesses the easiness of using stairs and ramps to access different levels of the building. It focuses on the visibility and attractiveness of the stairs and ramps in comparison to the lifts. The energy use of lifts, escalators and moving walks can be reduced considerably if 'energy-free' alternative means of travelling to different levels within the building can be					or those systems e excluded from ese systems (e.g. ly the points of these is re present is consumption .14 will be mps to access attractiveness of e of lifts, energy-free' uilding can be n lifts will		



Barriers	The benefit of visible and easily accessible stairs and ramps is particularly relevant to the first few floors and to inter-floor traffic in any building, regardless of it being high rise or lower rise. However, the impact will be greater in lower rise buildings as there will be proportionally more floors where traffic can be diverted from the lifts to the stairs. The following requirements are used to assess this indicator: 1. Stairs/ramps are visible from building entrance or they can be seen before the lift AND Stairs/ramps are see-through or open throughout the occupied floors of the building. Alternatively, if this is not possible (e.g. due to fire separation requirements), they are expressed in a way that they are easily identified and architecturally appealing to building users 2. Travel distance from entrance to the stairs or ramps is less than to the lifts.
Barriers	The points achieved in 1.14.2 and 1.14.3 are calculated only for those systems present in the building. Systems not present in the building are excluded from the calculation. For example, if the building has only one of these systems (e.g. lifts are present but no escalators nor moving walks), then only the points achieved for the lifts are taken into account. If more than one of these is present, then the number of points for these systems which are present is awarded. If none of these systems are present, there will be no energy consumption associated with them. Therefore full points for the indicator 1.14 will be achieved.
Rating	Sub Indicator Weighting 4
References	References provided in the References Section Below
SCALE	
Application	The Indicator can be applied at the building scale.
Details	-
Multiscale	The Indicator can be applied at the building scale.
References	References provided in the References Section Below

REFERENCES	
[1]	EN ISO 25745: Energy performance of lifts, escalators and moving walks (joint standardization work between ISO and CEN).
	Part 1 defines the measurement and verification method and related tools for energy consumption.
	Part 2 covers the energy efficiency for lifts, including energy classification for lifts.
	Part 2 covers the energy efficiency for escalators and moving walks, including energy classification for escalators and moving walks.
[2]	BREEAM Europe Commercial 2009: Ene 8 - Lifts and Ene 9 - Escalators and travelling walks



	Lift Design and Efficiency (-)								
ENV.En.UZ	ISSUE	C	ATEGORY	LEVE	L	SCALE			
(1.14)	Environmental Energy S B								
GENERAL									
Description	There is already about 4,8 million lifts, as well as about 75 thousand escalators and moving walks installed in the EU-27. Their energy consumption adds up to 3 to 5 % of the overall consumption of a building. The objective is to reduce the energy consumption of the vertical transportation systems through: - encouraging the use of stairs and ramps in preference to lifts, escalators and moving walks - encouraging the specification of energy efficient lifts, escalators and moving walks								
Background	Indicator ada	pted	from BREEAN	и, en iso	25745				
References	[1], [2]	•		,					
LEVEL									
	Software tool		Operational da	ata	In situ m	easurements			
Derived from	Simple Calculatio	ons	Empirical/Liter	rature	Other (sp Verificati	pecify) Site			
	assessed, as well as the design and efficiency of the lifts, escalators and moving walks. Buildings where none of these systems are present meet the requirements of this indicator by default as there is no energy consumption associated with them. If no lifts or escalators are present then this indicator is not assessed and full points are given. The following sub-indicator is assessed: 1.14.2 Lifts design and efficiency								
Areas covereu	 Calculation and Rating The points achieved in 1.14.2 and 1.14.3 are calculated only for those systems present in the building. Systems not present in the building are excluded from the calculation. For example, if the building has only one of these systems (e.g. lifts are present but no escalators nor moving walks), then only the points achieved for the lifts are taken into account. If more than one of these is present, then the number of points for these systems which are present is awarded. If none of these systems are present, there will be no energy consumption associated with them. Therefore full points for the indicator 1.14 will be achieved. 1.14.2 Lifts design and efficiency This sub-indicator assesses the design and efficiency of the lifts with a focus on energy efficiency. If EN ISO 25745-2 available If the average energy efficiency class for all the lifts in the building is available as defined by EN ISO 25745-2, the points will be given according to the class achieved: A. C. D. E. E. G.								
	If EN ISO 25745-2 not available If the energy efficiency class as defined by EN ISO 25745-2 is not available for								



Barriers	 an the first, the points will be given according to the achievement of the following requirements: The total weight of the car (including frame, finishes and associated equipment) doesn't exceed 60% of the rating of the lift (i.e. nominal load). The lifts operate in a standby mode during off-peak and idle periods. For example, the power side of the lift controller and other auxiliary equipment such as lift car lighting and ventilation fan switch off when the lift is not in motion. Lift motors use a drive controller capable of variable-speed, variable-voltage, variable-frequency control of the drive motor. The lift car uses energy-efficient lighting and display lighting (>60 lumens/watt or fittings that consume less than 5W e.g. LEDs). Where it is proved to be beneficial from the energy saving point of view, the lift has a regenerative unit so that energy generated by the lift (due to running up empty and down full) is returned back to the grid or used elsewhere on site. The lift cars (or lift shafts) do not require air conditioning or heating The points achieved in 1.14.2 and 1.14.3 are calculated only for those systems present in the building. Systems not present in the building are excluded from the calculation. For example, if the building has only one of these systems (e.g. lifts are present but no escalators nor moving walks), then only the points achieved for the lifts are taken into account. If more than one of these is present, then the number of points for these systems which are present is awarded. If none of these systems are present, there will be no energy consumption associated with them. Therefore full points for the indicator 1.14 will be
Ratina	Sub Indicator Weighting 4
References	References provided in the References Section Below
SCALE	
Application	The Indicator can be applied at the building scale.
Details	-
Multiscale	The Indicator can be applied at the building scale.
References	References provided in the References Section Below
Barriers Barriers References SCALE Application Details Multiscale References	 v. Where it is proved to be beneficial from the energy saving point of view, the lift has a regenerative unit so that energy generated by the lift (due to running up empty and down full) is returned back to the grid or used elsewhere on site. vi. The lift cars (or lift shafts) do not require air conditioning or heating The points achieved in 1.14.2 and 1.14.3 are calculated only for those systems present in the building. Systems not present in the building are excluded from the calculation. For example, if the building has only one of these systems (e.g. lifts are present but no escalators nor moving walks), then only the points achieved for the lifts are taken into account. If more than one of these is present, then the number of points for these systems which are present is awarded. If none of these systems are present, there will be no energy consumption associated with them. Therefore full points for the indicator 1.14 will be achieved. Sub Indicator Weighting 4 References provided in the References Section Below The Indicator can be applied at the building scale. References provided in the References Section Below

REFERENCES	
[1]	 EN ISO 25745: Energy performance of lifts, escalators and moving walks (joint standardization work between ISO and CEN). Part 1 defines the measurement and verification method and related tools for energy consumption. Part 2 covers the energy efficiency for lifts, including energy classification for lifts. Part 2 covers the energy efficiency for escalators and moving walks, including energy classification for escalators and moving walks.
[2]	BREEAM Europe Commercial 2009: Ene 8 - Lifts and Ene 9 - Escalators and travelling walks



	Escalators and moving walks design and efficiency (-)							
ENV.En.01	ISSUE CATEGORY LEVEL SCALE							
(1.14)	Environmental	В						
GENERAL								
Description	There is already about 4,8 million lifts, as well as about 75 thousand escalators and moving walks installed in the EU-27. Their energy consumption adds up to 3 to 5 % of the overall consumption of a building. The objective is to reduce the energy consumption of the vertical transportation systems through: - encouraging the use of stairs and ramps in preference to lifts, escalators and moving walks - encouraging the specification of energy efficient lifts, escalators and moving walks							
Background	Indicator adapted fro	m BREEAM, EN ISC) 25745					
References	[1], [2]							
LEVEL								
Derived from (Check – X - as appropriate)	Software tool Simple Calculations	Operational da Empirical/Liter	ata rature	In situ measurements Other (specify) Site Verification	x			
	assessed, as well as the design and efficiency of the lifts, escalators and moving walks. Buildings where none of these systems are present meet the requirements of this indicator by default as there is no energy consumption associated with them. If no lifts or escalators are present then this indicator is not assessed and full points are given. The following sub-indicator is assessed: 1.14.3 Escalators and moving walks design and efficiency							
Areas covered	Calculation and Rating The points achieved in 1.14.2 and 1.14.3 are calculated only for those systems present in the building. Systems not present in the building are excluded from the calculation. For example, if the building has only one of these systems (e.g. lifts are present but no escalators nor moving walks), then only the points achieved for the lifts are taken into account. If more than one of these is present, then the number of points for these systems which are present is awarded. If none of these systems are present, there will be no energy consumption associated with them. Therefore full points for the indicator 1.14 will be achieved. 1.14.3 Escalators and moving walks design and efficiency This sub-indicator assesses the efficiency of escalators and moving walks.							
	If EN ISO 25745-3 available If the average energy efficiency class for all the escalators and moving walks in the building is available as defined by EN ISO 25745-3, the points will be given according to the class achieved: A+++, A++, A, B, C, D, E. If EN ISO 25745-3 not available If the energy efficiency class as defined by EN ISO 25745-3 is not available for all the lifts, the points will be given according to the achievement of the							



	following requirements: i. The escalators and moving walks are fitted with a load sensing device that synchronizes motor output to passenger demand through a variable speed drive ii. The escalators and moving walks are fitted with a passenger sensing device for automated operation, so they operate in standby mode when there is no
	iii. The escalators and moving walks do not have handrail lighting.
Barriers	The points achieved in 1.14.2 and 1.14.3 are calculated only for those systems present in the building. Systems not present in the building are excluded from the calculation. For example, if the building has only one of these systems (e.g. lifts are present but no escalators nor moving walks), then only the points achieved for the lifts are taken into account. If more than one of these is present, then the number of points for these systems which are present is awarded. If none of these systems are present, there will be no energy consumption associated with them. Therefore full points for the indicator 1.14 will be achieved.
Rating	Sub Indicator Weighting 4
References	References provided in the References Section Below
SCALE	
Application	The Indicator can be applied at the building scale.
Details	-
Multiscale	The Indicator can be applied at the building scale.
References	References provided in the References Section Below

REFERENCES	
[1]	 EN ISO 25745: Energy performance of lifts, escalators and moving walks (joint standardization work between ISO and CEN). Part 1 defines the measurement and verification method and related tools for energy consumption. Part 2 covers the energy efficiency for lifts, including energy classification for lifts. Part 2 covers the energy efficiency for escalators and moving walks, including energy classification for escalators and moving walks.
[2]	BREEAM Europe Commercial 2009: Ene 8 - Lifts and Ene 9 - Escalators and travelling walks



	Abiotic Depletion Potential, ADP elements (kg SB-E /m ²)						
EINV.IM.24	ISSUE CATEGORY LEVEL SCALE						
(1.15)	Environmental Impacts S B						
GENERAL							
Description	Abiotic resources ar	e f	ound in nature that	t has	not been	subjected to any	
	mining or transforma	tio	n process into final pr	roduct	s.		
	The indicator Contri	but	ion to the depletion	n of al	piotic reso	ources - non fossil	
	fuels, figures the co	ontr	ibution of the build	ding to	o reducin	g the quantity of	
	mineral resources av	aila	ble.				
Background	Core Indicator adapte	ed f	rom EN 15978				
References	Give valid references	for	English speaking rea	ders t	o get furtl	her insight on the	
	indicator. Supply refe	erer	nces as numbers in br	rackets	s. The cori	responding full	
	reference will be sup	plie	d in the section "REF	ERENC	CES".		
LEVEL							
Darived from	Software tool	Х	Operational data		In situ	measurements	
Derived from	Simple Calculations		Empirical/Literature	ć	Other	(specify)	
Details	The indicator is main	ly b	ased on the method	of Life	Cycle Ass	sessment (LCA):	
	LCA results of the bui	ldir	ng to be assessed will	l be ca	lculated ir	n a standardized	
	way and evaluated ag	gair	ist benchmarks. Thus	S Abiot	ic Depleti	on Potential for	
	non-renewable resou	irce	s is a quantitative inc	dicato	ſ.		
	According to the stan	Idai	ds EN 15804 and EN	15978	8, the met	hod of Life-Cycle	
	Assessment generally	/ со	nsists of four steps: D	Definit	ion of goa	al and scope of the	
	study, inventory anal	ysis	, impact assessment	and ir	iterpretat	ion. The indicators	
	1.1-1.5, 1.9-1.10 and	1.1	5 are based on LCAs	and fo	r all these	e indicators the	
	same definitions for g	goa	l and scope and for th	he inve	entory and	alysis do apply.	
Areas covered	Calculation						
	when calculating the	When calculating the non-renewable primary energy demand for the building,					
	the following calculat	tion	rules must be follow	/ed:	,,		
	Abiotic Depietion Po	ten	tial for Designed Bu	linaing	o ovelo ic	composed of the	
	contribution to the a	According to figure the ADPelement for the building life cycle is composed of the					
	contribution to the abiotic resource depietion caused during the different life						
	$\Delta DP_{\text{algorate}} = (\Delta DP_{\text{algorate}})$	mont	$n_r + \Delta D P_{alamant c} + \Delta D P_{alamant c}$	Dalamant		(mont ool)/NEA(1)	
	where	ment		element			
	ADPelement ic Abiotic d	enlo	etion potential of the	build	ing during	the life cycle of	
	the entire building.	- p.				,	
	ADPelement, pr Contribut	tion	of the building const	tructic	on product	ts for the product	
	stage (from cradle to	gat	.e),		•	·	
	ADPelement, c Contribut	ion	of the building const	ructio	n product	s and temporary	
	construction works d	urir	ng the construction st	tage o	f the build	ling,	
	ADPelement,0 Contribut	ion	of the building const	ructio	n product	for maintenance,	
	repair and change of products during the operational stage,						
	ADPelement, eol Contribu	tio	n of the building cons	structi	on produc	cts during the end	
	of life stage (deconstruction, material segregation and transportation to final						
	destination),						
	ADPelement, LC Contribut	tior	of the building const	tructio	on produc	ts for the product	
	stage (from cradle to	gat	.e),				
	NFA Net Floor Area o	fth	e building.				
	Rating Method				-		
	The "designed building" is rated against a case-specific reference building.						



	Abiotic Depletion Potential for "Reference Building"					
	Calculation for the ADP _{Element} , Ref for the building life cycle is composed of the					
	contribution to the abiotic resource depletion caused during the different life					
	cycle stages of the building.					
	ADPelement.Ref.LC = (ADPelement.Ref.pr + ADPelement.Ref.C + ADPelement.Ref.0 +					
	ADPelement Ref. eq.)/NFA (2)					
	where					
	ADP _{element Befuc} Abjoric depletion potential of the building during the life cycle of					
	the entire huilding					
	ADP _{element Bef pr} Contribution of the building construction products for the					
	product stage (from cradle to gate).					
	ADP _{element Bef} c Contribution of the building construction products and					
	temporary construction works during the construction stage of the building					
	$\Delta DP_{element Ref a}$ Contribution of the building construction product for					
	maintenance, renair and change of products during the operational stage					
	ADP _{alament Bef col Contribution of the building construction products during the}					
	end of life stage (deconstruction material segregation and transportation to					
	final destination)					
	NEA Net Floor Area of the building					
	The reference values for ADP element Reflic can be extracted from Table1 and					
	Table 2. These tables show reference values for both assessment types – "Ouick					
	and Basic" assessment and "Complete" assessment.					
Barriers	-					
Rating	Sub Indicator Weighting 4					
References	References provided in the References Section Below					
SCALE						
Application	The Indicator can be applied at the building scale but can also be applied at the					
	neighbourhood scale for more buildings.					
Details	-					
Multiscale	It is possible to apply the indicator for the single building scale and also to a					
	group of buildings of similar function.					
References	References provided in the References Section Below					
REFERENCES						
[1]	ISO 14040: 2009-11: Environmental management – Life cycle assessment –					
	Principles and framework. International Organization for Standardization.					
[2]	ISO 14044: 2006 10: Environmental management Life such accessment					
[2]	Boguiromonts and guidelines. International Organization for Standardization					
	Requirements and guidelines. International Organization for Standardization.					
[3]	FprEN 15978: 2011: Sustainability of construction works — Assessment of					
	environmental performance of buildings — Calculation method. European					
	Committee for Standardization CEN.					
[4]	prEN 15804: 2010: Sustainability of construction works — Environmental					
	product declarations — Core rules for the product category of construction					
	products. European Committee for Standardization CEN.					
נרו	Directive 2000/28/EC of the European Darliement and of the Council of 22 April					
[5]	Directive 2009/28/EC of the European Parliament and of the Council of 23 April					
	2009 on the promotion of the use of energy from renewable sources and					



	amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
[6]	Kreißig, J., Binder, M. (2007): Methodische Grundlagen- Ökobilanzbasierte Umweltindikatoren im Bauwesen. Methodenbericht zum BMVBS-Projekt "Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das nachhaltige Bauen" (AZ 10.06.03 – 06.119) Mai 2007, www.baufachinformation.de/literatur.isp.
[7]	United Nations (1998): Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1998, http://unfccc.int/resource/docs/convkp/kpeng.pdf.
[8]	Bundesministerium für Verkehr, Bau- und Wohnungswesen: Guideline for Sustainable Building. Eigenverlag, 2001.
[9]	Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
[10]	VDI 2067: Economic efficiency of building installations – Fundamentals and economic calculation. Verein Deutscher Ingenieure, 2000.



A.11 – SuPerBuildings



SuPerBuildings

Sustainability and Performance assessment and benchmarking of Buildings http://cic.vtt.fi/superbuildings/ SuPer Buildings Sustainability and Performance assessment of Buildings – SuPerBuildings

SuPerBuildings (2010-2012) was project developed and selected sustainability indicators for buildings; improved the understanding about performance levels considering new and existing buildings, different building types and different national and local requirements; developed methods for the assessment and benchmarking of sustainable buildings; and made recommendations for the effective use of benchmarking systems as instruments of steering and in different stages of building projects.

The framework for the assessment of environmental, social and economic performance is being developed within CEN and ISO. SuPerBuildings considered the output of the standardization processes and focused on the development of the validity of sustainable building indicators, comparability of assessment results, benchmarking criteria and the usability of indicators in building processes. The project also provided recommendations for the improvement of standards.



