TESTING PROTOCOL

ASSESSMENT REPORT- Sant Cugat del Vallès

Version 2.0
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2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.3 Test of transnational assessment methods and indicators
Deliverable: 3.3.1 – Testing Protocol

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URBAN SCALE ASSESSMENT

1. INITIATION

General information on the selected urban area

City	*Neighborhoods of Monestir and Sant Francesc – City of Sant Cugat del Vallès*
Brief description	*The neighborhoods of the Monastery and San Francisco have a strong identity. For historical and social reasons, these neighborhoods have always been a benchmark in the local dynamics of Sant Cugat.* *However, it is also true that the neighborhoods were born with some deficiencies and that, over the years, important improvements have been achieved to integrate the city as a whole.* *The inclusion of the two neighborhoods within the CESBA MED pilot test in Sant Cugat del Vallès is based on the desire to respond to these deficiencies that have not yet been resolved.*
Size (ha)	*44 ha*
Residential population	*11,060 inhabitants*
Average building density (total m2/land surface m2)	*0,65*
Plan of the urban area	

	
Significant pictures	

	  
Desciption of the adjacent areas	*To the east of the neighborhoods is the historic center of the municipality, with a population density similar to the pilot and where the greatest commercial activity is concentrated. Also, in the historic center there are the most characteristic buildings of the municipality for its historical value. To the north and south, the neighborhoods are mainly residential, with low density of buildings and population and with private green areas in most buildings. Finally, to the west there are industrial and tertiary zones.*

Property ownership	*Most of the property ownership are private owners. Families owners without another property in the city or in the region.*
Social and economic context	*Medium incomes. Although both neighborhoods are considered low-income neighborhoods, this is only a perception of the citizens if one takes into account that Sant Cugat del Vallès has one of the highest income in Spain.* *They are not considered unsafe neighborhoods and the people who live there have a strong feeling of belonging to the neighborhood.*
Legal /administrative boundary lines	
Energy supply infrastructure	*The neighborhoods are consolidated urbanistically and have no lack of supply of any of the major energy networks (electricity and gas), water and telecommunications.* *In spite of this, some of the supply networks are quite old, at the end of their useful life and that give them a low performance or have negative visual impacts.*
Relevance of the surrounding infrastructures	*The neighborhoods are adjacent to the center of the city, where the largest municipal services are concentrated. On the other hand, is also at one end of the center which gives easy access to the main communication routes to access the two highways that cross the municipality.* *This proximity of Sant Cugat to the two highways gives a strategic situation that facilitates the mobility of citizens for trips outside the municipality. In addition, Sant Cugat is connected to Barcelona via train with a frequency of one train every 4 minutes at peak times.*
Reference stakeholders in retrofit process	*The main stakeholders are the private owners of the houses and the City Council of Sant Cugat del Vallès concerned about reaching a sustainable city.* *Other interested parties that have historically been involved are neighborhood associations that want to improve the quality of the neighborhood.*
Other significant information	

2. PREPARATION

a. SNTool structure

A- BUILT URBAN SYSTEMS	
A1	**Urban Structure and Forme**
A1.7	*Conservaiton of Land*
A2	**Transportation infrastructure**
A2.1	*Walking distance to public transport for area residents*
A2.9	*On-street and indoor parking spaces relative to local population*

B- ECONOMY	
B1	**Economic Structure and Value**
B1.2	*Affordability of housing rental*
B2	**Economic Activity**
B2.2	*Average annual per-capita income of residents*
B3	**Cost and Investment**
B3.3	*Operating energy costs for public buildings*

C- ENERGY	
C1	**Non-renwable energey**
C1.1	*Total final thermal energy consumption for building opeerations*
C1.4	*Total final electrical energy consumption for building oprations*
C1.7	*Total primary energy demand for building operations*
C1.20	*Energy consumption of public lighting*
C1.21	*Energy consumption of local public transport*
C2	**Renewable and Decarbonised energy**
C2.1	*Share of renewable energy on-site, relative to total final thermal energy consumption for building operations*
C2.4	*Share of renewable energy on-site, relative to total primary thermal energy consumption for building operations*
C2.7	*Share of renewable energy on-site, relative to total final electric energy consumption for building operations*
C2.8	*Aggregated electrical energy generation from renewable sources located on public properties*

D- ATMOSPHERIC EMISSIONS	
D1	**Atmospheric emissions**
D1.2	*Total GHG Emissions from primary energy used in building operations*
D1.7	*Total GHG Emissions from buildings, private and public mobility*

E- NON - RENEWABLE RESOURCES	
E1	**Potable water, stormwater and greywater**
E1.1	*Availability of a ublic municipal water supply*
E1.3	*Re-use of rainwater in residential buildings*
E1.6	*Consumption of potable water for residential population*
E1.7	*Consumption of potable water for public non-residential building systems*
E1.8	*Consumption of potable water for irrigation purposes*
E2	**Solid and Liquid Wastes**
E2.1	*Solid waste and recycling collection points*
E2.2	*Separate collection and disposal of solid waste and recycling*
E2.6	*Public wastewater that is disposed of treated*

F- ENVIRONMENT	
F1	**Environment impacts**
F1.3	*Recharge of groudwater throught permeable paving or landscaping*
F1.10	*Degree of athmospheric light pollution caused by exteior public lighting systems*
F2	**Outodr environmental quality**
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*
F3	**Ecosystems and landscapes**
F3.1	*Green zones & recreation areas availability*
F3.2	*Green zones & recreation areas accessibility*
F3.3	*Green zones & recreation areas density*
F3,6	*Tree coverage for shade and management of local ambient temperatures*
F3.9	*Presence or potencial for wildlife corridors*

G- SOCIAL ASPECTS	
G1	**Safety and Accessibility**
G1.2	*Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons*

G1.4	*Ease of access to and use of public transport for physically disabled persons*
G2	**Traffic and Mobility Services**
G2.1	*Performance of the public transport system*
G2.3	*Measures to limit traffic of cars and trucks passing through the local area*
G2.4	*Quality of pedestrian and bycycle network*
G2.5	*Availability of sheltered bicyble parking facilities*
G3	***Communication services***
G3.1	*Availability of a broadband communication network*
G3.2	*Access to a broadband communication network*
G4	**Public and private facilities and services**
G4.2	*Availability and proximity of key services*
G4.3	*Availability and proximity of a primary school*
G4.4	*Availability and proximity of a secondary school*
G4.6	*Availability and proximity of leisure facilities*
G4.7	*Access to indoor gymnastic facilities for winter use*
G5	**Local Food**
G5.2	*Residents' access to and use of urban agricultural plots*
G6	**Management and community involvement**
G6.3	*Community involvement in urban planning activities*
G7	**Society, Culture and Heritage**
G7.2	*Compatibility of public open space with local cultural values*

b. SNTool criteria selection rationale

A- BUILT URBAN SYSTEMS	
CRITERION	**REASON/MOTIVATION**
A1.7 *Conservaiton of Land*	*KPI (mandatory)*
A2.1 *Walking distance to public transport for area residents*	*Easy to calculate and useful*
A2.9 *On-street and indoor parking spaces relative to local population*	*Relative easy to calculate*

B- ECONOMY	
CRITERION	**REASON/MOTIVATION**
B1.2 *Affordability of housing rental*	*The economic capacity to live in an area is directly related to access to housing.*
B2.2 *Average annual per-capita income of residents*	*To know the economic reality of an urban area, it is essential to know the income level of the residents. It is not easy to calculate accurately but the approximate value is significant*
B3.3 *Operating energy costs for public buildings*	*KPI (mandatory)*

C- ENERGY	
CRITERION	**REASON/MOTIVATION**
C1.1 *Total final thermal energy consumption for building opeerations*	*KPI (mandatory)*
C1.4 *Total final electrical energy consumption for building oprations*	*KPI (mandatory)*
C1.7 *Total primary energy demand for building operations*	*KPI (mandatory)*
C1.20 *Energy consumption of public lighting*	*Easy to calculate because the municipality is the owner of public lighting. In addition, it is a criterion where the municipality can act directly and help achieve its objectives.*
C1.21 *Energy consumption of local public transport*	*Easy to calculate because the municipality is the owner of local public transport. In addition, it is a criterion where the municipality can act directly and help achieve its objectives.*
C2.1 *Share of renewable energy on-site, relative to total final thermal energy consumption for building operations*	*KPI (mandatory)*
C2.4 *Share of renewable energy on-site, relative to total primary thermal energy consumption for building operations*	*Useful criterion to introduce smart grids in an area and very useful to define how sustainable the area is.*
C2.7 *Share of renewable energy on-site, relative to total final electric energy consumption for building operations*	*KPI (mandatory)*
C2.8 *Aggregated electrical energy generation from renewable sources located on public properties*	*The generation of energy produced in public properties is easy to calculate to be municipal ownership. It is also a criterion where the administration can act directly and prove its involvement in search of sustainability.*

D- ATMOSPHERIC EMISSIONS

CRITERION	REASON/MOTIVATION
D1.2 *Total GHG Emissions from primary energy used in building operations*	*KPI (mandatory)*
D1.7 *Total GHG Emissions from buildings, private and public mobility*	*Mobility is one of the main causes of the emission of GHG into the atmosphere and therefore it is necessary to know at least estimated values. Municipal policies can act directly on this criterion.*

E- NON - RENEWABLE RESOURCES

CRITERION	REASON/MOTIVATION
E1.1 *Availability of a public municipal water supply*	*Easy to calculate because it is a public service. The importance of access to water is at the same level as access to energy and higher than access to telecommunications, so it is important to calculate it.*
E1.3 *Re-use of rainwater in residential buildings*	*Sant Cugat has very restrictive ordinances in this regard and has a reliable knowledge of the reality of the municipality in the reutilization of rainwater in private plots.*
E1.6 *Consumption of potable water for residential population*	*KPI (mandatory)*
E1.7 *Consumption of potable water for public non-residential building systems*	*KPI (mandatory)*
E1.8 *Consumption of potable water for irrigation purposes*	*Sant Cugat has very restrictive ordinances in this regard and has a fairly reliable knowledge of the reality of the municipality in the use of water for irrigation purposes*
E2.1 *Solid waste and recycling collection points*	*Easy to calculate because the municipality is the owner of solid waste and recylcing collection points. In addition, it is a criterion where the municipality can act directly and help achieve its objectives.*
E2.2 *Separate collection and disposal of solid waste and recycling*	*Easy to calculate because the municipality is the owner of waste collection syste.*
E2.6 *Public wastewater that is disposed of treated*	*Easy to calculate because the municipality is the owner of weber system..In addition, it is a criterion where the municipality can act directly and help achieve its objectives.*

F- ENVIRONMENT

CRITERION	REASON/MOTIVATION
F1.3 *Recharge of groudwater throught permeable paving or landscaping*	*KPI (mandatory)*
F1.10 *Degree of athmospheric light pollution caused by exteior public lighting systems*	*Easy to calculate because the municipality is the owner of public lighting. In addition, it is a criterion where the municipality can act directly and help achieve its objectives.*
F2.3 *Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	*KPI (mandatory)*

F3.1 *Green zones & recreation areas availability*	*Easy to calculate because the municipality is the owner of green areas. In addition, it is a criterion where the municipality can act directly and help achieve its objectives.*
F3.2 *Green zones & recreation areas accessibility*	*Easy to calculate because the municipality is the owner of green areas. In addition, it is a criterion where the municipality can act directly and help achieve its objectives.*
F3.3 *Green zones & recreation areas density*	*Easy to calculate because the municipality is the owner of green areas. In addition, it is a criterion where the municipality can act directly and help achieve its objectives.*
F3,6 *Tree coverage for shade and management of local ambient temperatures*	*Easy to calculate because the municipality is the owner of green areas. In addition, it is a criterion where the municipality can act directly and help achieve its objectives.*
F3.9 *Presence or potencial for wildlife corridors*	*Easy to calculate*

G- SOCIAL ASPECTS

CRITERION	REASON/MOTIVATION
G1.2 *Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons*	*It is a criterion where the municipality can act directly and help achieve its objectives. Safe modes of mobility for pedestrians are essential to become a sustainable city.*
G1.4 *Ease of access to and use of public transport for physically disabled persons*	*A criterion mixes mobility and accessibility. Concepts that socially equate citizens and therefore is very useful. In addition, the municipality can act directly to achieve its objectives and it is easy to calculate.*
G2.1 *Performance of the public transport system*	*KPI (mandatory)*
G2.3 *Measures to limit traffic of cars and trucks passing through the local area*	*El municipio puede actuar directamente en este criterio y es fácil de calcular.*
G2.4 *Quality of pedestrian and bycycle network*	*KPI (mandatory)*
G2.5 *Availability of sheltered bicyble parking facilities*	*A criterion mixes mobility and accessibility. Concepts that socially equate citizens and therefore is very useful. In addition, the municipality can act directly to achieve its objectives and it is easy to calculate.*
G3.1 *Availability of a broadband communication network*	*The availability and access to a broadband communication network are essential for the social equity of a territory.*
G3.2 *Access to a broadband communication network*	*The availability and access to a broadband communication network are essential for the social equity of a territory.*
G4.2 *Availability and proximity of key services*	*The ability to access basic services (schools, hospitals, businesses ...) close to citizens is necessary to reduce the cost of mobility. In addition, it encourages more sustainable ways and promotes the social equity of a territory.*
G4.3 *Availability and proximity of a primary school*	*The ability to access basic services (schools, hospitals, businesses ...) close to citizens is necessary to reduce the cost of mobility. In addition, it encourages more sustainable ways and promotes the social equity of a territory.*
G4.4 *Availability and proximity of a secondary*	*The ability to access basic services (schools,*

school	*hospitals, businesses ...) close to citizens is necessary to reduce the cost of mobility. In addition, it encourages more sustainable ways and promotes the social equity of a territory.*
G4.6 *Availability and proximity of leisure facilities*	*The ability to access basic services (schools, hospitals, businesses ...) close to citizens is necessary to reduce the cost of mobility. In addition, it encourages more sustainable ways and promotes the social equity of a territory.*
G4.7 *Access to indoor gymnastic facilities for winter use*	*The ability to access basic services (schools, hospitals, businesses ...) close to citizens is necessary to reduce the cost of mobility. In addition, it encourages more sustainable ways and promotes the social equity of a territory.*
G5.2 *Residents' access to and use of urban agricultural plots*	*Easy to calculate*
G6.3 *Community involvement in urban planning activities*	*The participation of citizens in urban design promotes the transparency of public administration and increases social awareness in relation to sustainability. Therefore, it is an interesting criterion to be known and improved by the public administration.*
G7.2 *Compatibility of public open space with local cultural values*	*The relevance to a territory is closely linked to the conservation of cultural values and public space is a place that can empower it*.

c. SNTool weights rationale

ISSUES WEIGHTS

ISSUE	WEIGHTING FACTOR (1 to 3)	MOTIVATION
A- BUILT URBAN SYSTEMS	2	The morphology and urban design of a territory is the first of the layers that define a city. In it, all actions will be implemented and their viability will be allowed. Its importance is not minor but it is not decisive.
B- ECONOMY	2	The viability of any action depends on its financing and its economic viability. The economy is not the objective, but it is a basic tool for the achievement of the objective; the sustainability of the territory
C- ENERGY	3	The sustainable use of energy is the basis of a sustainable city. In addition, public policies can have a direct impact on their results.
D- ATMOSPHERIC EMISSIONS	2	The atmospheric emissions allow us to know how habitable a city is. They are important in terms of value but it is difficult to implement actions directly on this issue.
E- NON - RENEWABLE RESOURCES	1	non-renewable resources are of great importance to guarantee sustainable cities, but

		no more than the other issues (energy, environment, ...)
F- ENVIRONMENT	3	The environment in a city is the definition of quality of life for its citizens. According to the European Commission; 80% of European citizens will live in cities in 2050 and according to the European Environment Agency; Long exposure to contaminated air was responsible for more than 400,000 premature deaths.
G- SOCIAL ASPECTS	1	Social aspects are important and allow equity among citizens. In fact, the urban agenda gives it great importance. Despite this, the project ceased med is focused on the other aspects and therefore should be given a lower weight.

CATEGORIES WEIGHTS

CATEGORIES	WEIGHT (%)
A1- Urban Structure and Form	4.9 %
A2- Transportation Infrastructure	5.3 %
TOTAL	10.2 %
B1- Economic Structure and Value	1.5 %
B2- Economic activity	1.5 %
B3- Cost and Investment	0.7 %
TOTAL	3.6 %
C1- Non-renewable energy	5.7 %
C2- Renewable and Decarbonised energy	20.2 %
C3- Energy recycling and storage	0.0 %
TOTAL	25.9 %
D1- Atmospheric emissions	12.7 %
TOTAL	12.7 %
E1- Potable water, stormwater and greywater	3.5 %
E2- Solid and Liquid Wastes	6.6 %
E3- Resource consumption, retention and maintenance	0.0 %
TOTAL	10.1 %
F1- Environmental impacts	5.8 %
F2- Outdoor environmental quality	8.2 %
F3- Ecosystems and landscapes	9.8 %
TOTAL	23.8 %
G1- Safety and Accessibility	1.5 %
G2- Traffic and Mobility Services	4.4 %
G3- Communication services	1.5 %
G4- Public and private facilities and services	4.6 %
G5- Local Food	0.7 %
G6- Management and community involvement	0.2 %
G7- Society, Culture and Heritage	0.7 %
G8- Perceptual	0.0 %
TOTAL	13.6 %

CRITERIA WEIGHTS

CESBA MED GF-U, sheet WeightsA: B= Impact of the Potential Effect (1-3), C=Extent of potential effect (1-5), D=Duration of potential effect (1-5)
CESBA MED SNTool, sheet WeightsB: LF = Local Factor

A- BUILT URBAN SYSTEMS

A1- Urban Structure and Forme

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A1.7	*4.85 %*	*2*	*5*	*4*	*1*	*Default value*

A2- Transportation infrastructure

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A2.1	*2.43 %*	*2*	*2*	*5*	*1*	*Default value*
A2.9	*2.91 %*	*3*	*4*	*2*	*1*	*Default value*
TOTAL	**10.2 %**					

B- ECONOMY

B1- Economic Structure and Value

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B1.2	*1.46 %*	*3*	*2*	*2*	*1*	*Default value*

B2- Economic Activity

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B2.2	*1.46 %*	*3*	*2*	*2*	*1*	*Default value*

B3- Cost and Investment

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B3.3	*0.73 %*	*3*	*2*	*1*	*1*	*Default value*
TOTAL	**3.6 %**					

C- ENERGY

C1- Non-renwable energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C1.1	*1.09 %*	*2*	*3*	*3*	*1*	*Default value*
C1.4	*1.09 %*	*3*	*3*	*2*	*1*	*Default value*
C1.7	*1.09 %*	*2*	*3*	*3*	*1*	*Default value*
C1.20	*0.61 %*	*1*	*5*	*2*	*1*	*Default value*
C1.21	*1.82 %*	*3*	*5*	*2*	*1*	*Default value*

C2- Renewable and Decarbonised energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C2.1	*3.28 %*	*2*	*3*	*3*	*1*	*Default value*
C2.4	*8.19 %*	*3*	*5*	*3*	*1*	*Default value*
C2.7	*6.55 %*	*3*	*4*	*3*	*1*	*Default value*
C2.8	*2.18 %*	*2*	*2*	*3*	*1*	*Default value*
TOTAL	**25.9 %**					

D- ATHMOSPHERIC EMISSIONS

D1- Atmospheric emissions

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.2	3.64 %	2	5	3	*1*	*Default value*

D1.7	9.10 %	3	5	5	*1*	*Default value*
TOTAL	**12.7 %**					

E- NON-RENEWABLE RESOURCES

E1- Potable water, stormwater and greywater

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E1.1	*1.09 %*	*3*	*2*	*3*	*1*	*Default value*
E1.3	*0.49 %*	*2*	*2*	*2*	*1*	*Default value*
E1.6	*0.73 %*	*3*	*4*	*1*	*1*	*Default value*
E1.7	*0.73 %*	*3*	*4*	*1*	*1*	*Default value*
E1.8	*0.49 %*	*2*	*2*	*2*	*1*	*Default value*

E2- Solid and Liquid Wastes

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E2.1	*1.46 %*	*2*	*2*	*2*	*1*	*Default value*
E2.2	*0.73 %*	*1*	*2*	*2*	*1*	*Default value*
E2.6	*4.37 %*	*2*	*4*	*3*	*1*	*Default value*
TOTAL	**10.1 %**					

F- ENVIRONMENT

F1- Environme nt impacts

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F1.3	*4.37 %*	*2*	*4*	*3*	*1*	*Default value*
F1.10	*1.46 %*	*2*	*2*	*2*	*1*	*Default value*

F2- Outdoor environmental quality

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F2.3	*8.19 %*	*3*	*3*	*5*	*1*	*Default value*

F3- Ecosystems and landscapes

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F3.1	*1.46 %*	*2*	*2*	*2*	*1*	*Default value*
F3.2	*1.46 %*	*2*	*2*	*2*	*1*	*Default value*
F3.3	*1.46 %*	*2*	*2*	*2*	*1*	*Default value*
F3,6	*3.28 %*	*3*	*2*	*3*	*1*	*Default value*
F3.9	*2.18 %*	*2*	*2*	*3*	*1*	*Default value*
TOTAL	**23.8 %**					

G- ENVIRONMENT

G1- Safety and Accessibility

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G1.2	*0.73 %*	*2*	*2*	*3*	*1*	*Default value*
G1.4	*0.73 %*	*2*	*2*	*3*	*1*	*Default value*

G2- Traffic and Mobility Services

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G2.1	*0.73 %*	*2*	*3*	*2*	*1*	*Default value*
G2.3	*0.73 %*	*3*	*2*	*2*	*1*	*Default value*
G2.4	*2.18 %*	*3*	*4*	*3*	*1*	*Default value*
G2.5	*0.73 %*	*2*	*2*	*3*	*1*	*Default value*

G3- Communication services

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G3.1	*0.73 %*	*2*	*2*	*3*	*1*	*Default value*
G3.2	*0.73 %*	*2*	*2*	*3*	*1*	*Default value*

G4- Public and private facilities and

services						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G4.2	*1.94 %*	*2*	*4*	*4*	*1*	*Default value*
G4.3	*0.73 %*	*2*	*2*	*3*	*1*	*Default value*
G4.4	*0.73 %*	*2*	*2*	*3*	*1*	*Default value*
G4.6	*0.73 %*	*2*	*2*	*3*	*1*	*Default value*
G4.7	*0.49 %*	*2*	*2*	*2*	*1*	*Default value*
G5- Local Food						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G5.2	*0.73 %*	*2*	*2*	*3*	*1*	*Default value*
G6- Management and community involvement						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G6.3	*0.24 %*	*1*	*4*	*1*	*1*	*Default value*
G7- Society, Culture and Heritage						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
TOTAL	**13.6 %**					

d. SNTool benchmarks rationale

The benchamarks was discussed deeply in the CLC. The experts took the values by default and within their knowledge and experiences, they adjusted them.

