

PrioritEE

D.3.2.2 “Preliminary study on available methods and tools: review and screening of existing tools, methods and good practices”

Work Package: WP3 Testing

A.3.2 Preparing pilot activities and implementing the PrioritEE toolbox

Work Package Leader: FCT-UNL

Authors:

Monica Salvia, Carmelina Cosmi, Filomena Pietrapertosa (CNR-IMAA)

João Pedro Gouveia, Sofia Simões, Júlia Seixas (FCT-UNL)

Norberto Fueyo, Antonio Gómez, María Herrando (UZ)

Kiki Papadopoulou, Elena Taxeri (CRES)

Adam Babić, Karlo Rajić (REGEA)

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Preface

The main goal of **Work Package 3 “Testing”** is to develop a decision support toolbox (DST) for promoting Energy Efficiency (EE) in Municipal Public Buildings (MPB) and prioritizing municipal investments.

The specific objectives of **Activity 3.2 “Preparing pilot activities and implementing the PrioritEE toolbox”** deal with providing: 1) the status quo of MPB in the 5 pilots regarding energy consumption and potential for the promotion of EE and RES measures; 2) a review of methods and good practices useful for the implementation of a decision support toolbox for the definition and prioritization of EE strategies in MPB.

This report focuses on the latter objective, which is reached through **Deliverable D3.2.2. “Preliminary study on available methods and tool: review and screening of existing tools, methods and good practices”**.

The report opens with an overview of the main projects and initiatives related to energy saving, energy efficiency and renewable energy sources adoption in municipal public buildings. The following chapters focus on the five main components of the PrioritEE toolbox (How to Briefs, Analytic Database on EE measures and RES, Actions to enhance awareness and foster EE behaviour, Decision Support Tools, Open data and knowledge access infrastructure) providing, for each of them, an overview of the main experiences, good practices and references at international level.

Acronyms

- CO₂ – Carbon Dioxide
- EE - Energy efficiency
- EU – European Union
- ICT – Information and Communications Technology
- KPI – Key Performance Indicators
- MPB – Municipal Public Buildings
- RES – Renewable Energy Source
- WP – Work Package

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1. Introduction

In the Mediterranean area, most of the public authorities need to enhance their institutional capacity in the field of Energy Efficiency (EE) and use of Renewable Energy Sources (RES) in order to contribute to the Energy Performance of Buildings and the Energy Efficiency Directives, developing solutions adapted to various regional contexts.

This report is aimed at providing a unitary overview of the main projects, methods, tools and good practices developed so far on energy savings, energy efficiency, renewable energy sources with a special focus on public buildings.

The outcomes of this extensive research, which was carried out between May 2017 and December 2017, are reported in the next sections with reference to the five main components of the PrioritEE toolbox, which will represent one of the main output of this project as described in D3.1.1 Methodology on WP3 activities:

1. **“how-to briefs”** aimed at compiling easy-to-use guides to the implementation of selected practices for EE in public buildings;
2. **analytic database of possible EE measures and RES technologies;**
3. **actions to enhance sustainable energy awareness and foster behavioural changes;**
4. **decision support tool (DST)** for comparing a portfolio of EE interventions on a set MPB typologies of a given local authority;
5. **open data & knowledge access infrastructure** on sustainable EE policies and measures for MPB.

2. Overview of projects & initiatives

PrioritEE builds on the approach and results of past and ongoing projects and initiatives, which were carefully reviewed in order to learn from them and capitalize their main outcomes in the development of the project's toolbox.

The results of this preliminary research is reported in the following sections with respect to:

- Interreg projects
- FP7 & Horizon2020 projects
- IEE - Intelligent Energy Europe projects
- Other international initiatives

2.1 Interregional cooperation projects

This section looks at the projects that have been funded by the European Union within the transnational programmes of territorial cooperation in the programming periods 2007-2013 and 2014-2020, as reported in Table 2.1.

Table 2.1: Main Interregional cooperation projects of interest for PrioritEE

Name of the Project / Weblink	Funding	Objectives	Main results of interest
FOSTERinMED (2013-2016) http://www.fosterinmed.eu/	ENPI CBCMED	FOSTER in MED project aims to promote the adoption of innovative solar photovoltaic (PV) technologies in the Mediterranean area	Decision Making Tool, How to Briefs

Name of the Project / Weblink	Funding	Objectives	Main results of interest
RENERGY (2012 - 2014) www.renergyproject.eu/	INTERREG IV C	It fits into the context of the EU Energy 2020 strategy setting out objectives and lines of action to address urgent global energy and environmental concerns as well as the negative consequences of the economic crisis. The project aided the development of more efficient energy policies that have the interest of local communities at their heart, while stimulating job creation and growth in local green economies.	Decision Making Tools, Good Practices
SERPENTE (2012- 2014) http://www.serpente-project.eu/index.html	INTERREG IVC	Improve energy efficiency in different typologies of publicly owned or managed buildings through improved public policies.	How To Briefs; Technological Database and for typologies definition
CESBAMED (2016- 2019) https://cesba-med.interreg-med.eu/	Interreg MED	It aims to improve the quality of energy efficiency plans for public buildings; reinforce the capacities of public building stock owners and start up a CESBA MED system to improve the quality of energy efficiency plans	CESBA SNTools; CESBA MED Passport; CESBA MED Training System; CESBA MED Network
GREEN PARTNERSHIPS (2013-2015) http://www.greenpartnerships.eu/	Interreg MED	It aims to support local administrations to overcome existing obstacles and effectively implement the set measures on the way to energy efficient cities and regions	How To Briefs
EduFootprint (2017-2019) https://edufootprint.interreg-med.eu/	Interreg MED	It aims at raising the capacity of owner and managers of public buildings for better management planning and verification of energy, through a Life Cycle Assessment approach, implementing energy efficient practices integrated with the local SEAPS. So far the partners have filled the baseline data for the footprint calculator and defined the energy plans for the 62 pilot school buildings.	A model of assessment and management of school buildings Competence of buildings owners and managers to develop and implement EE practices in public school buildings.
EMILIE (2013-2015) http://www.emilieproject.eu/eng/the-project.aspx	Interreg MED	It aims to support the growth potential and capacity for innovation of SMEs in the field of EE in buildings in the tertiary sector at the transnational level.	How To Briefs; Technological Database

Name of the Project / Weblink	Funding	Objectives	Main results of interest
ENERJ (2016- 2019) https://enerj.interreg-med.eu/	Interreg MED	It aims at improving the efficiency of policy tools and energy saving plans (national/regional and SEAPs), by promoting new financial mechanisms (EPCs, green taxation, PPPs), in order to undertake Energy Saving measures & policies related to public buildings. Special focus is given to Joint Actions between Cities for building refurbishments and training of public employees on energy management.	Energy Audits of Public Buildings; Plans and measures analysis; Funding tools report;
ENERMED (2010-2013) http://www.enermedproject.eu	Interreg MED	It aims to improve and bring coherence to the Mediterranean regional policies on renewable energy, experimenting with innovative solutions to optimize regional resources and financial locally available resources.	How to Briefs
IMPULSE (2016-2019) https://impulse.interreg-med.eu/	Interreg MED	It addresses insufficient capacities of local public administrations to manage integrated, reliable and cost-effective ERB action plans for their buildings' stock, responding to the above EU Directives and ensuring reliable completion of SEAPs	Libraries of municipal-building typologies; Management support information system;
MARIE (2007-2013) http://www.marie-medstrategic.eu/en.htm	Interreg MED	It identifies strategic lines for promoting EE of Mediterranean buildings looking into policies and territorial cooperation and assessing needs in terms of: territorial and financial governance; competitiveness, etc.	How to Briefs, Best Practices
MEDEEA (2010-2013) http://miema.org/projects/medeea-med-programme/	Interreg MED	Guidelines to Public Administrators for EU Energy Award process and Covenant of Mayors, good practices catalogue and policy recommendations	How To Briefs; Technological Database
NEW FINANCE (2016-2019) https://new-finance.interreg-med.eu/	Interreg MED	It aims to increase the confidence of public building owners and private investors to overcome the barrier in financing energy efficiency measures at local and regional level and thus help accelerate new investment in energy efficiency and renewable energy sources in public buildings	e-platform; Training system; Best Practices; methodology; implementation models

Name of the Project / Weblink	Funding	Objectives	Main results of interest
REPUBLIC MED (2010-2013) http://republic-med.eu/index.php/en	Interreg MED	It focuses on the development and experimentation of a new methodology for conducting complete techno-economical studies towards the refurbishment of public buildings and open spaces (public spaces).	How To Briefs; Technological Database
SCORE (2010-2012) http://www.scoremed.eu/	Interreg MED	It supports the implementation of sustainable energy policies in the construction sector in fragile coastal and rural MED areas. It develops a benchmarking model, foster sustainable construction and create transferable innovative tools for energy-efficient building practices.	Decision Making Tool; How To Briefs; Technological Database
SISMA (2016-2019) https://sisma.interrreg-med.eu/	Interreg MED	It aims to develop innovative financing schemes that leverage funds available to regional or local administrations in order to finance investment projects on deep energy retrofitting of public buildings. SISMA intends to fill in the gap between the demand of innovative energy services (EPC) and their suppliers (ESCOs).	Good practices in the Med basin, data; SISMA SET Tool
SHERPA (2017-2019) https://sherpa.interrreg-med.eu/	Interreg MED	It aims to reinforce the capacities of Mediterranean public administrations to improve energy efficiency in public buildings. So far, its partners have been testing a common methodology of energy renovation of public buildings in 114 regional buildings. They will then expand and apply the methodology to municipal buildings and prepare a Joint Action Plan for all Mediterranean Public Buildings.	Roadmaps; Regional EEB strategies supporting SEAPs implementation ; Shared information system
SMILE (2013-2015) http://www.programmemed.eu/librariy/detail-livvable.html?tx_ausybibliomed_pi1%5Blivvable%5D=1007#.Wa_HF4qQzRY	Interreg MED	It presents a scheme for the selection and implementation of measures to enable the selection of those presenting the highest applicability and the broader energy impact when implemented in each of the city participated to the SMILE project	How To Briefs; Technological Database

Name of the Project / Weblink	Funding	Objectives	Main results of interest
STEPPING (2016-2019) https://stepping.interreg-med.eu/	Interreg MED	It aims to increase the adoption of EPC investment schemes specifically designed for public buildings refurbishment in MED area. So far the project has delivered a report of EPC best practices and an EPC pilot implementation handbook. Partners are now identifying municipalities in order to develop 8 EPC investment plans and 4 pilot actions to test the procurement procedures.	Pilot's methodologies (EPC best collection)
TEENERGY (2009-2011) http://www.programmed.eu/en/the-projects/project-database/results/view/single.html?no_cache=1&idProject=84	Interreg MED	Has set up a good practice benchmark based on data from an Energy Survey in nearly 100 Secondary Schools in the Mediterranean Area which provides representative values and compares secondary schools' actual energy performance based on a common Energy Audit, specific end user's feedback questionnaires and an ICT based Tool for the benchmarking of the results	How To Briefs; Technological Database
TEESCHOOLS (2016-2019) https://teeschools.interreg-med.eu/	Interreg MED	It aims to help Local Authorities, technicians and school staff in transforming school buildings into nZEB, providing user friendly tools for energy audits and suitable financing schemes for the improvement actions; training courses to different stakeholders and open classes for students.	EE state of art in Mediterranean schools; Technical reports; Tools; Protocols; Database of BAT
ZEROCO2 (2010-2013) http://www.medzeroco2.eu/	Interreg MED	Favour the creation of local Public Private Partnership (PPP) promoted and coordinated by association of municipalities or provinces which involve both small municipalities and public and private actors active in the field of energy such as Local and National Energy Agencies, Energy Services Company (ESCO) research centers, etc.	How To Briefs
ClimACT (2016-2019) http://www.climact.net/	Interreg SudOE	Aims to support the transition to a low carbon economy in schools and has four main lines of action: new business models, develop decisions support tools, create educational tools, and establish a thematic network.	Decision Making Tool; Educational tools, Review of Related projects

Name of the Project / Weblink	Funding	Objectives	Main results of interest
REHABILITE (2016-2019) http://rehabilitate.eu/	Interreg SudOE	It aims to identify and capitalize innovative Financial Instruments to break the investment barrier for energy renovation, and contribute to the strengthening of the regional policies for EE.	How To Briefs

2.2 FP7/Horizon2020 projects

Our investigation focused also on the projects funded within the EU's main instruments for funding research in Europe (Table 2.2), namely:

- FP7, the Seventh Framework Programme for Research and Technological Development (2007-2013);
- Horizon 2020 (2014-2020).