INDICATORS

	Consumption of non-renewable primary energy (kWh/m ² yr)						
ENV.En.12	ISSUE CATEGORY LEVEL SCALE						
	Environmental		Energy	S	B/ N		
GENERAL							
Description	Sum of amounts of non-renewable energies used all along the life cycle of the building, expressed in primary energy. This is a quantitative indicator. Fossil and nuclear fuels are mainly concerned, including electricity based on these fuels. Primary energy means energy which has not undergone any conversion or transformation process.						
Background							
References	[1]						
LEVEL		1					
Derived from	Software tool		Operational data	In situ r	measurements X		
Derived from	Simple Calculations	Х	Empirical/Literature	Other (specify)		
	Simple Calculations X Empirical/Literature Other (specify) Definition: For transparency and decision-aid purposes, it is useful to be able to distinguish the calculation/ measure of: - Embodied energy in the life cycle of construction products (production, construction, use, end of-life), considering the replacement of certain products during the service life of the building - Energy consumed during the operation phase due to the building itself (building-related energy uses, with separation of EPBD uses and others (e.g. energy use of lifts, water pump for rain water use,), see EN 15978) - Energy consumed during the operation phase due to activity-related equipment (non-building related, optional in design phase, e.g. washing machines, cooking,) - Energy embodied in water-related services during the operation phase (provision of drinkable water, treatment of waste water), distinguishing building-related and non-building related water uses (optional) - Energy embodied in water-related services during the operation phase (provision of drinkable water, treatment of waste water), distinguishing building-related and non-building related and to be made on the reduction of energy consumed during the operation phase, endodied energy it is necessary to divide the total embodied energy by the service life of the building). Considering the efforts made and to be made on the reduction of energy consumed during the operation phase, endodied energy in construction products is not negligible, as well as energy due to activity-related equipment. Measurement unit KWhpe / m² year						
Areas covered	Building/site/location are	a					
Barriers	 Need database with embodied energy of construction products, based on LCA, and related tool in order to facilitate calculation. Limits come from the lack of available EPDs of construction products and related databases. EPDs on technical equipment (heating, etc.) are often lacking. The quantities of materials included in a building are not always available and complete, or are expressed in units not directly compatible with those used in EPDs. If dynamic simulation is chosen, adequate software is needed, knowing that it is relatively time-consuming. It is difficult to separate energy consumed for the building itself (heating, lighting, etc.) and the one for activities (computers, cooking, etc.) when energy metering is not specific per use 						



Weighting	As this indicator is a quantitative sum of kWh, no weighting or aggregation is necessary. If the intention is to go further and express an indicator in terms of depletion of non-renewable resources, some conversion or weighting factors should be used in order to be able to sum results from different energy sources.
References	
SCALE	
Application	Building/site/location
Details	
Multiscale	
References	
REFERENCES	
[1]	Sustainability and performance assessment and benchmarking of buildings <u>http://www.vtt.fi/inf/pdf/technology/2012/T72.pdf</u>



	Embodied water use (m ³ /m ² yr)									
ENV.Wa.01	ISSUE	С	ATEGORY	LE\	/EL	SCALE				
	Environmental		Water	0,	5	B / N				
GENERAL										
Description	On-site water manage	men	t that aims at limit	ing the deple	tion of fresh w	vater resources.				
Background										
References	[1]									
LEVEL										
	Software tool		Operational of	data	In situ	measurements				
Derived from	Simple	Х	Empirical/Lite	erature	Other ((specify)				
	Calculations									
Details	Definition:									
	Water necessary to pro	bduc	e, build, use, mair	tain and disp	ose of the bui	lding				
	Contribution of buildin	na t a ma	ne outdoor consti aterials and equin	ructions on the to	e building site	sumption				
	Measurement unit	Neasurement unit								
	m-runctional unit (e.g. m- net floor area) calculated either per year or total amount for the whole life cycle of the building									
	Classification:									
	The values of the indicators are compared to the typical values obtained for the building type									
	in question and a score	e is g	iven based on the	water saving	levels obtaine	ed.				
	Calculation method:									
	Lifecycle inventory of v	vate	r use (EN 15978: r	n ³ of fresh wa	iter)					
Areas covered	Building/site areas									
Barriers	A database on embodi	ed w	vater use is neede	d for all buildi	ng materials a	nd equipment's and a				
	tool to analyse the dat	a on	the building level	. Due to a lack	c of data, this i	indicator may be				
	difficult to evaluate at data, as INIES in France	ne i . or	Fcoinvent for gen	r, some datab eric data.	ases exist with	i empodied water				
Weiahtina	For the embodied wat	er us	e, aggregation ca	h be carried o	ut by water ty	pe (e.g. drinking				
	water, rain water,). Or	if a	total sum of all w	ater consume	d is required,	different types of				
	water can eventually b	e ag	gregated using we	eighting factor	s based on th	e quality of the water.				
	In any case, it is recom	men	ded to provide op	erational drin	iking water us luato oporatio	e separately from				
	building.				iuale operatio					
References										
SCALE										
Application	Building/site scale									
Details										
Multiscale										
References										
REFERENCES	l									
[1]	Sustainability and perform	nanc	e assessment and be	enchmarking of	buildings					
	http://www.ytt.fi/inf/pdf	/tech	nology/2012/T72.p	df						



				-						
	Operationa	l wate	er use (m³/yr							
ENV.Wa.03	ISSUE	C	ATEGORY	LEVEL		SCALE				
	Environmental		Water	S		B / N				
GENERAL										
Description	On-site water man	agement	t that aims at limitin	g the depletion	of fresh v	vater resources.				
Background										
References	[1]									
LEVEL										
	Software tool		Operational da	ta	In situ	measurements				
Derived from	Simple	X Empirical/Literature Other (specify)			(specify)					
	Calculations		•							
Details	Definition:		L							
	Water use of the b	uilding-i	ntegrated technical	systems and of t	the user, a	as needed for the				
	technically and fur	nctionally	defined operation	of the building.						
	Measurement uni	t voar or d	au)/parson (a.g. par	full time equive	lont or n	or inhabitant) or				
	m ³ /time unit (e.g.	vear or d	av)/functional unit	e.g. m2 net floo	or area)					
	Classification:	,			,					
	The values of the i	he values of the indicators are compared to the typical values obtained for the building type								
	in question and a s	n question and a score is given based on the water saving levels obtained.								
	Calculation metho	Calculation method:								
	water consuming b	Calculation of total (drinking) water consumption based on the characteristics of the chosen								
	appliances like was	appliances like washing machines) and scenarios for water use (e.g. number of flushes per day,								
	amount of water f	amount of water for irrigation).								
Areas covered	Building/site areas									
Barriers	Water consumptio	on (techn	ical information) of	appliances is ne	eded, as v	well as estimations of				
	typical patterns of	use (sce	narios) for different	building types/u	users and	eventually a tool to				
	Taking into accour	t the am	ount of rainwater th	hat can be used	within the	es and patterns of use	•			
	tool to dimension	and eval	uate the efficiency o	of the rainwater	collection	system based on				
	average rainfalls w	ithin the	considered region,	technical charad	cteristics of	of the rainwater				
	collection system (volume	of the water tank, ef	fficiency of filter	s,) and	estimated operational	I			
Mainhting	water needs of the	e building	g.	he carried out h	water	tuno (o.g. drinking				
weighting	water rain water	Or if a	total sum of all wat	er consumed is r	oy water i required	different types of				
	water can eventua	lly be ag	gregated using weig	hting factors ba	sed on th	e quality of the water.				
	In any case, it is re	commen	ded to provide oper	ational drinking	water us	e separately from				
	other water consu	mption a	s this number is nee	eded to evaluate	e operatio	onal costs of the				
	building.									
References							_			
SCALE	Duilding (site asole									
Application	Building/site scale									
Details										
Multiscale										
References							_			
REFERENCES										
[1]	Sustainability and pe http://www.vtt.fi/inf	rformance /pdf/tech	e assessment and benc nology/2012/T72.pdf	chmarking of build	lings					



	Waste water n	าลเ	nagement (m	n³/m² yr	·)			
ENV.Wa.15	ISSUE	(CATEGORY	LE	VEL	SCALE		
	Environmental		Water		S	B / N		
GENERAL	-							
Description	On-site water manager	nen	that aims at limitin	g the deplet	ion of fresh v	vater resources.		
Background								
References	[1]							
LEVEL				T				
	Software tool	Х	Operational da	ta	In situ	measurements X		
Derived from	Simple	Х	Empirical/Liter	ature	Other	(specify)		
	Calculations							
Details	Definition Evacuation of wastewater and excess rainwater from the building site to the public sewage system.							
	Measurement unit m ³ /functional unit (e.g. m2 net floor area) /year or m ³ /person (e.g. per full time equivalent or per inhabitant)/year							
	Classification: The values of the indicators are compared to the typical values obtained for the building type in question and a score is given based on the water saving levels obtained.							
	Calculation method: Assessment of the amount of water evacuated to the sewage system based on estimated operational water use (minus water "consumed" onsite for example for irrigation), excess rainwater and onsite water recycling.							
Areas covered	Urban areas							
Barriers	In addition to data and additional tools are nee systems so that amoun system can also be eval evacuated by onsite wa	too edec ts o uate iste	s needed for the ca l to dimension and e excess rainwater tl ed, and tools to eva water treatment eq	lculation of t evaluate the nat need to l luate the am uipment's.	the operation efficiency of be evacuated hount of wate	al water use, possible infiltration through the sewage r that will be		
Weighting	The total amount of wa rainwater and waste w eventually be used for and a lower factor can system (not mixed with	iter ater rain cert the	evacuated through that is evacuated to water as it has lowe ainly be used in case wastewater).	the sewage s o the sewage r levels of po e that rainwa	system is the e. A lower we ollution comp ater is evacua	sum of the excess ighting factor can ared to wastewater ted through a separate		
References								
SCALE								
Application	Building / site							
Details								
Multiscale								
References								
REFERENCES								
[1]	Sustainability and perform http://www.vtt.fi/inf/pdf/	ance tech	e assessment and ben nology/2012/T72.pdf	chmarking of I	buildings			



	Permeability of	sit	e / land (%)					
ENV.LU.04	ISSUE	С	ATEGORY	LE	VE	L	SCALE	
	Environmental		Land Use		A		B / N	
GENERAL								
Description	The indicator refers to the	lar	nd that is used for bu	uildings.				
Background								
References	[1]							
LEVEL								
De rive el free re	Software tool		Operational da	ta	Х	In situ	measurements	
Derived from	Simple Calculations		Empirical/Liter	ature		Other	(specify)	
Details	Definition							
	Soil sealing occurs becaus result of construction wor of soil sealing on a buildin building plot, but only to t reason for that is that dur areas can be influenced. Measurement unit The level of soil sealing is In Austria, the figure indic divided by the "area not b each plot; the higher the p In Germany, the level of so not permitted to build on Classification: The assessment result of a Calculation method: Quantitative assessment of	e of ks (g pl he : ing nor atin uilt perco oil s [m ²	covering earth with roads, buildings, par ot. Normally the fig area which is not bu the planning and bu mally given as a ratif g the level of soil se -on [m ²]" and is give eentage is the better ealing is calculated]". ilding is the better t	n non-perme rking etc.). 1 ure does no ilt-on or wh ilding proce o of areas (p aling is the en as a perce : by dividing f he less of a	eabl The t ref ich ess e enta the buil	e or low-p indicator i fer to the is not peri- specially f entage or a free of s age. It mus "sealed ar ding plot	permeable layers as a measures the degree whole area of the mitted to build on. Th the design of those m^2 / m^2). Examples: soil sealing $[m^2]^n$ st be calculated for rea $[m^2]^n$ by the "area is sealed.	he a
Areas covered	Building / site	/						
Barriers	Land use is dealt with on l institutions. Each municip responsible for the design of land use, spatial planni	oca ality atic ng s	l or community leve / has their own requ on of areas. In order hould be dealt with	l and there irements fo to enable s on superior	is a or th usta · lev	lack of su e level of inable de el.	perior planning soil sealing and is velopment in the fiel	d
Weighting	There is no common way	of v	veighting and aggreg	gating the la	ind i	use sub-in	dicators.	
References								
SCALE	-							
Application	Building / site							
Details								
Multiscale								
References								
REFERENCES								
[1]	Sustainability and performan http://www.vtt.fi/inf/pdf/tec	ce a hno	ssessment and benchr logy/2012/T72.pdf	narking of bu	ildin	gs		



	Change of lan	d use	e (-)							
ENV.LU.05	ISSUE	С	ATEGORY	LE\	/EL	SCALE				
	Environmental		Land Use	9	S	N				
GENERAL										
Description	The indicator refers to	o the lar	nd that is used for bu	uildings.						
Background										
References	[1]									
LEVEL				Г	Г					
Derived from	Software tool		Operational da	ta	In situ	measurements				
	Simple Calculation	ns X	Empirical/Liter	ature	Other	(specify)				
Details	Definition									
	As stated in ISO 2192 greenfield lands throu sites and redevelopm Measurement unit	As stated in ISO 21929-1:2011, "This indicator measures the avoidance of consuming of greenfield lands through the reuse of brownfield and derelict areas, refurbishment, using infill sites and redevelopment of existing built environment." Measurement unit								
	The type of land used is given as a qualitative description (e.g. use of an existing building, recycling of a previous building plot, development of new building areas, etc.). Examples (from best to worst case): - Use of contaminated land (after decontamination) - Use of an existing building or recycling of a building plot / brownfield site - Building on already developed sites inside of an existing housing settlement - Building on plots defined as building areas in addition to an existing housing settlement - Development of new building areas (provision of services necessary) - Building on re-designated, ecologically valuable areas									
	Calculation method:	nt of the	type of land used							
Areas covered	Site areas									
Barriers	Land use is dealt with institutions. Each mu responsible for the de of land use, spatial pl	on loca nicipality esignatic anning s	l or community leve y has their own requ on of areas. In order hould be dealt with	l and there is irements for to enable su on superior	s a lack of sup the level of stainable dev level.	perior planning soil sealing and is velopment in the field				
Weighting	There is no common	way of v	veighting and aggre	gating the lar	nd use sub-in	dicators.				
References										
SCALE										
Application	Site									
Details										
Multiscale										
References										
REFERENCES										
[1]	Sustainability and perfor http://www.vtt.fi/inf/po	rmance a lf/techno	ssessment and benchr logy/2012/T72.pdf	narking of buil	dings					



	Global warming potential (kg CO ₂ / (m ² yr)									
ENV.Im.09	ISSUE	C	ATEGORY	LE	EVE	L	SCALE			
	Environmental		Impacts	S	i / A		B / N			
GENERAL										
Description	Weighted sum of green	house	gases because of t	he building	inclu	uding its op	peration			
Background										
References	[1]	1]								
LEVEL										
Darived from	Software tool X Operational data		ata		In situ	measurements	Х			
Derived Itolii	Simple Calculations	Х	Empirical/Liter	rature		Other	(specify)			
Details	Definition	Definition								
	Greenhouse gases including at least CO ₂ , CH ₄ and N ₂ O									
	 Measurement unit kg (or tones) per m² (net floor area) calculated either per year or total amount during the chosen period (the chosen period may be the service life of the building). Classification: When benchmarking, the value of the indicator is compared to the average (or typical) value of the building type in question considering the purpose of use and the age group of the building. 									
Areas covered	Building/site/location									
Barriers	Applicable and relevant calculation tool are nee	data ded.	base of carbon foot	print of ene	ergy,	water and	d materials and a			
Weighting	Weighting in terms of g	lobal v	warming potential (GWP).						
References										
SCALE										
Application	Building/site/location									
Details										
Multiscale										
References										
REFERENCES										
[1]	Sustainability and perform http://www.vtt.fi/inf/pdf/	ance a	ssessment and bench	marking of bu	uildir	igs				



	Construction	and o	demolition w	aste gen	eration	(kg/m^2)				
ENV.Im.28	ISSUE	C	ATEGORY	LEV	/EL	SCALE				
	Environmental		Impacts	S		B / N				
GENERAL										
Description	Summary of constru and end-of-life phas	ction and es of the	l demolition waste و building life cycle	generated thr	ough constru	uction, refurbishment				
Background										
References	[1]									
LEVEL		Т								
Derived from	Software tool	Software tool Operational data In situ measurements								
	Simple Calculation	ons	Empirical/Liter	ature	X Other ((specify)				
Detuns	Calculation of constr demolition waste get the end of the life cy Sub-indicators: - Non-hazar - Hazardous - Nuclear w Measurement unit kg/m ² – amount of (Other possible units kg/m ² /year – amour for planned lifespan % – percentage of co used as a way to eva Classification: The value of the indi	ruction w inerated ycle wher dous was waste to aste to di each type cator (eac of buildin onstruction aluate wa	aste generated at the by refurbishment/re- a removing the build ste to disposal o disposal sposal e of) waste per squa h type of) waste per on and demolition w ste management or	ne constructio eplacements, ling. re meter of g square mete vaste for recyc site) erage (or typic	on phase, cor and demoliti ross building r of gross bu cling or ener cal) value of t	nstruction and ion waste generated at g area iilding area annualized gy recovery (may be the building type				
Areas sourced	considering the purpose of use, new construction and reconstruction									
Barriers	- It depends EN 15804 to define s - Time cons - Tracking a (landscapi	Building/site areas - It depends on the availability of EPDs. When EPDs don't cover all phases of life cycle (in EN 15804 only cradle to gate is mandatory, other phases are optional), it is necessary to define scenarios for the phases not covered, especially construction and end of-life. - Time consuming - Tracking amounts of waste leaving site and/or being produced on site and reused								
Weighting	The waste compone different categories instance based on th cost evolves over tin another. The cost re the environmental in Another possibility: categories of waste) weights within the v damage or risks (also	The waste components can be combined, if one figure is needed. In this case, the amounts of different categories of waste can't be simply summed up. Weighting factors are needed, for instance based on the cost of treatment / storage / management of each waste category. This cost evolves over time, and it may vary from one country to another, or from one region to another. The cost reflects more or less the efforts that it is necessary to make in order to limit the environmental impacts of the different categories of waste. Another possibility: we may keep the result split into the 3 sub-indicators (corresponding to the 3 categories of waste), and let the experts who set the system for local conditions to set the weights within the whole system. The weighting system must reflect the potential environmental damage or risks (also on health) of each waste category.								
References										
SCALE										
Application	Building/site									
Details										
Multiscale										
References										
REFERENCES	Custoinekilli sasila f		and a solution of the	and the other th						
[1]	http://www.vtt.fi/inf/r	ormance a odf/techno	logy/2012/T72.pdf	marking of build	ungs					