Those who were not able to correct because of lack of reference data were adjusted with subsequent studies or with the value obtained in the pilot test taking it as a minimum value.

A- URBAN STRUCTURE AND FORM				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
A1.7	*Conservaiton of Land*	%	*0: 10*	*The CLC approved the default values.*
			5: 20	*The CLC approved the default values.*
A2.1	*Walking distance to public transport for area residents*	%	*0: 50*	*The CLC proposed to change the values of minimum and best practices because of the importance of promoting sustainable mobility in a sustainable city (40% default value).*
			5: 90	*The CLC proposed changing the values of minimum and best practices because of the importance of promoting sustainable mobility in a sustainable city (60% default value).*
A2.9	*On-street and indoor parking spaces relative to local population*	%	*0: 80*	*The CLC approved the default values.*
			5: 25	*The CLC approved the default values.*

B- ECONOMY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
B1.2	*Affordability of housing rental*	%	*0: 30*	*The CLC approved the default values.*
			5: 20	*The CLC approved the default values.*
B2.2	*Average annual per-capita income of residents*	%	*0: 60%*	*The CLC approved the default values.*
			5: 90%	*The CLC approved the default values.*
B3.3	*Operating energy costs for public buildings*	*€/m^2/yr*	*0: 13.56*	*According to the models of average energy consumption for buildings published by the Catalan Institute of Energy and estimating a cost of 0.16 €/kWh*
			5: 3.33	*According to the models of energy consumption for buildings classified "A" and*

				published by the Catalan Institute of Energy and estimating a cost of 0.16 €/kWh

C- ENERGY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
C1.1	*Total final thermal energy consumption for building opeerations*	*kWh/m^2/yr*	*0: 76.23*	*The CLC proposed to change the value of the minimum practice to 75 kWh / m2 / year because it was more realistic (default value of 50 kWh / m2 / year). The final value used is 76.23 kWh / m2 according to the classification of ICAEN (Catalan Institute of Energy) for a label "D" and because it is a value very close to the proposal of CLC.*
			5: 33.8	*The CLC proposed to increase the value of good practice. It is done directly by changing the value of the best practice (default value 0 kWh / m2 / year). The final value used is 33.8 kWh / m2 according to the classification of ICAEN (Catalan Institute of Energy) for a label "A".*
C1.4	*Total final electrical energy consumption for building oprations*	*kWh/m^2/yr*	*0: 29.85*	*The CLC did not propose to change the default value (25 kWh /m2/yr). Despite this, the reference values have followed the benchmark of criterion C1.1 (label "D" according to ICAEN)*
			5: 10.88	*The CLC did not propose to change the default value (5 kWh /m2/yr). Despite this, the reference values have followed the benchmark of criterion C1.1 (label "A" according to ICAEN*
C1.7	*Total primary energy demand for building operations*	*kWh/m^2/yr*	*0: 152*	*The CLC did not propose to change the default value (50 kWh /m2/yr). Despite this, the reference values have followed the benchmark of criterion C1.1 (label "D" according to ICAEN)*
			5: 15	*The CLC did not propose to change the default value (15 kWh /m2/yr). Despite this, the reference values have followed the benchmark of*

				criterion C1.1 (label "A" according to ICAEN)
C1.20	*Energy consumption of public lighting*	*kWh/m²*	*0: 1.00*	*The CLC approved the default value. However, this value is not realistic, so the average value of the whole neighborhood becomes the value of the minimum practice (default value 50 kWh / m2)*
			5: 0.67	*The CLC approved the default value. However, this value is not realistic so two thirds of the average value of the whole city becomes the value of the best practice (default value 15 kWh/m²)*
C1.21	*Energy consumption of local public transport*	*pssg·km/ MJ*	*0: 500*	*The CLC approved the default value.*
			5: 1,000	*The CLC approved the default value.*
C2.1	*Share of renewable energy on-site, relative to total final thermal energy consumption for building operations*	*%*	*0: 25*	*The CLC approved the default value*
			5: 90	*The CLC approved the default value.*
C2.4	*Share of renewable energy on-site, relative to total primary thermal energy consumption for building operations*	*%*	*0: 20*	*The CLC approved to reduce the value because it was too restrictive (default value 25%).*
			5: 80	*The CLC approved the default value.*
C2.7	*Share of renewable energy on-site, relative to total final electric energy consumption for building operations*	*%*	*0: 15*	*The CLC approved to reduce the value because it was too restrictive (default value 35%).*
			5: 75	*The CLC approved the default value.*
C2.8	*Aggregated electrical energy generation from renewable sources located on public properties*	*%*	*0: 20*	*The CLC approved the default value.*
			5: 80	*The CLC approved the default value.*

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
D1.2	*Total GHG Emissions from primary energy used in building operations*	*KgCO2eq /m2/yr*	*0: 30*	*The CLC approved the default value.*
			5: 10	*The CLC approved the default value.*
D1.7	*Total GHG Emissions from buildings, private and public mobility*	*TnCO2eq /1,000hab .*	*0: 3,243*	*The CLC approved the default value. However, this value is not realistic, so the average value of the whole neighborhood becomes the value of the minimum practice (default value 80 TnCO2eq/100hab).*
			5: 2,173	*The CLC approved the default*

				value. However, this value is not realistic so two thirds of the average value of the whole city becomes the value of the best practice (default 40 TnCO2eq/100hab)

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
E1.1	*Availability of a public municipal water supply*	*%*	*0: 95*	*The CLC approved to increase the value because it is mandatory (default value 90%).*
			5: 99	*The CLC approved to increase the value because it is mandatory (default value 95%).*
E1.3	*Re-use of rainwater in residential buildings*	*%*	*0: 20*	*The CLC approved to reduce the value because it was too restrictive (default value 10%).*
			5: 40	*The CLC approved to reduce the value because it was too restrictive (default value 60%).*
E1.6	*Consumption of potable water for residential population*	*m^3/ occupant/ yr*	*0: 150*	*The CLC approved to reduce the value because it was too restrictive (default value 10%).*
			5: 60	*The CLC approved the default value.*
E1.7	*Consumption of potable water for public non-residential building systems*	*m^3/ m^2/yr*	*0: 15*	*The CLC approved the default value.*
			5: 5	*The CLC approved the default value.*
E1.8	*Consumption of potable water for irrigation purposes*	*m^3/ 1.000 m^2/yr*	*0: 5*	*The CLC approved the default value.*
			5: 0	*The CLC approved the default value.*
E2.1	*Solid waste and recycling collection points*	*%*	*0: 75*	*The CLC approved the default value.*
			5: 95	*The CLC approved the default value.*
E2.2	*Separate collection and disposal of solid waste and recycling*	*%*	*0: 40*	*The CLC approved to reduce the value because it was too restrictive (default value 60%).*
			5: 75	*The CLC approved to reduce the value because it was too restrictive (default value 60%).*
E2.6	*Public wastewater that is disposed of treated*	*%*	*0: 90*	*The CLC approved the default value.*
			5: 100	*The CLC approved the default value.*

F- ENVIRONMENT

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE

F1.3	*Recharge of groudwater throught permeable paving or landscaping*	*%*	*0: 20%*	*The CLC approved the default value.*
			5: 70%	*The CLC approved to reduce the value because it was too restrictive (default value 100%).*
F1.10	*Degree of athmospheric light pollution caused by exteior public lighting systems*	*mcd/m^2*	*0: 3*	*The CLC approved to change units and value because they were not realistic (default value 20 cd/m^2).*
			5: 0.4	*The CLC approved to change units and value because they were not realistic (default value 20 cd/m^2).*
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	*day/yr*	*0: 15*	*The CLC approved the default value.*
			5: 11	*The CLC approved the default value.*
F3.1	*Green zones & recreation areas availability*	*m^2/residents*	*0: 5*	*The CLC approved the default value.*
			5: 50	*The CLC approved the default value.*
F3.2	*Green zones & recreation areas accessibility*	*m*	*0: 500*	*The CLC considered that the minimum value could be more restrictive (default value 1,000 m)*
			5: 150	*The CLC considered that the minimum value could be more restrictive (default value 250 m)*
F3.3	*Green zones & recreation areas density*	*%*	*0: 20*	*The CLC approved the default value.*
			5: 50	*The CLC approved the default value.*
F3,6	*Tree coverage for shade and management of local ambient temperatures*	*%*	*0: 20*	*The CLC approved the default value.*
			5: 50	*The CLC approved the default value.*
F3.9	*Presence or potencial for wildlife corridors*	*Level (score)*	*0: There are few opportunities within the built-up urban area to establish wildlife corridors.*	*The CLC approved the default value.*
			5: There are opportunities within the built-up urban area to establish full wildlife corridors.	*The CLC approved the default value.*

G- SOCIAL ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
G1.2	*Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons*	%	*0: 50*	*The CLC approved the default value.*
			5: 90	*The CLC approved the default value.*
G1.4	*Ease of access to and use of public transport for physically disabled persons*	%	*0: 60*	*The CLC approved the default value.*
			5: 100	*The CLC approved the default value.*
G2.1	*Performance of the public transport system*	%	*0: 30*	*The CLC approved the default value.*
			5: 100	*The CLC approved the default value.*
G2.3	*Measures to limit traffic of cars and trucks passing through the local area*	*Level (score)*	*0: value*	*The CLC approved the default value.*
			5: value	*The CLC approved the default value.*
G2.4	*Quality of pedestrian and bycycle network*	*m/100 inhabitants*	*0: 5*	*The CLC approved the default value.*
			5: 40	*The CLC approved the default value.*
G2.5	*Availability of sheltered bicyble parking facilities*	%	*0: 20*	*The CLC approved the default value.*
			5: 60	*The CLC approved the default value.*
G3.1	*Availability of a broadband communication network*	%	*0: 80*	*The CLC approved the default value.*
			5: 95	*The CLC approved the default value.*
G3.2	*Access to a broadband communication network*	%	*0: 80*	*The CLC approved the default value.*
			5: 95	*The CLC approved the default value.*
G4.2	*Availability and proximity of key services*	%	*0: 50*	*The CLC approved the default value.*
			5: 100	*The CLC approved the default value.*
G4.3	*Availability and proximity of a primary school*	%	*0: 30*	*The CLC approved the default value.*
			5: 80	*The CLC approved the default value.*
G4.4	*Availability and proximity of a secondary school*	%	*0: 30*	*The CLC approved the default value.*
			5: 80	*The CLC approved the default value.*
G4.6	*Availability and proximity of leisure facilities*	%	*0: 20*	*The CLC approved the default value.*
			5: 40	*The CLC approved the default value.*
G4.7	*Access to indoor gymnastic facilities for winter use*	%	*0: 10*	*The CLC approved the default value.*
			5: 200	*The CLC approved the default value.*

G5.2	*Residents' access to and use of urban agricultural plots*	*%*	*0: 500*	*The CLC approved the default value.*
			5: 89	*The CLC approved the default value.*
G6.3	*Community involvement in urban planning activities*	*Level (score)*	*0: value*	*The CLC approved the default value.*
			5: value	*The CLC approved the default value.*
G7.2	*Compatibility of public open space with local cultural values*	*Level (score)*	*0: value*	*The CLC approved the default value.*
			5: value	*The CLC approved the default value.*

e. SNTool Criteria Specifications

A- BUILT URBAN SYSTEMS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.7	*Conservation of Land*	*Information source*	*Mesured data form Municipal Urban Planning*
		Assessment method	*<u>CESBA assessment method:</u> 1. Determine the area of the neighborhood. 2. Determine the undeveloped area of land that is considered by authorities to be of ecological and agricultural value. 3. Calculate the ratio between the undeveloped area and the area of the neighborhood. <u>Comments from Sant Cugat:</u> No comments*
		Standard	
A2.1	*Walking distance to public transport for area residents*	*Information source*	*Mesured ddta from the local public transport map*
		Assessment method	*<u>CESBA assessment method:</u> 1. Identify the location of public transport stops within the local area. 2. Identify major residential buildings and centers of other housing. 3. Calculate the walking distance for a sample of typical routes <u>Comments from Sant Cugat:</u> All the bus stops have been marked on the map and a radius of 500 m has been drawn around each stop. It has*

			been proven that the 15 stops within the area provide coverage to all residents within a radius of less than 500m.
		Standard	
A2.9	*On-street and indoor parking spaces relative to local population*	*Information source*	*Statics data from the Municipality (private parking data and public outdoor parking data)*
		Assessment method	*<u>CESBA assessment method:</u> 1. Determine the number of on-street parking spaces. 2. Determine the number of indoor parking spaces. 3. Determine the ratio of total parking spaces to the total residential and working population in the local area <u>Comments from Sant Cugat:</u> 1. Working population is calculated using a ratio (14pax/m^2) in bussiness center located in the area.*
		Standard	

B- ECONOMY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.2	*Affordability of housing rental*	*Information source*	*Statics data from webiste (average rental housing) Studies (citizen incomes) from IDESCAT (Institute of statiistics of Catalonia) www.idescat.cat*
		Assessment method	*<u>CESBA assessment method:</u> The percent of typical annual household income of the lowest income quintile in the area relative to the market rents local housing unit with two bedrooms that is considered to be modest in area and quality. <u>Comments from Sant Cugat:</u> The average rental price of flats in the area is calculated using the most widely used rental websites in Spain. No information is available for the calculation of the income of the lowest quintel nor of the average income of*

			the neighborhood. The known data is the average ot the whole ccity level (no quintels). *The ratio has therefore been calculated with the average income of the whole city.*
		Standard	*Insert text here*
B2.2	*Average annual per-capita income of residents*	*Information source*	*Studies (citizen incomes) from IDESCAT (Institute of statiistics of Catalonia) www.idescat.cat*
		Assessment method	*<u>CESBA assessment method:</u>* *Calculate the average per-capita income of residents in the local area relative to that of the urban region as a whole.* *<u>Comments from Sant Cugat:</u>* *Because there is not available income data in the neighborhood, the ratio has been calculated using the average income of the city relative to the region (Vallès Occidental).*
		Standard	
B3.3	*Operating energy costs for public buildings*	*Information source*	*Statics data from the Municipality*
		Assessment method	*<u>CESBA assessment method:</u>* *To characterize the indicator's value:* *1. For each building in the urban area, calculate the annual operating energy (thermal and electric) cost (euro/year).* *2. Sum the operating energy costs of each building in the urban area up to an aggregated annual operating energy cost value (euro/year).* *3. Sum the indoor useful area of each building in the area up to an aggregated indoor useful area value (m2).* *4. Calculate the indicator as: aggregated annual operating energy cost / aggregated indoor useful area (euro/m2/year).* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	

C- ENERGY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
C1.1	*Total final thermal energy consumption for building opeerations*	*Information source*	*Statics data from cadastre too calculet the total indoor surface* *Stimated energy data from PAES of Sant Cugat*
		Assessment method	*<u>CESBA assessment method:</u>* *To characterize the indicator's value:* *1. In the calculation of the primary energy consumption, the following energy uses must be Considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting.* *2. For each building in the local area, calculate the annual final (thermal and electric) energy consumption per energy carrier in kilowatt hours (kWh/year)* *3. Sum the annual final energy consumption of each building up to an aggregated annual final energy consumption per energy carrier (kWh/year).* *4. Using the national conversion factors, convert the aggregated annual final energy consumption per energy carrier in annual primary energy consumption per energy carrier (KWh/year).* *5. Sum the annual primary energy consumption per energy carrier up to an aggregated annual total primary energy consumption (kWh/year).* *6. Sum the indoor useful area of each building in the area up to an aggregated indoor useful area value (m2).* *7. Calculate the indicator's value as: aggregated annual total primary energy consumption / Aggregated indoor useful area (kWh/m2/year).* *<u>Comments from Sant Cugat:</u>* *Data used are taken from the PAES (SEAP, Sustainability and Energy Action Plan) of Sant Cugat. Last data published is 2015* *Data from the PAES is a city level. It*

			has been estimated to neighborhood level. *The latest update of the PAES is from 2015*
		Standard	*SEAP metodology published by DIBA (Diputació de Barcelona – Regional Public Administration)* *https://www.diba.cat/documents/102577937/126719106/Metodologia+PAESC_MAIG_18.pdf/b0f51601-1866-4783-a547-e80c828eb20d*
C1.4	*Total final electrical energy consumption for building oprations*	*Information source*	*Statics data from cadastre too calculet the total indoor surface* *Stimated energy data from PAES of Sant Cugat*
		Assessment method	*CESBA assessment method:* *To characterize the indicator's value, use of estimated data or metered data.* *Comments from Sant Cugat:* *Data used are taken from the PAES (SEAP, Sustainability and Energy Action Plan) of Sant Cugat.* *Data from the PAES is a city level. It has been estimated to neighborhood level.* *The latest update of the PAES is from 2015*
		Standard	*SEAP metodology published by DIBA (Diputació de Barcelona – Regional Public Administration)* *https://www.diba.cat/documents/102577937/126719106/Metodologia+PAESC_MAIG_18.pdf/b0f51601-1866-4783-a547-e80c828eb20d*
C1.7	*Total primary energy demand for building operations*	*Information source*	*Statics data from cadastre too calculet the total indoor surface* *Stimated energy data from PAES of Sant Cugat*
		Assessment method	*CESBA assessment method:* *To characterize the indicator's value:* *1. In the calculation of the primary energy consumption, the following energy uses must be considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting.* *2. For each building in the local area, calculate the annual final (thermal and electric) energy consumption per*

			energy carrier in kilowatt hours (kWh/year) *3. Sum the annual final energy consumption of each building up to an aggregated annual final energy consumption per energy carrier (kWh/year).* *4. Using the national conversion factors, convert the aggregated annual final energy consumption per energy carrier in annual primary energy consumption per energy carrier (kWh/year).* *5. Sum the annual primary energy consumption per energy carrier up to an aggregated annual total primary energy consumption (kWh/year).* *6. Sum the indoor useful area of each building in the area up to an aggregated indoor useful area value (m2).* *7. Calculate the indicator's value as: aggregated annual total primary energy consumption / aggregated indoor useful area (kWh/m2/year).* *Note:Calculations are based on EN 13790 using the quasi-steady state monthly method.* *Refer also to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale*. *<u>Comments from Sant Cugat:</u>* *Data used are taken from the PAES (SEAP, Sustainability and Energy Action Plan) of Sant Cugat.* *Data from the PAES is a city level. It has been estimated to neighborhood level.* *The latest update of the PAES is from 2015*
		Standard	*SEAP metodology published by DIBA (Diputació de Barcelona – Regional Public Administration)* *https://www.diba.cat/documents/102577937/126719106/Metodologia+PAESC_MAIG_18.pdf/b0f51601-1866-4783-a547-e80c828eb20d*
C1.20	*Energy consumption of public lighting*	*Information source*	*Statics data from the Municipality*

		Assessment method	*CESBA assessment method:* *Calculate the aggregated annual electrical consumption consumed by outdoor public lighting systems on a per capita basis.* *Comments from Sant Cugat:* *The energy conusmption for public lighting have been calculated using the lamps power installed and the average working hours per lamp of whole city. Working hours come from municipal studies*
		Standard	
C1.21	*Energy consumption of local public transport*	*Information source*	*Stimated energy data from PAES of Sant Cugat* *Statics public transport data from the Municipality*
		Assessment method	*CESBA assessment method:* *Calculate the energy efficiency of local public transport, in aggregated annual passenger-kilometers per MJ of non-renewable energy consumed.* *Comments from Sant Cugat:* *Data used are taken from the PAES (SEAP, Sustainability and Energy Action Plan) of Sant Cugat.* *The latest update of the PAES is from 2015*
		Standard	*SEAP metodology published by DIBA (Diputació de Barcelona – Regional Public Administration)* *https://www.diba.cat/documents/102577937/126719106/Metodologia+PAESC_MAIG_18.pdf/b0f51601-1866-4783-a547-e80c828eb20d*
C2.1	*Share of renewable energy on-site, relative to total final thermal energy consumption for building operations*	*Information source*	*Estimated energy data of the PAES of Sant Cugat.* *Measured renewable installation data of the Municipality.* *Average production rate of APERCA (Association of Renewable Energy Professionals of Catalonia)*
		Assessment method	*CESBA assessment method:* *To characterize the indicator's value, use estimated data OR metered data metered data aren't available,*

	estimated data shall be used. Estimated data are used for evaluating retrofit scenarios in planning and decision-making processes. *In reporting the indicator's value, data sources must always be indicated.* *Exported energy is the one delivered by technical systems through the system boundary (urban area) and used outside the system boundary. Exported energy is a benefit beyond the system boundary and it has not to be included in the calculation.* *Use of estimated data:* *1. In the calculation of the final thermal energy consumption, the following energy uses must be considered: heating, cooling, domestic hot water.* *2. For each building in the local area, calculate the annual final thermal energy consumption in kilowatt hours (kWh/year).* *3. Sum the annual final thermal energy consumption of each building up to an aggregated total annual final thermal energy consumption (kWh/year).* *4. For each building in the local area, calculate the annual final thermal energy consumption in specific MED territories: cities, islands and remote areas* *from on-site renewable energy sources in kilowatt hours (kWh/year).* *5. Sum the annual final thermal energy consumption from on-site renewable sources of each building up to an aggregated total annual final thermal energy consumption from on-site renewable sources (kWh/year).* *6. Calculate the indicator as: annual total final thermal energy consumption from on-site* *renewable sources / annual total final thermal energy consumption.* *Note: Calculations are based on EN 13790 using the quasi-steady state monthly method.* *Use of metered data:* *1. In the evaluation of the final thermal energy consumption, the following energy uses must be considered: heating, cooling, domestic hot water.* *2. For each building in the local area, collect the metered annual final thermal energy* *consumption) in kilowatt hours (kWh/year).*

