D3.4.3 – Regional CESBA MED SNTs

Date: October 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

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URBAN SCALE

BUILDING SCALE

REGIONAL TOOL

D.3.4.3 Regional Tool - TORINO

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
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Responsible Partner: Andrea Moro, iiSBE Italia R&D

URBAN SCALE ASSESSMENT

SNTool structure

A- BUILT URBAN SYSTEMS	
A1	**Urban structure and form**
A1.2	*Urban compactness*
A1.7	*Conservation of land*
A2	Transportation infrastructure
A2.1	*Walking distance to public transport for area residents*
A2.4	*Extent and connectivity of bicycle paths separated from vehicular traffic*.

B- ECONOMY	
B2	**Economic activity**
B2.2	*Average Annual per-capita income of residents*
B3	**Cost and investments**
B3.3	*Operating energy costs for public buildings.*

C- ENERGY	
C1	*Non-renewable energy*
C1.1	*Total final thermal energy consumption for building operations.*
C1.2	*Total final thermal energy consumption for residential building operations.*
C1.3	*Total final thermal energy consumption for non residential building operations.*
C1.4	*Total final electrical energy consumption for building operations*
C1.5	*Total final electrical energy consumption for residential building operations.*
C1.6	*Total final electrical energy consumption for non residential building operations.*
C1.7	*Total primary energy demand for building operations*
C1.20	*Energy consumption for public lightning*
C2	Renewable and Decarbonised energy

C2.1	*Share of renewable energy on-site, on total final energy consumptions for buildings operation*
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for buildings operation.*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy*
C2.8	*Aggregated electrical energy generation from renewable sources located on public properties*
D- ATMOSPHERIC EMISSIONS	
D1	**Atmospheric emissions**
D1.2	*GHG emissions from energy used for all purposes in buiding operations*

E- NON RENEWABLE RESOURCES	
E1	**Potable water, stormwater and grey water**
E1.6	*Consumption of potable water for residential population*
E.1.7	*Consumption of potable water for non residential building systems*
E2	**Solid and liquid wastes**
E2.1	*Solid waste and recycling collection points*
E2.2	*Separate collection and disposal of solid waste and recycling*

F- ENVIRONMENT	
F1	**Environmental impacts**
F1.3	*Recharge of groundwater through permeable paving or landscaping.*
F2	**Outdoor environmental quality**
F2.1	Ambient air quality with respect to particulates <2.5 mu (PM2.5) over a one-year period.
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*

G- SOCIAL ASPECTS	
G2	**Traffic and mobility Services**
G2.1	*Performance of the public transport service*

G2.4	*Quality of pedestrian and bicycle network*
G4	**Public and private facilities and services**
G4.2	*Availability and proximity of key public human services*
G4.3	*Availability and proximity of a primary school*
G.4.4	*Availability and proximity of a secondary school*
G4.5	*Availability and proximity of childrens' play facilities*

SNTool criteria selection rationale

A- BUILT URBAN SYSTEMS		REASONS/MOTIVATION
A1	**Urban structure an form**	
A1.2	*Urban compactness*	*It is an indicator used in Urban planning*
A1.7	***Conservation of land***	***It gives the indication of the soil consumption***
A2	Transportation infrastructure	
A2.1	*Walking distance to public transport for area residents*	*Support to sustainable mobility policies*
A2.4	*Extent and connectivity of bicycle paths separated from vehicular traffic*.	*Support to sustainable mobility policies*

B- ECONOMY		
B2	**Economic activity**	
B2.2	*Average Annual per-capita income of residents*	*Support to social and welfare policies*
B3	**Cost and investments**	
B3.3	**Operating energy costs for public buildings.**	**Rationalization of municipal expenditure**

C- ENERGY		
C1	**Non-renewable energy**	
C1.1	*Total final thermal energy consumption for building operations.*	*Achievement of the objectives set by the covenant of Mayors*
C1.2	*Total final thermal energy consumption for residential building operations.*	*Achievement of the objectives set by the covenant of Mayors*
C1.3	*Total final thermal energy consumption for non residential building operations.*	*Achievement of the objectives set by the covenant of Mayors*
C1.4	*Total final electrical energy consumption for*	*Achievement of the objectives set by the*

	building operations	*covenant of Mayors*
C1.5	*Total final electrical energy consumption for residential building operations.*	*Achievement of the objectives set by the covenant of Mayors*
C1.6	*Total final electrical energy consumption for non residential building operations.*	*Achievement of the objectives set by the covenant of Mayors*
C1.7	*Total primary energy demand for building operations*	*Achievement of the objectives set by the covenant of Mayors*
C1.20	*Energy consumption for public lightening*	*Achievement of the objectives set by the covenant of Mayors*
C2	Renewable and Decarbonised energy	
C2.1	*Share of renewable energy on-site, on total final energy consumptions for buildings operation*	*Achievement of the objectives set by the covenant of Mayors/burden sharing*
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for buildings operation.*	*Achievement of the objectives set by the covenant of Mayors/burden sharing*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy*	*Achievement of the objectives set by the covenant of Mayors/burden sharing*
C2.8	*Aggregated electrical energy generation from renewable sources located on public properties*	*Achievement of the objectives set by the covenant of Mayors/burden sharing*

D- ATMOSPHERIC EMISSIONS		
D1	**Atmospheric emissions**	
D1.2	*GHG emissions from energy used for all purposes in building operations*	*Achievement of the objectives set by the covenant of Mayors/EU targets*

E- NON RENEWABLE RESOURCES		
E1	**Potable water, stormwater and grey water**	
E1.6	*Consumption of potable water for residential population and non residential building systems*	*Support to sustainable consumption policies*
E.1.7	*Consumption of potable water for public non residential building systems*	*Support to sustainable consumption policies*
E2	**Solid and liquid wastes**	
E2.1	*Solid waste and recycling collection points*	*Support to waste management policies; consistency with the regional waste management plan*
E2.2	*Separate collection and disposal of solid waste and recycling*	*Support to waste management policies; consistency with the regional waste management plan*

F- ENVIRONMENT		
F1	**Environmental impacts**	
F1.3	*Recharge of groundwater through permeable paving or landscaping.*	*Support to urban development policies; consistency with the draft revision of the general regulation plan (P.R.G.) of the City*

F2	**Outdoor environmental quality**	
F2.1	Ambient air quality with respect to particulates <2.5 mu (PM2.5) over a one-year period.	*Support to public health policies/EU target; Support to urban development policies; consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
F2.3	Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period	*Support to public health policies/EU target Support to urban development policies; consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
F3	**Ecosystems and landscapes**	
F3.1	*Green zones & recreation areas availability*	*Support to urban development policies; consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
G- SOCIAL ASPECTS		
G2	**Traffic and mobility Services**	
G2.1	*Performance of the public transport service*	*Support to sustainable mobility policies consistency with the draft revision of the general regulation plan (P.R.G.) of the City and with the Urban sustainable mobility plan*
G2.4	*Quality of pedestrian and bicycle network*	*Support to sustainable mobility policies consistency with the draft revision of the general regulation plan (P.R.G.) of the City and with the Urban sustainable mobility plan*
G4	**Public and private facilities and services**	
G4.2	*Availability and proximity of key public human services*	*Support to sustainable mobility policies consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
G4.3	*Availability and proximity of a primary school*	*Support to sustainable mobility policies consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
G.4.4	*Availability and proximity of a secondary school*	*Support to sustainable mobility policies consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
G4.5	*Availability and proximity of childrens' play facilities*	*Support to sustainable mobility policies consistency with the draft revision of the general regulation plan (P.R.G.) of the City*