	Water pollution due to material leaching (mg/m ² yr)									
ENV.Im.30	ISSUE	С	ATEGORY	LE	VE	L	SCALE			
	Environmental		Impacts		А		B / N			
GENERAL										
Description	On-site water pollution environment) during	on induc operatic	ed by the leaching p on phase.	ohenomena	(wa	ter contac	ct with the built			
Background										
References	[1]									
LEVEL										
	Software tool	Х	Operational da	ata		In situ	measurements			
Derived from	Simple Calculatio	ns X	Empirical/Liter	ature	Х	Other	(specify)			
Details	A list of Regulated Da the CPD – Construction list is based on the da products developed b which substances and Annex A, List A "Soil a • A-1. Regula 2000/60/EC • A-2. Furthe • A-3. Other s Measurement unit mg /m ² exposed surfa and/or mg /m ² expose Classification : The specific requirem will be defined nation quantitative requirem products / construction Classification is not p harmonized or specifi	 Definition A list of Regulated Dangerous Substances possibly associated with construction products under the CPD – Construction Product Directive / Regulation was established at European level [1]. The list is based on the database on legislation on dangerous substances relevant for construction products developed by the Commission in cooperation with Member States. This list indicates on which substances and parameters the evaluation should focus. The substances are listed in Annex A, List A "Soil and water" and structured as follows: A-1. Regulated dangerous substances in main pollutant categories of Directive 2000/60/EC (Water Framework Directive) A-2. Further regulated substances and parameters A-3. Other substances deemed relevant Measurement unit mg /m² exposed surface /time unit (e.g. year) and/or mg /m² exposed surface /service life Classification: The specific requirements regarding the environmental compatibility of construction products will be defined nationally by the Member States. At present only few Member States have quantitative requirements on the release of regulated dangerous substances from construction products / construction works: The Netherlands and Germany. 								
Areas covered	Building/site areas		•							
Barriers	Commercial and free needed for data explo consuming. Moreove defined.	models, pitation r, no cor	databases and tool and interpretation a nsensus exists prese	s are availal and the proc ently on diffe	ole. cess eren	Neverthel could be o t scenario	ess, specialists are considered as time s or hypothesis to be	e		
Weighting	The emissions of poll evaluated via the CEN values are/will be def	utants (c I/TC 351 ined at i	f. list of Dangerous protocols. No aggr national level.	Substances egation is fo	in [2 prese	2]) into wa een. For ea	ater should be ach pollutant, limit			
References										
SCALE										
Application	Building / Site									
Details										
Multiscale										
References										
REFERENCES										
[1]	Sustainability and perfo	rmance a df <u>/techn</u> o	ssessment and benchi logy/2012/T72.pdf	marking of bu	ildin	gs				
[2]	European Commission. Construction. DS 041/05 associated with constru-	Enterprise 51 rev.12. ction proe	e and Industry Directo Indicative list of regu ducts under the CPD, I	rate-General. lated dangero March 2012, 3	Che ous s 31p.	micals and ubstances p	Construction. possibly			



		nator	المانيية أوم المناط	ing in its	contoxt						
	2co-mobility	poter		ing in its	context						
	ISSUE	C	ATEGORY	LEV	'EL	SCALE					
	Environmental		Impacts	5		B/N					
GENERAL	It was an income	a natalina			ut an daile ia						
Description	It refers to environm using the building, at features.	ental imp tributabl	e to the building ar	uting transpor nd its characte	t, or daily jo ristics, inclu	urneys, of persons ding its location					
	From the location da dana on the occupar	ta of the its and fr	building (urban cor om statistical data (ntext, distance (national or re	e from the be gional trans	uilding to key points), port surveys), the					
	Eco-mobility potenti	al of a bu	ilding in its context	could be an in	ndicator on i	its own, but it is also					
	environmental perfo	environmental performances calculation. In LCA terms, transport of users during operation									
Backaround	phase is one of the processes included within the system boundaries.										
References	[1]										
	[±]										
LEVEL	Software tool		Operational da	ata	In citu	maasuramants					
Derived from	Surrada Calavlatia		Operational da		In situ						
Deteile	Simple Calculation	ns x	Empirical/Liter	ature	Other	(specify)					
Details	Definition The transversal issue of the mobility is expressed through various indicators: - It could be expressed as kilometres travelled by transportation mode as a mid-point indicator.										
	 Because occupants' mobility is considered as a contributor to the environmental performance of the building (as energy services, construction products, etc.), environmental profiles of each transport mode are associated to kilometres travelled. According to adopted standard and environmental data, the environmental indicators are the usual ICA energy primary energy grouphouse are emissioned are associated. 										
	 are the usual LCA ones: primary energy, greenhouse gas emissions, air pollution, waste, water consumption, etc. It would be possible to translate mobility in terms of time spent into transport as a social indicator. (not developed here) Measurement unit Mobility as an indicator: kilometres by transportation mode, by square meter or occupant, or by dwelling; Mobility as a contributor: 										
	Classification: Currently, there is no scale (sum of various	o method s contribu	of classification for to state the state of	r this contribu	tor and no c	one at the building					
Areas covered	Building/location are	as									
Barriers	The challenge is in th - Statistical surveys da - Statistical (bicycle pa	ie availat data spe itasetb data illus ark space	ility of: cific for the locatior ut 36000 municipal trating the influenc s, restricted numbe	n of the buildin ities); se of design el er of car park s	ng (in France ements on c spaces, etc.)	e there is 80 regional occupant's behaviour or the close proximity					
	of the buil assessmer - Environme kilometre.	ding to a nt results ental data	public transport sto if the building is loo a/profile for the diff	op (currently, cated 500 m o ferent modes	there is no o r 5 m from a of transport	difference in the a tram stop); for one person					
Weighting	There is no need of a When a building is as	iggregationssessed fi	on of the different e rom an LCA point of	environmenta f view, includi	l impacts at ng construct	the contributor scale. ion products life cycle,					
	energy and water op necessary to adopt c comparable and "ag as to be able to clear users' transport.	oherent a gregable" ly disting	i services, it users it assumptions and th i figures. However, ruish between impa	ransport is als le same units it is recomme lets due to the	in order to h nded to kee building its	d as a contributor, it is lave consistent, p results separated, so elf and those due to					
References											
SCALE											



Application	Building / Location
Details	
Multiscale	
References	
REFERENCES	
[1]	Sustainability and performance assessment and benchmarking of buildings <u>http://www.vtt.fi/inf/pdf/technology/2012/T72.pdf</u>



	Concentratio	ns of	pollutants (j	ug/m ³)					
SOC.AQ.01	ISSUE	C	ATEGORY	LE	EVE	L	SCALE		
	Social	ŀ	Air Quality	S			B / N		
GENERAL									
Description	Indoor air quality is	assessed	in terms of concent	ration levels	s of p	ollutants			
Background									
References	[1]								
LEVEL	1								
	Software tool	Х	Operational da	ata	Х	In situ	measurements		
Derived from	Simple Calculation	Simple Calculations Empirical/Literature Other (specify)							
Details	Several pollutants ar independently from WHO gives guideline - Benzene: G - carbon mo - formaldeh - nitrogen d - PAH B[a]P - Trichloroe - Tetrachlor - radon exco - naphtalen WHO also gives guid - dampness - mould In addition, CO ₂ sho Measurement unit ppm or µg/m ³ or RH Classification: When benchmarking the building type in	Simple Calculations Empirical/Literature Other (specify) Definition Several pollutants are considered. The different pollutants are considered and assessed ndependently from each other. WHO gives guideline values for the following parameters of indoor air quality: - Benzene: unit risk 1 µg/m³ 6x10 -6 - carbon monoxide: 7mg/m³ (24 h) - formaldehyde: 0.1 mg/m³ (30 min average) - nitrogen dioxide: 200µg/m³ (1-hour average) and 40µg/m³ (annual average) - PAH B[a]P (benzo-a-pyrene): unit risk for lung cancer 1 ng/m³ 8.7 x 10 -5 - Trichloroethylene: unit risk estimate µg/m³ 4.3 x 10 -7 - Tetrachloroethylene: 0.25 mg/m³ (annual average) - naphtalene: 0.01 mg/m³ (annual average) WHO also gives guideline values for biological indoor air pollutants: - naphtalene: 0.01 mg/m³ (annual average) WHO also gives guideline values for biological indoor air pollutants: - mould In addition, CO2 should be included. Measurement unit ppm or µg/m³ or RH (%) or cfu (colony forming unit) Classification:							
Areas covered	Building / location a	reas	ensity.						
Barriers	- Commerci simulation - CO ₂ and R chemical s - Equipments equipped la	al and fre tools are d can be ubstance and stanc boratories	e models and softw not broadly known easily anticipated b s (formaldehyde, V lards are available. Bu	vare are ava and spread y calculation OCs), it is a t in certain co	ilabl d. n mo mucl ountr	e. But in c dels (stati h more co ies or regio	ertain countries, such ic or dynamic) but for mplex. ons, there is a lack of well-		
Weighting	In each class, limit va	alues are	always defined for	all paramete	ers c	onsidered	l.		
References		_							
SCALE									
Application	Building / location								
Details									
Multiscale									
References									
REFERENCES									
[1]	Sustainability and performed by the second s	ormance a odf/techno	ssessment and bench logy/2012/T72.pdf	marking of bu	uildin	gs			



SOC.TC.01	Predicted Mean Vote, PMV (-) Predicted Percentage Dissatisfied PPD (%)									
SOC TC 02		icei	CATECODY	eu, PPI		/0)	SCALE			
500.10.02	Social	т	CATEGORY	L	S S					
GENERAL	Social Inermal Comfort S B / N									
Description	Indicators to describe hygro-thermal comfort in indoor environments									
Backaround										
References	[1]									
LEVEL										
	Software tool X Operational data In situ measurements									
Derived from	Simple Calculation	ons	X Empirical/Liter	ature		Other	(specify)			
Details	Definition PMV (Predicted Mean Vote): It is an index defined in ISO 730:2005 that predicts the mean value of the votes of a large group of persons on the 7-point scale (+3 hot +2 warm +1 slightly warm 0 neutral -1 slightly cool -2 cool -3 cold), based on the heat balance of the human body. Thermal balance is obtained when the internal heat production in the body is equal to the loss of heat to the environment. PMV = [0.303 . exp(-0.036.M) + 0.028] . L where M = metabolic rate, L = thermal load PPD (Predicted Percentage Dissatisfied): Quantitative measure of the thermal comfort of a group of people under a particular thermal environment, also defined in ISO 730:2005. PPD = 100 - 95 . exp(-0,03353.PMV ⁴ - 0,2179. PMV ²) Operative temperature: Uniform temperature of an imaginary black enclosure in which an occupant would exchange the same amount of heat by radiation and convection as in the actual nonuniform environment. Percentage of hours outside a temperature range.									
	Air temperature Percentage of hours outside a temperature range.									
	Relative Humidity (RH) Air velocity									
	 PMV (-3, +3) PPD (%) Operative temperature (degree Celsius) Percentage of hours outside a temperature range (% winter, % summer) Air temperature (degree Celsius) Percentage of hours outside a temperature range (% winter, % summer) Air temperature (degree Celsius) Percentage of hours outside a temperature range (% winter, % summer) RH (%) Air velocity (m/s) Classification: Human's thermal sensation is mainly related to the thermal balance of the body as a whole. This balance is influenced by physical activity and clothing, as well as the environmental parameters. Numerous indices for the assessment and design of thermal comfort conditions have been developed during the past 50 to 60 years. One of the most widely used indices in moderate thermal environments, the PMV index (predicted mean vote), predicts the mean value of the overall thermal sensation of a large group of persons as a function of activity (metabolic rate), clothing insulation and the four environmental parameters: air temperature mean radiant 									



	temperature, air velocity, and air humidity. The principles are described in detail in the standard ISO 7730:2005. Indoor comfort is frequently classified just by setting indoor air temperatures
	ranges.
Areas covered	Urban areas
Barriers	-
Weighting	Three different "Comfort categories" are proposed in ISO 7730:2005 which suggest the possibility of using some values for the different sub-indicators depending on the comfort requirements for a particular building. The higher comfort requirements of a building, the narrower comfort bands will be accepted. This issue of classifying comfort is also considered in the standard EN 15251:2007 which suggests up to four categories, and tries to distance itself from the implication of closer control being superior, and to avoid the penalization of buildings with less control. However, it is suspected that categories are still used as quality indicators (Santamouris & Sfakianaki 2009). Recent research in this area even suggests that strictly controlled comfort bands offer no relative satisfaction benefits to occupants, compared to larger bands of comfort (Arens et al. 2010).
References	
SCALE	
Application	Building, site, location
Details	
Multiscale	
References	
REFERENCES	
[1]	Sustainability and performance assessment and benchmarking of buildings http://www.vtt.fi/inf/pdf/technology/2012/T72.pdf



	Illuminance (Ix)								
SOC.VC.01	Daylight factor (%)								
SOC.VC.02	ISSUE	C	ATEGORY	LE	VEL	SCALE			
	Social	Vis	ual Comfort	S / A		B / N			
GENERAL									
Description	Requirements for visual performance and daylight								
Background									
References	[1]								
LEVEL									
Dorived from	Software tool	Х	Operational da	ita	In situ	measurements	Κ		
Derived from	Simple Calculation	ons X	Empirical/Liter	ature	Other	(specify)			
Details	Illuminance Illuminance of a surface is defined as the luminous flux per unit area at any point on a surface exposed to incident (artificial) light. [2] Daylight factor The daylight factor is the ratio of the illuminance from the skylight measured on a horizontal surface within the room to the illuminance from a CIE (Commission Internationale de l'Eclairage) overcast sky measured on a horizontal plane which has an unobstructed access to the hemisphere of the sky. Measurement unit Illuminance [lux] Daylight factor [%] Classification: Classes may be defined for each sub-indicator. Attention has to be paid to high classes. Indeed,								
A reason assumed	factor and illuminance are not desirable, because they may be disturbing.								
Areas coverea									
Weighting	From a general point of view, for comfort or IAQ indicators, two levels of assessment exist: at the premise/room scale and at the building scale. The indicators proposed above are appropriate for a single space/room, or space by space. An average value for the entire building is not appropriate because it leads to a "compensation" between good and bad performance. A better aggregation principle may be based on a combination of classes covering all the spaces of the building (e.g. see EN 15251:2007 – Annex I). [3]								
References									
SCALE									
Application	Building, site, location								
Details									
Multiscale									
References									
REFERENCES									
[1]	Sustainability and perfect http://www.vtt.fi/inf/g	ormance a odf/techno	ssessment and benchr <u>logy/2012/T72.pdf</u>	narking of bui	ldings				
[2]	Huovila A., Prokka J., Huovila P., Steskens P., Loomans M., Botsi S., Sakkas N.: D1.5 A Generic Framework for Key Indoor Performance Indicators. Public report of the project PERFECTION – Performance Indicators for Health, Comfort and Safety of the Indoor Environment EN 15251:2007. Indoor environmental input parameters for design and assessment of energy								



	Aesthetic quality (-)							
ECO.Qu.01	ISSUE	C	ATEGORY	LEVEL	-	SCALE		
	Economic		Quality	S		Ν		
GENERAL								
Description	This indicator considers architectural quality in terms of aesthetic quality (functional quality is covered elsewhere, as many guides exist). Nevertheless, the aesthetic quality of a building can be decisive for its long-term success (making the resources invested in it worthwhile). It is also important for the buildings contribution to urban design and "place making" and contributes to the cultural value of the built environment. What makes "good" architecture, in particular good architectural aesthetics is notoriously difficult to define and most architects will shy away from any attempt at categorising or defining what such qualities are. One fear is that the skills of architects are compromised by reducing architectural aesthetics to "pattern books". What makes good architectural quality is:							
	 including arts and crafts e.g. by local artists or craftsmen 							
	However, such processes do not per se guarantee good quality, therefore an attempt is being made further a more rational process of decision making within such processes.							
Background								
References	[1]							
LEVEL			Γ	I _ I				
Derived from	Software tool		Operational da	ata	In situ n	neasurements		
	Simple Calculation	ons	Empirical/Liter	ature	Other (s	specify) X		
	- // - // N.B. This form conce considering alternat Measurement unit Qualitative	Architectu alternativ Architectu 'Educatec alternativ Public art entrates o cive desig	ural Quality in the d e design options) ural Quality in the te d" decision making e design options) in/ on/ around buil on "educated" deci n options)	esign stage (desi ender stage (as o (as part of a desi dings (mandator sion making (as	ign compet obligation c gn compet ry inclusion part of a d	tition, considering on contractor) ition, considering n of art work) lesign competition,		
Areas covered	Urban areas							
Barriers	-							
Weighting	There is no inherent	reason fo	or weighting the inc	licators.				
References								
SCALE								
Application	Building, site, location	on						
Details								
Multiscale								
References								
REFERENCES								
[1]	Sustainability and perf	ormance a	ssessment and bench logy/2012/T72.pdf	marking of building	gs			



	Monument or monumental value / Historical value (-)								
ECO.Qu.05	ISSUE	ISSUE CATEGORY			L	SCALE			
	Economic		Quality	S		B / N			
GENERAL									
Description	The characterisation of the historic, historical, aesthetical significance of a building or site.								
Background									
References	[1]								
LEVEL									
Denis ed frame	Software tool	Х	Operational da	ita	In situ	measurements			
Derived from	Simple Calculation	ons X	Empirical/Liter	ature	Other ((specify)			
Details	 Definition The heritage value of a building or site is a result of a complex (quite often very subjective) decision process. Since part of this decision process is subjective, pragmatic (depending on a situation not directly connected to a building, such as the economic situation of a country) or emotional, a clear indication of a definition cannot be given. Giving a definition for 'cultural heritage' would imply that 'heritage value' is an intrinsic property of a building or site, and this is not the case. Examples will be given below. The decision process, to decide "which building is heritage, and which building is not" is more enlightening when it comes to 'cultural heritage value'. Measurement unit: Non-quantitative or, very rarely, semi-quantitative Classification: Usually at least a vague classification exists: a hierarchy between different levels of heritage value (e.g. full protection, or only parts of the building), even though this may differ from country to country, and even region to region. This hierarchy is, as earlier stated, quite often subjective. Hierarchy in classification systems Usually we find different ways of 'listing' heritage buildings. What is quite general is the upper level, where the entire building or site is protected, and where for every single intervention the approval of the monument administration is necessary. This does not mean that nothing can be changed. 'Lower' layels are less general and the systems differ from country to country to country and eyes regions of the systems differ from country to country and be systems differ from country to country and be systems and the systems differ from country to country the counter administration is necessary. This does not mean that nothing can be changed. 'Lower' layels are less general and the systems culture for the country and from the country of the monument administration is necessary. 								
Areas covered	Urban areas								
Barriers	All works or interventions have to be approved by a commission, which is supposed to work completely independent from any government, to ensure an objective evaluation of every work or intervention done on these buildings.								
Weighting	-								
References									
SCALE									
Application	Building, site, location	on							
Details									
Multiscale									
References									
REFERENCES									
[1]	Sustainability and perf	ormance a	ssessment and benchr	narking of buildir	igs				