			3. Sum the annual final thermal energy consumption of each building up to an aggregated total annual final thermal energy consumption (kWh/year). *4. For each building in the local area, collect the monitored annual final thermal energy consumption from on-site renewable sources in kilowatt hours (kWh).* *5. Sum the annual final thermal energy consumption from on-site renewable sources of each building up to an aggregated total annual final thermal energy consumption from on-site renewable sources (kWh/year).* *6. Calculate the indicator as: annual total thermal energy generation from on-site renewable energy sources / annual total final thermal energy consumption.* *Refer also to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale.* *<u>Comments from Sant Cugat:</u>* *Data used are taken from the PAES (SEAP, Sustainability and Energy Action Plan) of Sant Cugat.* *Data from the PAES is a city level. It has been estimated to neighborhood level.* *The latest update of the PAES is from 2015* *The renewable energy production is calculated using the data collected from the Municipality about renewable public and private installations and using an average production rate; 700 kWh/m2·yr*
		Standard	*SEAP metodology published by DIBA (Diputació de Barcelona – Regional Public Administration)* *https://www.diba.cat/documents/102577937/126719106/Metodologia+PAESC_MAIG_18.pdf/b0f51601-1866-4783-a547-e80c828eb20d*
C2.4	*Share of renewable energy on-site, relative to total primary thermal energy consumption for building operations*	*Information source*	*Estimated energy data of the PAES of Sant Cugat.* *Measured renewable installation data of the Municipality.* *Average production rate of APERCA (Association of Renewable Energy*

			Professionals of Catalonia)
		Assessment method	*<u>CESBA assessment method:</u>* *To characterize the indicator's value, refer to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale.* *<u>Comments from Sant Cugat:</u>* *Data used are taken from the PAES (SEAP, Sustainability and Energy Action Plan) of Sant Cugat.* *Data from the PAES is a city level. It has been estimated to neighborhood level.* *The latest update of the PAES is from 2015* *The renewable energy production is calculated using the data collected from the Municipality about renewable public and private installations and using an average production rate; 700 kWh/m2·yr (thermal) and 333 kWh/m2·yr (photovoltaic)*
		Standard	*SEAP metodology published by DIBA (Diputació de Barcelona – Regional Public Administration)* *https://www.diba.cat/documents/10257 7937/126719106/Metodologia+PAESC _MAIG_18.pdf/b0f51601-1866-4783-a547-e80c828eb20d*
		Information source	*Estimated energy data of the PAES of Sant Cugat.* *Measured renewable installation data of the Municipality.* *Average production rate of APERCA (Association of Renewable Energy Professionals of Catalonia)*
C2.7	*Share of renewable energy on-site, relative to total final electric energy consumption for building operations*	*Assessment method*	*<u>CESBA assessment method:</u>* *Assessment method* *To characterize the indicator's value there are two options2018-12-16: use of estimated data* *OR Use of metered data* *Note* *For the evaluation of the actual performance of the urban area it is preferable to use metered data. If metered data aren't available,*

estimated data shall be used. Estimated data are used for evaluating retrofit scenarios in planning and decision-making processes.
In reporting the indicator's value, data sources must always be indicated.
Exported energy is the one delivered by technical systems through the system boundary (urban area) and used outside the system boundary. Exported energy is a benefit beyond the system boundary and it has not to be included in the calculation.
Use of estimated data:
1. In the calculation of the final electric energy consumption, the following energy uses must be considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting.
2. For each building in the local area, calculate the annual final electric energy consumption in kilowatt hours (kWh/year).
3. Sum the annual final electric energy consumption of each building up to an aggregated total annual final electric energy consumption (kWh/year).
4. For each building in the local area, calculate the annual final electric energy consumption from on-site renewable energy sources in kilowatt hours (kWh/year).
5. Sum the annual final electric energy consumption from on-site renewable sources of each building up to an aggregated total annual final electric energy consumption from on-site renewable sources (kWh/year).
6. Calculate the indicator as: annual total final electric energy consumption from on-site renewable sources / annual total final electric energy consumption.

Note
Calculations are based on EN 13790 using the quasi-steady state monthly method.
Use of metered data:
1. In the evaluation of the final electric energy consumption, the following energy uses must be considered: heating, cooling,

		ventilation, auxiliaries, domestic hot water and lighting water. *2. For each building in the local area, collect the metered annual final electric energy* *consumption) in kilowatt hours (kWh/year).* *3. Sum the annual final electric energy consumption of each building up to an aggregated total* *annual final electric energy consumption (kWh/year).* *4. For each building in the local area, collect the monitored annual final electric energy* *consumption from on-site renewable sources in kilowatt hours (kWh).* *5. Sum the annual final electric energy consumption from on-site renewable sources of each* *building up to an aggregated total annual final electric energy consumption from on-site renewable sources (kWh/year).* *6. Calculate the indicator as: annual total electric energy generation from on-site renewable* *energy sources / annual total final electric energy consumption.* *Refer also to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale..* *<u>Comments from Sant Cugat:</u>* *Data used are taken from the PAES (SEAP, Sustainability and Energy Action Plan) of Sant Cugat.* *Data from the PAES is a city level. It has been estimated to neighborhood level.* *The latest update of the PAES is from 2015* *The renewable energy production is calculated using the data collected from the Municipality about renewable public and private installations and using an average production rate; 333 kWh/m2·yr*
Standard		*SEAP metodology published by DIBA (Diputació de Barcelona – Regional Public Administration)*

			https://www.diba.cat/documents/10257 7937/126719106/Metodologia+PAESC _MAIG_18.pdf/b0f51601-1866-4783- a547-e80c828eb20d
C2.8	*Aggregated electrical energy generation from renewable sources located on public properties*	*Information source*	*Mesured data*
		Assessment method	*CESBA assessment method:* *Calculate the aggregated electrical energy generation from renewable sources located on public properties that is exported from the local area, in MWh per year.* *Comments from Sant Cugat:* *There is no generation of electrical energy from renewable sources located on public properties. Despite this, the criterion is used because it is interesting to use it and know the value in future improvement actions*
		Standard	

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	SPECIFICATIONS	
D1.2	*Total GHG Emissions from primary energy used in building operations*	*Information source*	*Estimated energy data of the PAES of Sant Cugat.* *Measured renewable installation data of the Municipality.* *Average production rate of APERCA (Association of Renewable Energy Professionals of Catalonia)*
		Assessment method	*CESBA assessment method:* *The scope of the indicator comprises the use stage of the building and includes the emissions correlated to the following energy uses: heating, cooling, ventilation, domestic hot water, lighting, auxiliaries.* *To characterize the indicator's value:* *1. For each building in the area calculate the emissions of CO2 eq. with the following formula:* $E = \left[\sum (Q_{fuel,i} \times LHV_i \times k_{em,i}) + (Q_{el} \times k_{em,el}) + (Q_{dh} \times k_{em,dh})\right]$ *Qfuel,I = annual quantity of i-th fuel (m3 or Kg)*

		Qel = annual quantity of electric energy from the grid (kWh) *Qdh = annual quantity of energy from district heating/cooling (kWh)* *LHVi = lower heating value of the i-th fuel (kWh/m3 or kWh/Kg)* *Kem,i = CO2 eq. emission factor of the i-th fuel (Kg CO2/kWh)* *Kem,i = CO2 eq. emission factor of the electric energy from the grid (Kg CO2/kWh)* *Kem,i = CO2 eq. emission factor of energy from district heating/cooling (Kg CO2/kWh)* *Calculate the aggregated annual total CO2 equivalent emissions from all buildings / total useful internal floor area of all buildings.* *Note* *In the calculation, the annual quantity of fuels, electric energy from the grid, energy from district heating/cooling can be metered or estimated. The source of data must always be clearly declared.* *Refer to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale.* *<u>Comments from Sant Cugat:</u>* *Data used are taken from the PAES (SEAP, Sustainability and Energy Action Plan) of Sant Cugat.* *Data from the PAES is a city level. It has been estimated to neighborhood level.* *The latest update of the PAES is from 2015* *The methodology to calculate the GHG emission is according the assessment methodology published by OCCC (Catalan Office of Climate Change)*
		SEAP metodology published by DIBA (Diputació de Barcelona – Regional Public Administration)
	Standard	*https://www.diba.cat/documents/102577937/126719106/Metodologia+PAESC_MAIG_18.pdf/b0f51601-1866-4783-a547-e80c828eb20d* *GHG emssion methodology published by OCCC (Catalan Office of Climate*

			Change) *http://canviclimatic.gencat.cat/es/oficina_catalana_del_canvi_climatic/*
D1.7	*Total GHG Emissions from buildings, private and public mobility*	*Information source*	*Estimated energy data of the PAES of Sant Cugat.*
		Assessment method	*CESBA assessment method:* *Estimate the annual aggregate GHG emissions emitted by all public and private buildings in the local area, averaged over a recent 3-year period.* *Estimate the annual aggregate GHG emissions emitted by all electric or fuel-powered vehicles operating in the local area* *Total the above and obtain the result in tonnes per 1000 residents* *Comments from Sant Cugat:* *Data used are taken from the PAES (SEAP, Sustainability and Energy Action Plan) of Sant Cugat.* *Data from the PAES is a city level. It has been estimated to neighborhood level.* *The latest update of the PAES is from 2015*
		Standard	*SEAP metodology published by DIBA (Diputació de Barcelona – Regional Public Administration)* *https://www.diba.cat/documents/102577937/126719106/Metodologia+PAESC_MAIG_18.pdf/b0f51601-1866-4783-a547-e80c828eb20d*

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	SPECIFICATIONS	
E1.1	*Availability of a public municipal water supply*	*Information source*	*Mesured water supply data from Municipality*
		Assessment method	*CESBA assessment method:* *1. Identify sections of the local area that are served by a municipal public water supply.* *2. Identify residential and non-residential end users.* *3. Ensure that each end user is equipped with one or more water meters.*

			4. Collect data on usage and assess whether water is consumed in an efficient way. *5. Place caps on consumption for various uses, and/or impose user charges to provide incentives for conservation.* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
E1.3	*Re-use of rainwater in residential buildings*	*Information source*	*Estimated using measured data from Meteorologiclal Service of Catalonia. http://www.meteo.cat/* *Installations of re-use of rainwater in residential building data from Municipality*
		Assessment method	*<u>CESBA assessment method:</u>* *Calculate the percentage of public wastewater that is disposed or treated* *<u>Comments from Sant Cugat:</u>* *There are only three facilities in the area with an accumulated capacity of 39.3 m3. The percentage of reuse is practically zero.*
		Standard	*Insert text here*
E1.6	*Consumption of potable water for residential population*	*Information source*	*Mesured water supply data from Municipality*
		Assessment method	*<u>CESBA assessment method:</u>* *The water consumption is calculated based on metered data when available or on the estimated use of water consuming appliances and sanitary fittings in the buildings. The scope of the criterion includes the use of both potable water and non-potable water and applies to processes for:* *- drinking water;* *- water for sanitation;* *- domestic hot water;* *- water for cleaning.* *1) For each non-residential public building, collect the monitored annual water consumptions for building operation. The consumption data must be estimated taking the average over 3 years period*

			(m3). *2) Sum the annual water consumption of each building up to an aggregated annual total water consumption (m3/year).* *3) Estimate the area of public buildings considered for the calculation.* *4) Calculate the indicator's value as: aggregated annual total water consumption / area of public buildings.* *Note:* *The public buildings that must be considered in the calculation are offices and schools (all levels, excluding universities).* *The consumption of water for dishwasher should not be considered for offices.* *Refer to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale, pp/ 17-19* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
E1.7	*Consumption of potable water for public non-residential building systems*	*Information source*	*Mesured water supply data from Municipality*
		Assessment method	*<u>CESBA assessment method:</u>* *The water consumption is calculated based on metered data when available or on the estimated use of water consuming appliances and sanitary fittings in the buildings. The scope of the criterion includes the use of both potable water and non-potable water and applies to processes for:* *- drinking water;* *- water for sanitation;* *- domestic hot water;* *- water for cleaning.* *1) For each non-residential public building, collect the monitored annual water consumptions* *for building operation. The consumption data must be estimated taking the average over 3 years period (m3).* *2) Sum the annual water consumption of each building up to an aggregated annual total water consumption (m3/year).* *3) Estimate the area of public buildings considered for the calculation.* *4) Calculate the indicator's value as: aggregated annual total water consumption*

			/ area of public buildings. Note: The public buildings that must be considered in the calculation are offices and schools (all levels, excluding universities). The consumption of water for dishwasher should not be considered for offices. Refer to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale, pp/ 17-19 <u>Comments from Sant Cugat:</u> No comments
		Standard	
E1.8	Consumption of potable water for irrigation purposes	Information source	Mesured water supply data from Municipality
		Assessment method	<u>CESBA assessment method:</u> Calculate the estimated consumption of potable water used for irrigation purposes in the local area, in m3/1000 m2. <u>Comments from Sant Cugat:</u> No comments
		Standard	
E2.1	Solid waste and recycling collection points	Information source	Solid waste and recycling collection points data from Municipality
		Assessment method	<u>CESBA assessment method:</u> The estimated percent of small residential and non-residential buildings in the local area requiring access to pick-up points for solid waste and recycling, located within a walking distance of 100 m. is: <u>Comments from Sant Cugat:</u> No comments
		Standard	
E2.2	Separate collection and disposal of solid waste and recycling	Information source	Solid waste and recycling data from Municipality
		Assessment method	<u>CESBA assessment method:</u> 1. Identify the total solid waste generated during the operation of key residential and commercial buildings over a 3-year period. 2. Identify how much of this waste was separated into separate waste

			streams. *3. Obtain data on the percent of waste that was recycled.* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
E2.6	*Public wastewater that is disposed of treated*	*Information source*	*Solid waste and recycling data from Municipality*
		Assessment method	*<u>CESBA assessment method:</u>* *Calculate the percentage of public wastewater that is disposed or treated.* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	

F- ENVIRONMENT

CRITERION	INDICATOR	SPECIFICATIONS	
F1.3	*Recharge of groudwater throught permeable paving or landscaping*	*Information source*	*Estimated permeable paving data from Municipality*
		Assessment method	*<u>CESBA assessment method:</u>* *1. Calculate the size of the urban area, m^2* *2. Calculate the size of the surfaces with a different paving or occupied by constructions in the urban area (i.e. green areas, asphalt paving, surfaces occupied by buildings, etc.)* *3. Calculate the real permeability of soil considering the permeability coefficient of each surface.* *$Sa,per = \Sigma\ Sa,ı \times \alpha i$* *Sa,i = i-th surface in the area, m2* *αi = permeability coefficient of the i-th surface (Reference permeability coefficients: Grass = 1, Gravel = 0.9, Sand = 0.9, Plastic gratings filled with land/grass = 0.8, Concrete gratings leaning on the grass = 0.6, Concrete gratings leaning on gravel = 0.6, Interlocking elements leaning on sand/ gravel = 0.3, Interlocking elements leaning on concrete pavement = 0, Continuous pavements leaning on concrete = 0, Asphalt = 0)* *4. Calculate the indicator's value as*

			the ratio of the real permeability of soil to the size of the urban area. *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
F1.10	*Degree of athmospheric light pollution caused by exteior public lighting systems*	*Information source*	*Athmospheric light pollution data from "Light Pollution Map" published by Goverment of Catalania http://mediambient.gencat.cat/es/05_ambits_dactuacio/atmosfera/contaminacio_luminica/index.html*
		Assessment method	*<u>CESBA assessment method:</u>* *Night sky brightness (NSB) is quantified aa the brightness of skyglow. The measured NSB is a combination of the scattered light from artificial lighting sources and natural emissions. Technically, NSB refers to the flux of "anything" coming from the night sky per unit surface per unit solid angle. Typical units of NSB include magnitude per arcsecond square (mag/arcsec2) and candela per meter square (cd/m2).* *<u>Comments from Sant Cugat:</u>* *The athmospheric light pollution is kwon throught the "Light Pollution Map" published by Goverment of Catalonia. The data is mesured in (mag/arcsec2) and is converted to cd/m2) using theSky Brightness Nomogram www.darkskiesawareness.org/nomogram.php*
		Standard	*theSky Brightness Nomogram www.darkskiesawareness.org/nomogram.php*
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	*Information source*	*Mesured data from Department of Territory and Sustainability of the Generalitat de Catalunya (Government of Catalonia) http://territori.gencat.cat/es/inici/*
		Assessment method	*<u>CESBA assessment method:</u>* *To characterize the indicator's value:* *1. Daily test air samples in accordance with national or regional procedures over a period of one year.* *2. Evaluate the number of days exceeding the daily limits in a year.*

			Refer to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale. *<u>Comments from Sant Cugat:</u>* *Daily limit value calculated is the daily averages of the year do not exceed the value of 50 µg / m3 in more than 35 occasions*
		Standard	
F3.1	*Green zones & recreation areas availability*	*Information source*	*Mesured data form Municipal Urban Planning*
		Assessment method	*<u>CESBA assessment method:</u>* *Calculate (Green zones & Recreation areas m2 / Number of inhabitants)* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
F3.2	*Green zones & recreation areas accessibility*	*Information source*	*Mesured data form Municipal Urban Planning*
		Assessment method	*<u>CESBA assessment method</u>* *Calculate the average distance to green zones and recreation area for a sample of key residential buildings in the area.* *Parks & Open Spaced are defined as:* *• Public garden (1000m), green spaces (500m), parks and other facilities for pedestrians and cyclists* *• Outdoor sport facilities with freedom of access (1300m)* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
F3.3	*Green zones & recreation areas density*	*Information source*	*Mesured data from Municipal Urban Planning*
		Assessment method	*<u>CESBA assessment method</u>* *Calculate (Green zones & Recreation areas m2 / Urban area square meters)* *<u>Comments from Sant Cugat:</u>*

			No comments
		Standard	
F3.6	*Tree coverage for shade and management of local ambient temperatures*	*Information source*	*Mesured data from satellit map*
		Assessment method	*<u>CESBA assessment method</u>* *Calculate the area of tree planting in the local area relative to total area, with trees suitable for shading and reduction of ambient temperatures through evapo-transpiration.* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
F3.9	*Presence or potencial for wildlife corridors*	*Information source*	*Mesured data from Municipal Urban Planning and from satellit map*
		Assessment method	*<u>CESBA assessment method</u>* *The continuity of green areas more than 100 m. in width, uninterrupted by structures or infrastructure, and traversing the whole local area, to support small wildlife.* *<u>Comments from Sant Cugat:</u>* *The existence of torrents and streams in the area is an opportunity to create wildlife corridors.*
		Standard	

G- SOCIAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G1.2	*Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons*	*Information source*	*Mesured data from Municipality*
		Assessment method	*<u>CESBA assessment method</u>* *1. Identify key pedestrian paths or other public routes that may be frequently used by persons with physical disabilities.* *2. Assess the accessibility of exterior parking and pedestrian routes, considering all major disability types.* *3. Establish the percent of public pedestrian routes that may be considered accessible.*

			Comments from Sant Cugat: *It has been taken in acount the acces to the public buildings as a public route.*
		Standard	
G1.4	*Ease of access to and use of public transport for physically disabled persons*	*Information source*	*Mesurated data from Municipality*
		Assessment method	*CESBA assessment method* *Evaluate the ease of access to and use of public transport for physically disabled persons.* *Comments from Sant Cugat:* *All buses an bus stops are accessible*
		Standard	
G2.1	*Performance of the public transport system*	*Information source*	*Mesured data from Municipality*
		Assessment method	*CESBA assessment method* *To characterize the indicator's value:* *1- Calculate the percentage of the inhabitants in the area that are within 400 meters walking distance of at least one public transportation service stop (bus, tram, metro).* *Refer to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale.* *Comments from Sant Cugat:* *All the inhabitants of the area are at least 400 meters from a service stop.*
		Standard	
G2.3	*Measures to limit traffic of cars and trucks passing through the local area*	*Information source*	*Estimated data from Municipality*
		Assessment method	*CESBA assessment method* *1. Identify sections of the urban road network that may be used by through traffic;* *2. Identify the designed traffic capacity of each section;* *3. Assess the proportion of current vehicle traffic volumes generated by local and through traffic at non-peak and peak traffic periods;* *4. Assess secondary impacts of high*

			traffic volumes on bicyclists, pedestrians and the function of retail, commercial or residential buildings facing the roads. *5. Summarize the situation by estimating the impact of local vehcile traffic on the peak road capacity.* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
G2.4	*Quality of pedestrian and bycycle network*	*Information source*	*Mesured data from Municipal Urban Planning and from satellit map*
		Assessment method	*<u>CESBA assessment method</u>* *To characterize the indicator's value:* *1. Estimation of the number of inhabitants in the area* *2. Calculation of the walkway meters of dedicated pedestrian paths in the area (A)* *3. Calculation of the meters of bicycle paths in the area (B)* *4. Calculate the indicator's value as: (A+B) / 100 inhabitants* *Note* *□ Pedestrian paths not part of a "shared space" must be safe to be considered (physicall separated from traffic roads)* *□ Bicycle paths not part of a "shared space" must be safe to be considered (physically separated from traffic roads)* *□ A "shared space" is an urban design approach that minimizes the segregation between modes of road user (car, pedestrian, bicycle, etc.) in order to make safe space for every type of mobility; the shared space is to be used by anyone. This can be done through minimizing traffic signs, road surface markings, enforcing speed reduction down to 15-20 kmh. Shared space is here understood in a broad definition including the different philosophies and implementation methods in force in Europe. For the calculation, it is necessary to evaluate the linear meters of all the streets included in a shared space.* *Refer to separate PDF file: D3.4.2*