SNTool weights rationale

ISSUES WEIGHTS

ISSUE	WEIGHTING FACTOR (1 to 3)	MOTIVATION
A- BUILT URBAN SYSTEMS	3	The Municipality considers Sustainable Urban Planning very relevant. *Consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
B- ECONOMY	1	
C- ENERGY	3	The Municipality considers Sustainable Urban Planning very relevant *Consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
D- ATMOSPHERIC EMISSIONS	3	The Municipality considers local impacts very relevant *Consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
E- NON - RENEWABLE RESOURCES	2	Good practices of sustainable consumption are relevant for the Municipality
F- ENVIRONMENT	3	Sustainable Urban Planning and health policies are a priority for the Municipality *Consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
G- SOCIAL ASPECTS	3	

CATEGORIES WEIGHTS

CATEGORIES	WEIGHT (%)
A1- Urban Structure and Form	8,3
A2- Transportation Infrastructure	3,3
TOTAL	11,6
B1- Economic Structure and Value	0
B2- Economic activity	0,6
B3- Cost and Investment	1,1
TOTAL	1,7
C1- Non-renewable energy	28,7
C2- Renewable and Decarbonised energy	12,5
C3- Energy recycling and storage	0
TOTAL	41,1
D1- Atmospheric emissions	6,9
TOTAL	6,9

E1- Potable water, stormwater and greywater	2,5
E2- Solid and Liquid Wastes	4,4
E3- Resource consumption, retention and maintenance	0
TOTAL	6,9
F1- Environmental impacts	5,5
F2- Outdoor environmental quality	11,1
F3- Ecosystems and landscapes	1,7
TOTAL	18,3
G1- Safety and Accessibility	0
G2- Traffic and Mobility Services	3,7
G3- Communication services	0
G4- Public and private facilities and services	9,2
G5- Local Food	0
G6- Management and community involvement	0,6
G7- Society, Culture and Heritage	0
G8- Perceptual	0
TOTAL	13,4

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 form

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
A.1.2	*4,16*	*3*	*3*	*5*	*1*	*weights related to the characteristics of the effects, defined on the basis of scientific assessments and the territorial context*
A. 1.7	*4,16*	*3*	*3*	*5*	*1*	
A2.1	*1,11*	*2*	*2*	*3*	*1*	
A2.4	*2,22*	*2*	*3*	*4*	*1*	
TOTAL	**11,6**					

B- ECONOMY

B2 - Economic activity

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B. 2.2	*0,55*	*3*	*3*	*2*	*1*	*weights related to the characteristics of the effects, defined on the basis of scientific assessments and the territorial context*
B. 3.3	*1,11*	*3*	*4*	*3*	*1*	
TOTAL	**1,7**					

C- ENERGY

C1 - Non-renewable energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C1.1	3,7	3	5	4	1	weights related to the characteristics of the effects, defined on the basis of scientific assessments and the territorial context
C1.2	3,7	3	5	4	1	
C1.3	3,7	3	5	4	1	
C1.4	3,7	3	5	4	1	
C1.5	3,7	3	5	4	1	
C1.6	3,7	3	5	4	1	
C1.7	4,62	3	5	5	1	
C1.20	1,85	2	5	3	1	
C2.1	4,16	3	5	3	1	
C2.4	4,16	3	5	3	1	
C2.7	1,39	3	5	3	1	
C2.8	2,77	2	5	3	1	
TOTAL	**41,1**					

D- ATHMOSPHERIC EMISSIONS

D 1 – Atmospheric emissions

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.2	*6,9*	*3*	*5*	*5*	*1*	*weights related to the characteristics of the effects, defined on the basis of scientific assessments and the territorial context*
TOTAL	**6,9**					

E- NON-RENEWABLE RESOURCES

E1 - Potable water, stormwater and greywater

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E1.6	*1,48*	*3*	*4*	*2*	*1*	*weights related to the characteristics of the effects, defined on the basis of scientific assessments and the territorial context*
E.1.7	0,99	2	4	2	*1*	

E2.1	*1,11*	*2*	*3*	*2*	*1*	
E. 2.2	*3,33*	*3*	*4*	*3*	*1*	
TOTAL	**6,9**					

F- ENVIRONMENT						
F1 - Environmental impacts						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
F.1.3	*5,55*	*3*	*4*	*5*	*1*	*weights related to the characteristics of the effects, defined on the basis of scientific assessments and the territorial context*
F. 2.1	*5,55*	*3*	*4*	*5*	*1*	
F. 2.3	*5,55*	*3*	*4*	*5*	*1*	
F. 3. 1	*1,66*	*2*	*3*	*3*	*1*	
TOTAL	**18,3**					

G- SOCIAL ASPECTS						
G2 – Traffic and Mobility Services						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G 2.1	*1,48*	*2*	*4*	*2*	*1*	*weights related to the characteristics of the effects, defined on the basis of scientific assessments and the territorial context*
G 2.4	*2,22*	*2*	*3*	*4*	*1*	
G 4.2	*1,11*	*2*	*3*	*2*	*1*	
G 4.3	*3,33*	*3*	*3*	*4*	*1*	
G 4.4	*2,22*	*2*	*3*	*4*	*1*	
G 4.5	*2,5*	*3*	*3*	*3*	*1*	
G6.3	*0,55*	*1*	*3*	*2*	*1*	
TOTAL	**13,4**					

SNTool benchmarks rationale

A- URBAN STRUCTURE AND FORM				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
A1.2	*(see table in SNTool criteria selection rationale)*	m^3/m^2	*0: 14*	*Technical evaluation of municipal offices*
			5: 18	*Technical evaluation of municipal offices*
A1.7	*(see table in SNTool criteria selection rationale)*	%	*0: 0,5%*	*Technical evaluation of municipal offices*
			5: 2%	*Technical evaluation of municipal offices*
A2.1	*(see table in SNTool*	%	*0: 85%*	*represents a minimum*

	criteria selection rationale)			*standard on average in the whole city (city center, peripherical areas, …)*
			5: 100%	*Represents the optimal standard*
A2.4	*(see table in SNTool criteria selection rationale)*	km/1000 residents	*0: 0,0014*	*Technical evaluation of municipal offices*
			5: 0,0042	*Technical evaluation of municipal offices*

B- ECONOMY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
B2.2	*(see table in SNTool criteria selection rationale)*	%	*0: 80%*	*Based on technical report (Rapporto Rota)*
			5: 90%	*Based on technical report (Rapporto Rota)*
B3.3	*(see table in SNTool criteria selection rationale)*	€/mq	*0: 7,4*	*Typical performance (ENEA REPORT)*
			5: 4	*Consumption reduction estimation (Politecnico of Turin study)*

C- ENERGY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
C1.1	*(see table in SNTool criteria selection rationale)*	kWh/m2 year	*0: 70*	*Values from TABULA project*
			5: 30	*Values from Casa ClimaBolzano and ENEA*
C1.2	*(see table in SNTool criteria selection rationale)*	kWh/m2 year	*0: 70*	*Values from TABULA project*
			5: 30	*Values from Casa ClimaBolzano and ENEA*
C1.3	*(see table in SNTool criteria selection rationale)*	kWh/m2 year	*0: 70*	*Values from TABULA project (excluded process)*
	(see table in SNTool criteria selection rationale)		*5: 30*	*Values from Casa ClimaBolzano and ENEA*
C1.4	*(see table in SNTool criteria selection rationale)*	kWh/m2 year	*0: 50*	*EURAC Study*