Table 2.2: Main FP7/H2020 projects of interest for PrioritEE

Name of the Project Weblink	Funding	Short Description	Useful for
ENERINVEST (2016-2019) https://www.enerinvest.es/en/enerinvest/	Horizon 2020	Developed a comprehensive guide for project promoters and financiers on how to finance sustainable energy projects.	How to Briefs
Beenergi (2015-2018) http://cordis.europa.eu/project/rcn/194620_en.html	Horizon 2020	Aims to provide technical, legal and financial assistance to Covenant municipalities in developing EE projects in public lighting, municipal buildings and district heating and cooling networks (focusing in particular on biomass boilers).	Decision Making Tool; How to Briefs
FosterREG - (2014-2017) http://www.fosterreg.eu/	H2020	Aims at enhancing public capacity at local, regional and national levels to plan, finance and manage integrated urban regeneration for sustainable energy uptake, through capacity building, promotion and articulation of effective multilevel coordination, and national as well as European network strengthening.	Capacity building

Name of the Project Weblink	Funding	Short Description	Useful for
TESS (2013-2016) http://www.tess-project.eu/	EU FP7	It designed a decision support system for policy makers to integrate local knowledge into their decision making, while also guiding and encouraging local activities that restore and maintain biodiversity and ecosystem services.	Decision Making Tool
CitInEs - (2011-2014) www.citines.com	FP7	The main objective of CitInEs is to design and develop two decision-support tools (Crystal City and Crystal Industry) for the optimization of the energy strategy of cities and large industrial complexes.	Decision Making Tool
MultEE (2015-2017) http://www.multee.eu	H2020	Facilitating multi-level governance for energy efficiency. The multEE Monitoring and Verification Platform (MVP) allows authorities to consistently measure progress towards energy efficiency targets.	Decision Making Tool
IN-BEE (2015-2017) http://in-bee.com/	H2020	Assessing the intangibles: the socio-economic benefits of energy efficiency	Decision Making Tool
RES Heating and Cooling - Strategic Actions Development (RES H/C SPREAD) (2007-2013) http://www.res-hc-spread.eu/en_GB/	FP7	It highlights and exploits the EU wide best practices in the field of the RES Heating and Cooling policies and strategies and set up an harmonized planning methodology to support national and local energy authorities in the development and implementation of their RES H/C plans.	How To Briefs, Energy plans
ODYSSEE-MURE : (2017-2020) http://www.odyssee-mure.eu	H2020	It provides a comprehensive monitoring of energy consumption and efficiency trends as well as an evaluation of energy efficiency policy measures by sector for EU countries and Norway. Results are provided in an interactive and attractive way to decision makers and actors involved in energy efficiency, the project has developed specific data and policy tools.	Online tool, database, how to briefs
CHESS UP - (2016-2019) https://www.chess-setup.net/simulation-software	Horizon 2020	Aims to design, implement and promote a reliable, efficient and profitable system able to supply heating and hot water in buildings mainly from renewable sources. The proposed system is based on an optimal combination of solar thermal energy production, seasonal heat storage and the use of highly efficient heat pump.	Decision making Tool

Name of the Project Weblink	Funding	Short Description	Useful for
ExcEED – (2016-2019) http://www.exceedproject.eu/concept/	Horizon 2020	ExcEED takes the pulse of the actual energy consumed by last generation of buildings. This tool will be dedicated to characterise performances of single buildings, building-local grid interactions, and districts in real operational conditions.	Decision Making Tool
iBRoad (2017-2020) http://ibroad-project.eu/about/at-a-glance/	Horizon 2020	iBRoad is a consumer-tailored project as it strongly supports building owners in step-by-step deep renovations, removing barriers and lock-in effects.	Technological Database

2.3 IEE - Intelligent Energy Europe projects

The Intelligent Energy – Europe (IEE) programme was launched in 2003 by the European Commission and supported EU energy efficiency and renewable energy policies, with a view to reaching the EU 2020 targets .

IEE run until 2013 and is now closed, although a number of projects funded under the programme are continuing. Table 2.3 summarizes the main projects of direct interest for PrioritEE.

Table 2.3: Main IEE projects of interest for PrioritEE

Name of the Project Weblink	Short Description	Useful for
INFINITE Solutions - Financing Buildings Energy Renovations (2014-2015) http://www.energy-cities.eu/spip.php?page=infinite_solutions_en	Includes peer coaching activities aiming at developing the expertise of local staff and at replicating two proved financing schemes: revolving fund linked to internal contracting (intracting) and evolving fund linked to soft loans	How to Briefs
EASY - Energy Actions and Systems for the Mediterranean local communities (2007-2009) https://ec.europa.eu/energy/intelligent/projects/en/projects/easy	Tools and concepts for Local Energy Planning - Methodological guidelines for the development of Sustainable Energy Communities and Systems in urban decentralized areas of the Mediterranean Region	Tools and concepts for Local Energy Planning

Name of the Project <u>Weblink</u>	Short Description	Useful for
3-NITY - 3-fold initiative for Energy planning and sustainable development at local level (2006-2008) https://ec.europa.eu/energy/intelligent/projects/en/projects/3-nity	It tested and demonstrated a comprehensive set of tools, quality systems and sustainable best practices for local energy planning and implementation. Local stakeholders were encouraged to apply this methodology for continuous improvement. The REAM-model was designed for local energy planning and successfully tested.	Decision Making Tool, Municipal energy and climate planning
ASPIRE - Achieving Energy Sustainability in Peripheral Regions of Europe (2006-2009) https://ec.europa.eu/energy/intelligent/projects/en/projects/aspire	It delivered the ASPIRE Tool-kit which is a compilation of the main deliverables accomplished during the ASPIRE Project. Guidance was made available as concern: the Stakeholder Steering Boards (SSB), Community engagement, for planners, developers & architects, for developing Sustainable Energy Action Plans (SEAP), for the assessment of energy planning actions, on financing mechanisms for supporting integration of SE into low density and rural communities, for evaluating impact of increased SE at community level.	Decision Making Tool
BELIEF - Building in Europe Local Intelligent Energy Forums (2006-2008) https://ec.europa.eu/energy/intelligent/projects/en/projects/belief	It promoted the Sustainable Energy Communities concept at European scale by: setting up Local Intelligent Energy Forums in 20 European communities from 11 countries; preparing and/or adapting Sustainable Energy Actions Plans; formalising methodologies and preparing tools;	Energy communities, Stakeholders engagement
INNOVATIVE THINKING - Actions and Strategies for Sustainable Growth through Community Networking and Innovative Thinking (2006-2009) https://ec.europa.eu/energy/intelligent/projects/en/projects/innovative-thinking	The main objective of the project is to establish and implement an action plan in each participating community. This includes concrete actions such as investment plans for appropriate technological innovations, action plans and capacity building activities. The project focuses on the processes for long-term involvement and innovative thinking in the fields of renewable energy, energy efficiency in buildings and industries as well as in the transport sector.	Action plans, Stakeholders engagement
Energy Neighbourhood - "Bet to win!" - the climate competition between municipalities and their citizens (2007-2010) https://ec.europa.eu/energy/intelligent/projects/en/projects/energy-neighbourhood	To successfully implement and support the national campaigns of the energy saving bet, a comprehensive Tool Kit has been developed for all participating countries. This Online Tool was needed to help measure the energy savings made by the participants as individual households and as a neighbourhood.	Decision Making Tool: an energy saving calculation tool

Name of the Project <u>Weblink</u>	Short Description	Useful for
CASCADE - Cities Exchanging on Local Energy Leadership (2011-2014) http://www.cascadecities.eu/	Cities exchanging on local energy leadership. Design and deliver large-scale networking opportunities and mutual learning activities for local energy leadership	Toolkit, Learning tools, Good practices
MAYORS in ACTION (2014-2017) http://www.mayorsinaction.eu	Strengthening organisation between different levels of government (national, regional, local) to accelerate sustainable energy planning monitoring and implementation	Training Materials: Information Campaigns, Regulatory Actions
ENTRANZE - Policies to enforce the transition to nearly zero energy buildings in the EU-27 (2012-2014) http://www.entranze.eu/	It was aimed to support policy making by providing the required data, analysis and guidelines to achieve a fast and strong penetration of nZEB and RES-H/C within the existing national building stocks.	Decision Making Tool, data, how to briefs
DEEP : Dissemination of Energy Efficiency Measures in the Public Building Sector (2005-2007) http://deep.iclei-europe.org/	It was aimed at raising awareness of the measures public authorities can take to improve energy efficiency in their operations and providing easy-to-use tools to assist in taking concrete steps.	Energy efficiency toolkit, how to briefs
PATRES - Public Administration Training and Coaching on Renewable Energy in their building regulations and codes (2010-2013) http://www.patres.net/media/121629/en.pdf	Public Administration Training and Coaching on Renewable Energy Systems - Guide on effective regulations to support the introduction of RE system in buildings	How to Briefs

2.4 Other international initiatives

This preliminary extensive research included also a wide set of initiatives and platform of possible interest for the PrioritEE project, as reported in Table 2.4.

Table 2.4: Other main initiatives and platforms of interest for PrioritEE

Initiatives and Platforms <u>Weblink</u>	Short Description	Useful for
CA EPDB - Consorted Action for Implementing the EE Directive http://www.epbd-ca.eu/home	Funded by Horizon 2020 the Concerted Action EPBD (CA EPBD) addresses the Energy Performance of Buildings Directive (EPBD). It aims to contribute to the reduction of energy use in European buildings, through the exchange of knowledge and best practices in the field of EE and energy savings between all 28 EU Member States plus Norway.	Deliverable 3.2.1 - Supporting the status quo on the country pilot
BUILD UP - The European Portal for EE in Buildings http://www.buildup.eu/en	The BUILD UP initiative was established by the EC in 2009 to support EU MS in implementing the Energy Performance of Buildings Directive (EPBD). The BUILD UP web portal is intended to reap the benefits of Europe's collective intelligence on energy reduction in buildings for all relevant audiences.	Decision Making Tool; Technological Database
Urban Europe Research Alliance (UERA) http://jpi-urbaneurope.eu/stakeholders-partners/uera/	Initiative of JPI Urban Europe, created in 2010 to address the global urban challenges of today with the ambition to develop a European research and innovation hub on urban matters and create European solutions by means of coordinated research.	The Strategic Research and Innovation Agenda
MANAGENERGY https://ec.europa.eu/easme/en/managenergy-leaders-energy-transition	ManagEnergy is the European Commission initiative for helping regional and local energy agencies to become leaders in the energy transition and to increase sustainable energy investments in regions and cities	Information, know-how
Energy Cities http://www.energy-cities.eu/	European Association of local authorities promoting energy efficiency, renewable energy and distributed generation	Good practices, Initiatives and Campaigns
CONCERTO https://www.concertoplus.eu	Initiative launched by the EC to support local communities in developing and demonstrating concrete strategies and actions that are both sustainable and highly energy efficient,	Pilots, Lesson learnt, Good practices

Initiatives and Platforms Weblink	Short Description	Useful for
Covenant of Mayors http://www.covenantofmayors.eu/index_en.html	Commitment by signatory towns and cities to go beyond the objectives of EU energy policy in terms of reduction in CO2 emissions through enhanced energy efficiency and cleaner energy production and use,	Actions, Good practices
OPENMOD https://wiki.openmod-initiative.org/wiki/Open_Models	Aimed at boosting the utilization of open source models, its primary mission is "to enable Open Source energy modelling by providing a platform for collaboration as well as tools along the full value chain of energy economics and energy system models	Decision Making Tools
UNEP - Tools for ENergy efficiency in Buildings https://www.usgbc.org/sites/default/files/Tools-Energy-Efficient-Buildings-A-Guide-for-Policy-Makers-and-Experts.pdf	To map the existing range of tools and to facilitate building energy efficiency improvements, this working paper presents an overview and categorization of current tools, as well as offers a decision tree, illustrating the types of tools policy and project development in the field of energy efficiency in buildings.	Decision Making Tools
Climate-Smart Planning Platform https://www.climatesmartplanning.org	Developed under the aegis of the World Bank it collects and makes available a set of tools addressed to strengthen decision-making processes on climate-smart planning. It also provides a forum where it is possible to find the tools within an extensive list updated over time and share analyses and modelling experiences	Decision Making Tool
Climate Alliance http://www.climatealliance.org	Climate Alliance is the largest European city network dedicated to climate action.	Tools and methods
Climate Interactive Tools https://www.climateinteractive.org/tools/	Climate Interactive creates interactive, easy-to-use, and scientifically rigorous tools that help people understand how to address the complex, interconnected challenges that affect our lives.	Decision Making Tool
Energy Efficiency Watch http://www.energy-efficiency-watch.org	The Energy-Efficiency-Watch 3 project wants to facilitate the implementation of the Energy Efficiency Directive and support market transition by collecting information on the implementation of EE policies and providing this information to a variety of stakeholders such as European Parliament, European Commission, national, regional, local policy makers and experts.	Decision Making Tool; How to Briefs

Initiatives and Platforms <u>Weblink</u>	Short Description	Useful for
FEDARENE - European Federation of Agencies and Regions for Energy and the Environment http://www.fedarene.org/	FEDARENE authorities wanted to make the voice of the regions heard in the debate on energy and environment policies at the European level. Locally, they raise public awareness through a diversity of actions, such as exhibitions, conferences, documentation services and meetings with local schools and professional bodies. They serve equally local elected officials and the public by helping and advising them.	Decision Making tool, Good practices
Building Efficiency Accelerator http://buildingefficiencyaccelerator.org	The Building Efficiency Accelerator (BEA) is a public-private collaboration that turns global expertise into action to accelerate local government implementation of building efficiency policies and programs.	Online tool (case studies, database, tools)
DISPLAY Campaign http://www.display-campaign.org/about839	The European Display® Campaign is a voluntary scheme designed by energy experts from European towns and cities. As most Member States now have a National certificate for their existing public buildings, Display is increasingly being used as a complementary communication tool.	Online DISPLAY software

3. How to Briefs

The “**how-to briefs**” are easy-to-use guides for the implementation of selected best practices for energy efficiency in public buildings. In this section, an overview of some existing examples of factsheets and briefings are reviewed; these will serve as a guide to define the format and contents of the PrioritEE **how-to briefs**.