			CESBA MED KPIs - Urban Scale. *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
G2.5	*Availability of sheltered bicyble parking facilities*	*Information source*	*Mesured data from Municipality*
		Assessment method	*<u>CESBA assessment method</u>* *Calculate the number of sheltered bicycle parking spaces relative to the total population of the local area.* *<u>Comments from Sant Cugat:</u>* *No comments*
		Standard	
G3.1	*Availability of a broadband communication network*	*Information source*	*Mesured data from Municipality*
		Assessment method	*<u>CESBA assessment method</u>* Calculate the percentage of the local area in which a broadband communication network is available. *<u>Comments from Sant Cugat:</u>* *All the inhabitants of the area have availability of a broadband communication network.*
		Standard	
G3.2	*Access to a broadband communication network*	*Information source*	*Mesured data from Municipality*
		Assessment method	*<u>CESBA assessment method</u>* *Identify all the dwellings that have access to high-speed Internet connection, estimate the occupancy, and divide the value for the overall population of the area.* *<u>Comments from Sant Cugat:</u>* *All the inhabitants of the area have access of a broadband communication network.*
		Standard	
G4.2	*Availability and proximity of key services*	*Information source*	*Mesured data from Municipality and satellit map*

		Assessment method	*<u>CESBA assessment method</u>* *Convenient locations of key human services for access by local residents is a major factor in reducing the use of private vehicles and in ensuring that residents can obtain access to the services they need. Key human services include health clinics, police stations, social welfare offices etc.* *Key services are:* *1. Education (schools, kindergartens, education centers, etc.)* *2. Health center (hospitals, medical ward, medical center, etc.)* *3. Law enforcement areas (police station, etc.)* *4. Sport facilities* *5. Food shops* *6. Bank* *7. Post office* *8. Pharmacy* *9. Shopping center* *It is possible to consider only one key service from each of the nine categories. Private services can be considered.* *Refer to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale.* *<u>Comments from Sant Cugat:</u>* *All the inhabitants of the area have full availibity of key services.*
		Standard	
G4.3	*Availability and proximity of a primary school*	*Information source*	*Mesured data from Municipality and satellit map*
		Assessment method	*<u>CESBA assessment method</u>* *Calculate the percentage of resident population with access to a primary school within a distance of 500 m.* *<u>Comments from Sant Cugat:</u>* *All the inhabitants of the area availibity and proximity of a primary school.*
		Standard	
G4.4	*Availability and proximity of a secondary school*	*Information source*	*Mesured data from Municipality and satellit map*
		Assessment method	*<u>CESBA assessment method</u>* *Calculate the percentage of resident population with access to a secondary school within a distance of 1 km.* *<u>Comments from Sant Cugat:</u>*

			All the inhabitants of the area availibity and proximity of a primary school.
		Standard	
G4.6	*Availability and proximity of leisure facilities*	*Information source*	*Mesured data from Municipality and satellit map*
		Assessment method	*<u>CESBA assessment method</u>* *For the indicator of performance calculation proceeds as follows:* *1. Identify the facilities for leisure in the area, distinguishing in sports and cultural structures.* *2. Calculate the actual distance on foot between these nodes and access the buildings.* *3. Calculate the percentage of the population that is less than 1km from at least one service for each of the two categories.* *.* *<u>Comments from Sant Cugat:</u>* *All the inhabitants of the area availibity and proximity of leisure facilities..*
		Standard	
G4.7	*Access to indoor gymnastic facilities for winter use*	*Information source*	*Mesured data from Municipality and satellit map*
		Assessment method	*<u>CESBA assessment method</u>* *Calculate the percentage of resident population of the local area who have access within a distance of 1 km. to an indoor gymnastic facility for winter use.* *<u>Comments from Sant Cugat:</u>* *All the inhabitants of the area have access to indoor gymnastic faciliteies for winter use.*
		Standard	
G5.2	*Residents' access to and use of urban agricultural plots*	*Information source*	*Mesured data from Municipality and satellit map*
		Assessment method	*<u>CESBA assessment method</u>* *Percent of resident population with access to public urban agriculture plots within a distance of 1 km.* *<u>Comments from Sant Cugat:</u>* *There is a public urgan agriculture plot*

			into the area.
		Standard	
G6.3	*Community involvement in urban planning activities*	*Information source*	*Estimated data from Municipality*
		Assessment method	*<u>CESBA assessment method</u>* *The assessment is about - how much citizens (inhabitants and users) are integrated to the planning process?* *- How much is their opinion is taken into consideration?* *- How much do they drive the planning agenda?* *- Are people "planned for" by external experts or are they part of the decision making process?* *- Is there a dichotomy between the planners holding power (and supposedly knowledge) and citizens?* *The Arnstein ladder, built by Sherry Arnstein (SA), is the reference for community planning assessment. Her work remains the basis of current research on citizen involvement in planning. The proposed assessment process is therefore based on the SA ladder and further development from Hélène Chelzen and Anne Jégou in 2015 which tends to take into consideration recent evolution in practices.* *Refer to separate PDF file: D3.4.2 CESBA MED KPIs - Urban Scale.* *<u>Comments from Sant Cugat:</u>* *Degrees of citizen power: Partnership, delegated power and citizen power (in the Arnstein ladder) partially in after delivery phase.*
		Standard	
G7.2	*Compatibility of public open space with local cultural values*	*Information source*	*Estimated data from Municipality*
		Assessment method	*<u>CESBA assessment method</u>* *Evaluate the compatibility of public open spaces in the local area with traditional cultural values in the region.* *<u>Comments from Sant Cugat:</u>* *The character of public open spaces in the local area are partially compatible with traditional cultural values in the*

	region.
	Standard

DIAGNOSIS

a. Performance scores

	SCORE
A – BUILT URBAN SYSTEMS	
A1 – Urban Structure and Forme	
A1.7 - Conservaiton of Land	*-1.00*
A2 – Transportation infrastructure	
A2.1 - Walking distance to public transport for area residents	*5.00*
A2.9 - On-street and indoor parking spaces relative to local population	4.20
B – ECONOMY	
B1 **– Economic Structure and Value**	
B1.2 – Affordability of housing rental	*0.20*
B2 **– Economic Activity**	
B2.2 – Average annual per-capita income of residents	*5.00*
B3 – Cost and Investment	
B3.3 – Operating energy costs for public buildings	3.20
C – ENERGY	
C1 – Non-renwable energey	
C1.1 – Total final thermal energy consumption for building opeerations	*3.40*
C1.4 – Total final electrical energy consumption for building oprations	*-1.00*
C1.7 – Total primary energy demand for building operations	*1.40*
C1.20 – Energy consumption of public lighting	*0.00*
C1.21 – Energy consumption of local public transport	*5.00*
C2 – Renewable and Decarbonised energy	
C2.1 – Share of renewable energy on-site, relative to total final thermal energy consumption for building operations	*-1.00*
C2.4 – Share of renewable energy on-site, relative to total primary thermal energy consumption for building operations	*-1.00*
C2.7 – Share of renewable energy on-site, relative to total final electric energy consumption for building operations	*-1.00*
C2.8 – Aggregated electrical energy generation from renewable sources located on public properties	*-1.00*
D – ATMOSPHERIC EMISSIONS	
D1 – Atmospheric emissions	
D1.2 – Total GHG Emissions from primary energy used in building operations	*-1.00*
D1.7 – Total GHG Emissions from buildings, private and public mobility	*0.00*
E – NON RENEWABLE SOURCES	
E1 – Potable water, stormwater and greywater	
E1.1 – Availability of a public municipal water supply	*5.00*
E1.3 – Re-use of rainwater in residential buildings	*-1.00*
E1.6 – Consumption of potable water for residential population	*5.00*
E1.7 – Consumption of potable water for public non-residential building systems	*5.00*
E1.8 – Consumption of potable water for irrigation purposes	*4.60*
E2 – Solid and Liquid Wastes	
E2.1 – Solid waste and recycling collection points	*5.00*
E2.2 – Separate collection and disposal of solid waste and recycling	*0.60*
E2.6 – Public wastewater that is disposed of treated	*5.00*
F – ENVIRONMENT	

F1 – Environment impacts	
F1.3 – Recharge of groudwater throught permeable paving or landscaping	*-1.00*
F1.10 – Degree of athmospheric light pollution caused by exteior public lighting systems	*0.00*
F2 – Outdoor environmental quality	
F2.3 – Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period	*5.00*
F3 – Ecosystems and landscapes	
F3.1 – Green zones & recreation areas availability	*-1.00*
F3.2 – Green zones & recreation areas accessibility	*5.00*
F3.3 – Green zones & recreation areas density	*-1.00*
F3.6 – Tree coverage for shade and management of local ambient temperatures	*-1.00*
F3.9 – Presence or potencial for wildlife corridors	*3.00*
G – SOCIAL ASPECTS	
G1 – Safety and Accessibility	
G1.2 – Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons	*3.20*
G1.4 – Ease of access to and use of public transport for physically disabled persons	*5.00*
G2 – Traffic and Mobility Services	
G2.1 – Performance of the public transport system	*5.00*
G2.3 – Measures to limit traffic of cars and trucks passing through the local area	*3.00*
G2.4 – Quality of pedestrian and bycycle network	*1.60*
G2.5 – Availability of sheltered bicyble parking facilities	*-1.00*
G3 – Communication services	
G3.1 – Availability of a broadband communication network	*5.00*
G3.2 – Access to a broadband communication network	*5.00*
G4 – Public and private facilities and services	
G4.2 – Availability and proximity of key services	*5.00*
G4.3 – Availability and proximity of a primary school	*5.00*
G4.4 – Availability and proximity of a secondary school	*5.00*
G4.6 – Availability and proximity of leisure facilities	*5.00*
G4.7 – Access to indoor gymnastic facilities for winter use	*5.00*
G5 – Local Food	
G5.2 – Residents' access to and use of urban agricultural plots	*5.00*
G6 – Management and community involvement	
G6.3 – Community involvement in urban planning activities	*2.00*
G7 – Society, Culture and Heritage	
G7.2 – Compatibility of public open space with local cultural values	*3.00*

b. Key Performance Indicators value

KPI	Indicator	Unit of measure	Value
A 1.7 Conservation of Land	Area of undeveloped land with ecological or agricultural value / area of the neighborhood	%	2.74
B.3.3 Running costs energy for public buildings	Aggregated annual operating energy cost per aggregated indoor useful floor area	Euro/m^2/year	7.10
C.1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption per aggregated indoor useful floor area	kWh/m^2/year	47.51
C.1.4 Total final electric energy consumption for building operations	Aggregated annual total final electric energy consumption per aggregated indoor useful floor area	kWh/m^2/year	33.26
C.1.7 Total primary energy demand for building operations	Aggregated annual total primary energy consumption per aggregated indoor useful floor area	kWh/m2/year	124.63
C.2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Annual total thermal energy consumption from on-site renewable energy sources / annual total final thermal energy consumption	%	1.59
C.2.7 Share of electric energy generation from on-site renewable sources on final electric energy	Share of renewable electric energy in final electric energy consumptions	%	0.03
D.1.2 Total GHG Emissions from primary energy used in building operations	CO2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	31.23
E.1.6 Consumption of potable water for residential population	Annual potable water consumption per occupant	m^3 per occupant*yr	49.12
E.1.7 Consumption of potable water for non-residential building systems	Annual water consumption per occupant	m^3 /m^2	4.95
F.1.3 Recharge of groundwater through permeable paving or landscaping	Area of permeable surfaces on total neighborhood area	%	15.37
F.2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	Number of days exceeding the daily limits in a year	days/year	6.67
G.2.1 Performance of the public transport	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop	%	100
G.2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated pedestrian paths and meters of bicycle path or “shared space” per 100 inhabitants.	m/100 inhabitants	16.18
G.4.2 Availability and proximity of key services	Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services.	%	100
G.6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Level (score)	2

c. SWOT analysis

STRENGTHS	WEAKNESSES
• The strong participation of citizens in everything that happens in the city, more if it is about issues related to sustainability. • Excellent management of waste collection, recycling, water supply and sewerage service. • All key services (health, sports, education, leisure and commercial) are provided in the area. • Broadband communications and public transport are full covered in the area.	• The area is urbanized and consolidated, so it is not easy to modify it urbanistically. • Private data are not available and are finally estimated (especially energy consumption and citizen behavior). • The production of energy through renewable sources in public plots is insignificant. • Most of the buildings were built before the 1980s, so they are energetically inefficient. • High GHG emissions for transport and building operations.
OPPORTUNITIES	**THREATS**
• Soon redevelopment projects will be carried out with the aim of converting some streets and roads into pedestrian zones and where the circulation of private vehicles will be restricted. • The area has several plots were RES can be installed.	• The price of rental housing has increased significantly in recent years. • Climate change will affect the quality of life in the area.

3. STRATEGIC DEFINITION

a. Performance targets

Environmental targets	*The environmental targets are focused in following issues:* *- Reduce GHG emissions in the area.* *- Reduce the energy consumption of owners of private buildings (domestic consumption).* *- Increase the energy generated from renewable sources within the area (in public and private plots).* *- Increase the percentage of reusable rainwater.*
Social targets	*Participating and raising awareness among citizens is the main social objective. On the one hand, the citizens of Sant Cugat are very active and want to be empowered in urban management towards a sustainable city, but on the other hand, they do not easily share their private data (energy consumption and citizen behavior).* *This private data is the key to success because it represents the most energy consumed in the area. Having precise values of energy consumption and how energy is used allows evaluation of the level of sustainability of the neighborhoods and how the actions to be implemented can modify the quality of life in the neighborhood.*
Economy targets	*Because private buildings account for most of the energy consumed, owners are who must make the investment. Without this private investment, any action will not have a great influence on the final result and the objectives of the 2030 Agenda will not be achieved.* *The public administration cannot therefore expect a private action and has to be more active; the co-financing of this investment, tax discounts, technical advice or whatever to reduce the bill should be the main economic objective to overcome.*

A – BUILT URBAN SYSTEMS			
A1 – Urban Structure and Forme			
A1.7 - Conservaiton of Land		Actual value	2.74
Area of undeveloped land with ecological or agricultural value / area of the neighborhood	%	Target value	10.00
A2 – Transportation infrastructure			
A2.1 - Walking distance to public transport fo%r area residents		Actual value	100.00
Percent of residential buildings located within 500m. of a public transport stop.	%	Target value	100.00
A2.9 - On-street and indoor parking spaces relative to local population		Actual value	33.30
Proximity to intermodal plateform.	%	Target value	25.00
B – ECONOMY			
B1 – **Economic Structure and Value**			
B1.2 – Affordability of housing rental		Actual value	30.00
Percentage of the average salary of the lowest quintile of the population used for rental payments.	%	Target value	24.00
B2 – **Economic Activity**			
B2.2 – Average annual per-capita income of residents		Actual value	136.25
Average per-capita income of residents in the local area realtive to that of the urban region as a whole.	%	Target value	100.00
B3 – Cost and Investment			
B3.3 – Operating energy costs for public buildings		Actual value	7.10
Aggregated annual operating energy cost per aggregated indoor useful floor area	€/m^2/yr	Target value	3.3
C – ENERGY			
C1 – Non-renwable energy			
C1.1 – Total final thermal energy consumption for building opeerations		Actual value	47.51
Aggregated annual total final thermal energy consumption per aggregated indoor useful floor area	kWh/m^2/yr	Target value	33.8
C1.4 – Total final electrical energy consumption for building oprations		Actual value	33.26
Aggregated annual total final electric energy consumption per aggregated indoor useful floor area	kWh/m^2/yr		18.5
C1.7 – Total primary energy demand for building operations		Actual value	124.63
Aggregated annual total primary energy consumption per aggregated indoor useful floor area	kWh/m^2/yr		94.4
C1.20 – Energy consumption of public lighting		Actual value	1.00
Annual electrical consumption by outdoor public lighting systems	kWh/m^2	Target value	0.8
C1.21 – Energy consumption of local public transport		Actual value	3,009.76
Energy efficiency of local public transport	pax.km/MJ	Target value	3,009.76

C2 – Renewable and Decarbonised energy			
C2.1 – Share of renewable energy on-site, relative to total final thermal energy consumption for building operations		Actual value	1.59
Annual total thermal energy consumption from on-site renewable energy sources / annual total final thermal energy consumption	%	Target value	25
C2.4 – Share of renewable energy on-site, relative to total primary thermal energy consumption for building operations		Actual value	0.88
Aggregated total annual primary energy consumption from on-site renewable energy sources / aggregated total annual primary energy consumption	%	Target value	20
C2.7 – Share of renewable energy on-site, relative to total final electric energy consumption for building operations		Actual value	0.03
Share of renewable electric energy in final electric energy consumptions	%	Target value	15
C2.8 – Aggregated electrical energy generation from renewable sources located on public properties		Actual value	0.00
Electrical energy generation from renewable sources from public properties	MWh/year	Target value	20
D – ATMOSPHERIC EMISSIONS			
D1 – Atmospheric emissions			
D1.2 – Total GHG Emissions from primary energy used in building operations		Actual value	31.23
CO2 equivalent emissions per useful internal floor area per year	KgCO2eq/m2/yr	Target value	18
D1.7 – Total GHG Emissions from buildings, private and public mobility		Actual value	3,243.08
Aggregate GHG emissions from buildings, pubblic and private transport fuels	TnCO2eq/1,000hab	Target value	3,243.08
E – NON RENEWABLE SOURCES			
E1 – Potable water, stormwater and greywater			
E1.1 – Availability of a public municipal water supply		Actual value	100.00
Availability of a public municipal water supply to all permanent buildings in the area.	%	Target value	100.00
E1.3 – Re-use of rainwater in residential buildings		Actual value	0.00
Share of rainwater collected from roofs of residential buildings.	%	Target value	20.00
E1.6 – Consumption of potable water for residential population		Actual value	49.12
Annual potable water consumption per occupant	m^3/ occupant/yr	Target value	49.12
E1.7 – Consumption of potable water for public non-residential building systems		Actual value	4.95
Annual water consumption per occupant	m^3/ m^2/yr	Target value	4.95
E1.8 – Consumption of potable water for irrigation purposes		Actual value	0.45
Potable water used for irrigation purposes.	m^3/ 1.000 m^2/yr	Target value	0.45

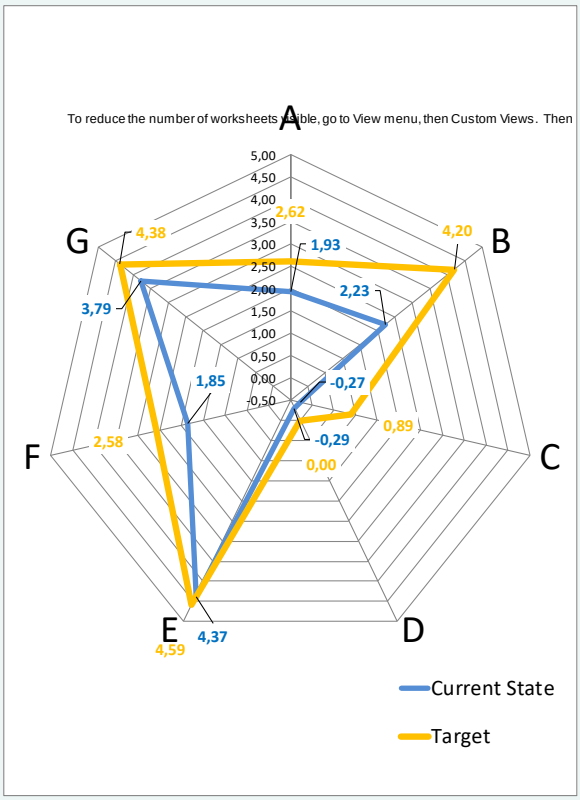
E2 – Solid and Liquid Wastes			
E2.1 – Solid waste and recycling collection points		Actual value	100.00
Proximity of the resident population to the solid waste and recycling collection point.	%	Target value	100.00
E2.2 – Separate collection and disposal of solid waste and recycling		Actual value	44.29
Separated collection and disposal of solid waste and recycling.	%	Target value	61.00
E2.6 – Public wastewater that is disposed of treated		Actual value	100.00
Perecent of public wastewater that is disposed or treated.	%	Target value	100.00
F – ENVIRONMENT			
F1 – Environment impacts			
F1.3 – Recharge of groudwater throught permeable paving or landscaping		Actual value	15.37
Area of permeable surfaces on total neighborhood area	%	Target value	20.00
F1.10 – Degree of athmospheric light pollution caused by exteior public lighting systems		Actual value	3.00
Light pollution caused by exterior public lighting systems.	mcd/m^2	Target value	1.90
F2 – Outdoor environmental quality			
F2.3 – Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period		Actual value	6.67
Number of days exceeding the daily limits in a year	day/yr	Target value	6.67
F3 – Ecosystems and landscapes			
F3.1 – Green zones & recreation areas availability		Actual value	3.41
Area of permeable surfaces on total neighborhood area	m^2/residents	Target value	5.00
F3.2 – Green zones & recreation areas accessibility		Actual value	150
Accessibility of green spaces within the area.	m	Target value	150
F3.3 – Green zones & recreation areas density		Actual value	8.57
Density of green spaces within the area.	%	Target value	20.00
F3.6 – Tree coverage for shade and management of local ambient temperatures		Actual value	12.14
Reduction of ambient temperatures through evapo-transpiration.	%	Target value	20.00
F3.9 – Presence or potencial for wildlife corridors		Actual value	3
Continuity of green areas to support small wildlife.	Level (score)	Target value	4
G – SOCIAL ASPECTS			
G1 – Safety and Accessibility			
G1.2 – Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons		Actual value	81.67
Percent of sidewalks and other pedestrian ways that are accessible for use by physically disabled persons.	%	Target value	100.00
G1.4 – Ease of access to and use of public transport for physically disabled persons		Actual value	100.00
Features of public transport to	%	Target value	100.00