	Life cycle costs	fe cvcle costs (€)									
ECO.LC.08	ISSUE	C	ATEGORY	LE	VEL	SCALE					
	Economic	Lif	e Cycle costs		S	В					
GENERAL											
Description	The LCC approach is that Only costs/ expenses, no These have to be defined parameters related to lif As a special case the inco negative costs. This appr LCC generally fits the poi If used during the design between one-off (capital	of to t inc d in a e cyc ome oach nt of stag) cos	otal cost of ownersh omes that occur in t accordance with ISO cle costs need to be from electricity gene a can also be applied f view of owner occu ge it can be used as a st and ongoing (in-use	ip. he course o 15686-5. Fu defined. erated with to incomes upiers. a tool for de se) costs is b	of the life rthermon PV or sin from rec sign opti being wei	e cycle are being captured. re, assumptions and nilar could be included as cycling. imization. Here the trade-off ighed up.					
Background											
References	[1]										
LEVEL		-									
Derived from	Software tool		Operational da	ita	In	situ measurements					
	Simple Calculations	Х	Empirical/Liter	ature	Ot	her (specify)					
Areas covered	In accordance with ISO 1 - Construction c - Operational co - Maintenance c - End of life cost Measurement unit: Currency unit e.g. EUR as absolute value or disc Classification: A typical NPV value over building to be assessed c An assessment scale can value. Generally, the net preset the operational phase th Building area	In accordance with ISO 15686-5:2008: Construction costs Operational costs Maintenance costs End of life costs Measurement unit: Currency unit e.g. EUR as absolute value or discounted to present day value (net present value/ NPV). Classification: A typical NPV value over a given reference study period needs to be established with which the building to be assessed can be compared An assessment scale can be set in terms of performance of XXX% above or below the typical value. Generally, the net present value of incomes should exceed the net present value of outgoings. In									
Areas coverea	Calculation is straight for	war	d in principle, but m	aintenance	costs and	d end-of-life costs can be					
Burners	difficult to obtain.	wart	a în principie, bat în	annenance							
Weighting	N/A – while Present Valu while these sub-indicato weighted.	e is a rs sh	a way of aggregating ould be declared se	g sub-indica parately, the	tors (i.e. ey are no	different types of cost) and ot separately assessed and					
References					_						
SCALE											
Application	Building / site										
Details											
Multiscale											
References											
REFERENCES											
[1]	Sustainability and performa http://www.vtt.fi/inf/pdf/te	nce a echno	ssessment and benchr plogy/2012/T72.pdf	narking of bu	iildings						



	Additional co	osts fo	or energy effi	ciency a	ano	d susta	ainability (€)			
ECO.IC.01	ISSUE	C	ATEGORY	LE	VE	L	SCALE			
	Economic	Inve	estment Costs		S		B / N			
GENERAL										
Description	The indicator aims to in comparison to ave Capital cost is the ac construction and no land, buildings, cons rendering of service commercially opera Often when plannin considerable extra co a luxury solution. Ac Capital costs can be "cost/ value ratio at	in comparison to average buildings of same type and use. Capital cost is the actual initial outlay required to pay for the construction project. It includes construction and non-construction costs. Capital costs are costs incurred on the purchase of land, buildings, construction and equipment to be used in the production of goods or the rendering of services, in other words, the total cost needed of bringing a project to a commercially operable status. Often when planning and designing a sustainable building it is feared that there will be considerable extra capital costs/ construction costs. Sustainable buildings however should not be a luxury solution. Additional capital costs should be limited. Capital costs can be assessed in their own right or be considered as part-indicator of LCC, WLC or "cost/ value ratio at point of hand-over".								
Backaround		point of								
References	[1]									
LEVEL										
	Software tool		Operational da	ata		In situ	measurements			
Derived from	Simple Calculation	ons X	Empirical/Liter	ature	х	Other	(specify)	+		
Details	Definition Additional costs for absolute capital cost Measurement unit: currency unit e.g. EU Classification: Additional costs in c additional capital co An assessment scale acceptable value. Switzerland restricts as part of the MINER	Definition Additional costs for energy efficiency and sustainability can be seen as a sub-indicator of the absolute capital costs. Measurement unit: currency unit e.g. EUR Classification: Additional costs in comparison to average buildings of same type and use acceptable maximum additional capital costs need to be established, as basis for a comparison. An assessment scale can be set in terms of performance of XXX% above or below the maximum acceptable value. Switzerland restricts extra cost to a maximum of 10% extra for highly energy efficient buildings								
Areas covered	Building / site areas									
Barriers	Fear of increased ca this an important an	pital cost Id necess	s is one of the main ary indicator.	reasons for	not	building s	sustainably, making			
Weighting	N/A.									
References										
SCALE										
Application	Building / site									
Details										
Multiscale										
References										
REFERENCES										
[1]	Sustainability and perf	ormance a	assessment and benchi blogy/2012/T72.pdf	marking of bu	iildin	gs				



	Cost in operati	ona	l phase (€)								
ECO.LC.06	ISSUE	С	ATEGORY	LEVE	EL	SCALE					
	Economic	Life	e Cycle costs	S		B / N					
GENERAL											
Description	It covers the building re operating of the buildin It comprises maintenan building operates as int Costs of the use stage a the implications of deci investor (except for in a considered. Aiming for environmental impacts Operational phase costs indicator of LCC or WLC	operating of the building related costs that arise arter the nand-over for the on-going running y operating of the building. It comprises maintenance, servicing, repair and replacement, as well as utility costs to ensure the building operates as intended. Costs of the use stage are influenced by decisions made at design stage. However, as sometimes the implications of decisions are not understood or discarded because they do not affect the investor (except for in an owner-occupier scenario) these costs are often not sufficiently considered. Aiming for low replacement costs and low utility costs will also mean aiming for low environmental impacts resulting from utility use or manufacture of spare parts. Operational phase costs in use can be assessed in their own right or be considered as part indicator of LCC or WLC.									
Background	-										
References	[1]	1]									
LEVEL											
Derived from	Software tool		Operational da	ata	In situ	measurements					
Derived from	Simple Calculations	Х	Empirical/Liter	ature	Other	(specify)					
Details	Sub-indicators are: - operational co - maintenance Indicators can also be so - costs that affe - costs that affe (both as defined by ISO Measurement unit: currency unit e.g. EUR as absolute value or dis Classification: Typical costs in use nee compared. Often only a years). An assessment scale can value. The sub-indicators may should be shown separa In the operational phase relating to data capture Building / site areas	Definition Sub-indicators are: - operational costs - maintenance costs Indicators can also be subdivided in - costs that affect the tenant - costs that affect the management/ the landlord (both as defined by ISO 15686-5:2008) Measurement unit: currency unit e.g. EUR as absolute value or discounted to present day value (Net present Value). Classification: Typical costs in use need to be established with which the building to be assessed can be compared. Often only a limited time period is considered as reference study period (e.g. 50 years). An assessment scale can be set in terms of performance of XXX% above or below the typical value. The sub-indicators may or may not be assessed separately in this way, but the relevant figures should be shown separately. In the operational phase the assessment may include qualitative and process related elements									
Areas coverea	There is generally a lack	ofro	liable data on in-use	a costs la g ma	intenance	costs) though this					
Burriers	varies from country to d	countr	ry (e.g. relatively go	od data availab	ility in the	UK).					
Weighting	N/A – the sub-indicator	s are o	only declared separa	ately, but not s	eparately a	ssessed and weighted.					
References											
SCALE											
Application	Building / site										
Details											
Multiscale											
References											
REFERENCES											
[1]	Sustainability and perform http://www.vtt.fi/inf/pdf/	ance a techno	ssessment and bench blogy/2012/T72.pdf	marking of buildi	ngs						



	Long term sta	bility	of value (€)							
ECO.Qu.15	ISSUE	C	ATEGORY	LEVE	Ľ	SCALE				
	Economic		Quality	S		B / N				
GENERAL										
Description	Long-term stability of	f value /	positive developm	ent of value or	conversely	r, long-term financial				
	risk.									
	This indicator assesses	s certair	building character	istics that can b	e expected	d to help safeguard the				
	fluctuation in value.	ine iong	term and that mea		s less allet					
Backaround										
References	[1]									
LEVEL										
	Software tool		Operational da	ita	In situ	measurements				
Derived from	Simple Calculation	ns X	Empirical/Liter	ature	Other	(specify)				
Details	Definition	-	F 7		,					
	 options for e ability to me ability to ad certain physis decades (e.g. financial risk (N (Li er Pr Ca N.B. Only building/ sit Measurement unit: (depending on indicat Classification: So far, no mature asses subindicators are: change of use adaptat qualitative a allow for ea Financial risk indicator – (proprieta 	Depending on approach used – can be assessed using consequential sub- indicators such as: options for easy adaptation to change of use ability to meet future legislative requirements (e.g. Energy legislation) ability to adapt to climate change (e.g. to greater over-heating risks) certain physical characteristics that have been proven to remain in demand over decades (e.g." neutrality "of spaces) financial risk indicators: (e.g. according to TEGOVA- PaM): (Market) (Location (suitability/ standing/ transport infrastructure/ facilities/ environment)) Property (Construction/ layout/sustainability/energy performance) Cash flow N.B. Only building/ site related indicators should be considered in this context Measurement unit: (depending on indicators chosen may or may not be quantitative units) Classification: qualitative assessment method is available. Examples for the assessment of potential subindicators are: change of use adaptation: qualitative assessment levels need to be defined, capturing building characteristics that allow for easy adaptation Financial risk indicators:								
Areas covered	Building / site area									
Barriers	-									
Weighting	Depending on the cho	oice of in	ndicator(s), weightir	ng factors may l	have to be	introduced.				
References										
SCALE										
Application	Building									
Details										
Multiscale										
References										
REFERENCES										
[1]	Sustainability and perfor http://www.vtt.fi/inf/pd	mance as f/techno	ssessment and benchion logy/2012/T72.pdf	marking of buildir	ngs					



	Integrated de	sign i	in the planni	ng proces	s (-)				
ECO.Qu.10	ISSUE	C	ATEGORY	LEVE	L	SCALE			
	Economic		Quality	S		N			
GENERAL									
Description	Project management collaborative and iter building.	before, ative wo	during and after de ork, aiming at optim	sign, involving a ising the sustain	multi-diso able perfo	ciplinary team, a ormances of the			
Background									
References	[1]								
LEVEL	-		-						
Dorived from	Software tool		Operational da	ita	In situ	measurements			
Derived from	Simple Calculation	ns X	Empirical/Liter	ature	Other	(specify)			
Details	This indicator is made process of a building, Additional requireme in the single descripti economic). Measurement unit: The evaluation of the The sub-criteria are o associated to that che Classification: According to the num good, very good, or e mandatory	This indicator is made of a list of qualitative sub-criteria covering several phases of the planning process of a building, from concept design to operation. Additional requirements related to the optimisation of the planning process could be integrated in the single description of the criteria of the certification schemes (environmental, social and economic). Measurement unit: The evaluation of the integrated design can be only qualitative. The sub-criteria are organised as a structured checklist. A list of credits / points may be associated to that checklist. Classification: According to the number of credits obtained, a level of performance may be defined (e.g. fair, good, very good, or excellent). Some credits as well as their documentation materials may be							
Areas covered	-								
Barriers	This approach require stages, but it can leac This approach require instruments (meters, high environmental p Applicability is easier (concept, design, con	es some I to signi es some probes, erforma if the in struction	investment in time ficant savings and a investment in time BEMS, etc.) but it c nce and satisfaction tegrated design was n, hand-over).	and money, esp dvantages durir and money, in s an lead to signif of users. s correctly imple	ecially du ng the nex taff and n icant savir mented ir	ring the upstream t phases. neasurement ngs during operation, n the previous phases			
Weighting	simplest one consists checklist, according to coherence. Another s also possible to imple credits according to t	in affec o its exp olution ment th he comp	ting a given number ected influence on t may be based on m le quality managem pleteness of this prir	of credits to ea che building perl andatory sub-cr ent principle "pl nciple, for each s	ch questio formances iteria plus an-do-che sub-criteri	on / item of the s and project optional ones. It is eck-act" and allow			
References									
SCALE									
Application	Processes								
Details									
Multiscale									
References									
REFERENCES									
[1]	Sustainability and perfor http://www.vtt.fi/inf/po	rmance a	ssessment and benchi logy/2012/T72.pdf	marking of buildin	gs				



A.12 – French Label Eco Quartier (eco-district)



www.eco-quartiers.fr/dl//img/dossier-de-labelisation-ecoquartier-986.pdf

The label formalizes the ambition of the French ministry to distinguish examples of sustainable development of districts and to clarify the conditions of success of Eco-districts. This approach is compatible with The Reference Framework for Sustainable Cities (http://rfsc.eu/). The certified projects meet 20 commitments of a common charter, distributed in 4 issues: governance and process; life quality and users practices; territorial development; environment and climate. Through their application file, communities have to measure several performance indicators. The Label is not a standard but a progressive approach, which recognizes the quality of a finished operation.

3 stages are included:

- Signature of the Charter by the community (stage 1);
- Commitment in the approach of labelling (stage 2) when the works begin,
- The label Eco-district (stage 3) when the operation is delivered and when objectives can be verified. After three campaigns of labelling until 2015:

39 operations "Eco-district" are certified which illustrates the concept of sustainable city everywhere in France;

98 projects are committed and carried the values of the Eco-districts of tomorrow.

The ministry has launched a 4th campaign of labelling in 2016.

This Tool was not in the initial project list we had to analyse for CESBA Med project but we add it because we think some indicators can be interesting for the Cesba-med project. As most of the indicators are also described in other tools, we just give details here on 9 indicators that are not in other projects/tools.

ISSUE/Category	criterion name	Indicator
		renewable electricity production over
ENV-En 20	Renewable Energy production on Site	annual consumption
		ratio of housings over urban area
ENV-LU 9	Urban compactness gross	(district area)
		ratio of surface of buildings converted
ENV-LU 10	Urban conversion	over total area
		ratio of vegetal areas (roof included)
ENV-Bi 4	Vegetal areas (roof included)	over total area
		ratio of housing under 500 m from a
SOC-Tr 14	Access to Public transport	stop over total housings
SOC-Tr 15	Parking Facilities	ratio of parking places pro housing
SOC-Ac 14	Availability of green spaces	ratio of green space pro inhabitant
	Participation of local authority in the	
ECO-IC4	total investment cost	investment cost of authority



INDICATORS

	Renewable el	enewable electricity production (%)								
ENV.En.19	ISSUE	C	ATEGORY	LEVE	L	SCALE				
	Environmental		Energy	S		Ν				
GENERAL										
Description	This indicator is a electricity consump electricity. Unit:%	ratio o otion. I	f the electricity p t gives an idea o	produced in f the autono	the distric omy of th	ct compared to the ne district regarding				
Background	French State Eco-di	strict la	belling							
References	[1], [2]									
LEVEL					1					
Derived from	Software tool		Operational data	1	In situ n	neasurements X				
Derived from	Simple Calculations	X	Empirical/Literat	ure	Other (s	pecify)				
	Divide the renewal by the total electric	Divide the renewable electricity production inside the district boundaries (kWh/year) by the total electricity consumption (kWh/year) in the district								
Areas covered	All types of building	g cluster	ſS							
Barriers										
Rating										
References	[1], [2]									
SCALE										
Application range	This indicator is dec level	dicated	to building cluster	level even if	it can be i	used at building				
Details										
Multiscale	The indicator can be impact of the buildi	e calcul	ated at building le ter.	vel but the in	iterest her	re is to assess the				
References	[1], [2]									
REFERENCES										
[1]	http://www.ecoq	uartier	s.logement.gouv	<u>.fr</u>						
[2]	www.eco-quartie	rs.fr/dl	//img/dossier-de	e-labelisatio	n-ecoqua	artier-986.pdf				



	Urban compa	actn	ies	s (dwelling/	m²)					
ENV.LU.12	ISSUE		C	ATEGORY	LE	VEL	SCALE			
	Environmental			Land Use		S	N			
GENERAL										
Description	This indicator is a r	atio	of t	he number of dw	ellings ove	r the total di	strict surface.			
	Unit : dwelling/m ²									
Background	French State Eco-d	French State Eco-district labelling								
References	[1], [2]									
LEVEL										
Dorived from	Software tool			Operational data	а	In situ r	measurements	Х		
Derived from	Simple Calculation	s	Х	Empirical/Litera	ture	Other (specify)			
Details	Evaluation method	Evaluation method :								
	Divide the total nu	mbe	r of	dwellings by the	total surface	ce of the dist	trict.			
Areas covered	This indicator is de	dicat	ted	to housing distric	ts					
Barriers										
Rating										
References	[1], [2]									
SCALE										
Application	This indicator is de	dicat	ed	to building cluste	r level.					
range										
Details										
Multiscale										
References	[1], [2]									
REFERENCES	-									
[1]	http://www.eco	quar	tier	s.logement.gou	<u>v.fr</u>					
[2]	www.eco-quartie	ers.fr	r/dl	//img/dossier-d	e-labelisa	tion-ecoqu	artier-986.pdf			



	Urban conve	rsio	n ((% ref area)						
ENV.LU.15	ISSUE		C	ATEGORY	LE	VEL	SCALE			
	Environmental			Land use		S	N			
GENERAL										
Description	This indicator is a	ratio d	of s	urface of buildings	s converte	d over tota	l area			
	It gives an idea of	the a	tte	ntion given to the	rehabilita	tion or reco	onvertion of land with			
	regard to the exist	ing su	urfa	ces which are alre	ady built.					
	Unit : %									
Backaround	Franch State Eco (lictric	+ 1-	halling						
References	[1] [2]	1] [2]								
IFVFI	[1], [2]									
	Software tool			Operational data		In situ	measurements X			
Derived from	Simple Calculation	IS	Х	Empirical/Literat	ure	Other	(specify)			
Details	Evaluation metho	valuation method :								
	Divide the m^2 of	rehab	oilita	ated or reconverte	ed existin	g surface *	100 by total m ² of			
	surface of floor of	the E	co-	district						
Areas covered	All the districts									
Barriers	For this indicator i	t is ne	eces	ssary to collect info	ormation	very early i	n the project.			
Rating										
References	[1], [2]									
SCALE										
Application	This indicator is de	edicat	ed	to building cluster	level ever	η if can be ι	used at building level			
range										
Details						• • • • •				
Multiscale	The indicator can	be cal	CUL	ated at building lev	vel but the	e interest h	ere is to assess the			
Poforoncos		ung c	ius	ler.						
REFERENCES	[1], [2]									
[1]	http://www.eco	quart	tion	s logement gouv	, fr					
[+]	1100.77 00 00.000	quart			<u></u>					
[2]	www.eco-quarti	ers.tr	/dl	//img/dossier-de	e-labelisa	tion-ecoq	uartier-986.pdf			



	Vegetal area	s (roo	of included) (S	% ref area							
ENV.Bi.08	ISSUE	C	ATEGORY	LE	VEL	SCALE					
	Environmental	E	Biodiversity		S	N					
GENERAL											
Description	This indicator is th	e ratio d	of vegetal areas (re	oof include	d) over total	area %					
	It gives informati	on on v	vegetated surfaces	s where b	iodiversity c	an be developed.	lt				
	gives also an idea	of the c	apacity to absorb	rain water	r and to stoc	k green effect gaze	es.				
	It contributes to	the free	shness and to life	e quality o	of the distric	ct. It is a direct li	nk				
	between building	and dist	rict quality.								
Development											
Background											
Rejerences	Label Eco-quartier	- Franc	.e								
LEVEL	Software tool		Operational dat	2	In citur	noocuromonto					
Derived from	Simple Calculation	x X	Empirical/Litera	a turo	Other (specify)					
Details	Assessment Meth			luie	Other (specify	_				
Detuns	Divide the m^2 of t	Assessment weinou Divide the m^2 of the vegetated surfaces (spaces and roof) * 100, by total m^2 of surface									
	of floor of the Eco	of floor of the Eco-district									
	All the districts. P	All the districts. Public spaces, private gardens, building roofs, roadsides, sport fields									
	woodsare consid	lered.			0 /	<i>,</i> ,					
Areas covered	All types of buildir	ng cluste	ers.								
Barriers	The indicator can	be calcu	lated programmin	g phase to	assign objec	tives to the projec	:t				
	and at the end to	evaluate	e if the objective h	as been re	ached.						
Rating											
References	[1], [2]										
SCALE											
Application	This indicator is de	edicated	to building cluste	r level.							
range											
Details											
Multiscale	(4) (e)										
References	[1], [2]	_		_							
REFERENCES				6							
[1]	nttp://www.eco	quartie	rs.logement.gou	<u>v.tr</u>							
[2]	www.eco-quarti	ers.fr/d	ll//img/dossier-d	le-labelisa	<u>tion-ecoqu</u>	artier-986.pdf					