3.1 Overview of previous examples

There are several examples of factsheets and briefings in many European and collaborative projects as shown in Chapter 2. These will serve as a guideline for the development of the “**how-to briefs**” of PrioritEE toolbox.

The most relevant documents are the following:

- **The Interreg Europe Policy Learning Platform on Low-Carbon Economy** developed a **Policy Brief on Financing energy efficiency**, which includes models and lessons (Figure 3.1). Specifically, it includes benefits and barriers of EE, a brief review of Interreg Europe energy projects that address them, and financial instruments to help enable EE (Interreg Europe, 2017).

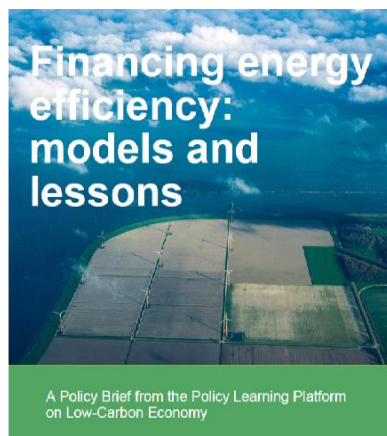


Figure 3.1: The Policy Brief on Financing energy efficiency by Interreg Europe

- The Build Upon Project provides a briefing of “**Recommendations for national renovation strategies**” in different European countries, as shown in Figure 3.2. (Build Upon, 2016)



Figure 3.2: Recommendations for national renovation strategies by the Build Upon Project

- The **CAN (Climate Action Network) Europe** developed a briefing on **Energy Efficiency (EE) and Emissions Trading System (ETS)** (CAN, 2017)
- The **EmBuild project** prepared two documents addressing **renovation in the building sector**, the first one regarding the barriers that hinder deep renovation in the building sector, and the second one including a template for public sector renovation strategies, reported in Figure 3.3 (EmBuild, 2017a, 2017b).

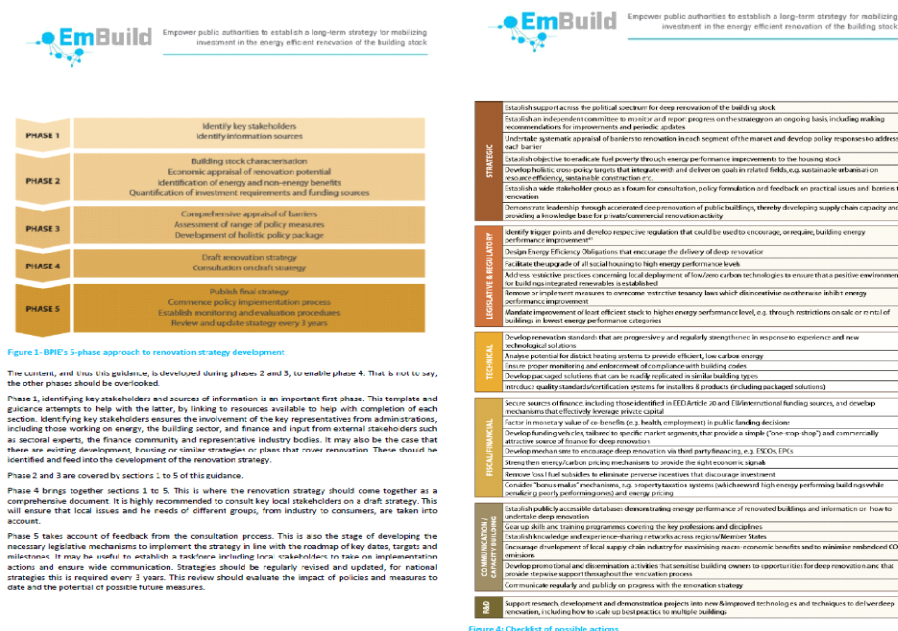


Figure 4: Checklist of possible actions

Figure 3.3: Supporting renovation in the building sector by the EmBuild project

- The **Buildings Performance Institute Europe (BPIE)** developed a policy factsheet (Figure 3.4) to attract investment in building renovation, which includes some policy recommendations (BPIE, 2015).

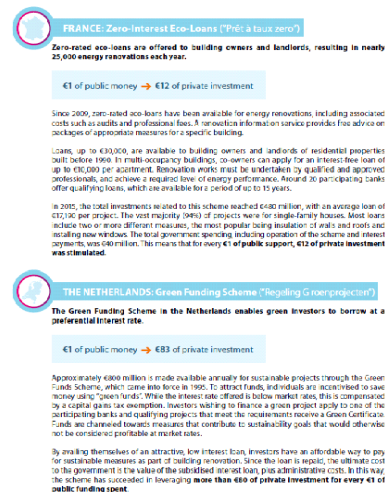


Figure 3.4: Policy factsheet to attract investment in building renovation by BPIE

- The Institute for Market Transformation (IMT) prepared a briefing on market analysis (Figure 3.5), addressing the financing of energy efficiency through mortgage loans (IMT),



Figure 3.5: Briefing on market analysis by IMT

- The **European Council for an Energy Efficient Economy (ECEEE)** published a couple of briefings on how to finance energy efficiency (Figure 3.6); the one in March 2017 includes the main benefits of EE and examples of available financing, the one in May 2017 involves how “ambitious binding EE legislation” works and what is its impact (ECEEE, 2017a, 2017b).

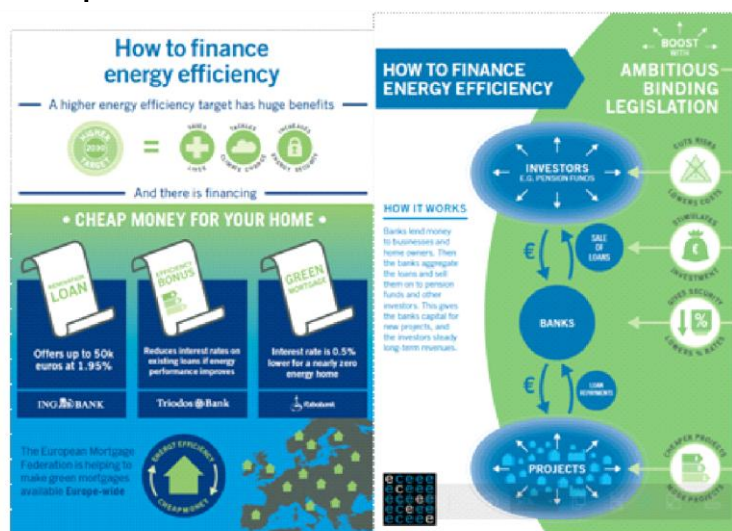


Figure 3.6: Briefings on how to finance energy efficiency by the ECEEE

- The **Enerinvest project** developed a “**Guide to financing for sustainable energy projects**” (Figure 3.7), which includes the basic steps in the implementation of Sustainable Energy Projects, the available financial alternatives and instruments, the parameters for evaluation, guarantees and associated risks (Enerinvest, 2017).

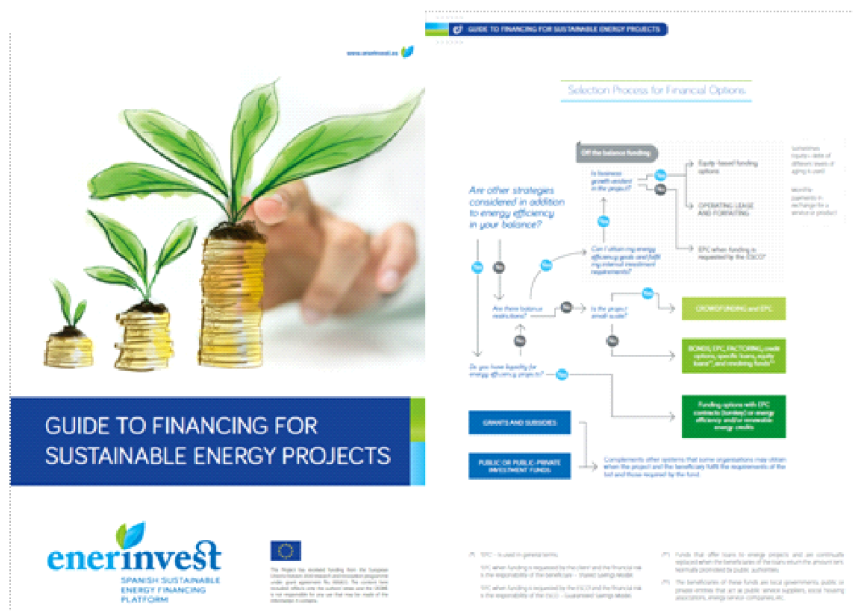


Figure 3.7: Guide to financing for sustainable energy projects by the Enerinvest project

- The **ETSAP (Energy Technology Systems Analysis Programme)** published a factsheet about building shell and thermal insulation, including process and technology status, performance costs and potential and barriers (ETSAP, 2012).
- Under the umbrella of **Sustainable Energy for All (SEforALL) Building Efficiency Accelerator (BEA)**, the Copenhagen Centre on Energy Efficiency developed a guide for policy-makers and experts regarding tools for Energy Efficiency in Buildings, as shown by Figure 3.8 (C2E2, 2016).

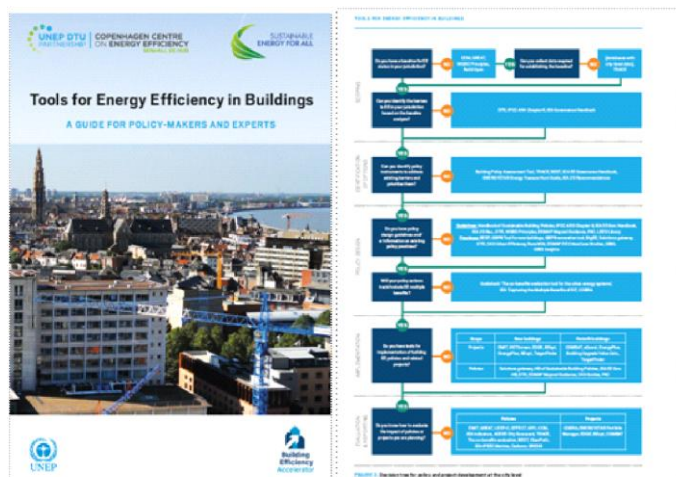


Figure 3.8: Guide on tools for EE in Buildings by the Copenhagen Centre on Energy Efficiency

- The **Practical Action, Technology challenging poverty**, published a technical brief (Figure 3.9) about **Solar Photovoltaic Energy**, including costs, technical issues, benefits, applications and other issues of PV systems (Practical Action, 2012).

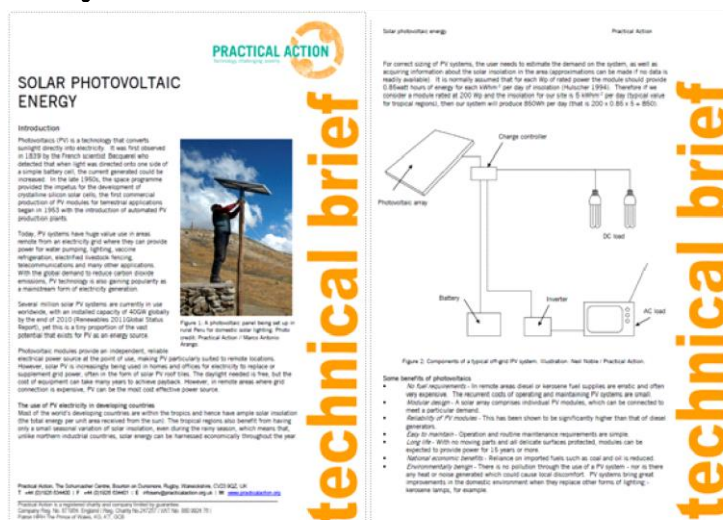


Figure 3.9: Technical brief on Solar Photovoltaic Energy by the Practical Action, Technology challenging poverty

4. Analytic Database on EE measures and RES

The transition towards a low-carbon society requires multifaceted interventions in order to promote:

- energy savings
- efficient use of fossil fuels.
- renewable energy sources

To support the choice of the right mix of interventions it is useful to have a wide knowledge on the available EE measures and RES. This can be done utilizing analytic databases that are built to store, manage and consume big data.