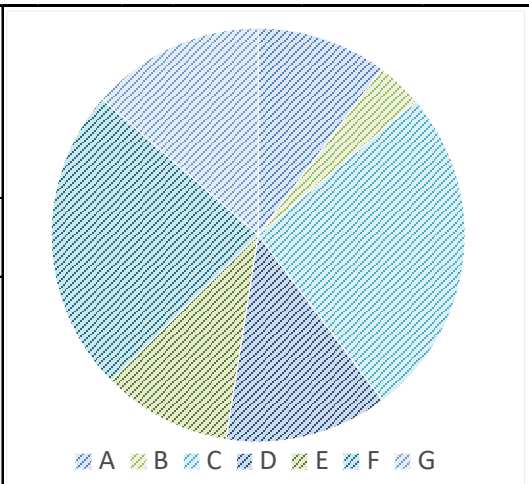
facilitate access physically disabled persons, such as kneeling buses and wide entries..			
G2 – Traffic and Mobility Services			
G2.1 – Performance of the public transport system		Actual value	100.00
Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop	%	Target value	100.00
G2.3 – Measures to limit traffic of cars and trucks passing through the local area		Actual value	3
The effectiveness of regulations or financial measures designed to limit number of vehicles passing at peak hours.	Level (score)	Target value	5
G2.4 – Quality of pedestrian and bicycle network		Actual value	16.18
Total walkway meters of dedicated pedestrian paths and meters of bicycle path or “shared space” per 100 inhabitants	m/100 inhabitants	Target value	26.00
G2.5 – Availability of sheltered bicycle parking facilities		Actual value	0.63
Sheltered bicycle parking spaces.	%	Target value	20.00
G3 – Communication services			
G3.1 – Availability of a broadband communication network		Actual value	100.00
Local area with available broadband communication network.	%	Target value	100.00
G3.2 – Access to a broadband communication network		Actual value	100.00
Percentage of population with access to broadband communication.	%	Target value	100.00
G4 – Public and private facilities and services			
G4.2 – Availability and proximity of key services		Actual value	100.00
Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services.	%	Target value	100.00
G4.3 – Availability and proximity of a primary school		Actual value	100.00
Percentage of population near a primary school.	%	Target value	100.00
G4.4 – Availability and proximity of a secondary school		Actual value	100.00
Percentage of population near a secondary school.	%	Target value	100.00
G4.6 – Availability and proximity of leisure facilities		Actual value	100.00
Percent of residential buildings located within a distance of 1 km. of public or commercial leisure facilities.	%	Target value	100.00
G4.7 – Access to indoor gymnastic facilities for winter use		Actual value	100.00
Percent of residential buildings located near an indoor gymnastic facility for winter use.	%	Target value	100.00
G5 – Local Food			
G5.2 – Residents’ access to and use of urban agricultural plots		Actual value	100.00
Percentage of the population with	%	Target value	100.00

access to public urban agricolture plots.			
G6 – Management and community involvement			
G6.3 – Community involvement in urban planning activities		Actual value	2
Level of involvement of users in urban planning	Level (score)	Target value	3
G7 – Society, Culture and Heritage			
G7.2 – Compatibility of public open space with local cultural values		Actual value	3
Compatibility with local area traditional values of local public open spaces, including major uses, dimensions and adjacent uses.	Level (score)	Target value	5

Performance results for an urban area performance assessment in Polytechnic Area, a neighbourhood of Torino

CESBA MED SNTool v4	Max	15Jun18





The number available criteria is:	177	The number active criteria is:	49
The number of active mandatory criteria with a score of less than 3 is:	10	Active low-level mandatory parameters:	16

	Issue	Active Weights	Scores	Target Scores
A	Built Urban Systems	10,2%	1,93	2,62
B	Economy	3,6%	2,23	4,20
C	Energy	25,9%	-0,27	0,89
D	Atmospheric emissions	12,7%	-0,29	0,00
E	Non-Renewable Resources	10,1%	4,37	4,59
F	Environment	23,8%	1,85	2,58
G	Social Aspects	13,6%	3,79	4,38
	Weighted total score	100,0%	1,57	2,32

0 = Acceptable Practice; 3 = Good Practice; 5 = Best Practice

b. Constraints and restrictions

CONSTRAINTS / RESTRICTIONS	
Legal constraints	• *The General Metropolitan Plan (PGM), which regulates urban planning in the Metropolitan Area of Barcelona, municipality of Sant Cugat del Vallès is part of the area.* *Any modification of the classification of the plots (new green zones, energy fields, etc) must be in accordance with what this regulation establishes. Any change is not easy because both neighborhoods are already consolidated.* • *Organic Law 3/2018, of December 5, on the protection of personal data and guarantee of digital rights.* *The law guarantees digital rights, but prevents power supply companies to share the energy consumption of citizens. When they did occaionaly, the data was inclomleted.* *If the law does not change, the only way to obtain energy consumption data must come from the citizens and this is not a easy point to reach.* • *Royal Decree 1699/2011, of 11-18-2011, regulating the connection to the network of small power electric power production facilities.* *The Spanish regulation has changed last years in bad way because it didn't promoute the self consumption.*
Technical constraints	• *Most of buildings were constructed in 80s, so they are potencialy refurbished to reach the sustainable actions. Unfortunately, any intervention in existing buildings has thecnical constraints and every particularized case have to be studied (roof available to install RES, non desire shadows form the other buildings, possibility to replace the facade issolation, etc...).* • *The Technical Building Code (CTE) is the regulatory framework that establishes the requirements that buildings must meet in relation to the basic safety and habitability requirements established in Law 38/1999 of November 5, on Building Regulation (LOE).* *The basic quality requirements that buildings must comply with refer to safety and habitability issues*
Financial constraints	• *Because private buildings account for most of the energy consumed and consequently the GHG emssions, owners are the ones who must make the investment. Without this private investment, any action will*

	not have a great influence on the final results and the objectives of the 2030 Agenda will not be achieved. *Therefore, any intervention will need a cofinancing from the public administration to be success.* • *The sale and rental price of the apartments has increased more than 30% in the last 3 years. This is not a point in favor because the inhabitants can allocate less money to invest in actions in favor of sustainability.*
Environmental condition constraints	• *The physical territory is not a restriciton in teh oreographic sense bices it is falt terriotry with a slihg slope. In any casds, it con not be modified, so the actions to be impementd must be adpated to this territory*
Stakeholder based restrictions	• *The involment of the citizents (sharing energy consumption data and behaivour data) is essential for success.*
Other relevant constraints	

4. DECISION MAKING

a. Description of scenarios

NAME OF SCENARIO	DESCRIPTION
1. Increase of the pedestrian streets of the neighborhoods.	Just as it was done with the urban historic center 20 years ago, with the so-called Pedestrian Master Plan of the nucleus. It is intended to replicate said plan to the neighborhoods of the pilot test. The results achieved with this plan, developed by 90%, have been more than satisfactory. The restriction of circulation of private vehicles only for the neighbors and in certain hours of loading and unloading of distribution vehicles, allowed to return the space to pedestrians and users of more sustainable mobility (for example, bicycles and scooters). As a result, a pacified area was created, practically without noise and annoying emissions, with an activated commercial zone, with the possibility of increasing the number of tree species that reduced the effect of the island of energy and turned the neighborhood into a very more livelable.
2. Subsidies and discounts of municipal taxes for the energy reform of private residential buildings.	The great challenge of cities at the sustainability level is the involvement of all their citizens to collaborate in reaching the objectives of the 2030 Agenda. Much of the energy consumption and GHG emissions come from private activity. As much as the public administration makes efforts to improve the area and urban infrastructures, without an important remodeling of the buildings of private ownership the impact will never be enough. This implies an important economic effort that not always a private owner can carry out. It is at this point that the public administration must collaborate with subsidies, discounts on municipal taxes and / or economic benefits. The scenario created has foreseen a reform of 5% of the total of existing buildings under two possible actions subsidized from the city council or any other public administration - Photovoltaic panels that produce 30% of total final electrical energy of buildings. - New insulation of the building envelope that reduces 30% of the total final thermal energy of the buildings.

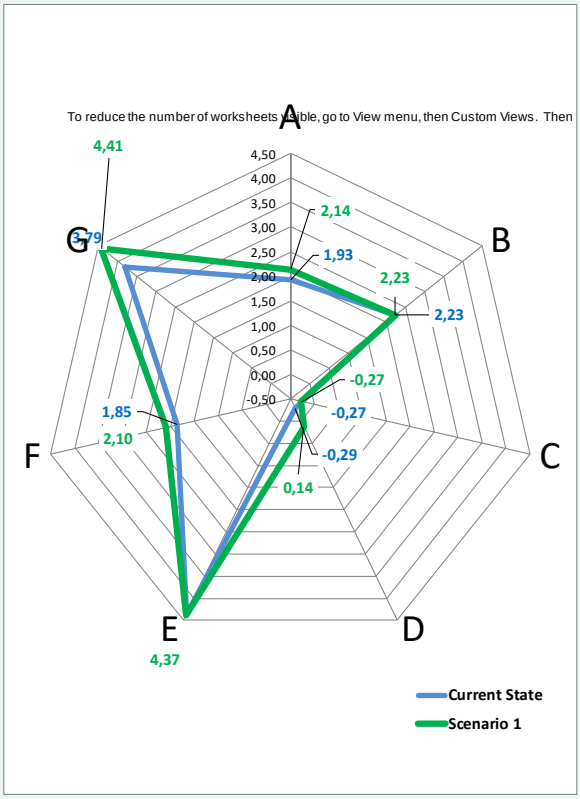
b. Scenarios raking

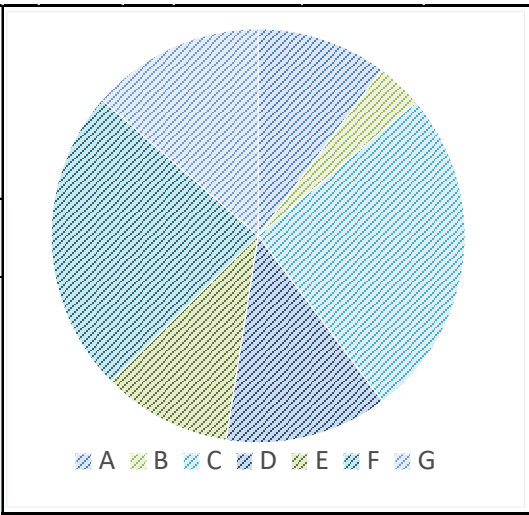
i. Performance Scores

Issues	Current state	Scenario 1	Scenario 2
TOTAL SCORE	**1.57**	**1.79**	**1.79**
A – Built Urban Systems	1.93	2.14	1.93
B – Economy	2.23	2.23	2.23
C – Energy	-0.27	-0.27	0.24
D – Atmospheric	-0.29	0.14	-0.19
E – Non-renewable sources	4.37	4.37	4.37
F - Environment	1.85	2.10	2.04
G – Social aspects	3.79	4.41	4.05

SCENARIO 1

	Performance results for an urban area performance assessment in Polytechnic Area, a neighbourhood of Torino	
CESBA MED SNTool v4	Max	15Jun18





The number available criteria is:	177	The number active criteria is:	49
The number of active mandatory criteria with a score of less than 3 is:	10	Active low-level mandatory parameters:	16

	Issue	Active Weights	Scores	Scenario 1
A	Built Urban Systems	10,2%	1,93	2,14
B	Economy	3,6%	2,23	2,23
C	Energy	25,9%	-0,27	-0,27
D	Atmospheric emissions	12,7%	-0,29	0,14
E	Non-Renewable Resources	10,1%	4,37	4,37
F	Environment	23,8%	1,85	2,10
G	Social Aspects	13,6%	3,79	4,41
	Weighted total score	100,0%	1,57	1,79

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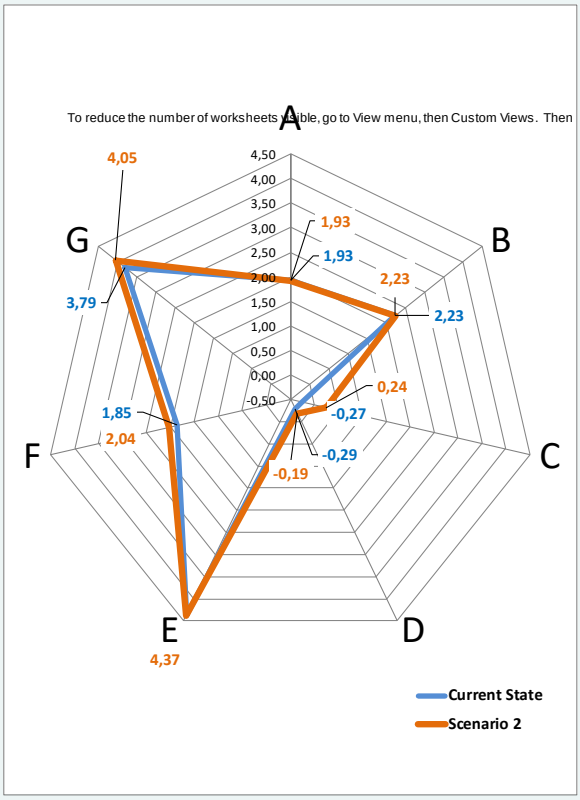
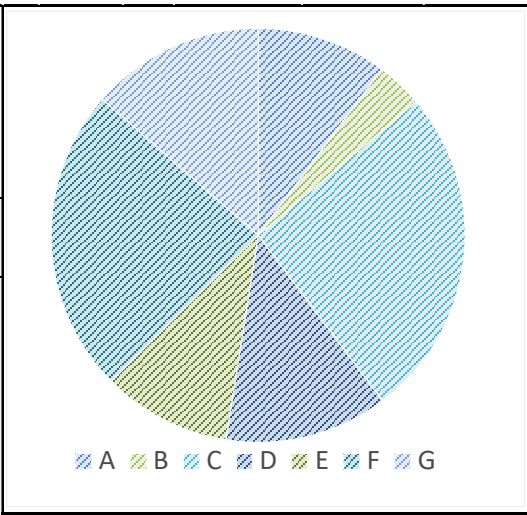
SCENARIO 2

	Performance results for an urban area performance assessment in Polytechnic Area, a neighbourhood of Torino	
CESBA MED SNTool v4	Max	15Jun18





The number available criteria is:	177	The number active criteria is:	49
The number of active mandatory criteria with a score of less than 3 is:	10	Active low-level mandatory parameters:	16

	Issue	Active Weights	Scores	Scenario 2
A	Built Urban Systems	10,2%	1,93	1,93
B	Economy	3,6%	2,23	2,23
C	Energy	25,9%	-0,27	0,24
D	Atmospheric emissions	12,7%	-0,29	-0,19
E	Non-Renewable Resources	10,1%	4,37	4,37
F	Environment	23,8%	1,85	2,04
G	Social Aspects	13,6%	3,79	4,05
	Weighted total score	100,0%	1,57	1,79

0 = Acceptable Practice; 3 = Good Practice; 5 = Best Practice

ii. Key Performance Indicators

SCENARIO 1			
KPI	**Indicator**	**Unit of measure**	**Value**
A 1.7 Conservation of Land	Area of undeveloped land with ecological or agricultural value / area of the neighborhood	%	2.74
B.3.3 Running costs energy for public buildings	Aggregated annual operating energy cost per aggregated indoor useful floor area	Euro/m^2/year	7.10
C.1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption per aggregated indoor useful floor area	kWh/m^2/year	47.51
C.1.4 Total final electric energy consumption for building operations	Aggregated annual total final electric energy consumption per aggregated indoor useful floor area	kWh/m^2/year	33.26
C.1.7 Total primary energy demand for building operations	Aggregated annual total primary energy consumption per aggregated indoor useful floor area	kWh/m2/year	1.59
C.2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Annual total thermal energy consumption from on-site renewable energy sources / annual total final thermal energy consumption	%	0.88
C.2.7 Share of electric energy generation from on-site renewable sources on final electric energy	Share of renewable electric energy in final electric energy consumptions	%	0.03
D.1.2 Total GHG Emissions from primary energy used in building operations	CO2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	31.23
E.1.6 Consumption of potable water for residential population	Annual potable water consumption per occupant	m^3 per occupant*yr	49.12
E.1.7 Consumption of potable water for non-residential building systems	Annual water consumption per occupant	m^3 /m^2	4.95
F.1.3 Recharge of groundwater through permeable paving or landscaping	Area of permeable surfaces on total neighborhood area	%	15.37
F.2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	Number of days exceeding the daily limits in a year	days/year	6.67
G.2.1 Performance of the public transport	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop	%	100
G.2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated pedestrian paths and meters of bicycle path or “shared space” per 100 inhabitants.	m/100 inhabitants	30
G.4.2 Availability and proximity of key services	Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services.	%	100
G.6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Level (score)	4

SCENARIO 2			
KPI	**Indicator**	**Unit of measure**	**Value**
A 1.7 Conservation of Land	Area of undeveloped land with ecological or agricultural value / area of the neighborhood	%	2.74
B.3.3 Running costs energy for public buildings	Aggregated annual operating energy cost per aggregated indoor useful floor area	Euro/m^2/year	7.10
C.1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption per aggregated indoor useful floor area	kWh/m^2/year	46.80
C.1.4 Total final electric energy consumption for building operations	Aggregated annual total final electric energy consumption per aggregated indoor useful floor area	kWh/m^2/year	33.26
C.1.7 Total primary energy demand for building operations	Aggregated annual total primary energy consumption per aggregated indoor useful floor area	kWh/m2/year	123.26
C.2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Annual total thermal energy consumption from on-site renewable energy sources / annual total final thermal energy consumption	%	1.61
C.2.7 Share of electric energy generation from on-site renewable sources on final electric energy	Share of renewable electric energy in final electric energy consumptions	%	1.50
D.1.2 Total GHG Emissions from primary energy used in building operations	CO2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	30.76
E.1.6 Consumption of potable water for residential population	Annual potable water consumption per occupant	m^3 per occupant*yr	49.12
E.1.7 Consumption of potable water for non-residential building systems	Annual water consumption per occupant	m^3 /m^2	4.95
F.1.3 Recharge of groundwater through permeable paving or landscaping	Area of permeable surfaces on total neighborhood area	%	15.37
F.2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	Number of days exceeding the daily limits in a year	days/year	6.67
G.2.1 Performance of the public transport	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop	%	100
G.2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated pedestrian paths and meters of bicycle path or “shared space” per 100 inhabitants.	m/100 inhabitants	16.18
G.4.2 Availability and proximity of key services	Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services.	%	100
G.6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Level (score)	2

iii. Financing mechanisms evaluation

Scenario 1	• 2020-2022 municipal own budget for refurbishment in urban areas • DIBA subsidy framework (Diputación de Barcelona - Regional Public Administration)
Scenario 2	Private investment jointly with subsidies from the city council and other agencies and / or public administrations at the regional and state level (ICAEN and IDAE)

5. RETROFIT CONCEPT

SELECTED SCENARIO	DESCRIPTION
Scenario 1	Both scenarios have the same final score so the score is not decisive to take the best alternative. In Scenario 1, a more livable neighborhood is promoted with the pedestrianization of the streets. With this, an improvement of the urban space is achieved without having a significant impact on the primary consumption of the neighborhood. The performance is not difficult to implement because it depends solely on the City Council and in fact, it has already begun to implement. On the other hand, scenario 2 focuses on private property, helping to reduce demand for the entire neighborhood in an energetic way. This milestone is very interesting but the reality is that its viability depends on the interest of the investment on the part of the private. Due to the more difficult implementation of scenario 2, work will be done on stage 1 as the chosen option.

KEY ELEMENTS OF THE CONCEPT

Retrofits Strategies	Create a more habitable place for citizens through the increase of pedestrian areas. Reduce and restrict access to the private vehicle area by promoting more sustainable transport modes
	Once space for paking and traffic is not need, this space can be used to develop new green and leisure areas.
	Full accessibility for phisically disabled persons
Performance improvement	Environment: • Less noise and less emissions from private vehicle • More green areas that reduce the invironmental temperature
	Society: • Promote activity on the street to be a space for citizen socilaisation.
	Economy • More comercial activity in both neigborhoods with more services.
Financial mechanism	2020-2022 municipal own budget for refurbishment in urban areas
	DIBA subsidy framework (Diputación de Barcelona - Regional Public Administration)

BUILDING SCALE ASSESSMENT – BUILDING 1

1. INITIATION

General information on the selected building

Building CASA DE CULTURA

Address	*Carrer Castellvi, 8 Jardins del Monestir, 08173 Sant Cugat del Vallès*
Building use **CASA DE CULTURA**	*The Casa de Cultura focuses its efforts on facilitating the work of the entities. For this reason, it houses around 50 local associations and has a large offer of public spaces that can be rented. Located in the historic centre of Sant Cugat, it has a very extensive opening hours (from 8am to 23h30pm), unbeatable accessibility and a long route in the field of citizen participation. The equipment is a reference in the centre of cultural resources for the city.* 
Owner	*Sant Cugat del Vallès City Council*
Year of construction	*1961*
Building method	*Steel structure. Double-pane windows with aluminium frame without thermal break. Concrete flat roof. The long axis of the building is along the W-E axis.*
Number of levels above earth	*3*
Number of levels underground	*1*
Heating system	*Gas*
Cooling system	*Electric power (69kW) 3.0 plan*

DHW system	*Gas*
Ventilation system	*Not exist*
Lighting system	*A total of 389 fluorescent lamps, 185 halogen spotlights and 20 incandescent lamps.*
Average U value	*Not available*
Number of occupants	*500*
Hours of occupation per year	*4344*

2. PREPARATION

a. SBTool structure

In this section it is described the structure of your CESBA MED SBTool.
Please, enter here the list of the criteria selected from the CESBA MED SBT Generic Framework.