	(see table in SNTool criteria selection rationale)		*5: 20*	*EURAC study*
C1.5	*(see table in SNTool criteria selection rationale)*	kWh/m2 year	*0: 20*	*EURAC study*
			5: 5	*EURAC study*
C1.6	*(see table in SNTool criteria selection rationale)*	kWh/m2 year	*0: 60*	*EURAC study*
			5: 39	*Insert EURAC study*
C1.7	*(see table in SNTool criteria selection rationale)*	kWh/m2 year	*0: 322*	*20% reduction compared to actual value*
			5: 242	*40% reduction compared to actual value*
C1.20	*(see table in SNTool criteria selection rationale)*	kWh/m2 year	*0: 1*	*20% reduction compared to actual value*
			5: 0,5	*Best practice (EU, DE)*
C2.1	*(see table in SNTool criteria selection rationale)*	%	*0: 20*	*20% objectives from 2020 EU Strategy*
			5: 100	*Excellent and ideal target*
C2.4	*(see table in SNTool criteria selection rationale)*	%	*0: 20*	*20% objectives from 2020 EU Strategy*
			5: 100	*Excellent and ideal target*
C2.7	*(see table in SNTool criteria selection rationale)*	%	*0: 20*	*20% objectives from 2020 EU Strategy*
			5: 100	*Excellent and ideal target*
C2.8	*(see table in SNTool criteria selection rationale)*	MWh/y	*0: 100*	*10% roof surface (sud facing) for PV*
			5: 1000	*90% roof surface (sud facing) for PV*

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
D1.2	*(see table in SNTool criteria selection rationale)*	$kgCO_2/1000m^2$	*0: 22,5*	*Technical evaluation*
			5: 0	*Excellent and ideal target*

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
E1.6	*(see table in SNTool criteria selection rationale)*	m3 inhabitants/y	*0: 65*	*Based on indication from SMAT sustainability report 2017*
			5: 61	*Based on indication from SMAT sustainability report 2017*
E1.7	*(see table in SNTool criteria selection rationale)*	m3/m2 y	*0: 1*	*Local current values*
	(see table in SNTool criteria selection rationale)		*5: 0,5*	*50% reduction based on local current value*
E2.1	*(see table in SNTool criteria selection rationale)*	%	*0: 75*	*represents a minimum standard on average in the whole city (city center, peripherical areas, …)*
	(see table in SNTool criteria selection rationale)		*5: 98*	*Represents the optimal standard*
E2.2	*(see table in SNTool criteria selection rationale)*	%	*0: 65*	*Based on indication of the regional waste plan*
			5: 75	*Best urban practices*

F- ENVIRONMENT

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
F1.3	*(see table in SNTool criteria selection rationale)*	%	*0: 20*	*Based on tech. std. for the implementation for urban development plan*
			5: 40	*Based on tech. std. for the implementation for urban*

				development plan
F2.1	*(see table in SNTool criteria selection rationale)*	µg/m3	*0: 20*	*Based on EU Directive limits*
	(see table in SNTool criteria selection rationale)		*5: 10*	*OMS recommendation*
F2.3	*(see table in SNTool criteria selection rationale)*	n	*0: 35*	*Based on EU Directive limits*
	(see table in SNTool criteria selection rationale)		*5: 25*	*Based on values in similar cities without significant pollution problems (suggested by ARPA)*
F3.1	*(see table in SNTool criteria selection rationale)*	m2 /inhab	*0: 12,5*	*Based on national urban standard*
	(see table in SNTool criteria selection rationale)		*5: 33*	*Amelioration on national urban standard*

G- SOCIAL ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
G2.1	*Performance of the public transport service*	%	*0: 70%*	*Technical evaluation*
			5: 100%	*Technical evaluation*
G2.4	*Quality of pedestrian and bicycle network*	m/100 inhab	*0: 14*	*Technical evaluation of municipal offices*
			5: 42	*Technical evaluation of municipal offices*
G4.2	*(see table in SNTool criteria selection rationale)*	%	*0: 80*	*Technical evaluation*
	(see table in SNTool criteria selection rationale)		*5: 100*	*Actual value*
G4.3	*(see table in SNTool criteria selection rationale)*	%	*0: 50*	*Based on National standard (DM 75/75, evaluated with municipal offices)*

	(see table in SNTool criteria selection rationale)		*5: 75*	*Increase compared to National standard (DM 75/75, evaluated with municipal offices)*
G4.4	*(see table in SNTool criteria selection rationale)*	%	*0: 30*	*Based on National standard (DM 75/75, evaluated with municipal offices)*
	(see table in SNTool criteria selection rationale)		*5: 60*	*Increase compared to National standard (DM 75/75, evaluated with municipal offices)*
G4.5	*(see table in SNTool criteria selection rationale)*	%	*0: 30*	*Technical evaluation*
			5: 60	*Technical evaluation*
G6.3	*(see table in SNTool criteria selection rationale)*	n	*0: -1(0)*	-
			5: 5	-

SNTool Criteria Specifications

A- BUILT URBAN SYSTEMS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.2	*Urban compactness*	*Information source*	*Shape file from Comune di Torino (ing. Gallo). The data are geometrical measurements*
		Assessment method	*Calculation of building volume and of the urban area from shapefile*
		Standard	*No*
A1.7	*Conservation of Land*	*Information source*	*Shape file from Comune di Torino (ing. Gallo). The data are geometrical measurements*
		Assessment method	*Calculation of undeveloped land (agricultural)*
		Standard	*no*
A2.1	*Walking distance…*	*Information*	*Shape file from Comune di Torino*

		source	*(ing. Gallo). The data are geometrical measurements*
		Assessment method	*Centroids for distance evaluation*
		Standard	*no*
A2.4	*Connectivity of bicycle path*	*Information source*	*Shape file from Comune di Torino (divisione infrastrutture e mobilità). The data are geometrical measurements*
		Assessment method	*Calculation of bicycle path length*
		Standard	*no*

B- ECONOMY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B2.2	*Per capita income*	*Information source*	*Rapporto Rota*
		Assessment method	*Content of the study*
		Standard	*no*
B3.3	*Running costs of energy for public buildings*	*Information source*	*Data from* Servizio Controllo Utenze e Contabilità Fornitori
		Assessment method	*Data given*
		Standard	*no*

C- ENERGY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
C1.1	*Total final thermal energy consumption for building operation*	*Information source*	*Overall city consumptions (DB from Convenant of Majors)/overall final thermal consumptions*
		Assessment method	*Value obtained from specific urban consumption reported in the Convenant of Mayors Database, compared to the surface of our pilot area*
		Standard	*TABULA project; when possible referred to UNI 11300*

C1.2	*Total thermal residential*	*Information source*	*Overall city consumptions (DB from Convenant of Majors)*
		Assessment method	*Value obtained from specific urban consumption of residential buildings reported in the Convenant of Mayors Database, compared to the surface of our pilot area-residential buildings*
		Std.	*TABULA; when possible referred to UNI 11300*
C1.3	*Total thermal NON residential*	*Information source*	*Overall city consumptions (DB from Convenant of Majors)*
		Assessment method	*Value obtained from specific urban consumption of NON residential buildings reported in the Convenant of Mayors Database, compared to the surface of our pilot area- NON residential buildings*
		Std.	*No – when possible referred to UNI 11300*
C1.4	*Total final electric energy consumption for building operation*	*Information source*	*Overall city consumptions (DB from Convenant of Majors)*
		Assessment method	*Value obtained from specific urban consumption reported in the Convenant of Mayors Database, compared to the surface of our pilot area*
		Std.	*No – when possible referred to UNI 11300*
C1.5	*Total final electric residential*	*Information source*	*Overall city consumptions (DB from Convenant of Majors)*
		Assessment method	*Value obtained from specific urban consumption of residential buildings reported in the Convenant of Mayors Database, compared to the surface of our pilot area-residential buildings*
		Std.	*No – when possible referred to UNI*