An analytic database on EE measures and RES is a dynamic and collective platform aimed at identifying the optimal set of measures to reduce energy consumption, upgrade the efficiency of municipal public buildings (MPB) and foster virtuous energy consumption behaviours.

This platform can be particularly useful for the identification and recognition of potentially “good” projects aimed at increasing energy efficiency and the use of renewable energy sources.

An analytic database on EE measures and RES can be used by organizations that are responsible for a large number of buildings, such as local and regional administrations, other institutions that manage large number of buildings and big companies. Energy efficiency database allows for the identification of priorities and/or financially most profitable projects, also to facilitate the preparation of financial plans.

Table 4.1 provides an overview of some examples of analytic databases on EE measures and RES.

Table 4.1: Some examples of Analytic Database on EE measures and RES

Name	Author	Web link	Brief Description
ODYSSEE DATABASE	ADEME with the technical support of Enerdata, Fraunhofer, ISINNOVA and ECN	http://www.indicators.odyssee-mure.eu/energy-efficiency-database.html	The Odyssee database contains detailed energy consumption by end-use and their drivers as well as energy efficiency and CO2 related indicators. Latest available data is providing by national representatives, such as energy agencies or statistical organization, from all EU countries as well as Norway, Switzerland and Serbia. Odyssee data and indicators are available through a friendly interface enabling advanced analysis, with the results of queries provided in tables and/or graphs and with the possibility to change units.
Eurostat	BPIE	http://ec.europa.eu/eurostat/data/database	Energy statistics database: - energy balances, - supply, transformation and consumption of solid fuels, oil, gas, electricity, heat, renewable energies - solar collectors surface - share of energy from renewable sources - energy saving - prices of energy - emissions of greenhouse gases
Building Performance Database	U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE)	https://energy.gov/eere/buildings/building-performance-database	The Building Performance Database (BPD) is the USA largest dataset of information about the energy-related characteristics of commercial and residential buildings. The BPD combines, cleanses and anonymizes data collected by Federal, State and local governments, utilities, energy efficiency programs, building owners and private companies, and makes it available to the public.

Name	Author	Web link	Brief Description
Data Mapper	Energy Economics Group	http://eeg.tuwien.ac.at/commonenergy/floor-area-non-residential	The data mapper is an online tool which represents a quick, easy and tailor-made access of national and comparative international indicators on the commercial building stock. The data mapper contains two main parts: - The current status of the commercial building stock at EU level with particular focus on shopping centres throughout Europe. The analysis provides indicators such as shopping centre gross leasable area (GLA) and final energy demand. - Scenarios of the future energy demand and renovation as well as new shopping centre development until 2030 in the EU-28 and Norway.
ENTRANZE Dana Tool	Energy Economics Group	http://www.entranze.eu/tools/interactive-data-tool	Data Tool contains an in-depth description of the characteristics of buildings and related energy systems in EU-28 and Serbia. It provides data on the thermal quality, size, age, type, ownership structure of buildings, on the heating and cooling systems and on the energy consumption by end-use.
IEA Building Energy Efficiency Policies Database	IEA	http://www.iea.org/beep/	Overview of Energy Efficiency Policies in whole world and data about final energy consumption during time.
System for monitoring, measuring and verification of energy savings (SMIV)	CEI Croatia	smiv.cei.hr	The main purpose of SMIV is to monitor the implementation of the Croatian National Action Plan for Energy Efficiency. Energy efficiency measures are monitored and verified in four sectors of final energy consumption: household, industry, service sector and transport. The register of implemented measures includes storing the following data: energy savings (kWh), reducing emissions (tCO ₂), the costs of the measures implemented (investment measures).
ISGE	APN Croatia	www.isge.hr	Energy Management Information System (ISGE) is online platform for energy consumption control and management in Croatian public buildings.

Name	Author	Web link	Brief Description
GEMIS - Global Emissions Model for integrated Systems	IINAS	http://iinas.org/gemis.html	GEMIS consists of an analysis model to determine energy and material flows (including transports), and a database. The analysis model calculates for processes and scenarios so-called life-cycles, i.e. it takes into account all processes from resource extraction (primary energy, raw materials) to final energy or material use, and also includes auxiliary energy and material uses as well as materials for constructing energy, material and transport systems.
Power	GlobalData	https://power.globaldata.com/Default.aspx?ReturnUrl=%2f	GlobalData Power is the interactive research platform designed for executives and analysts active in, or supplying services to, the power and renewable energy industries. The database covers detailed information on all power technologies such as thermal, wind, solar, hydro, nuclear and other renewable technologies.
Geospatial Data Science	NREL	https://www.nrel.gov/gis/data.html	Geographic information system (GIS) data resources for a variety of renewable energy technologies: - Biomass Data, - Solar Data, - Geothermal Data, - Marine and Hydrokinetic Data, - Wind Data.
Energy Research & Data	Enerdata	https://www.enerdata.net/research/	The Enerdata online portal offers 24/7 access to comprehensive and up-to-date global energy information, expert analysis as well as robust and exclusive forecasts to business developers, economists, strategists, analysts and researchers alike.
Renewable Energy Development: Databases, Tools, and Analyses	Environmental Science Division (EVS)	http://www.evs.anl.gov/research-areas/highlights/renewable-energy.cfm	Extensive geospatial libraries of energy and environmental data is made to analyse impacts of potential projects and programs, created models to simulate energy and environmental processes, and produced web-based and desktop tools to help stakeholders understand issues and participate in decision making.

4.1 Energy savings

Modern technology enables many various energy efficiency solutions. Analytic Databases should be focused on the most popular energy efficiency measures. Those will be effective in most of the buildings described in analytic database.

A common problem in building renovation is discrepancy between main design savings and real savings (Figure 4.1). Real savings are frequently significantly smaller than expected savings by main design.



Figure 4.1: Discrepancy between main design savings and real savings in building renovation.

An analytic database can be designed as a calculator for main design savings, real savings or both.

Reasons for mentioned discrepancy between main design savings and real savings are:

- Different time schedule of utilisation;
- Different time schedule of heating;
- Different room temperatures;
- Different air exchange.

4.2 Energy efficiency

Figure 4.2 shown set of the most popular energy efficiency measures:

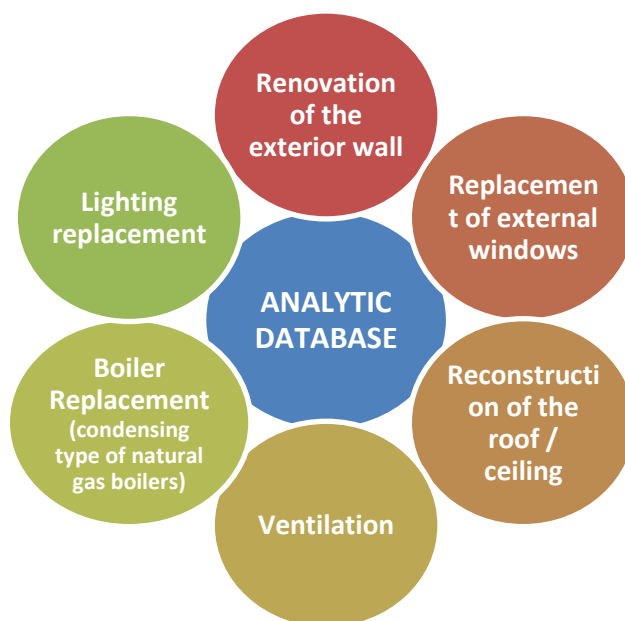


Figure 4.2: Summary of the most popular EE measures.

Each of the above-described measures should be valued through the following parameters:

- Energy savings;
- Primary energy savings;
- Investment costs;
- Financial savings;
- Simple payback periods;
- Reduction of CO₂ emissions.

4.3 Renewable energy sources

In Figure 4.3 it is shown a set of the most popular technologies based on renewable energy sources (RES).

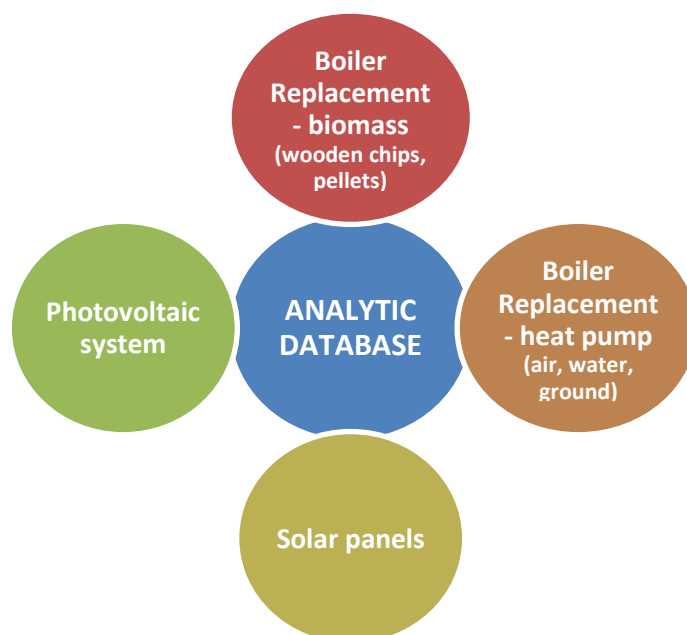


Figure 4.3: Summary of the most popular RES technologies.

Each of the above-described measures should be also valued through the following parameters:

- Energy savings;
- Primary energy savings;
- Investment costs;
- Financial savings;
- Simple payback periods;
- Reduction of CO₂ emissions.

5. Actions to enhance awareness and foster EE behaviour

Energy consumption is mainly determined by habits, social norms, cultural and economic factors. In this framework, energy efficiency can be considered as a “hidden fuel” that can be boosted by citizens’ engagement. Behavioural changes in consumption patterns of households and consumers can have a positive effect on energy systems performances and achieve considerable reductions in emissions at relatively low costs.

Behavioural models are used to understand the relationships between consumers behaviour and the various factors that influence consumption practices (a simplified model is represented in Figure 5.1).

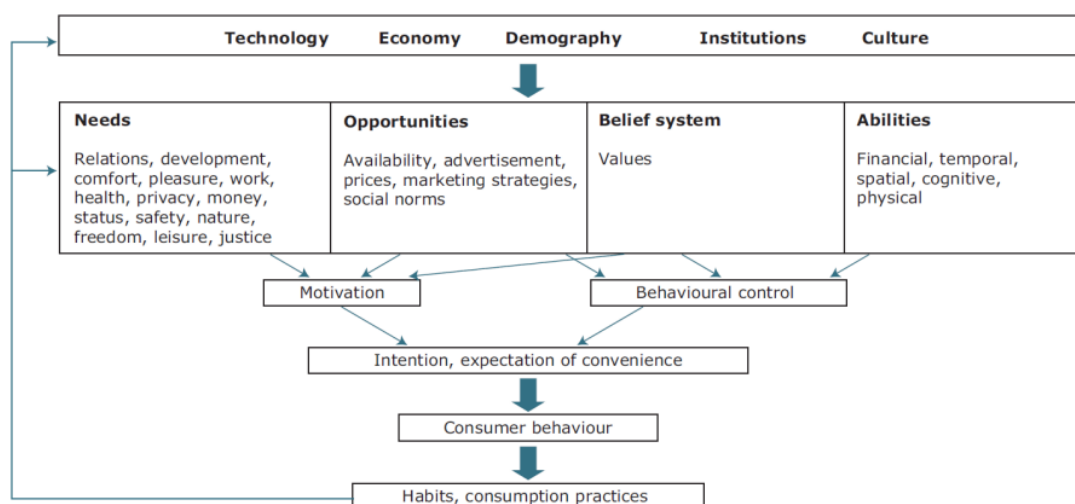


Figure 5.1: Main factors influencing consumer behaviour (Source: Barbu et al., 2013)

Energy consumption in itself is not behaviour, but rather a consequence of behaviours, such as turning the lights off or lowering thermostat levels (Becker et al. 1981). Energy saving behaviours can be

split in two different groups, as pointed out by Martiskainen (2007) with reference to households:

- Efficiency behaviours :
 - **One-shot behaviours - investment**
 - Loft insulation
 - Cavity wall insulation
 - Double-glazing
- Curtailment behaviours
 - **Repetitive efforts - operational**
 - Turning lights off
 - Closing curtains
 - Turning appliances off

In recent years, there has been growing interest in soft policy initiatives that include a broad range of actions among which energy advice, energy audits, energy management, education, training, information campaigns, smart metering, labelling, certification schemes and capacity building with territorial networks all addressed at increasing citizens' awareness and participation.