	Participation	Participation of local authority in the total investment cost									
ECO.IC.04	(% ref euros)										
	ISSUE	(CATEGORY	LE	VEL	SCALE					
	Economic	Inv	estment Costs		S	N					
GENERAL											
Description	This indicator is a project. It gives in the balance of the	ratio o format project	f investment cost ion on investment t is.	of the autl . The lowe	hority in the er the partici	total balance of the ipation is, the better					
Background											
References	[1], [2]	[1], [2]									
LEVEL											
Derived from	Software tool		Operational data	a	In situ r	measurements X					
Derived from	Simple Calculation	S	Empirical/Litera	ture	Other (specify)					
Details	Assessment Metho Divide the <u>Investr</u> investment cost of	Assessment Method Divide the <u>Investment expenditure of the local authority in the project by the total</u> investment cost of the project in euros Excl Taxes									
Areas covered	All types of district	ts									
Barriers	Defining the total some privacy issue almost 10 years or	investmes in the more.	nent of the project e data and also bec	is not alwa ause the p	iys simple to roject durati	establish because of ion is very long,					
Rating											
References	[1], [2]										
SCALE	-										
Application range	This indicator is de	edicated	d to building cluste	r level.							
Details	The investment of to the building clu	f local a ster.	authorities in the p	roject is n	ot dedicated	to one building but					
Multiscale	_										
References	[1], [2]										
REFERENCES											
[1]	http://www.eco	quartie	ers.logement.gou	v.fr							
[2]	www.eco-quarti	ers.fr/o	dl//img/dossier-d	e-labelisa	tion-ecoqu	artier-986.pdf					



	Parking facili	ties (number/dwe	lling)							
SOC.Tr.10	ISSUE	(CATEGORY	LE	VEL	SCALE					
	Social		Transport		S	N					
GENERAL											
Description	This indicator is to level. Ratio of the parkir Unit : number /dw	atio of the parking places per dwelling Juit : number /dwelling									
Background											
References	[1], [2]	[1], [2]									
LEVEL	r		-								
Derived from	Software tool		Operational dat	a	In situ r	neasurements	Х				
	Simple Calculation	IS	Empirical/Litera	ture	Other (specify)					
	Divide the number of parking places dedicated to the dwellings by the number of dwellings.										
Areas covered	All types of distric	ts but m	nostly for housing a	districts.							
Barriers	When the building places 'dedicated	g cluster to dwel	is composed of ho lings' is complicate	ousing build d to define	dings and ter e.	rtiary buildings, the	e				
Rating											
References	[1], [2]										
SCALE											
Application range	This indicator is de	edicated	I to building cluste	r level.							
Details	The objective of the level.	ne indic	ator is to define th	e share of	parking plac	es at building clus	ter				
Multiscale											
References	[1], [2]										
REFERENCES											
[1]	http://www.eco	quartie	ers.logement.gou	<u>v.fr</u>							
[2]	www.eco-quarti	ers.fr/c	ll//img/dossier-d	e-labelisa	tion-ecoqu	artier-986.pdf					



	Dwellings with	acc	ess to public	transp	ort	: (%)					
SOC.Tr.19	ISSUE	С	ATEGORY	LE	VE	L	SCALE				
	Social		Transport		S		N				
GENERAL											
Description	This indicator is to inhabitants. Ration of dwellings w Unit : %	This indicator is to evaluate the proximity of public transports for the district nhabitants. Ration of dwellings with a short access to public transport. Jnit:%									
Background											
References	[1], [2]										
LEVEL											
Derived from	Software tool		Operational dat	а		In situ r	neasurements	Х			
Derived from	Simple Calculations		Empirical/Litera	ture		Other (s	specify)				
Details	Assessment Method										
	dwellings Assessment method: to public transport no Then calculate the ac < 500m by the total c	dwellings Assessment method: For each building in the cluster, calculate if the walking distance to public transport nodes (train, tram, bus) is under or higher than 500 m. Then calculate the accessibility ratio by dividing the number of dwellings with an access < 500m by the total of the dwellings.									
Areas covered	Specific for housing d	istric	ts								
Barriers											
Rating											
References	[1], [2]										
SCALE											
Application range	This indicator is dedic	ated	to building cluste	r level.							
Details											
Multiscale	The calculation is bas of the indicator is onl same distance to pub	sed o y at k olic tra	n the sum of the c building cluster lev ansport nodes!	alculation el. All dwe	for Iling	each buil gs of one	ding but the intere building have the	est			
References	[1], [2]										
REFERENCES											
[1]	http://www.ecoqu	artie	rs.logement.gou	v.fr							
[2]	www.eco-quartiers	.fr/d	l//img/dossier-d	le-labelisa	itior	n-ecoqua	artier-986.pdf				



	Availability o	f pu	ıbl	ic green spa	ces (m²	/inhat	oitant)				
SOC.Ac.08	ISSUE		C	ATEGORY	LE	VEL	SCALE				
	Social		Ac	ccessibility		S	N				
GENERAL											
Description	This indicator is to	evalu	uate	e the quality of life	e through t	he quanti	ty of green spaces.				
	Ratio of green space	atio of green spaces (m ²) per inhabitant.									
	Unit : m²/inhabitar	nt									
Background											
References	[1], [2]		_								
LEVEL	-	_									
Derived from	Software tool			Operational data	a	In sit	u measurements				
	Simple Calculation	S	Х	Empirical/Literat	ture	Othe	r (specify)				
Details	Assessment Metho	bd									
	Divide the surface	Divide the surface of public groop spaces by the number of inhabitants									
	Divide the surface	Divide the surface of public green spaces by the number of initiabilants.									
Areas covered	Specific for housing	g dist	rict	S							
Barriers											
Rating											
References	[1], [2]										
SCALE											
Application	This indicator is de	dicat	ed 1	to building cluster	r level.						
range											
Details											
Multiscale											
References	[1], [2]										
REFERENCES											
[1]	http://www.ecoo	quart	ier	s.logement.gouv	<u>v.fr</u>						
[2]	www.eco-quartie	ers.fr	/dl	//img/dossier-d	e-labelisa	tion-eco	uartier-986.pdf				
							-				

FINAL D3.1.1 Transnational Indicators and Assessment Methods for Buildings and Urban areas Version 1.5

Mediterranean Mediterranean CESBA MED Pigete of Privaced by the Lungman Repeat Operational States Pigete and Privaced by the Lungman Repeat Operational States Pigete and Privaced by the Lungman Repeat Operational States Pigete and Pigete And Pigete Pigete Pigete And Pigete Pigete Pigete Pigete And Pigete Piget

A.13 – QDM

QDM



Quartiers Durables Méditerranéens Sustainable Mediterranean Neighbourhoods



http://www.envirobatbdm.eu/baroque

Quartiers Durables Méditerranéens – QDM – is a local and contextualised approach to sustainability in neighbourhood planning developed by EnvirobatBDM in Provence. Based on its successful experience on sustainable Mediterranean buildings approach, EnvirobatBDM broaden the scope of reflexion by addressing neighbourhood issues. The bottom up and participative approach is the core of the methodology used by EnvirobatBDM. It aims at putting back sustainability and Mediterranean issues at the top of the agenda. Through 8 themes, 31 criteria and 240 indicators; the QDM frame aims at supporting Provence local authorities, their contractors and partners in decision making. It was launched in 2017 in Avignon.



INDICATORS

ENV.Bi.02	During programming, design and before the beginning of works; the land is maintained through mowings, pruning maintenance of canals and hedges (yes / no)								
	ISSUE	C	ATEGORY	LE	VE	\$	SCALE		
	Environmental	В	iodiversity		В		N		
GENERAL									
Description	Development sites b infrastructures. If tal assessment indicator the beginning of the of canals and hedges	vevelopment sites before building works begin include a range of ecological systems and infrastructures. If taken care of, they can be preserved and remain in the project. The ssessment indicator therefore aims at promoting that during programming, design and before he beginning of the works, the land is maintained through mowing, pruning, and a maintenance of canals and hedges implemented.							
Background	It is included as part 2011/42/EC that enc environment. This in It can be linked to "c biodiversity, soils an	is included as part of the Strategic Environmental Assessment (SEA) as per Directive 011/42/EC that encourages a 3 step approach: avoid, reduce and compensate damages to the nvironment. This indicator is linked to the "avoid damages to the environment" criterion. can be linked to "commitment n°20" of the French Ecoquartier label "Preserve and enhance iodiversity, soils and natural ecosystems".							
References	[1]								
LEVEL									
Dorived from	Software tool		Operational da	ta		In situ measur	ements		
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other (specify))		
Details	It is more a qualitativ of being abandoned. The answer will ther	ve indicat efore be	tor that focuses on t a yes or no.	he approac	:h : T	he site is taken care	e of instead		
Areas covered	Urban areas								
Barriers	The content of the s	pecificati	ons is not detailed						
Rating	Binary (yes or no) The assessment tear help proving the mai	n will che	eck the effectiveness e process.	s of land ma	inte	nance contracts. Pi	ctures can		
References	[1]								
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : http://www.envirobatbdm.eu/baroque



	Ecological co	rridor	s and contin	and continuity (yes / no)						
ENV.Bi.06	ISSUE	C	ATEGORY	LE	EVE	L	SCALE			
	Environmental	Bi	iodiversity		В		N			
GENERAL										
Description	The continuity of na a project can disturk planning documents the city. On a smalle recreated on the sar existing non built ar interaction with the The indicators aims surrounding spaces.	a project can disturb the local balance. Some ecological corridors are now identified in different planning documents set up by different scales of local authorities from the regional council to the city. On a smaller scale, some continuity or corridors exist and should be maintained or recreated on the same basis. The emphasis is therefore put on the idea of continuity between existing non built areas and the project under development. The project should be thought in its interaction with the rest of the city and not as an isolated enclave. The indicators aims at assessing if ecological corridors are maintained or recreated with non-built surrounding spaces.								
Background	It is included as part of the Strategic Environmental Assessment (SEA) as per Directive 2011/42/EC that encourages a 3 step approach: avoid, reduce and compensate damages to the environment. This indicator is linked to the "avoid damages to the environment" criterion. It can be linked to "commitment n°20" of the French Ecoquartier label "Preserve and enhance biodiversity, soils and natural ecosystems".									
References	[1]									
LEVEL					1	r				
Derived from	Software tool		Operational da	ita		In situ	measurements			
Denved nom	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)			
Details	It is a qualitative ind or destroyed. The ar	icator than swer wil	at focuses on the ap I therefore be a yes	proach: the or no.	eco	logical cor	rridors are preserve	d		
Areas covered	Urban areas									
Barriers	Need for a prior ana	lysis on t	he existence of surr	ounding nat	tural	areas				
Rating	Binary (yes or no) The assessment tea areas on plans, sket	m will ch ches and	eck the effectivenes eventually works.	s of existen	ce o	f the cont	inuity with non-bui	lt		
References										
SCALE	-									
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Diversity (yes/no)									
ENV.Bi.05	ISSUE		CATEGORY	LE	VE	L	SCALE			
	Environmental		Biodiversity		В		N			
GENERAL										
Description	The indicator aims a made through a sim plant structures	The indicator aims at promoting the diversity of plants and in public spaces. The assessment is made through a simple approach assuming that public spaces should get 3 different types of plant structures								
Background	It is included as part 2011/42/EC that end environment. This ir It can be linked to "o biodiversity, soils an	: is included as part of the Strategic Environmental Assessment (SEA) as per Directive 2011/42/EC that encourages a 3 step approach: avoid, reduce and compensate damages to the environment. This indicator is linked to the "compensate damages to the environment" criterion. It can be linked to "commitment n°20" of the French Ecoquartier label "Preserve and enhance piodiversity, soils and natural ecosystems".								
References	[1]									
LEVEL										
Derived from	Software tool		Operational da	ata		In situ measurements				
Denved from	Simple Calculation	ons	X Empirical/Liter	ature		Other	(specify)			
Details	It is a qualitative app should get 3 of the 5 -tall standard trees, -bushes, -herbaceous plants, -ground covering pla -flower beds	It is a qualitative approach with a yes or no answer to the following statement : public spaces should get 3 of the 5 following plant structures : -tall standard trees, -bushes, -herbaceous plants, -ground covering plants,								
Areas covered	Urban areas									
Barriers	-									
Rating	Binary (yes or no) The assessment teau and eventually work	m will c s. Cont	heck the effectivenes racts to buy plants wi	s of existenc Il also be pro	e of oof.	the corri	dors on plans, sketches			
References										
SCALE										
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Enhance architectural, cultural and landscape patrimony							
FCO.00.02	(yes/no)							
2001Quio2	ISSUE	C	ATEGORY	LE	VE	L	SCALE	
	Economic		Quality		В		N	
GENERAL								
Description	The indicator aims a style. It assumes tha practices. Housings are therefo loggias, balconies.	The indicator aims at promoting a local and contextualized approach to architecture and life- style. It assumes that vernacular or typical architectural features are adapted to local use and practices. Housings are therefore supposed to include typical Mediterranean spaces such as terraces, loggias, balconies.						
Background	It can be linked to th (natural and built), h	ie "comm listory an	itment n°10″ of the d identity.	French Eco	qua	rtier label	"Enhance patrim	ony
References	[1]	[1]						
LEVEL								
Derived from	Software tool		Operational da	ita		In situ	measurement	S
Derived from	Simple Calculation	e Calculations Empirical/Literature × Other (specify)						
Details	It is a qualitative app typical Mediterrane bedroom flat)	proach wi an spaces	th a yes or no answe : terraces, loggias,	er to the fol balconies, o	lowi f at	ing statem least 8 m	nent : Housings in 1² (except for 1	clude
Areas covered	Urban areas							
Barriers	-							
Rating	Binary (yes or no) The assessment teau described features in	n will che n specifica	eck the effectiveness ations, sketches and	s of existenc d eventually	ce of v wo	the Medi rks	iterranean archite	ecture
References								
SCALE	_							
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Cul-de-sac roads and path ratio (%)										
SOC.Tr.21	ISSUE		CA	TEGORY	LE	VE	L	SCA	LE		
	Social		Tra	ansport		S		N	l		
GENERAL											
Description	This indicator measu	ures the	e acti	ual connection an	d accessibili	ty o	f the neig	hbourhood to	the re	st	
	connection and acce	ssihilit	tv of t	the neighbourboo	d Being iso	olate	nd it is les	s likely the			
	neighbourhood will	neighbourhood will be accessible, especially with public transport.									
Background	It can be linked to "o	t can be linked to "commitment n°9" of the Ecoquartier French label "Implement architectural									
	and planning quality	that re	econ	ciles intensity and	l life quality"	,					
References	[1]										
LEVEL											
Derived from	Software tool		(Operational data			In situ	u measurements			
	Simple Calculation	ons	XE	Empirical/Liter	ature		Other ((specify)			
Details	The proportion of cul-de-sac is measured by a percentage. It the ratio between cul-de-sac streets and the total number of streets. The calculation is quite simple as the detailed data is available in specifications, plans and sketch										
Areas covered	Urban areas										
Barriers	_										
Rating	Cul-de-sac roads and	d path s	shou	ld represent less t	han 20% of:	all r	oads and	paths			
References	[1]										
SCALE											
Application	Urban scale										
Details											
Multiscale											
References											
REFERENCES											
[1]	Quartiers Durables Mé	diterrar	néens	: <u>http://www.envir</u>	obatbdm.eu/	barc	oque				



	Car sharing p	ool/s	tation (yes/r	າວ)						
SOC.Tr.04	ISSUE	C	ATEGORY	LE	VE	L	SCALE			
	Social		Transport		S		Ν			
			GENERAL							
Description	Car sharing is a way mean for mobility. C on a flexible way. St dedicated infrastruc pollution due to car. A car sharing pool/s	Lar sharing is a way or reducing the predominance of car on public space as well being the main nean for mobility. Car clubs offer, through subscription, the possibility to share the use of a car on a flexible way. Still the implementation of such a service requires the implementation of a dedicated infrastructure. The indicator aims at promoting car sharing to reduce problems and pollution due to car. A car sharing pool/station is expected to be implemented as part of the development project.								
Background	It can be linked to "o and public transport	It can be linked to "commitment n°14" of the French Ecoquartier label: "promote soft mobility and public transport to lower dependency to cars".								
References	[1]									
LEVEL										
Darived from	Software tool		Operational da	ata		In situ	measurements			
Derived Irolli	Simple Calculations Empirical/Literature × Other (specify)									
Details	It is a qualitative ap pool/station is imple	proach v emented	vith a yes or no ans as part of the projec	swer to the ct	foll	owing sta	tement : A car sha	ring		
Areas covered	Urban areas									
Barriers	_									
Rating	Binary (yes or no) The assessment tear regarding that issue	n will che	eck the specification	s or discuss	witl	h the team	n regarding their wil	Ι		
References										
SCALE										
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Respecting streaming continuity (yes/no)								
ENV.Wa.09	ISSUE	C	ATEGORY	LE	VE	L	SCALE		
	Environmental		Water		В		N		
GENERAL									
Description	Rainwater streamin natural streaming i Mediterranean are Preserving the perr flooding preventio buildings implemen streaming continuit	Rainwater streaming create natural water corridor or supply ponds with water. Preserving natural streaming is important to preserve the continuity and ecosystems downstream. In the Mediterranean area, rains can be particularly intensive and heavy causing fast floodings. Preserving the permeability of soils, easing draining and streaming are therefore major issues of flooding prevention. For a neighbourhood development project, the indicator focuses on buildings implementation and whether it respects the site topography and do not modify streaming continuities.							
Background	It can be linked to " and ensure a qualit	can be linked to "commitment n°19" of the French Ecoquartier label "Preserve water resource nd ensure a qualitative and economical management" of the resource							
References	[1]	[1]							
LEVEL									
Darivad from	Software tool		Operational da	ata		In situ	i situ measurements		
Derived Itolii	Simple Calculati	ons	Empirical/Liter	ature	x	Other	er (specify)		
Details	It is a qualitative ind implementation res The answer will the	licator th pect the refore be	at aims at checking site topography and a yes or no.	the followin I do not mod	ig sta dify :	atement: streaming	buildings continuities		
Areas covered	Urban areas								
Barriers	Need for a prior and topography	alysis on t	the existing streamir	ng. Particula	r atl	tention wi	ll be given to the		
Rating	Binary (yes or no) The assessment tea identified in prior st	am will ch cudies.	neck plans and sketc	hes to see if	f the	ey respect	the continuities		
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