			11300
C1.6	*Total final electric for NON residential*	*Information source*	*Overall city consumptions (DB from Convenant of Majors)*
		Assessment method	*Value obtained from specific urban consumption of NON residential buildings reported in the Convenant of Mayors Database, compared to the surface of our pilot area-residential buildings*
		Std.	*No – when possible referred to UNI 11300*
C1.7	*Total primary for building operation*	*Information source*	*Overall city consumptions (DB from Convenant of Majors)*
		Std.	
		Assessment method	*The value is calculated as the sum of (thermal + electric) consumption for the whole city related to the surface of buildings in the AREA multiplied for the coefficient for energy conversion into primary energy, derived from the DM 26/6/2016*
		Std.	*No*
C1.20	*Energy consumption public lightning*	*Information source*	*Data derived from TERNA*
		Assessment method	*average annual consumption per inhabitants (TERNA), kWh/mq, multiplied for the AREA SURFACE, and then related to the number of inhabitants living in the AREA.*

C2.1	*Share of renewable energy on site…*	*Information source*	*Altlaimpianti_GSE; DB from Convenant of Majors*
		Assessment method	*Calculated the production of Renewable thermal energy from GSE database. Calculate the total thermal consumption, from DB from Convenant of Majors. Ratio between them*
		Standard	*No*
C2.4	*Share .. on total primary*	*Information source*	*Altlaimpianti_GSE; DB from Convenant of Majors*

		Assessment method	Calculated the production of Renewable thermal + electric energy from GSE database. Calculate the total thermal+ electric consumption, from DB from Convenant of Majors. Transformation into primary energy. Ration between them
		Standard	No
C2.7	*Share .. on total primary*	Information source	Altlaimpianti_GSE; DB from Convenant of Majors
		Assessment method	Calculated the production of Renewable thermal + electric energy from GSE database. Calculate the total thermal+ electric consumption, from DB from Convenant of Majors. Transformation into primary energy. Ration between them
		Standard	No
C2.8	*Aggregated electric …from RE…on public buildings*	Information source	Estimation Size of PV plant
		Assessment method	Estimation of the production of the existing PV plant
		Standard	No

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	SPECIFICATIONS	
D1.2	*GHG emission from energy used for all purposes in building operation*	Information source	Overall city consumptions (DB from Convenant of Majors)
		Assessment method	Calculation of the total emission from thermal and electric consumptions, in kg CO2.
		Standard	Conversion factors from POR 2014/2020

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	SPECIFICATIONS	
E 1.6	*Consumption of potable water for residential population*	*Information Source*	*SMAT Bilancio di Sostenibilità 2017*
		Assessment method	*Use of the indicator in the SMAT '2017 Sustainability Report'.*
		Standard	*no.*
E 1.7	*Consumption of potable water for non -residential building systems*	*Information Source*	
		Assessment method	
		Standard	*no.*
E 2.1	*Solid Waste and recycling point*	*Information Source*	*Iren -Amiat*
		Assessment method	*Definition of centroids drawn on the different census sections (centre of gravity of the polygon).* *The radius of the centroid (hypotenuse) is established using the formula of Pythagoras' theorem, assuming the length of the sum of the cathetes as the distance indicated for the calculation of the indicator. The City of Turin is in fact characterized by a predominantly Roman (orthogonal) urban plan.*
		Standard	*no.*

E 2.2	*Separate collection and disposal of solid waste and recycling*	*Information Source*	*Iren -Amiat*
		Assessment method	*weighted average of the percentages of separate collection of the two city districts (V and VI) included in the pilot area*
		Standard	*no.*

F- ENVIRONMENT			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
F 1.3	*Recharge of groundwater through permeable paving or landscaping*	*Information source*	*Shape file from Comune di Torino* *The data are geometrical measurements*
		Assessment method	*sum of green areas with a coefficient of permeability equal to one and a coefficient of permeability equal to 0.9 in relation to the total surface area of the pilot area*
		Standard	*no*
F 2.1	*Ambient air quality with respect to particulates PM 2,5 over a one year period*	*Information source*	*Annual report on air quality, drawn up by Arpa Piemonte and the Metropolitan City of Turin - Data from the monitoring unit*
		Assessment method	*extraction of the specific data from the Annual Air Quality Report*
		Standard	no
F 2.3	*Ambient air quality with respect to particulates PM 10*	*Information source*	*Annual report on air quality, drawn up by Arpa Piemonte and the Metropolitan City of Turin - Data*

	over a one year period		*from the monitoring unit*
		Assessment method	*extraction of the specific data from the Annual Air Quality Report*
		Standard	no
F 3.1	*Green zones and recreation areas availability*	*Information source*	*Shape file from Comune di Torino* *The data are geometrical measurements*
		Assessment method	*sum of green zones and recreations areas in relation to the inhabitants of the pilot area*
		Standard	no

G- SOCIAL ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
G 2.1	*Performance of the public transport services*	*Information source*	*Shapefile from Comune di Torino* *Divisione Infrastrutture e Mobilità*
		Assessment method	*Definition of centroids drawn on the different census sections (centre of gravity of the polygon).* *The radius of the centroid (hypotenuse) is established using the formula of Pythagoras' theorem, assuming the length of the sum of the cathetes as the distance indicated for the calculation of the indicator. The City of Turin is in fact characterized by a predominantly Roman (orthogonal) urban plan.*

		Standard	*no*
G 2.4	*Quality of pedestrian and bicycle network*	*Information source*	*Shapefile from Comune di Torino* *Divisione Infrastrutture e Mobilità*
		Assessment method	*sum of linear meters of bicycle path and pedestrians area in relation to the inhabitants of the pilot area.*
		Standards	*no*
G 4.2	*Availability and proximity of key public human services*	*Information source*	*Shape file from Comune di Torino*
		Assessment method	*Definition of centroids drawn on the different census sections (centre of gravity of the polygon).* *The radius of the centroid (hypotenuse) is established using the formula of Pythagoras' theorem, assuming the length of the sum of the cathetes as the distance indicated for the calculation of the indicator. The City of Turin is in fact characterized by a predominantly Roman (orthogonal) urban plan*
		Standards	*no*
G 4.3	*Availability and proximity of a primary school*	*Information source*	*Shape file from Comune di Torino*

		Assessment method	*Definition of centroids drawn on the different census sections (centre of gravity of the polygon).* *The radius of the centroid (hypotenuse) is established using the formula of Pythagoras' theorem, assuming the length of the sum of the cathetes as the distance indicated for the calculation of the indicator. The City of Turin is in fact characterized by a predominantly Roman (orthogonal) urban plan*
		Standards	*no*
G 4.4	*Availability and proximity of a secondary school*	*Information source*	*Shape file from Comune di Torino*
		Assessment method	*Definition of centroids drawn on the different census sections (centre of gravity of the polygon).* *The radius of the centroid (hypotenuse) is established using the formula of Pythagoras' theorem, assuming the length of the sum of the cathetes as the distance indicated for the calculation of the indicator. The City of Turin is in fact characterized by a predominantly Roman (orthogonal) urban plan*
		Standards	*no*
G 4.5	*Availability and proximity of children' play facilitiesl*	*Information source*	*Shape file from Comune di Torino*
		Assessment method	*Definition of centroids drawn on the different census sections (centre of gravity of the polygon).* *The radius of the centroid (hypotenuse) is established using the formula of Pythagoras' theorem,*

	assuming the length of the sum of the cathetes as the distance indicated for the calculation of the indicator. The City of Turin is in fact characterized by a predominantly Roman (orthogonal) urban plan
Standards	*no*