An emerging body of literature has shown that there is potential for energy savings due to measures targeting behaviour. The estimated energy saving potential varies from 2% to 20% depending on the proposed intervention, as reported in Table 5.1 (Barbu et al., 2013).

Table 5.1: Potential energy savings due to measures targeting behaviour (Source: Barbu et al., 2013)

Intervention	Range of energy savings
Feedback	5-15 %
Direct feedback (including smart meters)	5-15 %
Indirect feedback (e.g. enhanced billing)	2-10 %
Feedback and target setting	5-15 %
Energy audits	5-20 %
Community-based initiatives	5-20 %
Combination interventions (of more than one)	5-20 %

The importance of changing behaviour in reducing further greenhouse gas emissions at lower costs is acknowledged also by the Low Carbon Economy Roadmap (COM(2011) 112 final) whereas the Energy Efficiency Directive considers soft measures eligible for funding like energy and CO₂ taxes.

A fundamental mean to promote energy awareness and improve energy habits is thus to foster citizens engagement making them aware of their consumption and involving them in energy management practices. **Public buildings are privileged places to engage people in energy saving actions in which they can evaluate energy consumption and energy savings deriving from more “conscious” behaviours.**

An overview of the main initiatives carried out for changing behaviour on energy consumption in public buildings is reported in Table 5.2.

Table 5.2: Overview of the main initiatives for changing behaviour on energy consumption

Initiative	Brief Description	Target Audience
Green Schools Competition¹ Provincia di Treviso (IT)	A competition among schools for each of this 3 areas: Reducing Consumption, Sharing Ideas and Sustainable Coach. The energy consumption of each school is displayed at http://www.greenschools.eu/energy-consumption.aspx	- Schools
The European Display® Campaign² Energy Cities	It is a voluntary scheme designed by energy experts from European towns and cities. As most Member States now have a National certificate for their existing public buildings, Display is increasingly being used as a complementary communication tool. It provides: - a <u>poster generation software</u> to show information on the building and its energy and water consumption; - the <u>Display software</u> which determines the primary energy, carbon dioxide equivalents and water consumption performance indicators using the so-called “operational rating scheme”.	- Local authorities - Private companies - Private schools

¹ <http://www.greenschools.eu/greenschoolsen/green-schools-competition-v.aspx>

² <http://www.display-campaign.org/>

Initiative	Brief Description	Target Audience
EnerCities³ Intelligent Energy Europe	Stimulate energy awareness of youngsters with online serious gaming. The goal of the game is to create and expand virtual cities dealing with pollution, energy shortages, renewable energy etc. The game is web-based and suitable to play on low-budget computers.	- Citizens - Schools
ENGAGE⁴ Intelligent Energy Europe	ENGAGE was a participative communications campaign implemented by European local authorities. They used this initiative as a communication tool to share the CoM objectives locally. Each tangible engagement was displayed through a publicly visible poster on the European Gallery: http://citiesengage.eu/european_gallery.html	- Public servants - Stakeholders - Citizens
EURONET 50/50 MAX⁵ Intelligent Energy Europe	The project aimed at mobilizing energy savings in public buildings through the implementation of the 50/50 methodology: Achieved financial savings are shared equally between the building users and the local authority which covers the energy bills. The 9-step methodology increases energy awareness of the building users and actively involves them in energy-saving actions.	- Local authorities - Schools
Network for energy responsible personal in the municipal buildings⁶ Slagelse Municipality (DK)	Reduction of energy consumption in municipal buildings, optimisation of the buildings operation (SCADA system). In Slagelse (DK) all municipal buildings have one energy responsible person and are connected to a SCADA system "Min Energi".	- Local authorities

³ <http://www.enercities.eu/project/projectpage.html>

⁴ <https://ec.europa.eu/energy/intelligent/projects/en/projects/engage>

⁵ <http://www.euronet50-50max.eu/en/>

⁶ No website available. For more information refer to: teknik@slagelse.dk; drtru@slagelse.dk; uffhh@slagelse.dk

Initiative	Brief Description	Target Audience
The website for information exchange regarding the refurbishment of buildings⁷ Agency of house and urban development (LT)	An informative platform was implemented for exchange of practices, consultation and promotion of houses refurbishment aimed at enhancing energy efficiency to reduce the energy costs. This web portal provides thorough information regarding the building renovation process: measures of renovation; building renovation program; energy efficiency of the house; statistics; monitoring; reference. This tool allows improving the coordination and collaboration between different stakeholders fostering the promotion on buildings renovation with many advantages for all stakeholders categories.	- Local authorities - Householders - Businesses
Durham Partnership Climate Change Strategy⁸ County Durham Partnership (UK)	To engage communities in a dialogue about the impacts of climate change which affect them, encourage and support local ownership of action plans leading to measures and behaviour change and improved understanding of CC impacts by communities. Development and approval of a Climate Change Strategy for the County, identifying key themes and priorities, in a community accessible form and inviting response from local communities in the form of locally owned and relevant action plans. The good practice is related to a methodology for engaging communities in structured discussion related to priorities and actions around Energy efficiency and Renewable energy sources.	- Local authorities - Community
School Carbon Reduction Programme⁹ Durham County Council	Providing in school advice and support to reduce their energy use. School Carbon Reduction Programme delivered by OASES . This is working with over 250 schools in the Durham County.	- Community Group Leaders - Teachers - Children

⁷ <http://atnaujinkbusta.lt/>

⁸ <http://www.countydurhampartnership.co.uk/article/8441/County-Durham-Partnership>

⁹ <http://www.oasesnortheast.org.uk/funded-programmes/current-programmes/school-carbon-reduction-programme>

Initiative	Brief Description	Target Audience
The Pod ¹⁰ EDF	The programme has three main aims: 1. To help children understand that a low carbon, secure and affordable energy supply is vital for the future. 2. To role model EDF Energy values, by inspiring young people and their families to choose a more sustainable lifestyle and to promote diversity and inclusion. 3. To help build our future workforce by inspiring young people to study STEM subjects (science, technology, engineering and maths). The Pod is EDF Energy's award winning digital schools programme. It was launched in September 2008 and has become the largest programme of its type. www.jointhepod.org is an interactive website for teachers, community group leaders and children. All of our resources are free and are aimed at 4 – 16 year olds.	<ul style="list-style-type: none"> - Local Authorities - Community Group Leaders - Teachers - Children
Dorm Energy Efficiency Project (DEEP) ¹¹ GreenerU	Students of a resident halls have often been observed to open their windows during heating season, presumably as a means of regulating temperature. This behaviour increases the energy required to heat the dorm and places strain on building heating systems. DEEP aims to address this problem by implementing a two-pronged approach that combines energy efficiency retrofits and an engagement program. In conjunction with a variety of other infrastructure updates, GreenerU gave residents more control over their room temperature so as to reduce the need to open windows in the first place. Then, to ensure that students actually took advantage of the new technology, we implemented a targeted engagement program for residents that explained how to use it and why it was important. Through this process, DEEP seeks to make students more comfortable while reducing energy use and carbon emissions.	<ul style="list-style-type: none"> - Students

¹⁰ <https://jointhepod.org/about/the-pod>

¹¹ http://www.greeneru.com/wp-content/uploads/2016/12/DEEP-Report-2013-2014_final_updated-9.16.2014.pdf

Initiative	Brief Description	Target Audience
Smart Communities ¹² Kingston University London	Smart Communities action on energy over two years in supporting knowledge about domestic energy consumption and about the consumption of household appliances, as well as behaviour change and energy efficiency measures. The project action yielded a range of informal materials for analysis: workshop transcripts, email communications, notes from interactions with members, written reports from project members, photographs and materials produced by the school children. This was complemented by extensive formal research and analysis designed to understand the dynamics of change that the project action produced within households and social groups.	- Householders
TRIBE ¹³ : TRaining Behaviours towards Energy efficiency: Play it!	The overall objective of the TRIBE project is to contribute to a citizen's behaviour change towards energy efficiency in public buildings, through their engagement in the experience of playing a social game, linked by ICT to real time data collected from 5 pilot buildings including academic, living and workspaces environments.	- Building owners, managers and end-users
OrbEEt ¹⁴ : ORganizational Behaviour improvement for Energy Efficient administrative public offices	OrbEEt foresees dynamic, spatially fine-grained extensions of building-level Operational Rating methodologies and Display Energy Certificates to provide a detailed view of energy use in office spaces, business processes and organizational entities rather than entire buildings. The fusion of information from Building Information Models, Business Process Models and real-time energy use measurement via a comprehensive ICT cloud service - the Systemic Enterprise Operational Rating framework - will enable energy use tracking and will establish direct accountability of people, processes and spaces toward overall consumption.	- Building eng-users

¹²

http://business.kingston.ac.uk/sites/all/themes/kingston_business/charmproject/smartcommunities.pdf

¹³ <http://tribe-h2020.eu/>

¹⁴ <https://www.orbitproject.eu/portfolio/github/>

Initiative	Brief Description	Target Audience
ENTROPY¹⁵: Design of an innovative energy-aware IT ecosystem for motivating behavioural changes towards the adoption of energy efficient lifestyles	The ENTROPY project aims to design and deploy an innovative IT ecosystem targeting at improving energy efficiency through consumers understanding, engagement and behavioural changes. The focus is given on the collection of energy-related information from heterogeneous data sources, the proper analysis of the available data and the provision of interactive services, applications and serious games to end users for stimulating their interest for energy efficient activities, recommending actions for adopting more energy efficient lifestyles and increasing their overall energy consumption awareness.	- Building eng-users
EnerGAware¹⁶: Energy Game for Awareness of energy efficiency in social housing communities	The main objective of the EnerGAware project is to decrease energy consumption and emissions in an affordable housing pilot and increase the affordable housing tenants' understanding and engagement in energy efficiency. The EnerGAware project will develop and test, in 100 affordable homes, a serious game that will be linked to the actual energy consumption (smart meter data) of the game user's home and embedded in social media and networking tools.	- Social housing tenants
GreenPlay¹⁷: Game to promote energy efficiency actions	The overall objective of the GreenPlay project is to raise awareness among citizens through the implementation of a real time monitoring energy consumption platform and the development of a serious game.	- Citizens
AGENEAL¹⁸ and AREANATEjo¹⁹	"Kids with Energy" – The agencies present several energy related initiatives carried out in municipal schools. A few examples are games and simulators, solar toys; local tours and thematic workshops.	- Schools

¹⁵ <http://entropy-project.eu/>

¹⁶ <http://www.energaware.eu/>

¹⁷ <http://www.greenplay-project.eu/>

¹⁸ Almada Energy Agency, Portugal
<http://www.ageneal.pt/content01.asp?BTreeID=00/03&treeID=00/03&newsID=17>

¹⁹ Energy and Environmental Agency of North Alentejo and Tejo region
<https://ecoescolas.abae.pt/outros/formacao/abranes09/docs/AREANATEjo.pdf>

Initiative	Brief Description	Target Audience
POWERQUIZ (Coopérnico, Portugal) ²⁰	The POWERQUIZ project aims to sensitize young people to energy efficiency issues, and how they can reduce energy consumption and contribute climate change mitigation. This project will be implemented through a game, which will be available for computer and mobile platforms, for two age groups: 5th to 9th grade and 10th to 12th grade.	- Schools

²⁰ <http://www.coopernico.org/pt/blog/95-coopernico-promove-o-projeto-powerquiz-no-ambito-do-ppec-2017-2018>

6. Decision Support Tools

There is a significant number of various tools and information sources available at various platforms and directories tackling energy related topics: e.g. energy planning, energy efficiency. It might be overwhelming for policy-makers or experts to work their way in this pool of information in order to find the most relevant tool for their purposes.

Previous work from SENTECH (2010) presented a review of ten tools, however, only focused on energy audits. The review categorized the tools into five main types: web-based calculators; prioritized lists of measures; checklist or survey instruments; asset rating tools; and operational rating and audit tools). NREL (2016), provides a visual snapshot of 43 tools in order to support adoption of data-driven energy action plans by cities. The tools are categorised by sector, as well as by the city-planning phase: gathering baseline data; identifying energy sectors and demand; analysing sector-specific strategies; refining and optimizing projects; measuring and managing the results. All the tools in this review target cities, however, they are not specifically focusing on energy efficiency in buildings.

Becqué et al. (2016) provided an overview of technical assessment tools applicable to building efficiency policies and projects, which can be used by municipal policymakers to set targets, draft and implement programs, and assess performance. The available tools have been categorized into two groups: policy tools and project tools (Figure 6.1).