ENV.Wa.07	Landscaped and accessible retention ponds and ditches (yes/no)								
	ISSUE	C	ATEGORY	LE	VE	L	SCALE		
Landscaped and accessible retention ponds ENV.Wa.07 (yes/no) ISSUE CATEGORY LEVEL Environmental Water B GENERAL Description Retention ponds and ditches are part of rainwater management syste environment, it is assumed that they should be therefore landscaped public so they become enjoyable. The indicators assesses if retention ponds and ditches are landscaped and ensure a qualitative and economical management" of the resour References Background It can be linked to "commitment n°19" of the French Ecoquartier labe and ensure a qualitative and economical management" of the resour References Derived from Software tool Operational data In 1 LEVEL Simple Calculations Empirical/Literature × Ot Derived from Software tool Operational data In 1 Simple Calculations Empirical/Literature × Ot Details It is a qualitative indicator that focuses on the approach checking the ponds and ditches are landscaped and accessible to users. The answer will therefore be a yes or no. Areas covered Urban areas Barriers - Rating Binary (yes or no) The assessment team will check the specifications, sketches and ever References		N							
GENERAL									
Description	Retention ponds an environment, it is a public so they beco The indicators asses	Retention ponds and ditches are part of rainwater management systems. Being part of people's environment, it is assumed that they should be therefore landscaped and accessible to the public so they become enjoyable. The indicators assesses if retention ponds and ditches are landscaped and accessible to users							
Background	It can be linked to " and ensure a qualita	commitm ative and	ent n°19" of the Fre economical manage	ench Ecoqua ement" of th	rtie ne re	r label "Pr esource	eserve water resour	ce	
References	[1]	[1]							
LEVEL									
Danis and frame	Software tool		Operational da	ita		In situ	measurements		
Derived from	Simple Calculati	ons	Empirical/Liter	ature	x	Other	tu measurements er (specify)		
Details	It is a qualitative inc ponds and ditches a The answer will the	dicator that are landscorre be	at focuses on the ap aped and accessible a yes or no.	proach cheo to users.	ckin	g the state	ement: retention		
Areas covered	Urban areas								
Barriers	-								
Rating	Binary (yes or no) The assessment tea	m will che	eck the specificatior	ns, sketches	and	eventuall	y works.		
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Rainwater collection from roofs (%)								
ENV.Wa.08	ISSUE	C	ATEGORY	LE	VE	L	SCALE		
	Environmental		Water		S		N		
GENERAL									
Description	Rainwater can be a of rainwater using d to collect rainwater The indicators aims large scale	Rainwater can be a resource to different kind of uses and practices. Prior to the implementation of rainwater using devices; collection must be designed and implemented. Roofs are a key tool to collect rainwater because of the area they cover. The indicators aims at assessing if roofs collect rainwater to dedicated cisterns or barrels in a arge scale							
Background	It can be linked to " and ensure a qualita	can be linked to "commitment n°19" of the French Ecoquartier label "Preserve water resource nd ensure a qualitative and economical management" of the resource							
References	[1]	[1]							
LEVEL									
Derived from	Software tool		Operational da	ata		In situ	measurements		
	Simple Calculati	ons	Empirical/Liter	ature	x	Other	(specify)		
Details	It is a qualitative inc or destroyed. The answer will the	licator tha	at focuses on the ap a yes or no.	proach: the	ecc	ological co	rridors are preserve	d	
Areas covered	Urban areas								
Barriers									
Rating	Threshold is 50% : a The assessment tea eventually works.	t least 50 ım will ch	% of roofs should co eck the effectivene	ollect rainwa ss through s	ater peci	ifications,	sketches and		
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Dedicated network (yes/no)							
ENV.Wa.05	ISSUE	C	ATEGORY	LE	EVE	L	SCALE	
	Environmental		Water		В		N	
GENERAL								
Description	The separation of domestic wastewater and rainwater networks helps preventing pollution to the environment and/or designing a more cost effective networks as well as water treatment plant. Separated networks help coping with brutal changes in flows due to heavy rains, like in the Mediterranean area. It prevents wastewater overflow to the environment. Network separation also means a downsizing of water treatment plants as rainwater flows are managed. The indicators aims at assessing if wastewater network and rainwater networks are two separated networks							
Background	It can be linked to " and ensure a qualita	It can be linked to "commitment n°19" of the French Ecoquartier label "Preserve water resource and ensure a qualitative and economical management" of the resource						
References	[1]							
LEVEL			_					
Derived from	Software tool		Operational da	ata		In situ	measurements	
	Simple Calculati	ons	Empirical/Liter	rature × Other ((specify)	
Details	It is a qualitative inc networks are two se The answer will the	licator that eparated refore be	at check the statem networks. a yes or no.	ent: wastew	vate	r network	and rainwater	
Areas covered	Urban areas							
Barriers								
Rating	Binary (yes or no) The assessment tea and eventually worl	am will ch ks.	eck the effectivene	ss of exister	nce o	of the 2 ne	tworks on sketches	
References								
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Urban heat island (yes/no)								
SOC.TC.06	ISSUE	C	ATEGORY	LE	VE	L	SCALE		
	Urban heat island (yes/no) ISSUE CATEGORY LEVEL SC/ Social Thermal Comfort B M Urban heat island phenomenon is a major issue for urban areas. Heat increase and well as incapacity to cool down impact life quality. With global warming and the increnumber and duration of heatwaves, that phenomenon could take greater proportion. the design or urban areas, urban heat island effect needs to be tackled well in advardesign of the project. The indicators aims at assessing if consideration is given upstream to urban mespecially regarding material albedo, positioning to winds, Venturi effect, interest of pl anticipate and adapt to climate change" g [1] Software tool Operational data In situ measurem Simple Calculations Empirical/Literature × Other (specify) It is a qualitative indicator that focuses on the approach to check the statement: is con given upstream to urban heat island, especially regarding material albedo, positioning Venturi effect, interest of plants A preliminary note on heat island effect made as part of the project should be provided Urban areas S g The assessment team will check the existing note on heat island effect and the referer to it in the project development scheme s Urban scale	N							
GENERAL									
Description	Urban heat island phenomenon is a major issue for urban areas. Heat increase and storage as well as incapacity to cool down impact life quality. With global warming and the increase of the number and duration of heatwaves, that phenomenon could take greater proportion. Linked to the design or urban areas, urban heat island effect needs to be tackled well in advance in the design of the project. The indicators aims at assessing if consideration is given upstream to urban heat island, especially regarding material albedo, positioning to winds, Venturi effect, interest of plants								
Background	It can be linked to " anticipate and adap	It can be linked to "commitment n°16" of the French Ecoquartier label : "produce a planning that anticipate and adapt to climate change"							
References	[1]								
LEVEL			_						
Derived from	Software tool		Operational da	ita		In situ	measurements		
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)		
Details	It is a qualitative ind given upstream to u Venturi effect, inter A preliminary note o	icator tha rban heat est of plar on heat isl	t focuses on the ap island, especially re nts and effect made as	proach to cl egarding ma part of the	heck ateri proj	the state al albedo, ect should	ment: is consideration positioning to winds, I be provided		
Areas covered	Urban areas			•					
Barriers									
Rating	The assessment tea to it in the project d	m will che evelopme	eck the existing not nt scheme	e on heat isl	and	effect and	d the references made		
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Adaptation to users practices (yes/no)									
SOC.Ac.06	ISSUE	C	ATEGORY	LE	VE	L	SCALE			
	Social	А	ccessibility		В		N			
GENERAL										
Description	The practice of publ through a top-down their unsuitability to great basis to public practices can provid The indicator actual existing tracks	The practice of public space by users does not always match anticipated uses made by planers through a top-down approach. There are many examples of empty public spaces because of their unsuitability to users' needs. In existing sites, a prior analysis of users' practices provides a great basis to public spaces design. In particular, regarding pedestrian paths, using previous practices can provide the best basis to a walking path scheme that can connect public spaces. The indicator actually assesses if public spaces network lean on marks let by users passing or existing tracks								
Background	It can be linked to th (natural and built), h	t can be linked to the "commitment n°10" of the French Ecoquartier label "Enhance patrimony natural and built), history and identity.								
References	[1]	[1]								
LEVEL										
Derived from	Software tool		Operational da	ita		In situ	measurements			
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)			
Details	It is a qualitative ind let by users passing The answer will the	licator tha or existin refore be	at focuses on the ap g tracks. a yes or no.	proach: do j	publ	lic spaces	network lean on mar	ks		
Areas covered	Urban areas									
Barriers										
Rating	Binary (yes or no) The justification ha	s to be pr	ovided by the local a	authority an	id/o	r contract	or			
References										
SCALE										
Application	Urban scale									
Details										
Multiscale										
References										

REFERENCES

[1]

Quartiers Durables Méditerranéens : http://www.envirobatbdm.eu/baroque



	Public space	aualit	w (ves/ne)				
SOC Ac 12							
30C.AC.12	CATEGORY LEV		LEVE	L	SCALE		
	Social	A	ccessibility	В		N	
GENERAL							
Description	Public spaces are a	a major	component of life	quality and	community	y living. Diversity and	
	complementary space	ces offer	a wide range of pra	ictices and ther	efore help	including all users. An	
	emphasis on their d	lesign sh	ould therefore prev	vail to neighbo	urhood pr	ogramming. Indeed as	
	Oriol Bonigas taught	: us; pub	lic spaces are not t	ne remainder d	of buildings	s; they actually are the	
	Contrary. The indicator aims at	t accordin	og if various public s	nacos aro offor	od in cuffic	iont numbor	
Packaround	This can be linked to	"commi	tment n°9" of Frenc	h Ecoquartier la	ahel · "Imn	lement architectural	
Бискугоини	and urban quality th	at recond	ciles intensity and lif	e quality'	ber. mp		
References	[1]			- 17			
LEVEL							
Derived frem	Software tool		Operational da	lata In situ		measurements	
Derived from	Simple Calculation	ons x	Empirical/Liter	ature	Other	(specify)	
Details	The project offers at	least 4 o	ut of the 5 following	g public spaces	:	·	
	1.squares						
	2.walks and parks						
	3.Primary highways	bouleva	rds, avenues, roads)				
	4. Secondary ways (s	treets, d	ead ends)				
Areas covered	Urban areas	STOT LEAL	ic (patriways, laries,	alleysj			
Areus covereu							
Butters	Dinamy (was ar na)						
Rating	The assessment tea	m will ch	eck the specification	ns sketches and	l ovontuall	v works	
References	The discissionent ted		cert the specification	is, sketenes and	cventuun	y works.	
SCALE							
Application	Urban scale						
Details							
Multiscale							
References							

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Parks and ve	getate	ed spaces ne	twork (ye	s/no)		
SOC.Ac.11	ISSUE	ISSUE CATEGORY LEVEL					SCAL	.E
	Social	А	ccessibility		В		N	
GENERAL								
Description	Parks and green spa isolation even if nun continuity between need for continuity global and integrate The indicators aims	Parks and green spaces have a central place in life quality. Their too often small size and/or isolation even if numerous does not really meet people's expectations. Creating connection and continuity between green open spaces can provide a better user experience. It also meets the need for continuity of natural spaces to maintain biodiversity. The project should therefore think global and integrate the need for interaction between green spaces as a network. The indicators aims at assessing if parks and vegetated spaces are organised in networks						
Background	This can be linked to and urban quality th	e "commit at recond	tment n°9" of Frencl tiles intensity and lif	h Ecoquartie e quality'	er la	bel : "Imp	lement archite	ctural
References	[1]	[1]						
LEVEL								
Dariugd from	Software tool		Operational da	ita		In situ	measureme	nts
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other (specify)		
Details	It is a qualitative ind spaces are organized The answer will ther	icator tha d in netwo efore be	at focuses on checki orks. a yes or no.	ng the state	mer	nt: are pa	rks and vegeta	ted
Areas covered	Urban areas		•					
Barriers								
Rating	Binary (yes or no) The assessment tea works	Binary (yes or no) The assessment team will check the effectiveness on specifications, sketches and eventually works						
References								
SCALE	_							
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES

[1]

Quartiers Durables Méditerranéens : http://www.envirobatbdm.eu/baroque



	Accoustics st	udies	(yes/no)					
SOC.AC.06	ISSUE	CATEGORY LEV				L	SCALE	
	Social	Acc		В		N		
GENERAL								
Description	Noise pollution can limited if taken into measures on noise useful information t	Noise pollution cannot always be avoided. Nevertheless, potential exposure to noise can be limited if taken into consideration upstream. An acoustics study is necessary to provide objective measures on noise, identifying sources, analyzing aggravating factors. The data will provide useful information to design a neighbourhood that lower exposure to noise.						
Background	It can be linked to " everybody's require	commitm ment an	nent n°1" of the Fren d based on resources	ch Ecoquar s and pressu	tier ure"	label "Des	ign project answerii	ng
References	[1]							
LEVEL								
Darived from	Software tool		Operational da	ita		In situ	measurements	
Denved from	Simple Calculation	ons	Empirical/Literature X Oth		Other	(specify)		
Details	It is a qualitative ind phase (measuremer The answer will the	icator th its, sourc refore be	at aims at ensuring a ses identification, and a yes or no.	in acoustics alysis of agg	stu grava	dy is made ating facto	e before the design rs and frequency).	
Areas covered	Urban areas							
Barriers								
Rating	Binary (yes or no) The assessment tea the results into cons	Binary (yes or no) The assessment team will check the study and the developing team will explain how it has taken the results into consideration						
References								
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Shared comr	nunity	spaces (yes	/no)				
SOC.Ac.13	ISSUE	C	ATEGORY	LE	VE	L	SCALE	
	Social	A	ccessibility		В		N	
GENERAL								
Description	Public spaces are complementary spa emphasis on their c and shared spaces a The indicators aim community gardens	Public spaces are a major component of life quality and community living. Diversity and complementary spaces offer a wide range of practice and therefore help including all users. An emphasis on their design should therefore prevail to neighbourhood programming. Community and shared spaces also help people inclusive practice of living together. The indicators aims at assessing if shared spaces are designed on public spaces (squares, community gardens, playerounds, picnic areas)						
Background	It can be linked to "o social and intergene	commitm rational r	ent n°7" of the Fren nixity, living togethe	ich Ecoquart er and solida	tier l arity	label "Imp ".	lement conditions for	
References	[1]							
LEVEL								
Darived from	Software tool		Operational da	ata		In situ measurements		
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)	
Details	It is a qualitative ind spaces (squares, cor The answer will ther	icator tha nmunity រួ efore be	t focuses on the ap gardens, playgrounc a yes or no.	proach if sh Is, picnic are	arec eas	d spaces a .).	re designed on public	
Areas covered	Urban areas							
Barriers	Need for a prior ana	lysis on tl	ne existence of surro	ounding nat	ural	areas		
Rating	Binary (yes or no) The assessment tea eventually works.	Binary (yes or no) The assessment team will check the effectiveness the development scheme, plans, sketches and eventually works.						
References								
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES

[1]

Quartiers Durables Méditerranéens : http://www.envirobatbdm.eu/baroque



	Community s	uppo	rt (yes/no)					
SOC.Ac.16	ISSUE	С	CATEGORY LEVEL			SCALE		
	Social	A	ccessibility		В		N	
GENERAL								
Description	Community associat initiatives. Local auth them. The indicators aim neighbourhood	Community associations provide a base to community living. They initiate and support local nitiatives. Local authority can support community association by providing facilities to host hem. The indicators aims at assessing if community association facilities are hosted in the neighbourhood						
Background	It can be linked to "c social and intergene	ommitm rational r	ent n°7" of the Fren nixity, living togethe	ch Ecoquart er and solida	tier arity	label "Imp ".	lement conditior	is for
References	[1]	[1]						
LEVEL								
Dariuad from	Software tool		Operational da	ita		In situ	measurement	S
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)	
Details	It is a qualitative ind facilities are hosted i The answer will ther	icator tha in the nei efore be	at focuses on checki ighbourhood. a yes or no.	ng the state	mei	nt: commu	unity association	
Areas covered	Urban areas							
Barriers								
Rating	Binary (yes or no) The assessment tea	Binary (yes or no) The assessment team will check the effectiveness with planners						
References								
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Community g	garder	ns (yes/no)					
SOC.Ac.10	ISSUE	C	ATEGORY	LE	VE	L	SCALE	
	Social	А	ccessibility	В			Ν	
GENERAL								
Description	Community garden land through garden together. Not to thr The indicators aims implemented and th	Community garden have ecological and social benefits. They support people connecting to the and through gardening. They become a place where the community can meet and get on cogether. Not to threaten the environment, they should be run on organic principles. The indicators aims at assessing if open ground agricultural project (community gardens) are mplemented and that they are organic based.						
Background	It can be linked to "o fair economic develo	commitmo opment".	ent n°11″ of the Fre	nch Ecoqua	rtier	label "Co	ntribute to a local an	۱d
References	[1]							
LEVEL								
Darived from	Software tool		Operational da	ita		In situ	measurements	
Derived Itolii	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)	
Details	It is a qualitative ind (community gardens The answer will ther	icator tha s) are in efore be	at check the followir nplemented and if t a yes or no.	ng statemen hey are orga	it: op anic	ben groun based.	d agricultural project	ĩ
Areas covered	Urban areas							
Barriers								
Rating	Binary (yes or no) The assessment tea	m will che	eck the effectivenes	s with local	autl	horities ar	nd planners.	
References								
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Support to lo	ocal ec	conomy (%)					
ECO.Eq.03	ISSUE	С	ATEGORY	TEGORY LEVEL				
	Economic		Equity	S			N	
GENERAL								
Description	Project developmen development. Ideall therefore local empl	Project development through the studies and works they require supports economic development. Ideally the expenses made for the project should benefit to local companies and therefore local employment.						
Background	It can be linked to "c fair economic develo	t can be linked to "commitment n°11" of the French Ecoquartier label "Contribute to a local and fair economic development".						
References	[1]							
LEVEL								
Darived from	Software tool		Operational da	ita		In situ	measurements	
Derived Itom	Simple Calculation	ons	Empirical/Liter	ature	x	Other (specify)		
Details	80% of the compani	es involve	ed in the project are	based local	lly			
Areas covered	Urban areas							
Barriers								
Rating	The threshold is 80% The assessment tea	6 i.e. 80% m will ch	of the companies ir eck the contracts.	nvolved in th	ne p	roject are	based locally	
References								
SCALE								
Application	Urban scale							
Details								
Multiscale								
References								

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Flexibility and adaptability, programming (yes/no)											
ECO.Va.02	ISSUE	(ATEGORY	LEVEL		SCALE						
	Economic	Value			В		N					
GENERAL												
Description	Neighbourhood developments are long and complex projects. The initial project can change and											
	evolve to answer new needs or requirements. The capacity of the project to adapt to a changing											
	environment is an important auvalitage to keep the relevancy and avoid idlities.											
	The indicator aims at assessing adaptability and flexibility.											
	The indicator assesses if some plots / parcel lands are not assigned to a specific development in											
	order to adapt to the possible evolution of the project.											
Background	It can be linked to "commitment n°4" of the French Ecoquartier label "Take into account use and practices of developers and buildings managers in choice of conception".											
References	[1]											
LEVEL												
Derived from	Software tool		Operational da	ata		In situ	situ measurements					
	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)					
Details	It is a qualitative indicator that focuses on checking the statement: are some plots / parcel lands											
	are not assigned to a specific development in order to adapt to the possible evolution of the											
Areas covered	Urban areas											
Rarriers												
Durriers	Rinary (ves or no)											
Ruting	The assessment team will check the effectiveness of available plots in plans and schemes											
References						·						
SCALE												
Application	Urban scale											
Details												
Multiscale												
References												
REFERENCES												
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>											