REGIONAL TOOL

D.3.4.3 Regional Tool – City of Udine

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

URBAN SCALE ASSESSMENT

SNTool structure

A - BUILT URBAN SYSTEMS	
A1	**Urban Structure and Form**
A1.2	*Urban compactness*
A1.4	** Residential density*
A1.7	*Conservation of Land*
A2	**Transportation Infrastructure**
A2.5	*Cyclomatic complexity of the street network*
A2.8	*Scale of the street network*

B - ECONOMY	
B1	**Economic Structure and Value**
B1.1	*Affordability of housing property*
B1.2	*Affordability of housing rental*
B1.6	*Percent of residential units in the neighborhood that are vacant.*
B2	**Economic activity**
B2.3	*Employment rate.*
B3	**Cost and Investment**
B3.3	*Use stage energy cost for public buildings.*

C - ENERGY	
C1	**Non-renewable energy**
C1.1	*Total final thermal energy consumption for building operations.*
C1.4	*Total final electrical energy consumption for building operations.*
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 Decarbonized energy**
C2.1	*Share of renewable energy on-site, on total final thermal energy consumptions for buildings operation.*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy.*

D - ATMOSPHERIC EMISSIONS	
D1	**Atmospheric emissions**
D1.2	*Total GHG Emissions from primary energy used in building operations.*
D1.4	*Aggregate emissions of acidifying emissions during building operations.*

E - NON - RENEWABLE RESOURCES	
E1	**Potable water, stormwater and greywater**

E1.3	*Re-use of rainwater in residential buildings.*
E1.4	*Re-use of rainwater in non-residential building.*
E1.6	*Consumption of potable water for residential population.*
E1.7	*Consumption of potable water for 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.*
E2.6	*Public wastewater that is disposed or treated.*
E3	**Resource consumption, retention and maintenance**
E3.5	*Preservation and maintenance of existing buildings and structures.*

F - ENVIRONMENT	
F1	**Environmental impacts**
F1.3	*Recharge of groundwater through permeable paving or landscaping.*
F1.11	*Albedo*
F2	**Outdoor environmental quality**
F2.3	*Ambient air quality with respect to particulates <10 µm (PM10) over a one-year period.*
F2.11	*Ambient night-time noise conditions.*
F3	**Ecosystems and landscapes**
F3.1	*Green zones & recreation areas availability*
F3.6	*Tree coverage for shade and management of local ambient temperatures.*
F3.7	*Green roofs.*
F3.9	*Presence or potential for wildlife corridors.*

G - SOCIAL ASPECTS	
G1	**Traffic and Mobility Services**
G1.2	*Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons.*
G1.3	*Barrier-free accessibility in local outdoor public areas.*
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.*
G2.2	*Availability of car sharing services*
G2.4	*Quality of pedestrian and bicycle network.*
G3	**Communication services**
G3.1	*Availability of a broadband communication network*
G4	**Public and private facilities and services**
G4.2	*Availability and proximity of key services*
G4.6	*Availability and proximity of leisure facilities*
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*

SNTool criteria selection rationale

A - BUILT URBAN SYSTEMS

CRITERION	REASON/MOTIVATION
A1.2 - *Urban compactness*	*Assess the actual consumption and use of land. EMAS declaration 30.06.2017 rev. 13. General urban development plan.*
A1.4 - Residential density	*Analyze the population density to avoid creating "ghetto" areas.*
A1.7 - *Conservation of Land*	*Protect the area with high agricultural and environmental characteristics. EMAS declaration 30.06.2017 rev. 13. General urban development plan.*
A2.5 - *Cyclomatic complexity of the street network*	*Evaluate the network of paths and the ease of access to the various areas.*
A2.8 - *Scale of the street network*	*Evaluate the length of the routes.*

B - ECONOMY

CRITERION	REASON/MOTIVATION
B1.1 - *Affordability of housing property*	*Maintaining a proper ratio between the income of the residents and the purchase cost of the accommodation.*
B1.2 - *Affordability of housing rental*	*Maintaining a proper ratio between the income of the residents and the cost of renting the accommodation.*
B1.6 - *Percent of residential units in the neighbourhood that are vacant.*	*Evaluate hypothesis of abandonment of the area by residents.*
B2.3 - *Employment rate.*	*Evaluate social quality with respect to employment.*
B3.3 - *Use stage energy cost for public buildings*	*Evaluate the impact of energy costs per square meter of public buildings. PAES "Sustainable Energy (and Climate) Action Plan" of 23-07-2010*

C - ENERGY

CRITERION	REASON/MOTIVATION
C1.1 - *Total final thermal energy consumption for building operations.*	*Evaluate the real energy consumption index of the area. PAES "Sustainable Energy (and Climate) Action Plan" of 23-07-2010. Energy regulation.*
C1.4 - *Total final electrical energy consumption for building operations.*	*Evaluate the real electric consumption index of the area. PAES "Sustainable Energy (and Climate) Action Plan" of 23-07-2010.*
C1.7 - *Total primary energy demand for building operations.*	*Evaluate the deviation between the primary reference energy with the calculated primary energy. PAES "Sustainable Energy (and Climate)*

	Action Plan" of 23-07-2010. D.M. Minimum requirements
C1.20 - *Energy consumption of public lighting.*	*Evaluate the consumption of public lighting. EMAS declaration 30.06.2017 rev. 13.*
C1.21 - *Energy consumption of local public transport.*	*Check the level of sustainability achieved by the consumption of public transport. EMAS declaration 30.06.2017 rev. 13. PAES "Sustainable Energy (and Climate) Action Plan" of 23-07-2010*
C2.1 - *Share of renewable energy on-site, on total final thermal energy consumptions for buildings operation.*	*Evaluate the relationship between renewable and total energy. EMAS declaration 30.06.2017 rev. 13. PAES "Sustainable Energy (and Climate) Action Plan" of 23-07-2010. DLgs 28/11*
C2.7 - *Share of renewable energy on-site, on final electric energy consumptions.*	*Evaluate the percentage of on - site electric renewable energy with respect to the total. EMAS declaration 30.06.2017 rev. 13. PAES "Sustainable Energy (and Climate) Action Plan" of 23-07-2010. DLgs 28/11*

D - ATMOSPHERIC EMISSIONS

CRITERION	REASON/MOTIVATION
D1.2 - *Total GHG Emissions from primary energy used in building operations.*	*Evaluate the level of emissions in relation to the PAES "Sustainable Energy (and Climate) Action Plan" of 23-07-2010*
D1.4 - *Aggregate emissions of acidifying emissions during building operations.*	*Evaluate the impact of other emissions in relation to the ISO 14001 Environmental Certification. PAC (Municipal Action Plan) 4 February 2014.*

E - NON - RENEWABLE RESOURCES

CRITERION	REASON/MOTIVATION
E1.3 - *Re-use of rainwater in residential buildings.*	*Verify the recovery of rainwater in residential buildings. Energy regulation 6 February 2013. EMAS declaration 30.06.2017 rev. 13.*
E1.4 - *Re-use of rainwater in non-residential building.*	*Verify the recovery of rainwater in non-residential buildings. Energy regulation 6 February 2013. EMAS declaration 30.06.2017 rev. 13.*
E1.6 - *Consumption of potable water for residential building systems.*	*Analyze water savings in residential buildings*
E1.7 - *Consumption of potable water for non-residential building systems.*	*Analyze water savings in non-residential buildings*
E1.8 - *Consumption of potable water for irrigation purposes.*	*Check the impact of water consumption for irrigation and rainwater recovery.*
E2.1 - *Solid waste and recycling collection points.*	*Evaluate the quality of the service and the level of recycling. EMAS declaration 30.06.2017 rev. 13.*
E2.6 - *Public wastewater that is disposed or treated.*	*Evaluate the level of treatment of processed and disposed of public waters EMAS declaration 30.06.2017 rev. 13.*
E3.5 - *Preservation and maintenance of existing buildings and structures.*	*Evaluate the level of maintenance quality.*