NAME OF THE TOOL	DEVELOPER	SCOPE		STAGE OF THE POLICY DEVELOPMENT CYCLE				
		PROJECT	POLICY	SCOPING	IDENTIFICATION	DESIGN	IMPLEMENTATION	TRACKING
25 Recommendations for Buildings	IEA		●		●	●		
Assessment Tool for Building Efficiency Policies	World Resources Institute		●		●			
Benchmarking and Energy Saving Tool for Low Carbon Cities (BEST)	LBNL		●		●			●
BigEE Policy Guide	Wuppertal Institute		●			●		
Build Upon Resources	World Green Building Council		●	●				
Build Upon Stakeholder Mapping Tool	World Green Building Council		●	●				
Building Energy Efficiency Policies (BEEP)	IEA		●			●		
Building Energy Optimization (BEopt)	NREL	●					●	●
Building Energy Performance Metrics	IEA-IPEEC		●					●
Building Upgrade Value Calculator	U.S. EPA, U.S. DOE	●					●	
Capturing the Multiple Benefits of Energy Efficiency	IEA		●					
City Energy Efficiency Scorecard	ACEEE		●			●		
ClearPath	ICLEI USA		●					●
Co-Benefits Risk Assessment (COBRA)	U.S. EPA		●			●		●
Commercial Building Analysis Tool for Energy-Efficiency Retrofits (COMBAT)	LBNL	●					●	●

Figure 6.1: Selected example of Building Efficiency Tools Review (Adapted from Becqué et al., 2016).

Building on this work, Petrichenko *et al.* (2016) presented an analysis of 50 publicly available tools for energy efficiency in buildings characterizing the reviewed tools according to their approach, scope, stage of the policy development cycle and city focus (Figure 6.2).

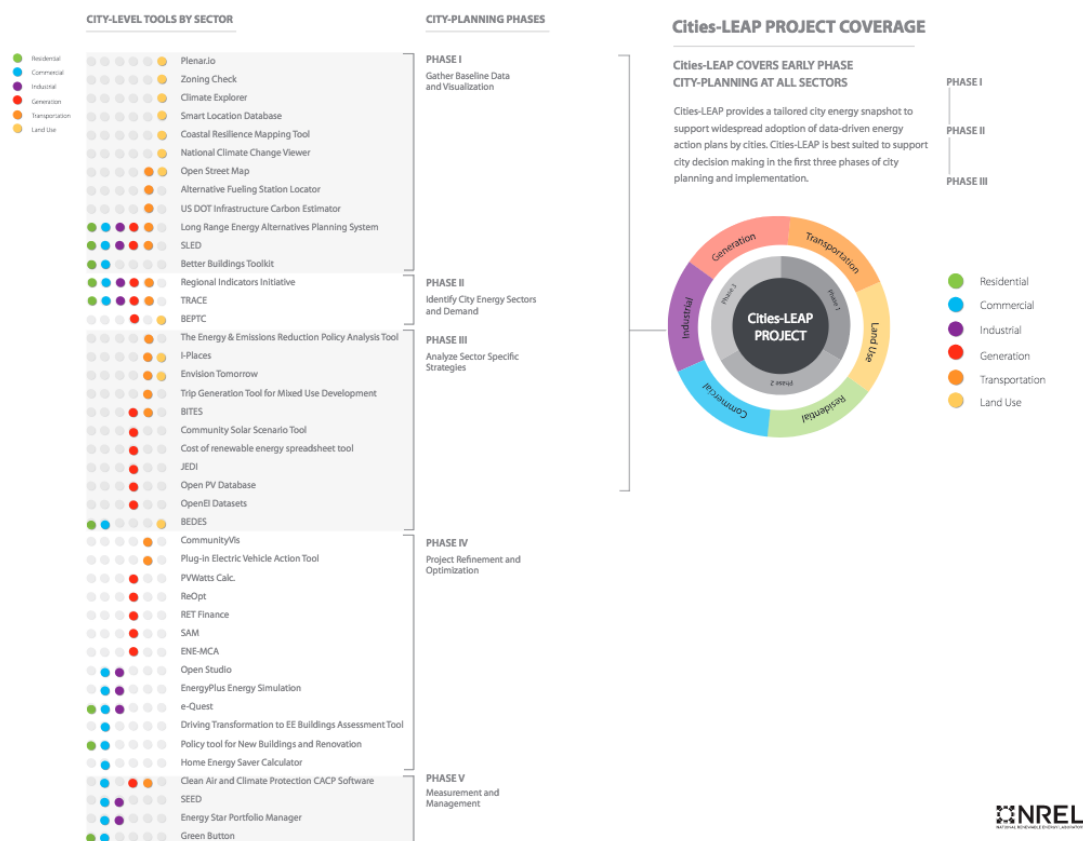


Figure 6.2: Tools revised under the Cities Leading through Energy Analysis and Planning Program (Adapted from Petrichencko et al. 2016)

Several other models and tools depicted in the openmod initiative²¹ and Climate-Smart Planning Platform²² were also scanned and evaluated for their possibility to be used directly or serve as a benchmark for the PrioritEE Decision Support Tool. The openmod initiative lists energy models published under open source licenses, approved by OSI (opensource.org) and The Open Definition (opendefinition.org) as suitable for open source models and open

²¹ https://wiki.openmod-initiative.org/wiki/Open_Models

²² <https://www.climatesmartplanning.org/tools.html>

data, respectively. The models listed are classified exclusively as bottom-up and the majority are confined to the electricity sector. The models are described by Sector, model class, math model type, time resolution, geo resolution and if it they are suited for many scenarios (Figure 6.3).

Model	Sectors	Model class	Math modeltype	Timeresolution	Georesolution	Is suited for many scenarios
Balmorel	electricity district heating	GAMS	Optimization	Hour	something between NUTS 3 and country	false
Calliope	User- dependent	Framework	Optimization	Hour	User-dependent	true
DESSTinEE	All / Electricity	Simulation	Simulation	Hour	National	true
DIETER	electricity plus sector coupling (EVs P2Heat)	Optimization	Optimization	Hour	In most applications so far, Germany as one node; version with additional central European country nodes available	true
Dispa-SET	Power system	EU power system	Optimization	Hour	NUTS1	true
ELMOD	Electricity Heat	German and European Electricity Market	Optimization	Hour	power plant block, transmission network node	false
EMLab- Generation	Electricity Market Carbon Market	Agent-based Simulation	Simulation	Year	Zones	true
EMMA	Electricity	Power market model	Optimization	Hour	Bidding areas (countries)	false
Energy Transition Model	Households Buildings Agriculture Transport Industry Energy	Demand driven energy model	Simulation	Year	Country	true

Figure 6.3: Selected examples of overview of models by purpose, scope and modelling type (Adapted from openmod-initiative)

On the other hand, Climate-Smart Planning Platform was developed under the aegis of the World Bank and it collects and makes available a set of tools addressed to strengthen decision-making processes on climate-smart planning. It also provides a forum where it is possible

to find the tools within an extensive list updated over time and share analyses and modelling experiences.

This section sets the scene for the decision support tool selection and/or main features to be considered within PrioritEE. It presents a review of existing tools or methodologies that could be of use for the PrioritEE's objectives, acting as a decision support tool to be tested in the project Pilots for energy efficiency investments and/or RES adoption rankings for their MPB. Some requisites to characterize the reviewed tools were set beforehand to address the needs identified by the local pilot stakeholders, such as:

- **User friendliness** of the interface (i.e. low, medium, high): *High* friendliness was set if a person without EE background can use it intuitively, *Medium* friendliness when only persons with EE or background on related topics can use it, *Low* friendliness refers to a complex tool that needs several days of training.
- **How it is Available:** (e.g. online, freeware, open source, downloadable). In order to: (i) be freely available for the project, (ii) be tested by the pilots during and after the project lifetime, and (iii) be aligned with one of the PrioritEE goals to have an open access infrastructure, the selected tool need to be freely available.
- **Scope of the tool:** micro level (i.e. equipment level), building level, sector level (e.g. residential, commercial), multi sector level, energy system level accounting for both supply and demand side.
- **Data input needs** (i.e. low, medium, high) in order to account for the possibility of several levels of data needs and accommodate different availabilities of information in distinct countries, regions and building typologies.

Therefore, this review intends to support the internal decision if an existing tool should be considered as it is, after being adapted for the

project objectives, or if a new tool has to be designed and built from scratch.

Table 6.1 summarises the review of tools made, which covered 24 tools either in use, developed or that the project partners are knowledgeable. The information in the table was compiled through mainly online sources (the tools themselves in most cases), but also through literature review and in some cases, via the direct contact with tool developers.

Table 6.1: Review of selected existing tools for energy efficiency decision making

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
2050 Calculator http://2050-calculator-tool.decc.gov.uk/#/home (UK Department of Energy & Climate Change)	Calculator to explore pathways to reduce GHGs emissions. Its features allow citizens, students and local administrators to create their own emissions reduction paths. Three versions are currently available to address a broader range of audiences (web tool version, classic version and full Excel version for experts who want to look at the underpinning model. The 2050 Calculator was designed for the UK energy system but its approach has been replicated also in other parts of the world with the support of the UK Department of Energy & Climate Change	High	Online and Free	Energy System Level	Low	Excellent layout but with a completely different scope of analysis. Not Possible to capitalize directly for PrioritEE.
HERON http://www.buildup.eu/en/news/build-webinar-recordings-heron-decision-support-tool-0	Decision Support Tool (DST) that provides policy makers with a user friendly software that facilitates the selection of the optimum combination of technologies and practices minimizing the negative impact of end-users behaviour in the implementation of EE scenarios.	High	Online and Free			