FCO.Va.01	Flexibility and adaptability, during the life of the project (yes/no)										
2001101	ISSUE	CATEGORY		LEVEL			SCALE				
	Economic		Value				N				
GENERAL											
Description	Neighbourhood developments are long and complex projects. It is difficult to anticipate the future needs in an evolving environment on the long run. The capacity of the project to adapt to such a changing environment is an important advantage to keep the relevancy and avoid failures. The indicator aims at assessing adaptability and flexibility of the project though its lifetime. The indicator assess if some land is preserved for the possible evolution of the neighbourhood.										
Background	It can be linked to "commitment n°4" of the French Ecoquartier label "Take into account use and practices of developers and buildings managers in choice of conception".										
References	[1]										
LEVEL						r					
Derived from	Software tool		Operational da	ata		In situ	measurements				
	Simple Calculation	ons	Empirical/Literature		x	Other (specify)					
REFERENCES											
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>										
Details	It is a qualitative indicator that focuses on checking the statement: Some land is preserved for the possible evolution of the neighbourhood. The answer will therefore be a yes or no.										
Areas covered	Urban areas										
Barriers	Need for a prior analysis on the existence of surrounding natural areas										
Rating	Binary (yes or no) The assessment team will check the development scheme and plans, sketches and eventually works.										
References											
SCALE											
Application	Urban scale										
Details											
Multiscale											
References											


	Working with skilled professionals (yes/no)								
ECO.Qu.14	ISSUE		CATEGORY	LE	VE	SCALE			
	Economic		Quality		В		N		
GENERAL									
Description	Neighbourhood dev	ighbourhood developments are long and complex projects. To ensure the quality of the							
	process along the pi	oject fr ernal su	om design to works, i innort from a consult:	ocal authori	ities	can make	a specific call for		
	expertise, it will pro	vide a c	omplementary view of	on the proje	ct is:	sues, supp	orting the decision		
	making process.						-		
	The indicator asses	s if an	assistant to the cor	ntracting au	tho	rity on en	vironmental quality	/ is	
Dackaround	assigned to follow the	ne total	ity of the project (des	ign, works, e	envi tior l	ronmenta	I quality of buildings).	
вискугоини	implementing a mar	implementing a management process and an enlarged governance".							
References	[1]	[1]							
LEVEL									
Derived from	Software tool		Operational da	ata		In situ	measurements		
Derived from	Simple Calculation	ons	Empirical/Liter	ature	^x Other (specify)				
Details	It is a qualitative ind	icator t	hat focuses on checki	ng the state	emer	nt: is an as	sistant to the		
	contracting authorit	y on en ronmen	vironmental quality is	s assigned to	D TOI	low the to	tality of the project		
	The answer will the	efore b	e a yes or no.						
Areas covered	Urban areas		,						
Barriers									
Rating	Binary (yes or no)								
	The assessment tea	m will c	heck the existing con	tracts betwe	een	local auth	orities and the		
Pafarancas	consultancy assistar	It.							
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Project management (yes/no)								
ECO.Qu.13	ISSUE	C	ATEGORY	LE	VE	L SCALE			
	Economic		Quality		В		N		
GENERAL	_								
Description	Neighbourhood dev authority develops i charge of "sustainab partners and contra- The indicator asses "sustainable plannin	The indicator assesses if a member of the local authority is identified and dedicated to "sustainable planning" and follows the project.							
Background	It can be linked to "c implementing a mar	It can be linked to "commitment n°2" of the French Ecoquartier label "Formalising and implementing a management process and an enlarged governance".							
References	[1]								
LEVEL									
Derived from	Software tool		Operational da	ata		In situ measurements			
Denved from	Simple Calculation	ons	Empirical/Liter	ature	× Other (specify)				
Details	It is a qualitative indicator that focuses on checking the statement: is a member of the local authority is identified and dedicated to "sustainable planning" and is that person follows the project.								
Areas covered	Urban areas								
Barriers									
Rating	Binary (yes or no) The assessment team will that person in charge of "sustainable planning". Signed presence sheets will prove its participation to the project process.								
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Assessing the current situation (yes/no)								
ECO.Va.03	ISSUE	(CATEGORY	LE	VE	L	SCALE		
	Economic		Value		В		N		
GENERAL									
Description	Neighbourhood dev its own history, com takes into considera insertion in the exist The indicator assess geography, sociolog diractions	The indicator assesses if on a broader scale, a study is made including an analysis on history, geography, sociology, urbanism and environment, and if cross analysis helped define the project directions							
Background	It can be linked to "o to all users' needs b	It can be linked to "commitment n°1" of the French Ecoquartier label "Making projects suitable to all users' needs based on local resources and pressures".							
References	[1]	[1]							
LEVEL									
Derived from	Software tool Operational data In situ measurem					measurements			
Denved from	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)		
Details	It is a qualitative ind made including an a does cross analysis I The answer will the	It is a qualitative indicator that focuses on checking the statement: is on a broader scale, a study made including an analysis on history, geography, sociology, urbanism and environment, and does cross analysis help define the project directions. The answer will therefore be a yes or no.							
Areas covered	Urban areas								
Barriers									
Rating	Binary (yes or no) The assessment team will consult the study and check if references to that study is made in the project development scheme								
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : http://www.envirobatbdm.eu/baroque



	Plus6 (+6) project management (yes/no)								
ECO.Qu.11	ISSUE	C	ATEGORY	LE	VE	L	SCALE		
	Economic		Quality		В		N		
GENERAL									
Description	Neighbourhood developments are long and complex projects. It is important someone in the contracting authority is identified as being in charge of the project. This person is the representative to contractors and the assessment team. The indicator assesses if a coordinator or a project manager is identified for the contracting authority.								
Background	It can be linked to "commitment n°2" of the French Ecoquartier label "Formalising and implementing a management process and an enlarged governance".								
References	[1]								
LEVEL									
Darived from	Software tool		Operational da	ata		In situ measurements			
Derived Itolii	Simple Calculations Empirical/Litera		ature	x Other (specify)					
Details	It is a qualitative indi manager identified fo The answer will there	cator tha or the co efore be	it focuses on checki ntracting authority. a yes or no.	ng the state	mei	nt: is a coo	ordinator or a projec	t	
Areas covered	Urban areas								
Barriers									
Rating	Binary (yes or no) The assessment tear	m will me	et that person and	check its po	sitio	on in the c	ontracting authority	<i>ı</i> .	
References									
SCALE	-								
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Finalising the	e desig	gn phase (ye	s/no)					
ECO.Qu.09	ISSUE	C	ATEGORY	LE\	VEI	L	SCALE		
	Economic		Quality	В		N			
GENERAL									
Description	The tendering pack contractors who w tendering package is for the project. If neighbourhood (QD the integration of th The indicator asses sustainable neighbo	The tendering package is provided by the public authority (or its delegate) to the potential contractors who want to answer the call for tender for neighbourhood development. The tendering package is therefore a core set of documents that conveys the public authority intents for the project. It should therefore include all the means chosen in the sustainable neighbourhood (QDM) approach as it guides potential contractors answer to the bid. It enforces the integration of the approach. The indicator assesses if the tendering package was written including means chosen in the sustainable neighbourhood (QDM) approach.							
Background	It can be linked to "o approach when inve	It can be linked to "commitment n°3" of the French Ecoquartier label "Integrating global cost approach when investing".							
References	[1]								
LEVEL	-		_						
Derived from	Software tool		Operational da	ita		In situ i	measurements		
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other ((specify)		
Details	It is a qualitative ind written including me The answer will ther	licator tha eans chose refore be a	t focuses on checki en in the sustainabl a yes or no.	ng the stater e neighbourf	ner hoo	nt: is the te d (QDM) a	endering package approach.		
Areas covered	Urban areas								
Barriers									
Rating	Binary (yes or no) The assessment tea	m will che	eck the tendering pa	ackage.					
References									
SCALE	-								
Application	Urban scale								
Details									
Multiscale									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Community	olanni	ng (yes/no)						
ECO.Qu.08	ISSUE	C	ATEGORY	LE	VE	L	SCALE		
	Economic		Quality		В		N		
GENERAL									
Description	Neighbourhood dev its own history and o takes into considera legitimately claims t for a successful inse the users' desires. The indicator assess during the design s consideration	its own history and community with its specific identity. A project can only be successful if it takes into consideration all this matters and respects them. Communities more and more legitimately claims to be real part of the project designing. Including communities is a condition for a successful insertion in the existing urban environment of a project that will actually match the users' desires. The indicator assesses if above mandatory consultation, a participatory approach is implemented during the design step (design choice, materials, furniture) and if users ideas are taken into consideration							
Background	It can be linked to "o implementing a mar	commitme nagement	ent n°2" of the Fren process and an enl	ch Ecoquart arged gover	tier l nan	abel "Fori ce".	malising and		
References	[1]	[1]							
LEVEL									
Dariuad from	Software tool		Operational da	ita		In situ	measuremen	ts	
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)		
Details	It is a qualitative indicator that focuses on checking the statement: is above mandatory consultation, a participatory approach implemented during the design step (design choice, materials, furniture) and if users ideas are taken into consideration.								
Areas covered	Urban areas								
Barriers									
Rating	Binary (yes or no) The assessment team will check the number of community planning meetings, the possible contract signed with a consultant dedicated to community planning. Eventually the developers will have to present which part of the project comes from the results of the participatory approach.								
References									
SCALE									
Application	Urban scale								
Details									
Multiscale									
References									

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Community	mana	gement (yes/	/no)										
ECO.Qu.07	ISSUE	(CATEGORY	LE	VEL		SCALE							
	Economic		Quality		В		N							
GENERAL														
Description	Communities now r communities to urb actually match the u garden for instance. The indicator asses spaces (managemen	communities now reclaim their right to public spaces use and management. Including communities to urban spaces management is a condition to build a relevant project that will actually match the users' desires. Community project and initiatives can be of a community garden for instance. The indicator assesses if community planning is implemented for the management of urban spaces (management of community gardens).												
Background	It can be linked to " implementing a mai	can be linked to "commitment n°2" of the French Ecoquartier label "Formalising and uplementing a management process and an enlarged governance".												
References	ces [1]													
LEVEL														
Derived from	Software tool		Operational da	ata		In situ	measurements							
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other ((specify)							
Details	It is a qualitative inc implemented for the The answer will the	icator th e manag refore be	hat focuses on checki ement of urban spac e a yes or no.	ng the state es (manage	men men	it: is comr t of comn	nunity planning nunity gardens).							
Areas covered	Urban areas													
Barriers														
Rating	Binary (yes or no) The assessment tea agreements signed representative)	Binary (yes or no) The assessment team will check the documents proving the development of such schemes (e.g agreements signed between the local authority or contracting authority with the community representative)												
References														
SCALE														
Application	Urban scale													
Details														
Multiscale														
References														

REFERENCES	
[1]	Quartiers Durables Méditerranéens : <u>http://www.envirobatbdm.eu/baroque</u>



	Mixing functions (yes/no)													
SOC.Ac.24	ISSUE	C	CATEGORY	LE	VE	L	SCALE							
	Social	A	Accessibility		В		N							
GENERAL														
Description	Mixing functions in neighbourhood i.e planning a mix of different buildings from residential to shops or offices is important for the life quality of residents and users.													
	The indicator assesses if mixing functions is planned.													
Background	It can be linked to "o functions for a short	t can be linked to "commitment n°12" of the French Ecoquartier label "Promoting diversity of unctions for a short distance territory"												
References	erences [1]													
LEVEL														
Dariyad from	Software tool		Operational da	ita		In situ	measurements							
Derived from	Simple Calculation	ons	Empirical/Liter	ature	x	Other	(specify)							
Details	It is a qualitative ind for the neighbourho The answer will ther	icator th od. efore be	at focuses on checki a yes or no.	ng the state	emei	nt: is mixir	ng functions planned	_						
Areas covered	Urban areas		•											
Barriers														
Rating	Binary (yes or no) The assessment tea	m will ch	neck the planning do	cuments pro	ovid	ed by the	contracting authorit	.y						
References														
SCALE														
Application	Urban scale													
Details														
Multiscale														
References														



Appendix B

Overview of available indicators and frequencies in transnational projects and PAS

							level		scale					proje	ects				public	a.s. ⋝	
							dard	nced	ding	hbourhood		NOL =	MED	COPE		N HOUSE MED	erBuildings	ocollo ITACA	F	Quartier BDI	t
No	ISSUE	CATEGORY	CRITERION	INDICATOR	UNITS	basic	stan	adva	build	neigl	CLUE	FASL	Ś	EN EF	CECS	OPE1	SuPe	Prot	[₽]	Eco-O	coun
	1 ECO	equity	Housing value	Affordability of housing property	m2			х		х	А							Α			2
	2 ECO	equity	Housing value	Affordability of housing rental	%			х		х	А							Α			2
	3 ECO	equity	Local economy	Support to local economy	%		Х			Х									S		1
	4 ECO	equity	Prevention of prejudice	Prevention of prejudice		х				х						В					1
	5 ECO	equity	Social & Economic cohesion	Future evolution and modularity		х				х						В					1
	6 ECO	equity	Social & Economic cohesion	Gentrification index	-			х		Х		А									1
	7 ECO	equity	Social & Economic cohesion	Labor force participation	%		Х			Х			S								1
	8 ECO	equity	Social & Economic cohesion	Potential Employment	%			х		Х	А							А			2
	9 ECO	equity	Social & Economic cohesion	Social housing ratio	%		х			Х			S								1
	10 ECO	equity	Social & Economic cohesion	Social mixing and solidarity based economy		х				х						В					1
	11 ECO	equity	Social & Economic cohesion	Unemployment rate	%		Х			Х			S								1
	1 ECO	investment costs	Capital cost	Additional costs for energy efficiency and sustainability	€		х		х	х							S				1
	2 ECO	investment costs	Capital cost	Investment costs	€/m2		х		х	х							5	5			1
	3 ECO	investment costs	Capital cost	Investment costs aggregated	€			х		Х		А									1
	4 ECO	investment costs	Capital cost	Participation of local authority in the total investment cost	%		х			Х										S	1
	5 ECO	investment costs	Performance	Return on investment	%		Х	х	х	Х		A					9	5			2
	1 ECO	life cycle costs	Benchmarking & Targeting	Verifiable sustainable targets		х			х	х						В					1
	2 ECO	life cycle costs	Cost benefit	Cost benefit analysis focused on sustainability		х			х	х						В					1
	3 ECO	life cycle costs	Energy cost	Operational energy costs	€/m2		х		х	х							5	S			1
	4 ECO	life cycle costs	Energy cost	Operational energy costs aggregated	€		Х	х	х	Х		A					S				2
	5 ECO	life cycle costs	Non- Energy cost	Operational non-energy costs aggregated	€			х		х		A									1
	6 ECO	life cycle costs	Total cost	Cost in operational phase	€		х		х	х							S				1
	7 ECO	life cycle costs	Total cost	Life cycle costs	-			х	х					A	A						2
	8 ECO	life cycle costs	Total cost	Life cycle costs	€		х		х								S				1
	9 ECO	life cycle costs	Total cost	Life cycle costs aggregated	€			х		х		A									1
	1 ECO	management	Building operation	Communication and information management	%		х		х	х		5				_					1
	2 ECO	management	Building operation	Information and participation of users		х			х	Х						В					1
	3 ECO	management	Building operation	Synergy management	-		х			х		5									1
	4 ECO	management	Building operation	User information	-	х	X		х					S	В						2
	5 ECO	management	Social & Economic cohesion	Environmental activities in primary school	%		X			X			5								1
	1 ECO	quality	Architectural	Aesthetic quality	-	~	x			X							5				1
	2 ECO	quality	Architectural	Enhance architectural, cultural and landscape patrimony	yes / no	^	~		~	~				~	~				в		1
	3 ECO	quality	Benchmarking & Targeting	Setting vernable environmental targets	-		Ŷ		Ŷ					د د	S						2
	4 ECO	quality	Sultural basitana	Energy optimization during planning	-		Ŷ		Ŷ	v				3	3		c				2
	S ECO	quality	Cultural heritage	Nonument or monumental value / Historical value	-	~	X		x	X						Р	5				1
	8 ECO	quality	Process & Planning	Community management	was I no	Ŷ			^	v						в			р		1
	9 ECO	quality	Process & Planning		yes / no	Ŷ				Ŷ									D		1
	9 500	quality	Process & Planning	Einalising the design phase	yes / no	Ŷ				Ŷ									B		1
	10 FCO	quality	Process & Planning	Integrated design in the planning process	-	Â	x			x	1						s		D		1
	10 ECO	quality	Process & Planning	Internal project management	ves / no	x	~			x							5		в		1
	12 FCO	quality	Process & Planning	Process and planning quality	-	~	х		x	x		ç		s	s				5		3
	13 ECO	quality	Process & Planning	Project management	ves / no	х				x				-	-				В		1
	14 ECO	quality	Process & Planning	Working with skilled professionals	yes / no	х				х									В		1
	15 ECO	quality	Risk management	Long term stability of value	€		х		х	х							S				1
	16 ECO	quality	Risk management	Risk management	-		х			х		5									1
	17 ECO	quality	Territorial management & Urban design	Urban complexity, Shannon-Wiener index	-		х			х			S								1
	1 ECO	value	Flexibility & Adaptability	Flexibility and adaptability, during the life of the project	yes / no	х				х	1								в		1
	2 ECO	value	Flexibility & Adaptability	Flexibility and adaptability, programming	yes / no	х				х	1								В		1
	3 ECO	value	Process & Planning	Assessing the current situation	yes / no	х			l	х	1								В		1
	4 ECO	value	Process & Planning	Competent professional team		х			l	х	1					В					1
	5 ECO	value	Process & Planning	Economic advantage of cluster in comparison to single buildings	-	х	х	х		х	1	в / 9	/A								1
	6 ECO	value	Process & Planning	Equipment and services pooling		х				х	1					В					1
	7 ECO	value	Social & Economic cohesion	Tourist frequency trends, seasonality overnight stays	%		х			х	1		S								1
	8 ECO	value	Social & Economic cohesion	Tourist frequency trends, seasonality tourists	%		х			х	1		S								1
	1 ENV	biodiversity	Building site	Ecological quality of the building site	-		х		х		1			S	S						2
	2 ENV	biodiversity	Land preservation	During programming, design and before the beginning of the works;	the yes / no	х				х	1								В		1
	3 ENV	biodiversity	Public spaces	Change in ecological value of the site, species	-		х		х	х	1					S					1
	4 ENV	biodiversity	Public spaces	Connectivity of green spaces	%	1		х	l	х	А							А			2