Total number of criteria in SBTool: 40

A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
A1	**Site regeneration and development**
A1.8	*Use of native plant types*
A1.10	*Provision and quality of children's play area(s)*
A1.12	*Provision and quality of bicycle pathways and parking*
A2	**Urban Design**
A2.2	*Reducing need for commuting transport through provision of mixed uses*
A2.3	*Impact of orientation on the passive solar potential of building(s)*
A3	**Project Infrastructure and Services**
A3.6	*Provision of solid waste collection and sorting services*
A3.8	*Provision of split grey / potable water services*
A3.10	*On-site treatment of rainwater, stormwater and greywater*
A3.14	*Connectivity of roadways*
A3.15	*Provision of access roads and facilities for freight or delivery*

B – ENERGY AND RESOURCES CONSUMPTION	
B1	**Total life cycle non-renewable energy**
B1.1	*Primary energy demand*
B1.2	*Delivered energy demand*
B1.3	*Delivered electric demand*
B1.4	*Energy from renewable sources in total primary energy consumption*
B1.5	*Energy from renewable sources in total thermal energy consumption*
B1.6	*Energy from renewable sources in total electric energy consumption*
B1.11	*Embodied energy (Not for Use phase) **
B2	**Electrical peak demand**
B2.2	*Electrical peak demand for building operations*
B3	**Use of materials**
B3.5	*Recycled materials (Not for Use phase) **
B4	**Use of potable water, stormwater and greywater**
B4.2	*Water consumption for indoor uses*
B4.3	*Use of water for irrigation purposes*

C- ENVIRONMENTAL LOADINGS	
C1	**Greenhouse Gas Emissions**
C1.3	*Global Warming Potential*
C3	**Solid and Liquid Wasters**
C3.1	*Construction and demolition waste (Not for Use phase) **
C3.2	*Solid waste from building operations*
C4	**Impacts on Project Site**
C4.1	*Recharge of groundwater through permeable paving or landscaping*

D- INDOOR ENVIRONMENTAL QUALITY	
D1	**Indoor Air Quality and Ventilation**
D1.4	*TVOC concentration in indoor air (Not for Use phase) **
D1.5	*CO2 concentration in indoor air*
D2	**Air Temperature and Relative humidity**
D2.1	*Time outside of the thermal comfort range*
D2.2	*Thermal comfort index * (Not calculated)*

E- SERVICE QUALITY	
E1	**Safety and Security**
E1.2	*Risk to occupants and facilities from fire*
E1.3	*Risk to occupants and facilities from flooding*
E1.6	*Maintenance of core building functions during power outages*
E2	**Functionality and Efficiency**
E2.6	*Spatial efficiency*
E3	**Controllability**
E3.1	*Effectiveness of facility management control system*
E3.2	*Capability for partial operation of facility technical systems*
E4	**Flexibility and Adaptability**
E4.5	*Adaptability to future changes in type of energy supply*
E5	**Optimization and Maintenance of Operating Performance**
E5.6	*Retention of as-built documentation*

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
F1	**Social Aspects**
F1.1	*Universal access on site and within the building*
F2	**Culture and Heritage**
F2.3	*Impact of the design on existing streetscapes*
F3	**Perceptual**
F3.7	*Access to exterior views from interior*

G- COST AND ECONOMIC ASPECTS	
G1	**Cost and Economics**
G1.1	*Construction cost*
G1.2	*Operating and maintenance cost*
G1.4	*Use stage energy cost*
G1.5	*Use stage water cost*

b. SBTool criteria selection rationale

In this section, PPs must motivate the selection of the criteria that have been included in the regional CESBA MED SBTool. Why the criterion has been included? The reason could depend on regional policies or targets.

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
CRITERION	**REASON/MOTIVATION**
A1 Site regeneration and development A1.1 Use of native plant types	*The city has a Green areas plan, which also apply to new buildings and refurbishment to minimize*

	the effect of heat island.
A.1.10 Provision and quality of children's play area(s) A.1.11.Provision and quality of bicycle pathways and parking	*The city plan has different targets to achieve more bicycle pathways and improve the quality of children`s play areas.*
A2 Urban Design	
A2.1 Reducing need for commuting transport through Provisions of mixed uses	*The aim is to encourage the designs that promote public and private electric and bicycle transportation, as they provide a direct saving of energy demand for transportation and an environmental improvement based on triple reduction: avoiding oil extraction, associated GHG emissions in use and noise pollution in cities.*
A2.2 Impact of orientation on the passive solar Potential of building(s)	Passive strategies for all new buildings

B – ENERGY AND RESOURCES CONSUMPTION

CRITERION	REASON/MOTIVATION
B1 Total life cycle non-renewable energy	
B1.1 Primary energy demand B1.2 Delivered energy demand B1.3 Delivered electric demand B1.4 Energy from renewable sources in total primary energy consumption B1.5 Energy from renewable sources in total thermal energy consumption B1.6 Energy from renewable sources in total electric energy consumption	*The aim of B1 criteria is to promote and reward the reduction of the energy consumption necessary for the heating of buildings (heating and cooling) and generation of hot water. Fossil fuels are currently the main energy resource on a global scale and are the causes, with their associated emissions, of a serious problem from the greenhouse effect.*
B2 Electric peak demand	
B2.2 *Electrical peak demand for building operations*	
B4 Use of potable water, stormwater and greywater	
B4.2 Water consumption for indoor uses B4.3 Use of water for irrigation purposes	*Sant Cugat city council has a water saving local ordinance to reduce the water consumption in all new and refurbished buildings since year 2002. The main reduction of tap water consumption in buildings comes through grey water reuse to indoor WC discharge and rain water tanks with also water from swimming pools to use outdoors for irrigation purposes.*

C- ENVIRONMENTAL LOADINGS

CRITERION	REASON/MOTIVATION
C1 Greenhouse Gas Emissions C1.3 Global Warming Potential	*Calculation of GEH greenhouse gas emissions in buildings for Covenant of mayors SEAP template and Agenda 2030 in order to achieve the 40% reduction.*
C3 Solid and Liquid Wasters C3.2 Solid waste from building operations	*The city has a segregating waste priority plan in order to increase the rate of separate collection and recycle of solid waste from building operation.*

C4 Impacts on Project Site C4.1 Recharge of groundwater through permeable paving or landscaping	*2018 new local water saving ordinance has a specific rule to improve the recharge of groundwater through permeable paving or landscaping in free areas of the plot.*

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	REASON/MOTIVATION
D1 Indoor Air Quality and Ventilation D1.5 CO2 concentration in indoor air **D2 Air Temperature and Relative humidity** D2.1 Time outside of the thermal comfort range D2.2 Thermal comfort index	*The selection of materials with low polluting emissions, the good illumination and ventilation of the interior spaces and an adequate purge process of the building before its occupation significantly reduce the risks to the health of its occupants.*

E- SERVICE QUALITY

CRITERION	REASON/MOTIVATION
E1 Safety and Security E1.2 Risk to occupants and facilities from fire E1.3 Risk to occupants and facilities from flooding E1.6 Maintenance of core building functions during power outages	*To reduce to acceptable limits the risk that people involved in an emergency will suffer damages. Mainly in buildings of public concurrence. The regulations determine de security requirements corresponding to the security of people, the protection of the environment and the property.*
E2 Functionality and Efficiency E2.6 Spatial efficiency	*To improve the building quality of new buildings.*
E3 Controllability E3.1 Effectiveness of facility management control system E3.2 Capability for partial operation of facility technical systems.	*To manage, metering and control the building operations in public buildings and also in new private ones. The aim is to obtained good quality data by sectorization for efficient consumption.*
E4 Flexibility and Adaptability E4.5 Adaptability to future changes in type of energy supply	*To identify those buildings that can adapt quicker and cheaper to any future change of renewable energy systems.*
E5 Optimization and Maintenance of Operating Performance E5.6 Retention of as-built documentation	*To improve the quality of public buildings information by digitalising as-built documentation*

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	REASON/MOTIVATION
F1 Social Aspects F1.1 Universal access on site and within the building	*It is important for the city to control the impact of existing, refurbished and new buildings in the city*

F2 Culture and Heritage F2.3 Impact of the design on existing streetscapes **F3 Perceptual** F3.7 Access to exterior views from interior	*landscape.*

G- COST AND ECONOMIC ASPECTS

CRITERION	REASON/MOTIVATION
G1 Cost and Economics G1.1 Construction cost G1.2 Operating and maintenance cost G1.4 Use stage energy cost G1.5 Use stage water cost	*To rate the construction cost of public buildings according to the degree of sustainability.* *To rate the operation cost on energy and water of all buildings according to their use and typology.*

c. SBTool weights rationale

In this section PPs must motivate the value of weights assigned to the different issues, categories and criteria. Why the weight of a particular issue or criterion is higher (or lower)? Weights should reflect the regional political priorities.

ISSUE	WEIGHT (1 to 3)	MOTIVATION
A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	1	The priority was given by CLC as a principal effort in urban planning.
B – ENERGY AND RESOURCES CONSUMPTION	3	Political priority; 2030 Agenda, SECAP, EMAS and PAM municipal activity plan.
C- ENVIRONMENTAL LOADINGS	3	Political priority; 2030 Agenda, SECAP, EMAS and PAM municipal activity plan.
D- INDOOR ENVIRONMENTAL QUALITY	2	Lower chances of intervention in buildings
E- SERVICE QUALITY	3	Political priority; 2030 Agenda, SECAP, EMAS and PAM municipal activity plan.
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS	2	The priority was given by CLC
G- COST AND ECONOMIC ASPECTS	2	The priority was given by CLC

CATEGORIES	WEIGHT (%)
A1- Site regeneration and Development	3,0
A2- Urban design	4,6
A3- Project Infrastructure and Services	4,0
TOTAL A- Site regeneration and development, urban design and infrastructure	**11,6**
B1- In use energy consumptions	42,0
B2- Embodied energy	6,3
B4 – Use of water, stormwater and greywater	6,3
TOTAL B- Energy and resources consumption	**54,9**
C1- Greenhouse gas emissions	13,2
C3- Solid and liquid wastes	2,5
C4- Impact on project site	1,3
C5- Other local and regional impacts	3,4
TOTAL C- Environmental loadings	**20,4**
D1- Indoor air quality and ventilation	0,6
D2- Thermal comfort	0,6
D4– Acoustic comfort	0,2
TOTAL D- Indoor Environmental Quality	**1,50**
E1- Safety and Security	6,3
E2- Functionality and efficiency	0,2

E3- Controllability	0,3
E4– Flexibility and adaptability	1,3
TOTAL E- Service Quality	**8,1**
F1- Social aspects	1,9
F2- Culture and heritage	0,8
TOTAL F- Social Cultural and perceptual aspects	2,7
G1- Cost and economics	**0,8**
TOTAL G- Cost and economic aspects	0,8
TOTAL	**100**

CRITERIA WEIGHTS

SBTool file A – Weight A-G

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE

A1 - Site Regeneration and Development

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A1.8	*1.27*	*2*	*3*	*2*	*1*	*Default value*
A1.10	*0.84*	*2*	*3*	*2*	*1*	*Default value*
A1.12	*0.84*	*2*	*3*	*2*	*1*	*Default value*

A2 - Urban Design

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A2.2	*2.53*	*3*	*3*	*2*	*1*	*Default value*
A2.3	*2.11*	*1*	*5*	*3*	*1*	*Default value*

A3 - Project Infrastructure and Services

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A3.6	*0.28*	*2*	*2*	*2*	*1*	*Default value*
A3.8	*1.90*	*2*	*3*	*3*	*1*	*Default value*
A3.10	*1.27*	*2*	*3*	*2*	*1*	*Default value*
A3.14	*0.28*	*2*	*2*	*2*	*1*	*Default value*
A3.15	*0.28*	*2*	*2*	*2*	*1*	*Default value*
TOTAL	11,6					

B - ENERGY AND RESOURCES CONSUMPTION

B1 - Total Life Cycle Non-Renewable Energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B1.1	*7.03*	*5*	*5*	*2*	*4*	*Default value*
B1.2	*7.03*	*5*	*5*	*2*	*4*	*Default value*
B1.3	*7.03*	*5*	*5*	*2*	*4*	*Default value*
B1.4	*7.03*	*5*	*5*	*2*	*1*	*Default value*
B1.5	*7.03*	*5*	*5*	*2*	*1*	*Default value*
B1.6	*7.03*	*5*	*5*	*2*	*5*	*Default value*

B2 - Electrical peak demand

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION

B2.2	*6.33*	5	*3*	*3*	*1*	*Default value*

B4 - Use of potable water, stormwater and greywater

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B4.2	*3.80*	4	*3*	*3*	*1*	*Default value*
B4.3	*2.53*	4	*3*	*2*	*1*	*Default value*
TOTAL	54,9					

C - ENVIRONMENTAL LOADINGS
C1- Greenhouse Gas Emissions

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C1.3	*13.19*	5	*5*	*3*	*1*	*Default value*

C3 – Solid and liquid wastes

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C3.2	*2.53*	4	*3*	*2*	*1*	*Default value*

C4 – Impacts on project site

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C4.1	*1.27*	2	*3*	*2*	*1*	*Default value*

C5 – Other local and regional impacts

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C5.8	*3.38*	4	*3*	*2*	*1*	*Default value*
TOTAL	20,4					

D - INDOOR ENVIRONMENTAL QUALITY
D1 – Indoor air quality and ventilation

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.5	*0.63*	*1*	*3*	*3*	*1*	*Default value*

D2 - Thermal comfort

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D2.1	*0.63*	*1*	*3*	*3*	*1*	*Default value*

D4 – Noise and illumination

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D4.1	*0.21*	*1*	*3*	*1*	*1*	*Default value*
TOTAL	1,50					

E- SERVICE QUALITY
E1 – Safety and security

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E1.2	*1.90*	*2*	*3*	*3*	*1*	*Default value*
E1.3	*2.53*	*2*	*4*	*3*	*1*	*Default value*
E1.6	*1.90*	*2*	*3*	*3*	*1*	*Default value*

E2 – Functionality and efficiency

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E2.6	*0.21*	*1*	*3*	*2*	*1*	*Default value*

E3 – Controllability

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E3.1	*0.14*	*1*	*2*	*2*	*1*	*Default value*
E3.2	*0.14*	*1*	*2*	*2*	*1*	*Default value*

E4 – Flexibility and adaptability

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E4.5	*1.27*	*1*	*3*	*3*	*1*	*Default value*

E5 – optimization and maintenance of operating performance

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E5.6	*0.11*	*1*	*1*	*3*	*1*	*Default value*
TOTAL	8,1					

F- Social, cultural and perceptual aspects

F1 – Social aspects

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F1.1	*1.90*	*2*	*3*	*3*	*1*	*Default value*

F2 – Culture and heritage

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F2.3	*0.84*	*2*	*3*	*2*	*1*	*Default value*
TOTAL	2,7					

G- COST AND ECONOMIC ASPECTS

G1 – Cost and economics

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G1.4	*0.63*	*2*	*3*	*3*	*1*	*Default value*
G1.5	*0.21*	*2*	*3*	*1*	*1*	*Default value*
TOTAL	0,8					

d. SBTool benchmarks rationale

In this section PPs must motivate the value of benchmarks assigned to the different criteria for score zero (minimum acceptable performance) and for score 5 (excellent and ideal performance). The value of indicators corresponding to score zero is usually depends on regulations, standards or a typical performance in the region. Please keep in mind that score 3 represents a best practice performance. Score 5 is an excellent performance.

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
A1.8	*Use of native plant types*	*%*	*0: 50*	*Compliance of local water saving ordinance*
			5: 100	*Compliance of local water saving ordinance*
A1.10	*Provision and quality of children's play area(s)*	*text*	*0: 0*	*Specific local city plan for children's play areas*
			5: 5	*Specific local city plan for children's play areas*
A1.12	*Provision and quality of bicycle pathways and parking*	*text*	*0: 0*	*Specific local city plan for mobility and parking areas*
			5: 5	*Specific local city plan for mobility and parking areas*
A2.2	*Reducing need for commuting transport through provision mixed*	text	*0: 0*	*Only one occupancy type*
			5 : 5	*The project contents 3 or + occupancy types*
A2.3	*Impact of orientation on the passive solar potential of building (s)*	e-w angle degree	*0: 28*	*Current level, up to 30º.*
			5 : 5	*Long axis of the building is oriented within 5º of east-west*
A3.6	Provision of solid waste collection and sorting services	text	*0: 0*	*1 or + organic solid waste*
			5 :5	*4-5 organic and non-organic communal solid waste are located in the project*
A3.8	*Provision of split grey / potable water services*	%	*0: 0*	*Local water saving ordinance: No grey water systems are implemented in buildings generating less than 400 m3 of grey water a year.*
			5 : 100	*Local water saving ordinance compliance when a building generates more than 400 m3 of grey water/year.*
A3.10	*On-site treatment of rainwater, stormwater and greywater*	%	*0:25*	*Local water saving ordinance*

			5 : 100	*Local water saving ordinance*
A3.14	*Connectivity of roadways*	m	*0: 200*	*Mean distance between intersections. CESBA MED reference*
A3.15	*Provision of access roads and facilities for freight or delivery*	text	*5 : 60*	*Current results*
			0: 0	Acceptable level of access for freight or delivery
			5 : 5	Convenient and direct access

B- ENERGY AND RESOURCES CONSUMPTION

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
B1.1 Primary energy demand	*Primary energy demand per area per year*	*kWh/m^2/y*	*0: 292*	CTE energy certificate regulation in buildings in Spain (for office buildings) G level (worst scenario)
			5 : 58	CTE energy certificate regulation in buildings in Spain (for office buildings) A level (BEST scenario)
B1.2 Delivered thermal energy demand	*Delivered thermal energy demand per area per year*	*kWh/m^2/y*	*0: 75*	CESBA MED references and energy certification in tertiary buildings
			5 : 20	CESBA MED references and energy certification in tertiary buildings
B1.3 Delivered electric energy demand	*Delivered electric energy demand per area per year*	*kWh/m^2/y*	*0:70*	CESBA MED references and energy certification in tertiary buildings
			5 : 30	CESBA MED references and energy certification in tertiary buildings
B1.4 Energy from renewable sources in total primary energy consumption	*Primary energy demand of the building that is met by renewable sources on total primary energy demand*	*%*	*0: 30*	*The minimum value given corresponds to the criteria given in local ordinance which requires an active renewable energy production with a minimum* High-performance building
			5 :90	*Autonomous building nZEB*
B1.5 Energy from renewable sources in total thermal energy consumption	*Share of renewable energy in final thermal energy consumptions*	*%*	*0: 30*	*The minimum value given corresponds to the criteria given in local ordinance which requires an active renewable*

				energy production with a minimum
			5 : 100	Autonomous building nZEB
B1.6 Energy from renewable sources in total electric energy consumption	*Share of renewable energy in final electric energy consumption*	*%*	*0: 40*	The minimum value given corresponds to the criteria given in local ordinance which requires an active renewable energy production with a minimum
			5 : 100	Autonomous building nZEB
B2.2. Electrical peak demand for BO	*Electrical peak demand for building operations*	*W/m^2*	*0: 40*	*CESBA assessment criteria for offices*
			5 : 10	*objective of professional best practice for nZEB buildings*
B3.5 Recycled materials	*Weight of recycled materials on total weight of materials (Not for Use phase) **	*%*	*0: 15*	*Actual professional practice based on discussions with national local committee in Catalunya.*
			5 : 50	*objective of professional best practice*
B4.2 Potable water consumption for indoor uses	*Water consumption per occupant per year*	*m^3/m^2 year*	*0: 11*	*From values for offices*
			5 : 5	*Consumption can be reduce a 75%*
B4.3 Use of water for irrigation purposes	*Water consumption per green area per year*	*m^3/m^2/ year*	*0: 0,20*	CESBA assessment criteria
			5 : 0,05	CESBA assessment criteria

C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
C1.3 Global Warming potential	*CO2 equivalent emissions per area per year*	*kg CO2 eq./m^2/yr*	*0: 96,31*	Emissions from Spanish *energy certification G level in tertiary buildings*
			5: 19,26	*Emissions from Spanish energy certification in A level tertiary buildings*

C3.2 Construction and demolition waste	*Weight of waste and materials generated per 1 m2 of useful floor area demolished or constructed (not calculated)*	*kg/m^2/life cycle stage*	*0: 1700*	Figures given in the CESBA protocol
			5: 600	Figures given in the CESBA protocol
C4.1 Recharge groundwater	*Recharge of groundwater through permeable paving or landscaping.*	*% m^2 permeable area / m^2 total area*	*0: 50*	Figures given in the CESBA protocol
			5: 90	Figures given in the CESBA protocol
C5.8 Atmospheric light	*Degree of atmospheric light pollution caused by project exterior lighting systems. (not calculated)*	%	0: 25	Figures given in the CESBA protocol
			5: 0	Figures given in the CESBA protocol