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
CHESS UP Simulation Model www.chess-setup.net/simulation-software (EU H2020 - CHESS UP)	Software for a preliminary RES system sizing in a very quickly and simple way. The software allows for the calculation of: the required solar surface and storage volume; power and energy performance of the equipment; solar production; electrical consumption of the heat pump; gas consumption; and thermal losses. It also executes an economic analysis (investment cost, economic saving and payback).	High	Online and Free	Building Level	Medium	Interesting structure and evaluate the inputs.
CITYNVEST One Stop Shop www.citynvest.eu/ (EU H2020 - CITYNVEST project)	The project has developed a tool pack for financing energy retrofitting. a) Self-assessment tool, b) Comparison tool, c) Barriers tool, d) Developing an action plan, e) One stop shop guide. the toolkit clearly explains how to start an energy retrofitting project and identifies the main challenges and success factors, based on RenoWatt's experience in Pilot Region Liège.	High	Online and free	Building Level	Low	This is not a decision support tool, cannot be used for PrioritEE DST. Potentially useful for some How to Briefs.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
Climate Compass www.climate-compass.net/ (Climate Alliance and European Union)	Online calculator that helps to track individual local activities, provides orientation and offers direct complements to existing activities. The tool is organized around individual checklist containing 26 and 47 questions. Whether in the field of energy, procurement, transport, climate justice or public relations – the activities in eight areas are reviewed and analysed. It presents a comprehensive overview of the overall local commitment.	High	Online needing registration	Energy System Level	Medium.	Structure and user friendliness potentially interesting. Scope and type of analysis significantly different. Not Possible to capitalize directly for PrioritEE.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
Crystal City software www.citines.com/crystal-city/presentation/ (EU FP7 – CitInES project)	Multi-energy model developed under the CitInES project integrating pollutant emissions, energy efficiency, energy bills for citizens. The decision support tool allows to: 1) Assess economic and environmental impacts of urban planning, 2) Define a strategy to minimize polluting emissions at lower costs, 3) Handle with vulnerability to fossil fuel costs variations, 4) Identify new cost-efficient energy actions. Crystal City offers a fine and dynamic representation of the territories for the analysis of energy systems, energetic opportunities, and long-term environmental and economic impacts of territorial projects. includes different type of fuels, sectors, explicit modelling of public buildings consumption, several end-uses, and other.	Medium	Downloadable but not free	Energy System Level	High	Possibly interesting to use the library of technologies for the PrioritEE Analytical Database. Uses hourly time resolution which is far from PrioritEE needs.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
E2 Tool www2.gov.bc.ca/assets/gov/environment/climate-change/z-orphaned/ceei/ghgmodelingtool_rdck.pdf (Stantec Consulting)	Spreadsheet based tool which can be used to develop energy consumption and GHG emissions forecasts for milestone years (2010, 2015, 2020, 2025, 2030). The data input is open source to avoid the use of specialized data sets. Key data requirements for building the base scenario include statistics on population and dwellings, energy balances, emissions inventories, population growth forecasts. It is used by local governments in British Columbia (Canada) also to assess the impact of reduction measures at the community scale. The focused sectors are agriculture, industrial buildings, transport (personal vehicle and commercial transportation), residential and commercial buildings, solid waste.	High	Not available	Energy System Level	Not available	Not available for download or online use.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
Economic Assessment Tool http://commonenergyproject.eu/ (EU FP7 CommONEnergy)	Targeted for managers and owners and allows entering relevant information about their centre. It provides quick information on the energy consumption and options to reduce energy demand, CO ₂ -emissions, environmental impacts and provides an economic assessment of the investments. It can be applied for shopping centres located in the EU and Norway. The economic assessment tool allows estimating the energy saving potential and economic benefits of retrofitting shopping centres. It can be applied for shopping centres located in the EU and Norway.	High	Online and Free	Building Level	Medium	Totally different scope of PrioritEE. Focused on Shopping Centres.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
Energy efficiency database (EED) (Not available) (REGEA)	Excel based tool for identifying and recognition of potentially “good” energy efficiency and renewable energy projects. Several public building typologies are used and characterized. Different end uses and linked EE measures impacts are considered, considers a ranking of the results based on several KPIs. It is intended to be used by organizations that are responsible for a large number of buildings, such as local and regional administrations, and other institutions that manage large number of buildings and big companies. The encompassed energy efficiency database allows to make a measures priority evaluation, most profitable projects recognition and investment cost calculation.	Medium	Free but language is in Croatian.	Building Level	Medium to high	Interesting to be considered for PrioritEE DST as a starting point: due to its structure and organization, buildings typologies and EE measures.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
EIS Zagreb https://eis.zagreb.hr/ (KONČAR - Elektronika i informatika d.d)	Energy Information System for all public buildings owned by the City of Zagreb, focusing on public building energy and water consumption. The system is connected to automatic devices for energy and water metering in buildings. It is possible to control consumption and it is easy to find eventually energy and water losses. System has module for calculation for energy efficiency measures upon technical documentation or energy audits.	Medium	No (Login is needed and language is Croatian)	Building Level	High (data from meters in buildings + energy audits for the buildings)	Interesting for benchmarking to have some of the features in the PrioritEE DST.
Energy Plan www.energyplan.eu/ (Department of Development and Planning of Aalborg University, Denmark)	Downloadable model with a variety of free online training, guides, workshops, and documentation, including a forum. Existing models are already available for many countries. The model is used by many researchers, consultancies, and policymakers worldwide. This is possible due to the key focus on sharing the model during its development. The model simulates the operation of national energy systems on an hourly basis, including the electricity, heating, cooling, industry, and transport sectors.	Medium	Downloadable and Free	Energy System Level	High	Not possible to capitalize for PrioritEE due to its scope and complexity stage.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
Energy Plus https://energyplus.net/ (Funded by U.S. Department of Energy's (DOE) Building Technologies Office (BTO) and developed in collaboration with NREL, various DOE National Laboratories, academic institutions, and private firms)	Console-based program that reads input and writes output to text files. EnergyPlus™ is a whole building energy simulation program that engineers, architects, and researchers use to model both energy consumption—for heating, cooling, ventilation, lighting and plug and process loads—and water use in buildings. Several comprehensive graphical interfaces for EnergyPlus are also available. DOE does most of its work with EnergyPlus using the OpenStudio software development kit and suite of applications. Support and training and several support documentations are available.	Low	Free, open-source, and cross-platform—it runs on the Windows, Mac OS X, and Linux operating systems.	Building level	High (detailed characterisation of the building)	Not sure if possible, maybe collecting data on EE measures for the database and the DST

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
eReNet Web Tools http://erenet-tools.epu.ntua.gr/webTools.aspx (Intelligent Energy for Europe Programme)	eReNet Web Tools provide an efficient, user friendly environment addressing especially the interested stakeholders who are not experts in the field. Through the tools' Tutorial, Best Practices and Wiki all interested stakeholders have the opportunity to be aware of a variety of issues related to the development and implementation of a successful Sustainable Energy Action Plan (SEAP). Moreover, a Forum is available giving interested stakeholders the opportunity to exchange opinions online. eReNet aims to add value to local actions in rural communities, sustaining them in the development, implementation and monitoring of their Sustainable Energy Action Plans (SEAPs) and capacity building of the related actors through knowledge transfer from experienced communities.	High	Online and Free	Multi Sector Level.	Medium	It has an online forum, tutorials and repository of information that could be useful for WP4 and Open Data and Access Platform.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
EURECA Tool https://tool.dceureca.eu/ (EU H2020 funded and developed by the Datacenter EURECA Project)	Web-based platform that helps public procurers and data centre professionals self-assess the energy efficiency and profile of their data centres, and provides improvements and suggestions. This is based on the latest standards, best practices and frameworks as well as research findings and industry input. In addition, the tool provides a market directory and procurement support with various templates and case studies. The tool maps the Data Centre Maturity Model to the EU Code of Conduct for Data Centres to provide tailored recommendations for data centres energy efficiency.	High	Online needing registration	Micro Level	Medium	Layout is interesting but is focused on ICT. Not relevant for PrioritEE

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
Exceed www.exceedproject.eu/evaluation-tool/ (EU H2020 – ExcEED project)	This tool is dedicated to characterise performances of single buildings, building-local grid interactions, and districts in real operational conditions: the tool support both building managers and owners providing: a) Insights and useful information on building energy behaviour b) Suggestions on possible control optimisations; c) Data on inefficiencies in the HVAC components, control and measurement system, and building operation d) Comparison between single building performances or district performances and similar buildings or districts.	Not Available	Available from April 2018	Building Level	Not Available	When available it will probably have interesting features that could be used in the PrioritEE DST.
FMAT (Financial Mechanism Assessment Tool) (not available) (ANKO/TRACIS - INTERREG/MED MARIE project)	The tool has been developed on a spreadsheet basis and includes two parts: a) A standard information form to assess the profitability of investments in energy efficiency from a financial point of view and the characteristics of the agents promoting the investments in question and those who are to carry it out and b) A second form aiming to match specific alternatives of Third Part Financing, Public and private-public partnership with a building energy efficiency investment programme.	High	Not available.	Building level.	Medium to High	Structure and indicators might be of use for PrioritEE DST

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
FOODPRINT MCA TOOL http://foodprint.gr/index.php/en/ EU LIFE Foodprint project	An innovative software tool to identify, quantify and implement measures to reduce, the carbon footprint (CF) of the pastry and flour food industry sector along the supply chain		Free and available for download			LCA Tool
Heron http://heron-project.eu/ Information available at http://www.buildup.eu/en/news/build-webinar-recordings-heron-decision-support-tool-0	HERON - Decision Support Tool (DST) provides the policy makers with a user friendly software that facilitates the selection of the optimum combination of technologies and practices minimizing the negative impact of end-users behavior in the implementation of Energy Efficiency scenarios.		Under construction			
IMPULSE Web based System https://impulse.interreg-med.eu/ (Interreg MED - IMPULSE project)	Excel based tool for energy performance indicators and definition of buildings' classification. It supports the prioritization building typologies and retrofit scenarios and extrapolating KPIs to the entire building stock of Communities	Medium to High	Free and available for download	Building Level	Medium	Excel based decision support tool with interesting structure and design. Important for KPIs and buildings typologies definition in the PrioritEE DST.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
Klimaschutz-Planer www.klimaschutz-planer.de/ (Climate Alliance and the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety)	Climate Alliance feeds this web-based tool with updated statistics, factors and other data. Municipalities may use this valuable data as is or improve upon it where possible with local level information. The Klimaschutz-Planer also fulfils reporting requirements for the Covenant of Mayors. Climate Alliance's Klimaschutz-Planer (Climate Protection Planner) is the recommended emissions inventory and monitoring instrument for member municipalities in Germany.	Not Available	Online but not free	Energy System Level	Not Available	In German. Not possible to capitalize directly for PrioritEE.
multEE Monitoring and Verification Platform www.multee.eu (EU H2020 – MultEE project)	Application that assists in measuring progress towards Energy Efficiency targets. The application is based on the collection of bottom-up data on a number of plans and measures, their implementation, energy savings, CO ₂ emissions and implementation costs. Online tutorials and training material are available. The tool considers a set of measures to be applied for transports, buildings and Industry. It allows for a characterization of measures on general data (e.g. lifetime, fuel type), savings and costs, calculation data.	High	Online but needing registration	Micro Level	Medium	Very good structure and set of measures that can be replicated for the PrioritEE DST and Analytical Database.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
PROITACA Family www.proitaca.com/family/	Proitaca Family is a software to calculate how sustainable an apartment or building is and the energy expenditure needed to sustain living. It is only applied to Italian houses.	High	Online and free but language is Italian	Building Level	Low, it is not a tool, it is basically just a questionnaire with minimum inputs.	Interesting and easy interface for the front end of a more detailed tool.
REPUBLIC MED MCDA Building www.republic-med-apps.eu/ (EU MED)	Toolkit for Multiple-criteria decision-making Analysis, focusing on the development and experimentation of a methodology for conducting complete techno-economic studies towards the refurbishment of public buildings and open spaces (public spaces).	Medium to High	Free	Building Level	Medium	Excel based decision support tool. Indicators could be reviewed to possibly be considered under the PrioritEE DST.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
SCORE www.scoremed.eu/ (Interreg MED – SCORE project)	It is an eco-construction tool aimed to allow local planners and building practitioners to use criteria to make energy-efficient choices new build, conversion & renovation/retrofitting. Support the implementation of sustainable energy policies in the construction sector in fragile coastal and rural MED areas with exceptional landscape values, exploiting eco-innovative potential, using traditional building elements combined with innovative green technologies.	High	Online and Free	Building Level	Low	Insights for the PrioritEE local pilots' countries regarding topics e.g. as passive solar, solar PV, Insulation and HVAC systems that could be included in the How to Briefs and DST.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
Swiss-ENERGYscope www.energyscope.ch/ (Energy Center of Ecole Polytechnique Federale de Lausanne)	Online platform composed of four tools: A national energy calculator that shows the status of the current consumption and what it could be in 2035 and 2050, based on multiple parameters to play with; 100 answers to 100 questions that can be asked about the energy transition in Switzerland. Available online and as an electronic book; An online course for all, open for everyone who wishes to understand the energy challenges of today and tomorrow; a pocket book, bringing together the 100 questions / answers in a condensed form. It allows for results to be visualised in a user-friendly way the current Swiss energy situation, compare options for the energy transition, allowing to create and share future energy scenarios.	High	Online and Free	Energy System Level	Low	Layout very interesting. Simplified versus Advanced modes. Not possible to capitalize directly for PrioritEE.
TEE-KENAK http://portal.tee.gr/portal/page/portal/TEE/TCC (Technical Chamber of Greece)	It is software tool used by engineers, technical departments etc. in Western Macedonia region in Greece. It is the certificated official national calculation tool of the energy performance of buildings in Greece, in order to issue Building Energy Audits.	Low (need preliminary calculations in order to conclude to the proper inputs.	Not freeware.	Building Level	High	In Greek. Not possible to capitalize directly for PrioritEE.

Name Weblink (Developer / Funding)	Type of Tool	User Friendliness	Availability	Scope	Data Needs	How to capitalise for PrioritEE
TRACE - Tool for Rapid Assessment of City Energy https://esmap.org/TRACE (Energy Sector Management Assistance Program of the World Bank)	Decision-support system designed to help cities to identify opportunities to increase Energy Efficiency. TRACE focuses on the 10 municipal sectors (e.g. public lighting and municipal buildings) with the highest energy use and evaluates improvement and cost-saving potential, helping prioritization of actions for EE interventions. It consists of three modules: 1) energy benchmarking module which compares key performance indicators (KPIs) among peer cities, 2) sector prioritization module which identifies sectors that offer the greatest potential with respect to energy-cost savings, 3) intervention selection module which functions like a “playbook” of tried-and-tested EE measures and helps select locally appropriate EE interventions. It has online free courses and training materials.	High	Free and downloada ble	Multi Sector Level	Medium	Very good layout and interface. Good list of KPI and EE measures. A good example to follow though might be too complex for PrioritEE objectives.

The conducted review allowed identifying a highly diverse set of tools for energy and energy efficiency measures analysis in buildings, specific equipment and whole energy systems regarding the different abovementioned parameters. Looking for the scope of the tool analysis we identified #2 Micro Level, #13 Building Level, #2 Multi Sector and #7 Energy System level tools. For the PrioritEE DST objectives and based on what is considered in each type of screened tool, further selection should be more oriented to the Building level tools.

Regarding data input needs, we identified #5 tools with low level of inputs; #10 tools with medium needs and #5 considered with high data needs. For the PrioritEE DST selection, a tool with low to medium data needs will be preferable based on local stakeholders' needs and knowledge gathered from local workshops.

Since the selected tool to be used in the project needed to be either open source or freeware allowing changes or improvements, payed or online tools were dismissed from further consideration.