5 ENIV	biodiversity	Public spaces	Divercity	ves / no	L V		1	×	1						1	P	11
C ENIX	biodiversity	Public spaces	Ecological contriders and continuity	yes/110	Ŷ			v								D	
B EINV	biodiversity	Public spaces		yes / no	^			<u>.</u>								Б	
/ ENV	biodiversity	Public spaces	Use of local plants	%		X		X	A						A	_	4
8 ENV	biodiversity	Public spaces	Vegetal areas	%		Х		Х								S	1
1 ENV	energy	Building vertical transportation	Escalators and moving walks design and efficiency	-		х	х						S				1
2 ENV	energy	Building vertical transportation	Lift design and efficiency	-		Х	Х						S				1
3 ENV	energy	Building vertical transportation	Stairs and ramps planning	-		х	х						S				1
4 ENV	energy	Embodied energy	Embodied energy demand	kWh/m2		х	x			А							1
5 ENV	energy	Final energy	Annual heat generation for space heating and DHW	kWh/m2 vr		х	х	х				s					1
6 ENIV	energy	Final energy	Cooling demand	kWh/m2 vr		x x	x					s	Δ				-
7 ENIV	energy	Einal energy	Delivered energy demand	kW/b/m2 yr		v		v				5		^			
	energy	Final energy		Tee (inhebitent ur		v ^	· ^	v			c			~			
BEINV	energy	Final energy	Energy consumption	Toe/Innabitant yr		^		~			5	-					
9 ENV	energy	Final energy	Heating demand	kWh/m2 yr		х х	x					S	A				2
10 ENV	energy	Final energy	Peak Energy demand		х		х	Х						В			1
11 ENV	energy	Primary energy	Abiotic Depletion Potential, ADP_Enr	kWh/m2		Х	Х						S				1
12 ENV	energy	Primary energy	Consumption of non-renewable primary energy	kWh/m2 yr		Х	х	Х						S			1
13 ENV	energy	Primary energy	Operational primary energy	kWh/m2 vr		х х	x	х		А		S	А	А			4
14 FNV	energy	Primary energy	Primary energy for cooling	%		x		х		s							1
15 ENIV	epergy	Primary energy	Primary energy for beating	9/		v v		v	^	c					^		
	energy	Drimony energy	Primary energy for meaning	76 07		~ ^ v	•	v	^	5							
16 ENV	energy	Primary energy	Primary energy for public lighting	%		X		X		5							
17 ENV	energy	Primary energy	Primary energy for public lighting	kWh/yr		x		х	A						А		4
18 ENV	energy	Primary energy	Total primary energy demand	kWh/m2		х х	Х	Х		A			S				2
19 ENV	energy	Renewables	Renewable electricity production	%		Х		Х								S	1
20 ENV	energy	Renewables	Renewable energy on site	%		х х	Х	Х		Α				S			2
21 ENV	energy	Renewables	Share of renewable primary energy in total primary energy demand	kWh/m2		х	х						S				1
22 FNV	energy	Renewables	PV-nower plant	kWh/a		x	x						s				1
22 ENIV	energy	Virtual power systems	Electric energy and Virtual nower systems	%		v	~	v		c			5				1
2.3 ENV	immente		Electric energy and virtual power systems	/o		v	v	v		5				c			
1 ENV	impacts	ECO-mobility	Eco-mobility potential of a building in its context	Km/umit		<u> </u>	. ^							5			
2 ENV	impacts	Effects on surrounding buildings	Impacts on surrounding buildings	%		хх		X		57	A		_				1
3 ENV	impacts	Emissions	Acidification potential	kgSO2-eq/m2yr		х х	x	Х		A			S				2
4 ENV	impacts	Emissions	Acidifying emissions, Intensity	%		Х	(Х	А						А		2
5 ENV	impacts	Emissions	Annual CO2 emissions	kgCO2/m2 yr		Х	Х	Х				S					1
6 ENV	impacts	Emissions	CO2 emission factor heat supply	kg/kWh	х		х	Х				В					1
7 ENV	impacts	Emissions	CO2 emissions	tonnes CO2-eg/yr		х		х			S						1
8 FNV	impacts	Emissions	Eutrophication potential	kgPO4-ea/m2vr		х х	x	х		А			S				2
9 ENV	impacts	Emissions	Global Warming Potential	kgCO2-eg/m2 vr		x x	x	х					s	S/A S/4	Δ		
10 ENIV	impacts	Emissions	Global Warming Potential			v	, ^	Ŷ		^			5	5,715,7			1
	impacts	Emissions	Clobal Warming Potential	-		v v		, v		~			. / .				
	impacts	Emissions		kgCO2-eq/m2 yr		<u> </u>	. ^					5 3	уА				4
12 ENV	impacts	Emissions	Intensity of GHG emissions	%		х х		Х	A	5					A		3
13 ENV	impacts	Emissions	Ozone depletion potential	kgR11-eq/m2yr		х х	X	Х		A			S				2
14 ENV	impacts	Emissions	Photochemical Ozone creation potential	kgC2H4-eq/m2yr		х х	Х	Х		A			S				2
15 ENV	impacts	Emissions	Photo-oxidants emissions, intensity	%		Х	(Х	Α						А		2
16 ENV	impacts	Light pollution	Light on properties	lx		Х		Х					S				1
17 ENV	impacts	Light pollution	Light pollution	%		х	:	х	А						А		2
18 FNV	impacts	Light pollution	Light pollution		x			х						в			1
19 ENV	impacts	Light pollution	Luminaire Intensity	cd	~	x		x					s	5			1
20 ENIV	impacts	Light pollution	Luminance intensity	cd/m2		v		v					5				1
20 ENV	impacts	Light pollution	Lummanue	cu/112	1	~		~					з с				
ZI ENV	impacts	Light pollution	upwaru Ligitt	6 (1	^	.	X	1.				5		1.		11
ZZ ENV	impacts	Outdoor conditions	ivionitoring of air quality	%	1	х	1	х	А						A		2
23 ENV	impacts	Outdoor conditions	Thermal comfort of outdoor areas	%	1	Х		х	А						А		2
24 ENV	impacts	Raw materials	Abiotic Depletion Potential elements	kgSB-eq/m2yr	1	х х	x	х		А			S				2
25 ENV	impacts	Solid waste management	Accessibility to differentiated waste collection	%	1	х		х	А						А		2
26 ENV	impacts	Solid waste management	Accessibility to waste sorting facilities	%		Х	х	Х		S							1
27 ENV	impacts	Solid waste management	Composting			х	х						S				1
28 ENV	impacts	Solid waste management	Construction and demolition waste generation	kg/m2	1	х	×	х	1				-	S			1
29 ENV	impacts	Solid waste management	Recyclable waste storage	m2	1	x	x	~	1				ç	5			
20 ENIV	impacts	Water pollution	Water pollution due to material leaching	<u>-</u>	1	· ·	, Ç	v					5	^			
JU ENV	impacts	water poliution	water ponution due to material reduiling	111g/1112 yr	1	X	: I ^	Č.	1.					А			11
1 ENV	iario use	Preservation	conservation of built environment	70		х	1.	X	A						A		1
2 ENV	land use	Preservation	Preservation of land	%	х	Х	x	х	А	В					А		3
3 ENV	land use	Quality	Site quality	-	х		1	х	1					В			1
4 ENV	land use	Soil sealing	Permeability of site / land	%	1	х х	x	х	А	А				A S	А		5
5 ENV	land use	Spatial planning	Change of land use	-	1	х	1	х	1				S	S			12
6 ENV	land use	Spatial planning	Imperviousness change, Imperviousness coefficient	-	1	х	1	х	1				S				1
7 FNV	land use	Urban design	Green zones & recreation areas	m2 /inhabitant	1	х		x			s						1
8 ENV	land use	Urhan design	Green zones & recreation areas density	%	1	x		x			s						1
9 ENV	land use	Urban design	Green zones & recreation areas provimity	%	1	v	1	Ŷ	1		ç						
JEINV	ianu use	or barr design	Green zones & recreation areas proximity	70	1	^		~			2				1		14

					1		1		1							1
10 ENV	land use	Urban design	Outdoor space	-	х			х				В				1
11 ENV	land use	Urban design	Population density	inhabitants/ha		х		Х		S						1
12 ENIV	land use	Urban design	lirhan compactness	dwelling/m ²		x		x							s	1
42 500/	land use	United design				~		~		<i>c</i>					5	-
13 EINV	land use	Urban design	Urban compactness	m3/m2		^		~		2						1
14 ENV	land use	Urban design	Urban context	-	х			х				В				1
15 ENV	land use	Urban design	Urban conversion	%		х		Х							S	1
1 ENV	materials	ECO materials	low-pollutant and low-emission materials			x	x				\$ \$					2
I LINV						^	<u></u>									2
2 ENV	materiais	Emmissions	Building materials and construction, OI3 Index	-		X	x	X			AA					2
1 ENV	water	Embodied water	Embodied water use	m3/m2 yr		Х	х	Х					S			1
2 ENV	water	Freshwater	Intensity of water treatment	%		х		х	Α							1
2 ENIV	water	Freshwater	Operational water use	m2/vr		v	v	v					c			1
JENV	water			1113/91			^	<u>.</u>					5			1
4 ENV	water	Freshwater	Water consumption	l/inhabitant day		х		х		5						1
5 ENV	water	Rainwater	Dedicated network	yes / no	х			Х							В	1
6 ENV	water	Bainwater	Intensity of rainwater usage	%		x		х		S						1
7 500/	water	Reinweter	Intensity of runnater usuge		v	~		v		5					D	1
/ ENV	water	Kainwater	Landscaped and accessible retention ponds and ditches	yes / no	x			X							в	1
8 ENV	water	Rainwater	Rainwater collection from roofs	%		Х		х							S	1
9 ENV	water	Rainwater	Respecting streaming continuity	yes / no	х			х							В	1
10 ENV	water	Total water use	Operational water use and waste water	m3		x	x	x				s				1
IO LINV	water	i otal watel use	Operational water use and waste water	1115		^	^					5				1
11 ENV	water	Wastewater	Intensity of wastewater treatment	%		Х		х	A					A		2
12 ENV	water	Wastewater	Waste management & removal	l/inhabitant day		х		Х		S						1
13 FNV	water	Wastewater	Waste management & removal	%		x		х		S						1
14 ENN/	water	Masterrater	Westerneter menerer	04		~ v		v		5						2
14 EINV	water	wastewater	wastewater management	70		~		~	А					А		2
15 ENV	water	Wastewater	Wastewater management	m3/m2 yr		х	х	х					S			1
16 ENV	water	Water use	Water consumption & use of rainwater	-		х	х				S					
1 500	accessibility	Broadband communication network	Access to a broadband communication network areas	9/		v		v	٨					^		2
1 300	accessionity	bioadband communication network	Access to a broadband communication network, areas	70		. ^		<u>.</u>	^					~		2
2 500	accessibility	Broadband communication network	Access to a broadband communication network, population	%		х		х		5						1
3 SOC	accessibility	Flexibility	Flexibility of residential buildings	%		Х	Х	х		S						1
4 SOC	accessibility	Flexibility	Elexibility use	%		х		х	А					А		2
E 50C	accoscibility	Bublic space planning	Access to parks and open spaces			×		v								1
3 300	accessionity	Public space planning	Access to parks and open spaces	- ,		^		^	A						-	1
6 SOC	accessibility	Public space planning	Adaptation to users practices	yes/no	х			х							В	1
7 SOC	accessibility	Public space planning	Availability of green spaces	%		Х		Х	A					Α		2
8 500	accessibility	Public space planning	Availability of public green spaces	m² /inhahitant		x		x							s	1
0 500	accessioney	Public space planning	Provide Free second billing of the district			~ ~		~							5	-
9 SOC	accessibility	Public space planning	Barrier-Free accessibility of the district	%		X		X	A							1
10 SOC	accessibility	Public space planning	Community gardens	yes / no	х			х							В	1
11 SOC	accessibility	Public space planning	Parks and vegetated spaces network	yes/no	х			х							В	1
12 500	accessibility	Public space planning	Public space quality	ves/no	x			x							B	1
12 300	accessionity	Fubic space plaining	Fubic space quality	yes/110	<u>.</u>			<u>.</u>								1
13 500	accessibility	Public space planning	Shared community spaces	yes / no	х			х							В	1
14 SOC	accessibility	Services & Leisure facilities	Access to services and facilities	%		Х		х	A							1
15 SOC	accessibility	Services & Leisure facilities	Collective facilities and outsourcing of services	%		х		х		S						1
16 500	accoscibility	Somicos & Loisuro facilitios	Community support	vor / no	v			v							D	1
10 300	accessionity	Services & Leisure facilities		yes / no	^			^							D	1
17 SOC	accessibility	Services & Leisure facilities	Proximity to leisure facilities	%		Х		х	A					A		2
18 SOC	accessibility	Services & Leisure facilities	Proximity to services	%		х х		Х	A	S				Α		3
19 500	accessibility	Services & Leisure facilities	Proximity to services and leisure facilities	%		x		х		S						1
20 505	accessioney	Considers & Leisure facilities	Cooled anthonings and common eluster activities	<i>,</i> ,,		~		~		с С						-
20 500	accessibility	Services & Leisure facilities	social gatherings and common cluster activities	-		x		X		5						1
21 SOC	accessibility	Street network	Cyclomatic complexity of the street network	-		Х		х	A					A		2
22 SOC	accessibility	Urban planning	Development and integration of land parcels	%		х		х	А					А		2
22 500	accessibility	Urban planning	Homogeneity of the urban fabric	9/		v		v	٨					^		2
23 300	accessionity		nonogeneity of the urban labit.	/0		. ^		<u>.</u>	^					~		2
24 SOC	accessibility	Urban planning	Mixing functions	yes /no		х		х							в	1
1 SOC	acoustic comfort	Noise - Indoor	Indoor A-weighted sound pressure level	dBA		Х	Х	х					S			1
2 500	acoustic comfort	Noise - Indoor	Weighted sound pressure from ventilation	dBA		x	x				A S					2
2 500		Noise Outdoor	Duilding area aver point limit	0/		~	~	v								-
3 SUC	acoustic comfort	Noise - Outdoor	Building area over noise limit	%		X		X	A							1
4 SOC	acoustic comfort	Noise - Outdoor	Noise Pollution, silence quality - day	%		Х		х		S						1
5 SOC	acoustic comfort	Noise - Outdoor	Noise Pollution, silence quality - night	%		х		х		S						1
6 500	acoustic comfort	Noise pollution management	Accoustics studies	ves / no	x			x							B	1
0 500		holse politicion management	Accoustics studies	yes/ no	^	~	~	~					c .		D	
1 SOC	air quality	Indoor air quality	Concentration of pollutants	µg/m3		x	x	x					5			1
2 SOC	air quality	Outdoor air quality	Number of days with bad air quality	days/y		х		Х		S						1
	6 ·															
1 500	sarety&security	Energy & Management systems	Objective/subjective safety measures	-	1	x	1	х		2						1
2 SOC	safetv&security	Green production	Local production of food	m ² /inhabitant	1	х	1	х	1	S						1
2 500	cofoty@cocountry	Mobility	Dedectrian cafety nathe	0/	1		1	Ŷ		5				^		1
3 SUC	saletyosecurity	widdhity	reuestilail salety patilis	70	1	X	1	х	А				_	А		12
1 SOC	thermal comfort	Indoor conditions	Predicted Mean Vote, PMV	-	1	х	Х	х					S			1
2 SOC	thermal comfort	Indoor conditions	Predicted Percentage Dissatisfied, PPD	%	1	Х	х	х	1				s			1
3 500	thermal comfort	Indoor conditions	Thermal comfort in summer		1	v	×		1		<u>م</u>					2
J 500	the second confort	Out de la serve d'Alerer	Finderheiten efteret ersennen eine der Belet unter		1		^	~			A A					2
4 500	thermal comfort	Outdoor conditions	Exploitation of local resources: sun, daylight, wind	-	1	x	1	х		A						1
5 SOC	thermal comfort	Outdoor conditions	Heat island effect	-	х		1	х	1			В				1
6 SOC	thermal comfort	Outdoor conditions	Heat island effect, urban	ves / no	х		1	х	1						В	1
7 500	thormal comfort	Outdoor conditions	Microelimate Index I	,,	1	v v	1	v					c		-	1
1 300	chermal comort		where ochinate much i	-	1	~ X	1	~	A				2			1 4

1 SOC	transport	Mobility & Alternative transportation	Availability of safe bicycle routes	m		х		х	А						А			2
2 SOC	transport	Mobility & Alternative transportation	Bicycle and pedestrian network quality	-		х		х		A								1
3 SOC	transport	Mobility & Alternative transportation	Bicycle facilities	-		х		х		A								1
4 SOC	transport	Mobility & Alternative transportation	Car sharing pool/station	yes/no	Х			х								S		1
5 SOC	transport	Mobility & Alternative transportation	Contiguity of bicycle and car routes	%		х		х	А						А			2
6 SOC	transport	Mobility & Alternative transportation	Pedestrian streets and walkways, area	%	Х			х			S							1
7 SOC	transport	Mobility & Alternative transportation	Pedestrian streets and walkways, length	%	х	х		х	А		S				А			3
8 SOC	transport	Mobility & Alternative transportation	Proximity to bicycle lanes and paths	%	х			х			S							1
9 SOC	transport	Mobility & Alternative transportation	Shared mobility	%	Х	х	х	х	А	S					А			3
10 SOC	transport	Parking facilities	Parking facilities	number/dwelling	Х			х									S	1
11 SOC	transport	Parking facilities	Parking facilities, Off-street parking spaces	%		х		х		A								1
12 SOC	transport	Parking facilities	Parking places with innovative features	%		х		х		A								1
13 SOC	transport	Parking facilities	Bicycle Parking	%	х		х						S					1
14 SOC	transport	Public transportation	Access to public transport nodes, areas	%		х		х		A								1
15 SOC	transport	Public transportation	Access to public transport nodes, population	%	х	х		х	А		S				S A			4
16 SOC	transport	Public transportation	Access to public transport, District Accessibility Index		х			х							5			1
17 SOC	transport	Public transportation	Accessibility of public transport, stops and frequency	-	Х		х					S	S					2
18 SOC	transport	Public transportation	Accessibility to public transport, Lense index	-	Х		х	х		S								1
19 SOC	transport	Public transportation	Dwellings with access to public transport	%	х			х									s	1
20 SOC	transport	Street network	Connectivity of the street network	number/m2		х		х	А						А			2
21 SOC	transport	Street network	Cul-de-sac roads and path ratio	%	Х			х								S		1
22 SOC	transport	Street network	Scale of the street network	m		х		х	А						А			2
23 SOC	transport	Street network	Traffic modal split	%	Х			х			S							1
1 SOC	Visual comfort	Artificial lighting	Illuminance	lx	Х	х	х	х						S/A				1
2 SOC	Visual comfort	Dayligthing	Daylight factor	%	х	х	х	х				Α	S/A	S/A				3

43 125 77 74 192 35 28 24 26 3 16 19 22 15 23 12 35 29 8