F - ENVIRONMENT

CRITERION	REASON/MOTIVATION
F1.3 - *Recharge of groundwater through permeable paving or landscaping.*	*Check the capacity of the area to feed the groundwater. UNI PdR 13 ITACA.*
F1.11 - *Albedo*	*Evaluate the quality of the external environment during the summer season. UNI PdR 13 ITACA ...*
F2.3 - *Ambient air quality with respect to particulates <10 µm (PM 10) over a one-year period.*	*Analyze the quality of the air. EMAS declaration 30.06.2017 rev. 13.*
F2.11 - *Ambient night-time noise conditions.*	*Evaluate the level of noise pollution. EMAS declaration 30.06.2017 rev. 13.*
F3.1 - *Green zones & recreation areas availability*	*Evaluate the allocation of Green surfaces. EMAS declaration 30.06.2017 rev. 13.*
F3.6 - ** Tree coverage for shade and management of local ambient temperatures.*	*Evaluate the quality of the Green areas in relation to their usability. Green regulation*
F3.7 - *Green roofs.*	*Encourage the use of green roofs Energy regulation 6 February 2013.*
F3.9 - Presence or potential for wildlife corridors.	*Allow the fauna to be able to populate the various green areas and allow their full use*

G - SOCIAL ASPECTS

CRITERION	REASON/MOTIVATION
G1.2 - *Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons.*	*Evaluate the accessibility of the sidewalks by disabled people*
G1.3 - *Barrier-free accessibility in local outdoor public areas.*	*Verify the barrier-free accessibility of public areas.*
G1.4 - *Ease of access to and use of public transport for physically disabled persons.*	*Evaluate the accessibility of public transport by people with disabilities.*
G2.1 - *Performance of the public transport.*	*Analyze the public service in its general aspects EMAS declaration 30.06.2017 rev. 13. PUM Urban Mobility Plan October 2011.*
G2.2 - *Availability of car sharing services*	*Incentive use of car-sharing. EMAS declaration 30.06.2017 rev. 13. PUM Urban Mobility Plan October 2011.*
G2.4 - *Quality of pedestrian and bicycle network.*	*Measure the availability of pedestrian paths and cycle paths. EMAS declaration 30.06.2017 rev. 13. PUM Urban Mobility Plan October 2011.*
G3.1 - *Availability of a broadband communication network*	*Allow access to information and online services Reduce the digital divide. AGICOM.*
G4.2 - *Availability and proximity of key services*	*Evaluate the quality of public human services in the area. EMAS declaration 30.06.2017 rev. 13.*
G4.6 - *Availability and proximity of leisure facilities*	*Analyze the sporting and cultural services in the area. EMAS declaration 30.06.2017 rev. 13.*
G5.2 - *Residents' access to and use of urban agricultural plots.*	*Offer the opportunity to produce garden produce on site and encourage the consumption of vegetables and forms of socialization. Agenda 21. Guidelines "The garden and the moon" by G.C. n. 338 of 1 October 2013.*
G6.3 - *Community involvement in urban planning activities*	*Evaluate the level of community involvement and the actual level of participatory planning. EMAS declaration 30.06.2017 rev. 13. Programmatic declarations of the Mayor of Udine*

SNTool weights rationale

ISSUES WEIGHTS

ISSUE	WEIGHTING FACTOR (1 to 3)	MOTIVATION
A - BUILT URBAN SYSTEMS	1	Rigidity of the system
B - ECONOMY	2	Reduced power of intervention - Reduced intervention domain
C - ENERGY	3	Political priority; PAC - PAES - EMAS
D - ATMOSPHERIC EMISSIONS	2	Reduced power of intervention - Reduced intervention domain
E - NON - RENEWABLE RESOURCES	3	Political priority; PAC - PAES - EMAS
F - ENVIRONMENT	2	Reduced power of intervention - Reduced intervention domain
G - SOCIAL ASPECTS	2	Reduced power of intervention - Reduced intervention domain

CATEGORIES WEIGHTS

CATEGORIES	WEIGHT (%)
A1 - Urban Structure and Form	44,44
A2 - Transportation Infrastructure	55,56
TOTAL	100
B1 - Economic Structure and Value	73,91
B2 - Economic activity	13,04
B3 - Cost and Investment	13,04
TOTAL	100
C1 - Non-renewable energy	68,24
C2 - Renewable and Decarbonized energy	31,76
C3 - Energy recycling and storage	NA
TOTAL	100
D1 - Atmospheric emissions	100
TOTAL	100
E1 - Potable water, stormwater and greywater	55,10
E2 - Solid and Liquid Wastes	32,65
E3 - Resource consumption, retention and maintenance	12,24
TOTAL	100
F1 - Environmental impacts	16,51
F2 - Outdoor environmental quality	41,28
F3 - Ecosystems and landscapes	42,20
TOTAL	100
G1 - Safety and Accessibility	25,35
G2 - Traffic and Mobility Services	29,58
G3 - Communication services	8,45
G4 - Public and private facilities and services	16,90
G5 - Local Food	8,45
G6 - Management and community involvement	11,27

G7 - Society, Culture and Heritage	NA
G8 - Perceptual	NA
TOTAL	100

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 Form

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A1.2	*1,73*	*3*	*2*	*4*	*1*	*Confirmed*
A1.4	*1,73*	*3*	*2*	*4*		*Except for the criterion A1.2*
A1.7	*1,15*	*2*	*2*	*4*	*1*	*Confirmed*

A2 - Transportation Infrastructure

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A2.5	*1,44*	*2*	*2*	*5*	*1*	*Confirmed*
A2.8	*4,33*	*3*	*4*	*2*	*1*	*Confirmed*
TOTAL	10,38					

B - ECONOMY

B1 - Economic Structure and Value

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B1.1	*2,60*	*3*	*2*	*3*	*1*	*Confirmed*
B1.2	*1,73*	*3*	*2*	*2*	*1*	*Confirmed*
B1.6	*0,58*	*2*	*2*	*1*		

B2 - Economic activity

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B2.3	*0,87*	3	*2*	*1*	*1*	*Confirmed*

B3 – Cost and Investment

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B3.3	*0,87*	*1*	*2*	*3*	*1*	*Confirmed*
TOTAL	6,63					

C - ENERGY

C1 - Non-renewable energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C1.1	*3,89*	*3*	*2*	*3*	*1*	*Confirmed*
C1.4	*2,60*	*3*	*2*	*2*	*1*	*Confirmed*
C1.7	*2,60*	*3*	*2*	*2*	*1*	*Confirmed*
C1.20	*0,87*	*1*	*2*	*2*		*Shortage of documentation*
C1.21	*2,60*	*2*	*2*	*1*		*Service managed by another body*

C2 - Renewable and Decarbonised energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C2.1	*3,89*	*3*	*2*	*3*	*1*	*Confirmed*
C2.7	*1,95*	*1*	*3*	*3*	*1*	*Confirmed*

TOTAL	18,39					

D - ATHMOSPHERIC EMISSIONS

D1 - Atmospheric emissions

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.2	*10,81*	*3*	*5*	*5*	*1*	*Confirmed*
D1.4	*3,46*	*2*	*4*	*3*	*1*	*Confirmed*
TOTAL	14,28					