Therefore, this extensive review allowed identifying several promising tools that through their design, scope, structure, contents and user friendliness could be interesting to frame and support the selection or design and development of the PrioritEE DST. From further analysis of the existing tools, we narrowed the list down to identify specifically:

- publicly-available energy efficiency-related tools;
- focusing on building project development and implementation evaluation;
- with a specific focus on the relevance for the city governments and local stakeholders

- that could be tailored to the PrioritEE needs and objectives, with an easy and user-friendly interaction (or that could be improved);
- that allow ranking EE measures and RES solutions implementation under several KPIs.

Details on the tool selection and structure will be presented under project Deliverable 3.3.1.

7. Open data and knowledge access infrastructure

7.1 Overview

The 2010 Energy Performance of Buildings Directive²³ and the 2012 Energy Efficiency Directive²⁴ are the EU's main legislation covering the reduction of the energy consumption of buildings.

On 30 November 2016 the Commission proposed an update to the Energy Efficiency Directive²⁵ including a new 30% energy efficiency target for 2030, and measures to update the Directive to make sure the new target is met. Also, on the 30 November 2016 the Commission proposed an update to the Energy Performance of Buildings Directive²⁶ to help promote the use of smart technology in buildings and to streamline the existing rules. The Commission also published a new buildings database – the EU Building Stock Observatory – to track the energy performance of buildings across Europe.

Under the existing Energy Performance of Buildings Directive:

- energy performance certificates are to be included in all advertisements for the sale or rental of buildings

²³ http://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=FZMjThLLzfxmmMCQGp2Y1s2d3Tjwtd8QS3pqdkhXZbwqGwlgY9KN!2064651424?uri=CELEX:32010L0031

²⁴ <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027>

²⁵ <https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition>

²⁶ <https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition>

- EU countries must establish inspection schemes for heating and air conditioning systems or put in place measures with equivalent effect
- all new buildings must be nearly zero energy buildings by 31 December 2020 (public buildings by 31 December 2018)
- EU countries must set minimum energy performance requirements for new buildings, for the major renovation of buildings, and for the replacement or retrofit of building elements (heating and cooling systems, roofs, walls and so on)
- EU countries have to draw up lists of national financial measures to improve the energy efficiency of buildings.

Under the Energy Efficiency Directive:

- EU countries make energy efficient renovations to at least 3% of buildings owned and occupied by central government
- EU governments should only purchase buildings which are highly energy efficient
- EU countries must draw-up long-term national building renovation strategies which can be included in their National Energy Efficiency Action Plans²⁷.

As the new National Action Plans are not all translated in English, we forward any interested person to the following link that includes all the updates in every National language.

- [Buildings under the Energy Efficiency Directive²⁸ \(EED\)](#)

²⁷ <https://ec.europa.eu/energy/node/84>

²⁸ <https://ec.europa.eu/energy/node/85>

7.2 Related legislation

- Energy Performance of Buildings Directive (2010/31/EU)²⁹
- Delegated Regulation establ. a comparative methodol. framework for calculating cost-optimal levels of minimum energy performance³⁰
- Guidelines accompanying the Delegated Regulation 2012/244/EU³¹
- Energy Efficiency Directive (2012/27/EU)³²
- Report on progress by Member States on reaching cost-optimal levels of minimum energy performance requirements³³
- Energy Labelling Directive³⁴
- Ecodesign Directive³⁵

²⁹ http://eur-lex.europa.eu/legal-content/EN/ALL/?ELX_SESSIONID=FZMjThLLzfxmmMCQGp2Y1s2d3Tjwtd8QS3pqdkhXZbwqGwlgY9KN!2064651424?uri=CELEX%3A32010L0031

³⁰ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A32012R0244%3AEN%3ANOT>

³¹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A52012XC0419%2802%29%3AEN%3ANOT>

³² <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX%3A32012L0027>

³³ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016DC0464>

³⁴ <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32010L0030>

³⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ%3AL%3A2009%3A285%3A0010%3A0035%3Aen%3APDF>

7.3 Sources of information on policies and measures

Hubs of current and accurate information on policies, measures, news and funding opportunities, are demanding in building the capacity of municipalities and regions to develop sustainable energy strategies. The European Portal For Energy Efficiency In Buildings³⁶ gathers all current policies, the framework and news on European level.

In order to enhance the decision making of local stakeholders and helping them setting priorities at municipal level, this tool should also lead to open access infrastructures where the political strategies and the funding initiatives are announced.

Although municipalities should have their own networks of information, they usually complain that they do not view the whole scene. This chapter will serve as a capacity-building pillow for a wide range of information on policies and measures in Buildings, energy and related topics.

PrioritEE searched and collected the main points of centralized information on which policies or measures exist on National or European level for energy efficiency mainly in buildings and in some cases focused on public/municipal buildings. This tool will support the municipalities providing them web sources for consultancy or for everyday information on news regarding new initiatives and opportunities.

This repository mainly includes institutions, public bodies, ministries or networks that are constantly updated with accurate and official data, as reported in Table 7.1.

³⁶ <http://www.buildup.eu/en/topics/energy-policies-and-regulatory-framework>

Table 7.1: Summary of the main sources of centralized information on EE policies and measures

Source	Content	Info	Application area	Language
Ministry of Energy	Technologies, Policies, Measures, Catalogues, Reports, Legislation, Programs	www.ypeka.gr/?tabid=282	Greece	Greek
ENEA ³⁷ - Italian National Agency for New Technologies, Energy and Sustainable Economic Development	Data Laws, Incentive mechanisms, technological solutions, training courses proposals, good practices, simplified methodologies for a more rational use of energy for the Country's families, enterprises and Public Administration.	www.efficientenergy.enea.it	Italy	Italian
CRES - Center for Renewable Energy Sources and Saving	News, incentives, training, projects, Legislation, workshops	www.cres.gr	Greece, Europe	Greek/English
ODYSSEE	Trends and Policies	www.odysseum.eu/publications/profiles/	Europe	English
MURE	Measure Policies	www.measures-odysseum.eu/	Europe	English
International Energy Agency	Energy Policies	www.iea.org/countries/membercountries/	Worldwide	English
European Investment Bank	Funding	www.eib.org/projects/regions/	Europe	English
European Commission	Policies, Financial support measures	ec.europa.eu/energy/en/topics/energy-efficiency/buildings/financing-renovations ec.europa.eu/energy/node/84		

³⁷ Legislative decree n. 115 of 30 May 2008 assigned ENEA the functions of National Agency for Energy Efficiency.

Source	Content	Info	Application area	Language
The International Institute for Applied Systems Analysis	Database of CO2 emitting energy technologies	www.iiasa.ac.at	Worldwide	English
World Bank's Climate-Smart Planning Platform	Models, Tools, Methods, Procedures, and Guides	www.climatesmartplanning.org/	Worldwide	English
The Open EI Platform	Energy information and data	https://openei.org/wiki/Main_Page	Worldwide	English
Transparent Cost Database	Cost and performance estimates for energy technologies	openei.org/wiki/Transparent_Cost_Database	Worldwide	English
Reegle Clean Energy Info Portal	Country energy profiles: Statistics on energy, electricity and emissions, policies and regulations	www.reegle.info/	Worldwide	English
World Energy Council	Energy Efficiency Policies and Measures	www.worldenergy.org/data/energy-efficiency-policies-and-measures/	Worldwide	English
The European Portal For Energy Efficiency In Buildings	Portal	www.buildup.eu	Europe	Several
Buildings Performance Institute Europe	Measure Policies	bpie.eu/	Europe	English
Covenant of Mayors for Climate & Energy	Policies, Measure	www.covenantofmayors.eu/index_en.html	European local authorities	Several
Green Fund	Funding	www.prasinotameio.gr/index.php/el/	Greece	Greek, English
ETEAN SA - Hellenic Fund for entrepreneurship and development	Funding	www.etean.com.gr/PublicPages/HomePage.aspx	Greece	Greek, English
Energyhubforall	Portal, Measures	www.energyhubforall.eu/	Greece	Greek
ERENET	Training Best practices Forum	http://erenet-tools.epu.ntua.gr/	Europe	English

Source	Content	Info	Application area	Language
Ministry of Public Works	Long-term strategic plans for Energy rehabilitation in the Spanish building sector	www.fomento.gob.es/MFOM/LAING_CASTELLANO/PLANES/ELPRESEEEESP/	Spain	Spanish
IDAE & Ministry of Energy, Tourism and Digital Agenda	Energy Performance Certificate of Buildings: Normative, official registry, official software, related links	www.idae.es/tecnologias/eficiencia-energetica/edificacion/calificacion-energetica-de-edificios www.minetad.gob.es/ENERGIA/DESARROLLO/EFICIENCIAENERGETICA/CERTIFICACIONENERGETICA/Paginas/certificacion.aspx	Spain	Spanish
Ministry of Energy, Tourism and Digital Agenda	Regulation of Thermal Installations in Buildings: Regulation, documents of interest	www.minetad.gob.es/energia/desarrollo/EficienciaEnergetica/RITE/Paginas/InstalacionesTermicas.aspx	Spain	Spanish
IDAE	Building Technical Code (CTE): Regulation and free tool to validate the compliance with the CTE	www.idae.es/tecnologias/eficiencia-energetica/edificacion/codigo-tecnico-de-la-edificacion	Spain	Spanish
Exceed project	European ongoing project with an evaluation and an environmental quality control tools	www.exceedproject.eu/environmental-quality-tool/	Europe	English
Foundation for energy efficiency	Guidelines for energy efficiency and energy data	www.f2e.es/es/guias-para-eficiencia-energetica	Spain/Europe	Spanish/English
The World Bank	Free and open access to global development data	data.worldbank.org/	World	English
Eurostat	Key European Statistics	ec.europa.eu/Eurostat	Europe	English

Source	Content	Info	Application area	Language
European Environmental Agency	Information on the environment for those involved in developing, adopting, implementing and evaluating environmental policy, and also the general public	www.eea.europa.eu/	Europe	English
OECD	Books, papers and statistics and is the gateway to OECD's analysis and data.	www.oecd-ilibrary.org/	OECD countries	English
IRENA – International Energy Agency	Statistics and reports on Renewable Energy Topic	resourceirena.irena.org/gateway/dashboard/	World	English
PORDATA	Statistics About Municipalities, Portugal And Europe	www.pordata.pt/en/Home	Portugal and Europe	English / Portuguese
REN21 – Renewable Energy	Global Status of Renewables	www.ren21.net/resources/charts-graphs/	World	English
World Resources Institute	Produces maps, charts, data sets, infographics, and other visual resources as part of our commitment to turn “information into action.”	www.wri.org/resources	World	English
TABULA	Data on Buildings Stock and Typologies	episcope.eu/building-typology/webtool/	Europe	English
World Energy Council	Facts and figures about all aspects of energy	www.worldenergy.org/data/	World	English
ADENE (Portuguese Energy Agency)	Energy Performance Certificate of Buildings: Normative, official registry, official software, related links	www.adene.pt/	Portugal	Portuguese
ERSE (Portuguese Energy Regulator)	Price Simulators, Bad Practices Awareness, Energy Efficiency Recommendations	www.erse.pt	Portugal	Portuguese

Source	Content	Info	Application area	Language
APA (Portuguese Environmental Agency)	Database on Environmental Legislation; Policy Instruments, Links to related information systems, State of the Environment Reports, and other related topics.	www.apambiente.pt/	Portugal	Portuguese
INE (Statistics Portugal)	All statistical data for Portugal, national accounts, studies and related reports.	www.ine.pt	Portugal	Portuguese/ English
IPCC (Intergovernmental Panel on Climate Change)	Assessment Reports, thematic reports and methodology reports on climate change, emissions and energy scenarios.	www.ipcc.ch/	World	English

8. Conclusions and the way ahead

The objective of this Deliverable D3.2.2 was to provide a comprehensive overview of previous and current projects and initiatives focusing on energy saving, energy efficiency and renewable energy sources adoption in municipal public buildings.

This served as a knowledge basis for a screening and critical review of the main experiences, good practices and references at international level on the five main components of the PrioritEE toolbox: How to Briefs, Analytic Database on EE measures and RES, Actions to enhance awareness and foster EE behaviour, Decision Support Tools, and Open data and knowledge access infrastructure.

The outcomes of this extensive research together with:

- the status quo of MPB in the 5 pilots regarding energy consumption and potential for the promotion of EE and RES measures (Deliverable D3.2.1 “Definition of goals, objectives and expected results for the 5 pilots”)
- the needs and expectations arisen from local authorities involved in the project (Deliverables D2.2.2 “First Local Living Labs” and D 3.4.1 “Reports on local workshops 1”)

will allow the detailed design of the PrioritEE toolbox, both in terms of single components than in terms of information flow and data exchange among them. This further step will constitute the core of Deliverable D3.3.1 “Methodology to improve EE in public buildings”.

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