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
D1.4 TVOC concentration in indoor air	*TVOC concentration in indoor air (not calculated)*	µg/ m^3	*0:1000*	Recommendation of Catalonia government
			5 :200	*Local objective*
D1.5 CO2 concentration in indoor air	*CO2 concentration in indoor air*	ppm	*0: 800*	*Minimum quality of air for commercial buildings, cinemas, theatres, restaurants, coffee shops, bar. Gym and computers room.*
			5 : 550	*Minimum quality of air for offices, tertiary residences, libraries, schools and swimming pools*
D2.1 Time outside of the thermal comfort rang	*Predicted Percentage Out of TC rang*	*%*	0: 30	CESBA Default value
			5 : 10	Good quality
D2.2 Thermal comfort index	*Predicted Percentage Dissatisfied (not calculated)*	*%*	0: 10	CESBA Default value
			5 : 0	Good quality

D4.1 Noise attenuation through the exterior envelope	*Attenuation degree trough the exterior envelope to environmental outdoors sound*	*dBA*	0: 27,5	CESBA Default value
			5 : 38,5	Good quality

E- SERVICE QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
E1.2 Risk to occupants and facilities from fire.	*Risk of level for occupants in the most vulnerable part of the building*	*text*	*0: 0*	*CESBA Default value*
			5: 5	*Best practice*
E1.3 Risk to occupants and facilities from flooding	*Probability of injury or death or major property damage in case of 100 year flood event*	*text*	*0: 0*	*High Probability of injury*
			5: 5	Very low Probability of injury
E1.6 Maintenance of core building functions during power outages	*Probability of injury in case of an accidental or wilful explosion in or near the building*	*days*	*0: 2*	*Emergency plans compliance*
			5: 5	*CESBA MED default value*
E2.6 Spatial efficiency	*The time to travel for lifts from the ground floor to the top floor*	*%*	*0: 85*	*CESBA MED default value*
			5: 90	*CESBA MED default value*
E3.1 Effectiveness of facility management control system		*text*	*0:0*	*CESBA MED default value*
			5:5	*CESBA MED default value*
E3.2 Capability for partial operation of facility technical systems		*text*	*0:0*	CESBA MED default value
			5:5	*CESBA MED default value*

			0:0	CESBA MED default value
E4.5 Adapting the building to a new fuel source will be possible with a moderate level of renovations, but installing photovoltaics will require major renovations.		*text*		
			5:5	CESBA MED default value
		text	*0: 0*	*CESBA MED default value*
E5.6 Retention of as-built documentation.				
			5: 5	*CESBA MED default value*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
F1.1	*Universal access on site and within the building*	*text*	*0: 0*	*CESBA MED default value*
			5: 5	*CESBA MED default value*
F2.3	*Impact of the design on existing streetscapes*	*text*	*0: 0*	*CESBA MED default value*
			5: 5	*CESBA MED default value*
F3.7	*Access to exterior views from interior*	*text*	*0: 0*	*CESBA MED default value*
			5:5	

G- COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
G1.2 Operating and maintenance cost	*Maintenance annual cost per usable floor area*	€/m^2/yr	*0: 24*	Current level in cost results
			5: 15	*Best result in public building*
G1.4 Use stage energy cost	*Energy annual cost per usable floor area*	€/m^2/yr	*0: 35*	Worst scenario in current level
			5:10	*Best scenario in different public buildings*
G1.5 Use stage water cost	*Water annual cost per usable floor area*	€/m^2/yr	*0: 5*	*CESBA MED default value*
			5: 1	*CESBA MED default value*

e. SBTool Criteria Specifications

In this section, PPs must indicate for each selected criterion:

- *Information source: The source of the data/information that will be used to characterize the value of the indicator. Example: monitored data, measured data, statistic data, models and simulation, studies, data banks, etc.*
- *Assessment method: Short and concise description of the assessment method used to verify the value of indicators. Example: calculation steps, data analysis process, monitoring procedure, content of a study, use of statistic data, etc.*
- *Standards: technical documents taken as reference for the assessment method.*

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.8	*Use of native plant types*	*Information source*	*Measured data.* *Green area consulted on plans and type of plantation verified with City Hall.*
		Assessment method	*Determine the percentage of green area that contains native species and / or that do not require greater irrigation than alternative plants with respect to the total of gardenable space*
		Standard	*Master Plan of green areas in Sant Cugat del Vallès*
A1.10	*Provision and quality of children's play area(s)*	*Information source*	Descriptive qualification
		Assessment method	*Determine what provision of spaces reserved for children is in the building and evaluate the quality of play facilities for children participating in the activity of the building.* *Assessment according to the criteria associated with each score, provided in the description of the indicator*
		Standard	*Master plan for children's play areas in Sant Cugat del Vallès.*
A1.12	*Provision and quality of bicycle pathways and parking*	*Information source*	*Bicibox web, city hall data and google maps to verify bicycle paths*
		Assessment method	*Determine the extent and quality of space reserved for cycling to promote its use, considering the bike lane and bicycle parking lots.* *Check the bike lanes that reach the building, the distance the building is with respect to the bike lane network and distance to the bicycle parking lots, both individual and shared*

		Standard	*Mobility masterplan of the city*
A2.2	*Reducing need for commuting transport through provision mixed*	*Information source*	*Verification of the functional program of the buildings according to type of activity and consultation City council*
		Assessment method	*Determine the different uses that can accommodate the same building. Hosting more than one use implies that it is deigned in transportation since more than one activity could be carried out in the same place.*
		Standard	*Know and evaluate the functional programs of each building*
A2.3	*Impact of orientation on the passive solar potential of building (s)*	*Information source*	*Calculated data (AutoCAD or similar)google maps or orthomaps*
		Assessment method	*Calculate the angle of deviation of the main axis of the building with respect to the east-west orientation, with the highest rating being the closest to the east-west axis, understanding that they are the ones that receive the highest level of sunlight.*
		Standard	*Spanish technical code of the building CTE*
A3.6	Provision of solid waste collection and sorting services	*Information source*	*Calculated data from the city hall*
		Assessment method	*Determine the existence of selective recycling and the associated type of service.* *To know the recycling system that is implanted in each centre*
		Standard	*Solid waste master plan of the city*
A3.8	*Provision of split grey / potable water services*	*Information source*	*City Hall: It is verified that none of the public buildings consists of a network of recovery and reuse of grey water.*
		Assessment method	*To learn about the sanitation network system implanted in each building to determine if there is recovery of grey water. From 2002, it is compulsory to install a grey water reuse system in all new buildings generating more than 400 m3 of grey water per year.*
		Standard	*Local water saving ordinance*
A3.10	*On-site treatment of*	*Information*	

	rainwater, stormwater and greywater	*source*	*City Hall: do any building consists of a network of recovery and reuse of grey water.*
		Assessment method	*To determine the existence of treatment and exploration of rainwater and greyscale to reduce the consumption of drinking water in the building. To learn about the sanitation network system implanted in each building to determine if there is recovery of grey water. Local water saving ordinance it is compulsory for all new buildings since 2002.*
		Standard	*Local water saving ordinance, Catalonian Ecoeficiency decree*
A3.14	*Connectivity of roadways*	*Information source*	*City Hall: map of the city in AutoCAD format*
		Assessment method	*To measure the street distances to each intersection and calculate the average street and street stretch. Determining the average distance between street intersections evaluates how distances are long on foot near the building.*
		Standard	*Mobility master plan of the city*
A3.15	*Provision of access roads and facilities for freight or delivery*	*Information source*	*City Council and google to check the type of spaces / streets adjacent to the building*
		Assessment method	*To detect near each building if there are loading and unloading areas and / or spaces or service routes enabled for these purposes. If we know what kind, of areas, each building has around, the degree of ease of loading / downloading can be evaluated according to the criteria described in the indicator.*
		Standard	*Mobility master plan of the city and activity licences for business.*

B- ENERGY AND RESOURCES CONSUMPTION

CRITERION	INDICATOR	SPECIFICATIONS	
B1.1	*Primary energy demand per area per year*	*Information source*	*City Hall: Consumptions in kWh of electricity and gas of 3 whole years of each building*
		Assessment method	*Calculated using the measured values. 1) Calculation of the final energy of electricity and gas: annual consumption (kWh) of electricity and gas, making the average consumption of the last 3 years. 2) Final energy passage to primary electricity*

			consumption and gas with a pass factor of 2.04 for electricity and 1,195 for gas.
		Standard	*The reference standard for the evaluation of lighting consumption must be EN 15193.* *References and standards* *Level (s)* *EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments).* *EN 52016-1*
B1.2	*Delivered thermal energy demand per area per year*	*Information source*	*City Hall: Electricity and gas bills for a year of each building and information extracted from audits carried out in similar tertiary buildings*
		Assessment method	*Determine the percentage of electricity consumption allocated to each type of service (lighting, climate, household appliances, office automation and others) according to type of building, to assign the corresponding percentage of the total electrical consumption to each building according to the invoice. Add the gas consumption extracted from each invoice* *Distribution consumption by use (to determine% of electricity intended for climate)* *Schools (tertiary buildings)* *Lighting 78%* *Heating 3%* *Electric appliances 5%* *Office automation and other 15%* *Pilot building: Casa de Cultura* *Lighting 52.00%* *Office equipment 22.57%* *Electromagnetic and elevator 3.43%* *Heating and cooling 22.00%*
		Standard	*The reference standard for the evaluation of lighting consumption must be EN 15193.* *References and standards* *Level (s)* *EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments).* *EN 52016-1* *Governmental energy audit*
B1.3	*Delivered electric energy demand per area per year*	*Information source*	*City Hall: Consumptions in kWh of electricity*
		Assessment method	*Summary of the consumption of electrical kWh per year, for 3 years and calculation of the average annual consumption resulting from the 3 years analysed*
		Standard	*The reference standard for the evaluation of lighting consumption must be EN 15193.* *References and standards* *Level (s)*

			EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments). *EN 52016-1*
B1.4	*Primary energy demand of the building that is met by renewable sources on total primary energy demand*	*Information source*	*City council: renewable energy (EERR) production data provided*
		Assessment method	*Calculation of the sum of energy produced with EERR in buildings and compared by percentage of the total primary energy of the building*
		Standard	*The reference standard for the evaluation of lighting consumption must be EN 15193.* *References and standards* *Level (s)* *EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments).* *EN 52016-1*
B1.5	*Share of renewable energy in final thermal energy consumptions*	*Information source*	*City council: renewable energy (EERR) production data provided*
		Assessment method	*Calculation of the sum of energy produced with EERR in the building with respect to the total consumption destined to thermal use (% electric + gas). Each m2 of solar thermal plate is considered equivalent to a production of 700 kWh / m2 * 0.85 reduction coefficient of installation operation*
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments).* *EN 52016-1* *CTE HE4 spanish regulation* *RITE: regulation of thermal installations in building*
B1.6	*Share of renewable energy in final electric energy consumption*	*Information source*	*City council: renewable energy (EERR) production data provided. There is no production of electrical energy in any of the buildings evaluated*
		Assessment method	*Calculation of the sum of energy produced with EERR in the building with respect to the total consumption destined for electrical use.*
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments*
B2.2	*Electrical peak demand for building operations*	*Information source*	*City council: to check electrical bills received for a whole year.*
		Assessment method	*Review of electrical bills to detect the peak power values of each month and make the average of one year. Once the average peak value is determined, divide it between*

			the surface of the building to calculate the power per m2
		Standard	*Spanish technical code of the building CTE. Specific regulation*
B3.5	*Weight of recycled materials on total weight of materials (Not for Use phase) **	*Information source*	*Models and simulation or material documents*
		Assessment method	*The General Council of Technical Architecture of Spain has agreed to the implementation of the Statistical file of materials in the processing of the visa / registration of the executions of works within the scope of the LOE, to obtain State statistical data of the materials used in these works.* *Catalonia has other forms adapted to the autonomous and state regulations on quality control (the "Quality Control Program" and the "Controlling relationship and its results"*
		Standard	*CTE- Spanish edification code technique. Bill of materials from the data on constructions type and materials used in project and execution phases.*
B4.2	*Water consumption per area per year*	*Information source*	*Measured data*
		Assessment method	Calculation of the total annual water consumption of the building and average annual consumption for the last 3 years. The measured consumption must be averaged over a period of 3 years
		Standard	*Water saving local ordinance in Sant Cugat del Vallès*
B4.3	*Water consumption per green area per year*	*Information source*	*City council: Consultation on irrigation system implanted in each building and volume of water consumed. On a map of the city, cadastre or direct consultation at the Town Hall, calculate the area of the garden area of each building.*
		Assessment method	*Forecast of the volume of water for irrigation in the landscaped areas of the building, taking into account the possible use of grey or rainwater.* *Detect the landscaped area of each building, calculate the surface area and, in case of having an irrigation system, calculate the volume of water that is destined for this purpose.*

		Standard	*Water saving local ordinance in Sant Cugat del Vallès. Master plan of green areas in the city.*

C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	SPECIFICATIONS	
C1.3	*CO2 equivalent emissions per area per year*	*Information source*	*City hall: consumptions in kWh of electricity and gas of 3 years of each building*
		Assessment method	*Calculate the total consumption in kWh of electricity and gas for a whole year (the average of 3 years is calculated) and the kWh pass factor equivalent to kg of C02 of each type of energy is applied. The Catalan Office for Climate Change (OCCC) has published on the climate change website the update of the tools for the calculation of GHG emissions (version of March 2018), useful for calculating the GHG emissions inventory of the year 2017.* Conversion factors kWh — KgCO2 / kWh Electricity 0.308 Natural gas 0.182 Liquid fuels / transport 0.274 GLP 0.234 Red heat / cold 0,000 Biomass 0,000 Thermal solar 0,000 Geothermal 0,000
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments)* *Catalan Office for Climate Change (OCCC)*
C3.2	*Weight of waste and materials generated per 1 m2 of useful floor area demolished or constructed (not calculated)*	*Information source*	*Visit the building / google maps or similar*
		Assessment method	*Relation of the amount of recyclable solid waste 50 meters away from the entrance of the building to the solid waste categories of reference.* *Count the number of containers destined for different waste, located at a distance less than 50 m from the entrance to the building. NOTE: 7 categories are specified in the description of the indicator but in the study municipality, they do not exist. The indicator is valued based on the maximum number of categories of Sant Cugat, which corresponds to 5: paper / packaging / organic / glass / rest*
		Standard	*Spanish Royal Decree 105/2008, of February 1, regulating the Production and management of construction and demolition waste*

C4.1	*Recharge of groundwater through permeable paving or landscaping.*	*Information source*	*City Council/Google maps: verification of the areas to be considered, along with tools like google maps.*
		Assessment method	*Percentage of precipitation rainwater that can return to the subsoil through pavement or permeable soil in the building's terrain. Detect the sum of areas with permeable floor / floor of each building, and calculate the percentage of area relative to the total of the plot where the building is located.*
		Standard	*Local water saving ordinances Metropolitan general plan*
C5.8	*Atmospheric light. Determine the degree of light pollution of the exterior lighting of buildings.*	*Information source*	*City council: Relation of the external lighting installed in each centre and technical sheet of each luminaire that specifies the projection opening to determine if it is inside or outside the cone of 120º.*
		Assessment method	*Determine the degree of light pollution of the exterior lighting of buildings. Calculation of the percentage of exterior lighting of the building that has a light projection outside of a 120-degree vertical cone.*
		Standard	*Spanish Royal Decree 1890/2008. Regulation of energy efficiency in outdoor lighting*

D- INDOOR ENVIRONMENTAL QUALITY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
D1.4	*TVOC concentration in indoor air*	*Information source*	*Measured data in new buildings. Not calculated.*
		Assessment method	*Determine the level of TVOC concentration of the interior air of the building. Extraction of sensor data installed in the building and calculation of the average result of the sensors placed*
		Standard	*Content in VOC according to UNE-EN ISO 11890-1 / 2 and ASTM D2369 standards. Issuance of VOC according to ISO 16000. Determination of the formaldehyde emission on wood derived boards according to UNE-EN 717*
D1.5	*CO2 concentration in indoor air*	*Information source*	*Measured data in buildings. Cliensol query platform with sensors in different places.*
		Assessment method	Determine the level of CO2 concentration of the interior air of the building.

			Extraction of sensor data installed in the building and calculation of the average result of the sensors placed
		Standard	*NTP 742: General ventilation of buildings. Good practices guide*
D2.1	*Time outside of the thermal comfort rang*	*Information source*	*CLIENSOL Consultation Platform (01/10 / 2018-30 / 11/2018 period)*
		Assessment method	*Determine the percentage of hours that are out of range of comfort, within the activity schedule of the building. Extraction of temperature sensor data installed in the building and calculation of the percentage of hours that are out of range of comfort within the activity hours of the building and in accordance with the opening calendar of the building downtown*
		Standard	*NTP 322: Evaluation of the thermal stress risk: WBGT index. Good practices guide*
D2.2	Thermal comfort index	*Information source*	*Not calculated*
		Assessment method	*Predicted Percentage Dissatisfied (PPD)*
		Standard	*UNI EN ISO 7730 Class B*
D4.1	Noise attenuation through the exterior envelope	*Information source*	*Design documents of the building*
		Assessment method	*Ratio between DF and DF lim. Determine the degree of attenuation that exterior exterior facing external environmental noise provides. Calculation of the acoustic transmission of the windows of the building according to the composition of glass.*
		Standard	*Table 4.3.2.1 of the CTE's constructive Spanish catalogue. Standard window*

E- SERVICE QUALITY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
E1.2	Risk to occupants and facilities from fire.	*Information source*	*City council: verification that all buildings have a plan of fire strategy in compliance with current regulations.*
		Assessment method	*Revision of fire protection plans, detection and extinction and evacuation routes of the building.*

		Standard	*Spanish regulation* *Royal Decree 513/2017, of May 22, approving the Regulation of fire protection facilities. Emergency plans, self-protection plans, emergency measures in buildings.*
E1.3	Risk to occupants and facilities from flooding	*Information source*	*City council: Plan "Identification of risk and basic structures" of Civil Protection where the flood areas of the municipality are specified.*
		Assessment method	*Based on the existing documentation on the probability of flooding of the zone near the building one of the risk categories for the occupants described in the criteria of the indicator is established.*
		Standard	*Royal Decree 638/2016 in several aspects, among which is the management of flood risks through the identification of those uses and vulnerable activities in front of avenues*
E1.6	Maintenance of core building functions during power outages	*Information source*	*Documentation of the building. Consult property (City Hall)*
		Assessment method	*Determine the number of days the building can operate autonomously in case of fall of the facilities services (ventilation, climate, lighting, internal transport systems ...). Check if there are reservation systems in the building to act in case of emergency and calculate the days that these alternative systems can install autonomy in the building.*
		Standard	*ITC-BC-28: technical guide applied to local public concurrence*
E2.6	Spatial efficiency	*Information source*	*Building plans provided by the property (Town Hall)*
		Assessment method	*Determine the relationship between the total useful surface of the building and the useful functional surface, which excludes vertical circulation and technical premises. Calculate the percentage that represents the functional surface with respect to the total usefulness.*
		Standard	*CTE Spanish construction code in buildings*
E3.1	Effectiveness of facility management control system	*Information source*	*Check property (Town Hall)*
		Assessment method	*Determine any type of monitored control that allows control of the installations.*

		Standard	*CTE Spanish construction code in buildings*
E3.2	Capability for partial operation of facility technical systems	*Information source*	*Check property (Town Hall)*
		Assessment method	*Determine the degree of sectorization of the facilities and viability of providing partial service according to zone or time.*
		Standard	*CTE Spanish construction code in buildings*
E4.5	Adapting the building to a new fuel source will be possible with a moderate level of renovations, but installing photovoltaics will require major renovations.	*Information source*	*Check property (Town Hall) and check through the existing buildings plans.*
		Assessment method	*Determine the degree of viability to install a climate system that requires a fuel different from the existing one or the possibility of incorporating photovoltaic solar installation. Revise possible existing or available space reserves for future installations as well as checking the structural viability of the building to withstand new loads or renovations in the building.*
		Standard	*CTE Spanish construction code in buildings*
E5.6	Retention of as-built documentation.	*Information source*	*Check property*
		Assessment method	*Verification of existing documentation and punctuation application based on the cataloguing of each criterion specified in the indicator.* *Determine the scope and quality of the "as built" documentation preserved for later use by the occupants of the building.*
		Standard	*CTE Spanish construction code in buildings*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
F1.1	*Universal access on site and within the building*	*Information source*	*Plans provided by the property (Town Hall)*
		Assessment method	*Accessibility to people with mobility problems*
		Standard	*CTE Spanish construction code in buildings and activity licence*
F2.3	*Impact of the design on existing streetscapes*	*Information source*	*Check property (Town Hall) and check through the existing buildings plans*

		Assessment method	*Determine the degree of integration with the environment, height, colour and type of materials. Visual inspection where height is reviewed regarding neighbouring buildings, facade material, facade restriction with respect to the street limit and facade composition with types of openings and alignment with neighbouring buildings.*
		Standard	*CTE Spanish construction code in buildings*
F3.7	*Access to exterior views from interior*	*Information source*	*Check property (Town Hall) and check through the existing buildings plans*
		Assessment method	*Evaluate the quality of the external views available to an observer located in an interior space of a main occupation. Calculate the distance from the interior of the adjacent room to the façade that has a window to the outside, to the nearest external obstacle to determine the visual amplitude*
		Standard	*CTE Spanish construction code in buildings*

G- COST AND ECONOMIC ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
G1.2	Operating and maintenance cost	*Information source*	*Check property all bill consumption*
		Assessment method	*Costs of use of the building + cost of maintenance, by surface, to compare the cost of putting into operation the building evaluated (cost of energy, water and maintenance) with respect to one built under parameters of "acceptable pact". To have the expenditure for energy, water and maintenance (annual) and divide it by the total area constructed: the item "maintenance and repair of the building" has been considered + the consumption of the services of air conditioning, electricity, water and gas*
		Standard	*Good practices guides for buildings*
G1.4	Use stage energy cost	*Information source*	*Check property all bill consumption*

		Assessment method	*Calculation of the average consumption of three years for the fuels destined to energy of the building, extracted from the invoices provided by the property*
		Standard	*Insert text here*
G1.5	Use stage water cost	*Information source*	*Check property all bill consumption*
		Assessment method	*Calculation of the average water consumption of three whole years, extracted from the invoices provided by the property*
		Standard	*Insert text here*

3. DIAGNOSIS

a. Performance scores

Evaluation of the actual performance and relative level of sustainability of the Building.
PPs have to indicate the scores reached.