E - NON-RENEWABLE RESOURCES

E1 - Potable water, stormwater and greywater

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E1.3	*1,73*	*2*	*2*	*2*	*1*	*Confirmed*
E1.4	*0,87*	*1*	*2*	*2*	*1*	*Confirmed*
E1.6	*2,60*	*3*	*2*	*2*	*1*	*Confirmed*
E1.7	*0,87*	*1*	*2*	*2*	*1*	*Confirmed*
E1.8	*1,73*	*2*	*2*	*2*		*Large lawn surfaces*

E2 - Solid and Liquid Wastes

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E2.1	*1,15*	*2*	*2*	*2*	*1*	*Confirmed*
E2.6	*3,46*	*2*	*4*	*3*	*1*	*Confirmed*

E3 - Resource consumption, retention and maintenance

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E3.5	*1,73*	*2*	*2*	*3*	*1*	*Confirmed*
TOTAL	14,13					

F - ENVIRONMENT

F1 - Environmental impacts

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F1.3	*0,87*	*1*	*2*	*3*	*1*	*Confirmed*
F1.11	*1,73*	*2*	*2*	*3*	*1*	*Confirmed*

F2 - Outdoor environmental quality

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F2.3	*3,89*	*3*	*3*	*3*	*1*	*Confirmed*
F2.11	*2,60*	*3*	*2*	*3*		*Lack of punctual data*

F3 - Ecosystems and landscapes

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F3.1	*1,15*	*2*	*2*	*2*	*1*	*Confirmed*
F3.6	*2,60*	*3*	*2*	*3*		*Large lawn surfaces*
F3.7	*1,15*	*2*	*2*	*2*		*Seismic zone no increase in coverage load*
F3.9	*1,73*	*2*	*2*	*3*	*1*	*Confirmed*
TOTAL	15,72					

G - SOCIAL ASPECTS

G1 - Safety and Accessibility

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

G1.2	*1,73*	*2*	*2*	*3*		*Data not available*
G1.3	*1,73*	*2*	*2*	*3*		*Data not available*
G1.4	*1,73*	*2*	*2*	*3*		*Data not available*
G2 - Traffic and Mobility Services						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G2.1	*2,60*	*3*	*2*	*3*	*1*	*Confirmed*
G2.2	*1,73*	*2*	*2*	*3*	*1*	*Confirmed*
G2.4	*1,73*	*2*	*2*	*3*	*1*	*Confirmed*
G3 - Communication services						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G3.1	*1,73*	*2*	*2*	*3*	*1*	*Confirmed*
G4 - Public and private facilities and services						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G4.2	*1,73*	*2*	*2*	*3*	*1*	*Confirmed*
G4.6	*1,73*	*2*	*2*	*3*	*1*	*Confirmed*
G5 - Local Food						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G5.2	*1,73*	*2*	*2*	*3*	*1*	*Confirmed*
G6 - Society, Culture and Heritage						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G6.3	*2,31*	*2*	*2*	*4*	*1*	*Confirmed*
TOTAL	20,48					

SNTool benchmarks rationale

A - URBAN STRUCTURE AND FORM				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
A1.2	***Urban compactness***	m^3 / m^2	*0: 1,0*	*maximum index of extensive zones*
			5: 3,5	*Maximum territorial Index PRGC*
A1.4	***Residential density***	Pp/ha	*0: 40*	*Average value of the city*
			5: 300	*Assumption of doubling the value of Aurora neighborhood*
A1.7	***Conservation of Land***	%	*0: 7*	*Real data of the neighborhood*
			5: 42	*Global data of the city*
A2.5	***Cyclomatic complexity of the street network***	n	*0: 30*	-
			5: 100	-
A2.8	***Scale of the street network***	m	*0: 160*	*Walking path in two minutes*
			5: 80	*walking path in one minutes*

B - ECONOMY				
CRITERION	INDICATOR	UNIT OF	BENCHMARK	RATIONALE

		MEASURE		
B1.1	***Affordability of housing property***	%	*0: 18*	-
			5: 25	-
B1.2	***Affordability of housing rental***	%	*0: 18*	-
			5: 25	-
B1.6	***Percent of residential units in the neighbourhood that are vacant***	%	*0: 4*	-
			5: 2	-
B2.3	***Employment rate.***	%	*0: 65*	*FVG employment rate 2018*
			5: 98	*Physiological value 2%*
B3.3	***Use stage energy cost for public buildings***	Euro/m^2/year	*0: 10*	*Current basic data*
			5: 3	*Passive or NZEB Building*

C - ENERGY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
C1.1	***Total final thermal energy consumption for building operations.***	kWh/m^2/year	*0: 80*	*Current index*
			5: 10	*Energy regulation*
C1.4	***Total final electrical energy consumption for building operations.***	kWh/m2	*0: 23*	-
			5: 5	-
C1.7	***Total primary energy demand for building operations.***	kWh/m^2/year	*0: 72*	*D.M. Minimum requirements*
			5: 50	-
C1.20	***Energy consumption of public lighting.***	kWh/m2	*0: 56*	*Present value*
			5: 16	*PAES value*
C1.21	***Energy consumption of local public transport.***	Pax.km/Mj	*0: 500*	-
			5: 1000	-
C2.1	***Share of renewable energy on-site, on total final thermal energy consumptions for buildings operation.***	%	*0: 25*	*D.Lgs 28/11*
			5: 50	-
C2.7	***Share of renewable energy on-site, on final electric energy consumptions***	%	*0: 35*	-
			5: 75	-

D - ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	UNIT OF	BENCHMARK	RATIONALE

		MEASURE		
D1.2	***Total GHG Emissions from primary energy used in building operations.***	kg CO_2 eq,/ m^2/year	*0: 13*	*D.M. Minimum requirements*
			5: 11	*PAES value*
D1.4	***Aggregate emissions of acidifying emissions during building operations.***	g / 1000 m2	*0: 120*	*The data is confirmed*
			5: 18	*PAES savings 40%*

E - NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
E1.3	***Re-use of rainwater in residential buildings.***	%	*0: 10*	*The data is confirmed*
			5: 60	*The data is confirmed*
E1.4	***Re-use of rainwater in non-residential building.***	%	*0: 10*	*The data is confirmed*
			5: 80	*The data is confirmed*
E1.6	***Consumption of potable water for residential population.***	m^3/occupant/year	*0: 47,450*	*ITACA standard value*
			5: 23,700	*With best performance at 50% on the standard*
E1.7	***Consumption of potable water for non-residential building systems.***	m^3/m^2	*0: 1,3*	*Standard UNI PdR ITACA not residential*
			5: 0,6	*Best UNI PdR ITACA not residential*
E1.8	***Consumption of potable water for irrigation purposes.***	m^3/1000m2	*0: 300*	*UNI PdR ITACA not residential*
			5: 0	*Total recovery*
E2.1	***Solid waste and recycling collection points.***	%	*0: 70*	*Current neighborhood data*
			5: 98	*Expected coverage*
E2.6	***Public wastewater that is disposed or treated.***	%	*0: 90*	*The data is confirmed*
			5: 100	*All the waters are processed*
E3.5	***Preservation and maintenance of existing buildings and structures.***	benchmark text scale	*0: 0*	*Maintenance standard*
			5: 5	*High quality interventions*