	SCORE
A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
A1 – Site regeneration and development	
A1.8 - Use of native plant types	5,0
A1.10 - Provision and quality of children's play area(s)	5,0
A1.12 - Provision and quality of bicycle pathways and parking	3,0
A2 – Urban Design	
A2.2 - Reducing need for commuting transport through provision of mixed uses	5,0
A2.3 - Impact of orientation on the passive solar potential of building(s)	0
A3 – Project Infrastructure and Services	
A3.6 - Provision of solid waste collection and sorting services	5,0
A3.8 - Provision of split grey / potable water services	5,0
A3.10 - On-site treatment of rainwater, stormwater and greywater	5,0
A3.14 - Connectivity of roadways	5,0
A3.15 - Provision of access roads and facilities for freight or delivery	3,0
B – ENERGY AND RESOURCES CONSUMPTION	
B1 – Total life cycle non-renewable energy	
B1.1 - Primary energy demand	3,0
B1.2 - Delivered energy demand	3,0
B1.3 - Delivered electric demand	3,0
B1.4 - Energy from renewable sources in total primary energy consumption	3,5
B1.5 - Energy from renewable sources in total thermal energy consumption	4,0
B1.6 - Energy from renewable sources in total electric energy consumption	4,0
B1.11 - Embodied energy (Not for Use phase) *	N.A
B2 – Electrical peak demand	
B2.2 - *Electrical peak demand for building operations*	3,0
B3 – Use of materials	
B3.5 - Recycled materials (Not for Use phase) *	N.A
B4– Use of potable water, stormwater and greywater	
B4.2 - Water consumption for indoor uses	5,0
B4.3 - Use of water for irrigation purposes	3,0
C- ENVIRONMENTAL LOADINGS	
C1 – Greenhouse Gas Emissions	
C1.3 - Global Warming Potential	3,5
C3 – Solid and Liquid Wasters	3,0
C3.1 - Construction and demolition waste (Not for Use phase) *	N.A
C3.2 - Solid waste from building operations	3,0
C4 – Impacts on Project Site	
C4.1 - Recharge of groundwater through permeable paving or landscaping	4,0
D- INDOOR ENVIRONMENTAL QU	
D1 – Indoor Air Quality and Ventilation	
D1.4 - TVOC concentration in indoor air (Not for Use phase) *	N.A
D1.5 - CO2 concentration in indoor air	4,0
D2 – Air Temperature and Relative humidity	

D2.1 - Time outside of the thermal comfort range	3,0
D2.2 - Thermal comfort index * (Not calculated)	N.A
D4 –Noise and acoustics	
D4.1 – Noise attenuation through the exterior envelope	4,5
E- SERVICE QUALITY	
E1 – Safety and Security	
E1.2 - Risk to occupants and facilities from fire	5,0
E1.3 - Risk to occupants and facilities from flooding	5,0
E1.6 - Maintenance of core building functions during power outages	4,5
E2 – Functionality and Efficiency	
E2.6 - Spatial efficiency	3,0
E3 – Controllability	
E3.1 - Effectiveness of facility management control system	3,0
E3.2 - Capability for partial operation of facility technical systems	0,0
E4 – Flexibility and Adaptability	
E4.5 - Adaptability to future changes in type of energy supply	3,0
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS	
F1 – Social Aspects	
F1.1 - Universal access on site and within the building	5,0
F2 – Social Aspects	
F2.3 - Impact of the design on existing streetscapes	5,0
G- COST AND ECONOMIC ASPECTS	
G1 – Cost and Economics	
G1.4 - Use stage energy cost	4,0
G1.5 - Use stage water cost	4,0

b. Key Performance Indicators value

KPI	Indicator	Unit of measure	Value
B.1.1 Primary energy demand	Primary energy demand per internal useful floor area per year	kWh/m2/year	161,02
B.1.2 Delivered thermal energy demand	Delivered thermal energy demand per internal useful floor area per year	kWh/m2/year	54,05
B.1.3 Delivered electric energy demand	Delivered electric energy demand per internal useful floor area per year	kWh/m2/year	63,42
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	0
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumption	%	0
B.1.11 Embodied non-renewable primary energy	*Embodied primary non-renewable energy*	*MJ/m^2*	*NA*
B.3.5 Recycled materials	*Weight of recycled materials on total weight of materials*	*%*	*NA*
B.4.2 Potable water consumption for indoor uses	Potable water consumption per occupant/area per year	m^3/occupant/year m^3/m^2/year	1,89 0,32
C.1.3 Global Warming potential	CO_2 equivalent emissions per internal useful floor area per year	kg CO_2 eq./m^2/year	24,35
C.3.1 Construction and demolition waste	*Weight of waste and materials generated per 1 m^2 of useful floor area demolished or constructed*	*kg/m^2/life cycle stage*	*NA*
C.3.2 Solid waste from building operation	Ratio of the number of collectable solid waste categories within a 100 m distance from the building's entrance to the reference solid waste categories	%	100
D.1.4 TVOC concentration in indoor air	*TVOC concentration in indoor air*	*$\mu g/ m^3$*	*NA*

D.2.1 Time outside of thermal comfort range	Determine the percentage of hours that are out of range of comfort, within the activity schedule of the building	%	2
D.2.2 Thermal comfort index	*Predicted Percentage Dissatisfied (PPD)*	*%*	*NA*
G.1.4 Use stage energy cost	Energy annual cost per usable floor area	€/m2/year	12,97
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m2/year	0,74

c. Actual performance analysis

WEAKNESSES ASPECTS	*Difficulties in the search of construction building information in old existing buildings.* *No automatic control in lighting Practices in refurbishment are not sustainable enough (formaldehyde, VOC concentration in indoor air, humidity and CO2 concentration in indoor air). We need real data in existing buildings but sensors are not cheap. It is also difficult the follow up of the data.* *Only 2 of the 4 levels of the pilot case study building are energy refurbished.* *Inefficient heating system.* *Old lighting system with only partial renovation.*
STRENGHT ASPECTS	*Sant Cugat city council is applying this new concept metering the buildings. This all about getting data from their buildings. It is compulsory for all new building projects to collect data by air quality sensors and energy and water consumption in real time through monitored metering.* *The public buildings are maintained by VEOLIA and all interventions are part of the public contract of its tender competition.* *We are regulating the use of recycled material in all new public construction works.*
POTENTIAL FOR PERFORMANCE IMPROVEMENT	*B.2.1 Embodied non-renewable primary energy, Construction and demolition waste: theses theme are not yet part of the practices in the construction and renovation, but will become more prominent in the coming years with the new regulation in 2020.* *Improve energy consumption and CO2 emissions of the building. Reduce energy cost. The presence of the flat roof could allow the installation of a photovoltaic system and solar thermal.*

4. STRATEGIC DEFINITION

a. Performance targets

Each partner must establish a target value for each criterion in the SBTool.
The target values have to reflect the global Environmental, Social and Economic targets established at urban level.

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE			
A1 – Site regeneration and development			
A1.8 - Use of native plant types		Actual value	100
(Indicator)	%	Target value	100
A1.10 - Provision and quality of children's play area(s)		Actual value	2
(Indicator)	-	Target value	5
A1.12 - Provision and quality of bicycle pathways and parking		Actual value	3
(Indicator)	-	Target value	5
A2 – Urban Design			
A2.2 - Reducing need for commuting transport through provision of mixed uses		Actual value	5
(Indicator)	-	Target value	5
A2.3 - Impact of orientation on the passive solar potential of building(s)		Actual value	0
(Indicator)	e-w angle degree	Target value	5
A3 – Project Infrastructure and Services			
A3.6 - Provision of solid waste collection and sorting services		Actual value	5
(Indicator)	-	Target value	5
A3.8 - Provision of split grey / potable water services		Actual value	0
(Indicator)	%	Target value	5
A3.10 - On-site treatment of rainwater, stormwater and greywater		Actual value	0
(Indicator)	%	Target value	5
A3.14 - Connectivity of roadways		Actual value	60
(Indicator)	meters	Target value	60
A3.15 - Provision of access roads and facilities for freight or delivery		Actual value	3
(Indicator)	-	Target value	5
B – ENERGY AND RESOURCES CONSUMPTION			
B1 – Total life cycle non-renewable energy			
B1.1 - Primary energy demand		Actual value	161,2
(Indicator)	kWh/m2/year	Target value	58,00
B1.2 - Delivered energy demand		Actual value	54,20
(Indicator)	kWh/m2/year	Target value	20,00
B1.3 - Delivered electric demand		Actual value	63,00
(Indicator)	kWh/m2/year	Target value	30,00
B1.4 - Energy from renewable sources in total primary energy consumption		Actual value	0
(Indicator)	%	Target value	90,00
B1.5 - Energy from renewable sources in total thermal energy consumption		Actual value	0
(Indicator)	%	Target value	100
B1.6 - Energy from renewable sources in total electric energy consumption		Actual value	0

(Indicator)	%	Target value	100
B2 – Electrical peak demand			
B2.2 - Electrical peak demand for building operations		Actual value	20,7
(Indicator)	W/m2	Target value	10,00
B3 – Use of materials			
B3.5 - Recycled materials (Not for Use phase) *		Actual value	Not calculated
(Indicator)	%	Target value	15
B4– Use of potable water, stormwater and greywater			
B4.2 - Water consumption for indoor uses		Actual value	0,32
(Indicator)	m3/occupant/year	Target value	0,18
B4.3 - Use of water for irrigation purposes		Actual value	0,20
(Indicator)	m3/m2*yr	Target value	0,05
C- ENVIRONMENTAL LOADINGS			
C1 – Greenhouse Gas Emissions			
C1.3 - Global Warming Potential		Actual value	24,00
(Indicator)	kg CO2 eq./m2/year	Target value	19,26
C3 – Solid and Liquid Wasters			
C3.2 - Solid waste from building operations		Actual value	100
(Indicator)	%	Target value	100
C4 – Impacts on Project Site Impacts on Project Site			
C4.1 - Recharge of groundwater through permeable paving or landscaping		Actual value	14,0
(Indicator)	% m^2 permeable area/m^2 total area	Target value	4,0
D- INDOOR ENVIRONMENTAL QUALITY			
D1 – Indoor Air Quality and Ventilation			
D1.5 - CO2 concentration in indoor air		Actual value	610
(Indicator)	ppm	Target value	550
D2 – Air Temperature and Relative humidity			
D2.1 - Time outside of the thermal comfort range		Actual value	30,00
(Indicator)	%	Target value	10,00
D4 – Noise and acoustics			
D4.1 – Noise Attenuation through the exterior envelope		Actual value	30,00
(Indicator)	dBA	Target value	38,5
E- SERVICE QUALITY			
E1 – Safety and Security			
E1.2 - Risk to occupants and facilities from fire		Actual value	5,0
(Indicator)	-	Target value	3,5
E1.3 - Risk to occupants and facilities from flooding		Actual value	5
(Indicator)	-	Target value	3,5
E1.6 - Maintenance of core building functions during power outages		Actual value	0
(Indicator)	days	Target value	4,5
E2 – Functionality and Efficiency			
E2.6 - Spatial efficiency		Actual value	74,0
(Indicator)	%	Target value	90
E3 – Controllability			
E3.1 - Effectiveness of facility management control system		Actual value	3,0
(Indicator)	-	Target value	4,0
E3.2 - Capability for partial operation of facility technical systems		Actual value	0,0
(Indicator)	-	Target value	3,0
E4 – Flexibility and Adaptability			
E4.5 - Adaptability to future changes in type of energy supply		Actual value	3,0
(Indicator)	-	Target value	3,0
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS			

F1 – Social Aspects			
F1.1 - Universal access on site and within the building		Actual value	5
(Indicator)	(Unit of measure)	Target value	5
F2 – Social Aspects			
F2.3 - Impact of the design on existing streetscapes		Actual value	5
(Indicator)	(Unit of measure)	Target value	5
G- COST AND ECONOMIC ASPECTS			
G1 – Cost and Economics			
G1.4 - Use stage energy cost		Actual value	12,97
(Indicator)	€/m2/year	Target value	10,00
G1.5 - Use stage water cost		Actual value	0,74
(Indicator)	€/m2/year	Target value	0,40

b. Constraints and restrictions

CONSTRAINTS / RESTRICTIONS	
Legal constraints	*Spanish Building Codes for new nZEB buildings and indicators are still pending approval. Cultural Heritage Protection in the city centre interference in roofs of buildings for PV systems. Administration public procurement is slow and full of difficulties with private corporations' alliances.*
Technical constraints	*Building constraints*
Financial constraints	*Budget constraints*
Environmental condition constraints	*Changeable weather conditions with hotter summers, which increase the use of cooling in buildings.*
Stakeholder based restrictions	*Some parts of the building do not have optimal temperature while staying in the north area.*
Other relevant constraints	

c. Potential strategies at building scale

Synergy zones	
Energetic synergies	*There is no possibility for super plus energy to cover electricity for the nearby buildings.*
Water synergies	*Centralized rainwater collection could be a possibility combined with the city museum building.*
Waste synergies	
Mobility synergies	*Shared mobility in nearby locations.*
Other synergies	

5. DECISION MAKING

a. Description of scenarios

SCENARIO A	DESCRIPTION
1. Envelope retrofit	Ventilated façade, energy savings of around **30%** compared to a traditional façade, including the windows and thus have a very efficient surrounding to avoid the thermal bridge.
2. Lighting system	Replacement of **50%** of the lamps of the building with new LED, which are 20 kW instead of the actual 58 kW fluorescents.
3. PV modules	Installation of PV panels, with an area of **191 m2** and annual production of 53.550 kWh equivalent of **30%** of electric demand in the building.
4. Integral retrofit	Installation of an Optimus system (monitored systems combining control of CO2, temperature and humidity sensors related to energy consumption and thermal comfort index of the building).
5. Water saving measures	Install water flow reducers in taps, showers, urinals and toilets that allow savings between **20%.**

SCENARIO B	DESCRIPTION
1. Envelope retrofit	Ventilated façade, energy savings of around **40%** compared to a traditional façade, including the windows and thus have a very efficient surrounding to avoid the thermal bridge.
2. Lighting system	Replacement of **100%** of the lamps of the building with new LED, which are 20 kW instead of the actual 58 kW fluorescents.
6. PV modules	Installation of photovoltaic panels (PV) with an area of **318 m2** and annual production of 89250 kWh equivalent of **50%** of electric consumption in the building.
7. Integral retrofit	Installation of an Optimus system (monetarized systems combining control of CO2, temperature and humidity sensors related to energy consumption and thermal comfort index of the building).
8. Water saving measures	Installation of water flow reducers in taps, showers, urinals and toilets that allow savings between **45%.**
9. Solar thermal system	New solar thermal (ST) for hot water consumption in the building with an area of **52 m2** with 30940 kWh/year which represents **65%** of the hot water consumption. Total area available in the south facing deck is 388 m2 (318m2PV+52m2 ST)

b. Scenarios raking

i. Performance Scores

Issues	Current state	Scenario 1	Scenario 2
TOTAL SCORE	**2.91**	**2.95**	**2.99**
A – Site regeneration	2.8	2.8	2.8
B – Energy and Resources C.	2.4	2.5	2.6
C – Environmental Loadings	3.5	3.5	3.5
D – Indoor Env. Quality	3.0	3.0	3.0
E – Service Quality	4.3	4.4	4.4
F – Social Aspects	5.0	5.0	5.0
G – Cost and Economic Asp.	4.3	4.3	4.3

ii. Key Performance Indicators

SCENARIO A			
KPI	**Indicator**	**Unit of measure**	**Value**
B.1.1 Primary energy demand	Primary energy demand per internal useful floor area per year	kWh/m^2/yr	112,71
B.1.2 Delivered thermal energy demand	Delivered thermal energy demand per internal useful floor area per year	kWh/m^2/yr	37,84
B.1.3 Delivered electric energy demand	Delivered electric energy demand per internal useful floor area per year	kWh/m^2/yr	52,61
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	0
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumption	%	35
B.1.11 Embodied non-renewable primary energy	*Embodied primary non-renewable energy*	*MJ/m2*	-
B.3.5 Recycled materials	*Weight of recycled materials on total weight of materials*	*%*	-
B.4.5 Potable water consumption for indoor uses	Potable water consumption per area per year	m^3/m^2/year	0,26
C.1.3 Global Warming potential	CO_2 equivalent emissions per internal useful floor area per year	kg CO_2 eq./m^2/yr	22,11
C.3.1 Construction and demolition waste	*Weight of waste and materials generated per 1 m2 of useful floor area demolished or constructed*	*kg/m2/life cycle stage*	

C.3.2 Solid waste from building operation	Ratio of the number of collectable solid waste categories within a 100 m distance from the building's entrance to the reference solid waste categories	%	100
D.1.4 TVOC concentration in indoor air	*TVOC concentration in indoor air*	*µg/ m3*	-
D.1.10 Ventilation rate	*Ventilation rate normalized per useful floor area*	*l/s/m2*	-
D.2.2 Thermal comfort index	*Predicted Percentage Dissatisfied (PPD)*	*%*	-
G.1.4 Use stage energy cost	Energy annual cost per usable floor area	€/m^2/yr	8,90
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m^2/yr	0,59

SCENARIO B			
KPI	**Indicator**	**Unit of measure**	**Value**
B.1.1 Primary energy demand	Primary energy demand per internal useful floor area per year	kWh/m^2/yr	96,61
B.1.2 Delivered thermal energy demand	Delivered thermal energy demand per internal useful floor area per year	kWh/m^2/yr	32,43
B.1.3 Delivered electric energy demand	Delivered electric energy demand per internal useful floor area per year	kWh/m^2/yr	35,49
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	35
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumption	%	72
B.1.11 Embodied non-renewable primary energy	*Embodied primary non-renewable energy*	*MJ/m2*	-
B.3.5 Recycled materials	*Weight of recycled materials on total weight of materials*	*%*	-
B.4.5 Potable water consumption for indoor uses	Potable water consumption per occupant per year	m^3/m^2/year	0,18
C.1.3 Global Warming potential	CO_2 equivalent emissions per internal useful floor area per year	kg CO_2 eq./m^2/yr	18,30
C.3.1 Construction and demolition waste	*Weight of waste and materials generated per 1 m2 of useful floor area demolished or constructed*	*kg/m2/life cycle stage*	-
C.3.2 Solid waste from building operation	Ratio of the number of collectable solid waste categories within a 100 m distance from the building's entrance to the reference solid waste	%	100%

	categories		
D.1.4 TVOC concentration in indoor air	*TVOC concentration in indoor air*	*µg/ m3*	
D.1.10 Ventilation rate	*Ventilation rate normalized per useful floor area*	*l/s/m2*	-
D.2.2 Thermal comfort index	*Predicted Percentage Dissatisfied (PPD)*	*%*	-
G.1.4 Use stage energy cost	Energy annual cost per usable floor area	€/m^2/yr	5,41
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m^2/yr	0,41

iii. Financing mechanisms evaluation

Scenario 1	2020-2022 municipal own budget for refurbishment in public buildings National and European funds for nZEB intervention similar to actual Sun Horizon 2020 project in Sant Cugat del Vallès city school.
Scenario 2	Benefits in cost energy and water consumption of the building from could be uses for refurbishment in public buildings New European funds for nZEB intervention similar to actual Sun Horizon 2020 project in Sant Cugat del Vallès city school

iv. Synergies at building level

Scenario A	Urban redevelopment developed on the basis of a common strategic project in order to coordinate multiple actions carried out by different public and Private bodies. Increase wellbeing of occupants in building. Lower energy demand and reduce pollution nearby.
Scenario B	Promotion of the local economy in the refurbishment of buildings. To give example to the citizens and users of the facilities with an integral measure of energy efficiency and PV/Solar thermal systems. Final energy consumption would be lower as well as wellbeing of occupants.

6. RETROFIT CONCEPT

SELECTED SCENARIO	DESCRIPTION
A.	The two proposed scenarios are not alternative. They are progressive. Scenario A is the short-term scenario and Scenario B is the long-term to final achievement of nZEB building. The selected scenario is Scenario A, could be implemented in the following years.
B	It is very important to give more weight to KPI in SB Tool A in order to obtain visible differences in the final diagram when selecting different scenarios. Max version SB tools are very complex to manage vulnerable to any change in a cell.

KEY ELEMENTS OF THE CONCEPT

Retrofits Strategies	Intervention in the skin of the building in order to low down energy demand and increase comfort to occupants of the building.
	Replacement of all lamp Led lighting system and water flow reducers in taps, showers, urinals and toilets to allow more energy and water consumption savings.
	Monitored systems combining control of CO^2, temperature and humidity in order to increase the wellbeing and comfort of users.
	Installation of PV/solar thermal panels to the final achievement of an nZEB public building.
Performance improvement	Environment: Improved energy efficiency in the building, increase production of RES and low CO^2 emissions.
	Society: Improved thermal comfort to increase wellbeing of occupants in some areas of the buildings.
	Economy: Reduced energy and water maintenance cost.
Financial mechanism	Municipality's own funds
	Call from European or national financing sources.