F - ENVIRONMENT

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
F1.3	***Recharge of groundwater through permeable paving or landscaping.***	%	*0: 40*	*UNI PdR ITACA*
			5: 60	*UNI PdR ITACA*
F1.11	***Albedo***	%	*0: 0*	*UNI PdR ITACA*
			5: 100	*UNI PdR ITACA*
F2.3	***Ambient air quality with respect***	day/year	*0: 35*	*Average annual limit*

	to particulates <10 µm (PM10) over a one-year period.		*5: 0*	*Value 3 = 35 ug/m3 - EMAS*
F2.11	***Ambient night-time noise conditions.***	%	*0: -*	-
			5: -	-
F3.1	***Green zones & recreation areas availability***	m2/inhab	*0: 20*	*ISTAT value about city of Udine*
			5: 75	-
F3.6	***Tree coverage for shade and management of local ambient temperatures.***	%	*0: -*	-
			5: -	-
F3.7	***Green roof***	%	*0: -*	-
			5: -	-
F3.9	***Presence or potential for wildlife corridors.***	benchmark text scale	*0: 0*	*Traffic with low traffic*
			5: 5	*Specific design.*

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: -*	-
			5: -	-
G1.3	***Barrier-free accessibility in local outdoor public areas.***	%	*0: -*	-
			5: -	-
G1.4	***Ease of access to and use of public transport for physically disabled persons.***	%	*0: -*	-
			5: -	-
G2.1	***Performance of the public transport.***	%	*0: 60*	*The data is confirmed*
			5: 100	*Total coverage*
G2.2	***Availability of car sharing services***	%	*0: 1*	*The data is confirmed*
			5: 20	*The data is confirmed*
G2.4	***Quality of pedestrian and bicycle network.***	m/100 inhabitants	*0: 43*	*Average data of the city*
			5: 129	*PUM forecast*
G3.1	***Availability of a broadband communication network***	%	*0: 50*	*Minimum coverage required by the broadband strategy*
			5: 100	*Cancellation of the digital divide*
G4.2	***Availability and proximity of key services***	%	*0: 30*	*The data is confirmed*
			5: 80	*The data is confirmed*
G4.6	***Availability and proximity of***	%	*0: 20*	*The data is confirmed*

	leisure facilities		*5: 40*	*The data is confirmed*
G5.2	***Residents' access to and use of urban agricultural plots.***	%	*0: 20*	*Analogy with criterion G4.6*
			5: 40	*Analogy with criterion G4.6*
G6.3	***Community involvement in urban planning activities***	-	*0: 3*	*Tokenism degree - minimum 3 - information*
			5: 9	*Total control of citizens from project to project delivery 9*

SNTool Criteria Specifications

A - BUILT URBAN SYSTEMS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.2	***Urban compactness***	*Information source*	*CTRN - tema: edifici - Edificato CTRN 5000 - 2° Edizione - Edificato 066 Census areas - 2011*
		Assessment method	*Calculated the area of the scope and the volumes by reprocessing volumes to deduce the surface of the eaves.*
		Standard	*Rules of the General urban development plan*
A1.7	***Conservation of Land***	*Information source*	*Full Surface area - census areas.*
		Assessment method	*To relate the total surface with respect to the ecological value of the neighborhood area.*
		Standard	*Present value of the district*
A2.5	***Cyclomatic complexity of the street network***	*Information source*	*Database Regione Friuli Venezia Giulia - Road segment*
		Assessment method	*Evaluate the number of segments that connect the individual nodes*
		Standard	*I keep the present data*
A2.8	***Scale of the street network***	*Information source*	*Evaluate the ease of access to the various areas of the neighborhood*
		Assessment method	*Ratio between length and number of segments*
		Standard	*Walking path in two minutes (UNI PdR_13 ITACA Residential)*

B - ECONOMY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.1	***Affordability of housing property***	*Information source*	*OMI Observatory trades*
		Assessment method	*Ratio between income and purchase value*

		Standard	*-*
B1.2	***Affordability of housing rental***	*Information source*	*OMI Observatory trades*
		Assessment method	*Ratio between income and rent value*
		Standard	*-*
B2.3	***Employment rate.***	*Information source*	*ISTAT index*
		Assessment method	*Relationship between people in working age and employed*
		Standard	*FVG 2018 employment rate*
B3.3	***Use stage energy cost for public buildings***	*Information source*	*Energy costs from bills*
		Assessment method	*Ratio between energy cost and net area of public buildings exceeding 1000 square meters*
		Standard	*Current value of consumption*

C - ENERGY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
C1.1	***Total final thermal energy consumption for building operations.***	*Information source*	*Energy consumption data*
		Assessment method	*Calculate the annual consumption and divide it by the net area of the buildings*
		Standard	*Current value*
C1.4	***Total final electrical energy consumption for building operations.***	*Information source*	*Energy consumption data*
		Assessment method	*Calculate the annual consumption and divide it by the net area of the buildings*
		Standard	*Current value*
C1.7	***Total primary energy demand for building operations.***	*Information source*	*APE Energy Performance Certification*
		Assessment method	*Calculate the standard consumption and compare it to the reference standard consumption*

		Standard	*References of the law*
C2.1	***Share of renewable energy on-site, on total final thermal energy consumptions for buildings operation.***	*Information source*	*APE Energy Performance Certification*
		Assessment method	*Calculate the consumption of renewable energy in relation to total energy consumption*
		Standard	*References of the law*
C2.7	***Share of renewable energy on-site, on final electric energy consumptions.***	*Information source*	*APE Energy Performance Certification*
		Assessment method	*Calculate the consumption of renewable electricity in relation to total electricity consumption*
		Standard	*Reference of the law*

D - ATMOSPHERIC EMISSIONS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
D1.2	***Total GHG Emissions from primary energy used in building operations.***	*Information source*	*APE Energy Performance Certification*
		Assessment method	*Calculate standard CO2 emitted*
		Standard	*References of the law*
D1.4	***Aggregate emissions of acidifying emissions during building operations.***	*Information source*	*Energy bills*
		Assessment method	*Calculate the emissions of individual fuels by normalizing them and dividing by the useful surfaces of buildings*
		Standard	*The data is accepted*

E - NON-RENEWABLE RESOURCES			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
E1.3	***Re-use of rainwater in residential buildings.***	*Information source*	*Numerical regional technical map. Building authorizations*
		Assessment method	*Calculate the ratio between the amount of rainwater and the recoverable one*

		Standard	*The data is accepted*
E1.4	***Re-use of rainwater in non-residential building.***	*Information source*	*Numerical regional technical map. Building authorizations*
		Assessment method	*Calculate the ratio between the amount of rainwater and the recoverable one*
		Standard	*The data is accepted*
E1.6	***Consumption of potable water for residential population.***	*Information source*	*Water suppliers*
		Assessment method	*Amount of water consumed*
		Standard	*130 lt/gg from UNI PdR_13 ITACA*
E1.7	***Consumption of potable water for non-residential building systems.***	*Information source*	*Water suppliers*
		Assessment method	*Ratio between consumption in mc and the net area in square meters of buildings*
		Standard	*1,3* m^3/m^2
E2.1	***Solid waste and recycling collection points.***	*Information source*	*Waste plan and on-site relief of containers*
		Assessment method	*Percentage of the population at a distance of 100 m from the containers*
		Standard	*Current neighborhood data*
E2.6	***Public wastewater that is disposed or treated.***	*Information source*	*Water suppliers*
		Assessment method	*Ratio between treated water and produced water*
		Standard	*Standard not present at least 90%*
E3.5	***Preservation and maintenance of existing buildings and structures.***	*Information source*	*Projects or interventions performed*
		Assessment method	*Evaluation of the maintenance standard*
		Standard	*Typical regional ordinary maintenance*

F - ENVIRONMENT

CRITERION	INDICATOR	SPECIFICATIONS	
F1.3	***Recharge of***	*Information*	*Census territorial area.*

	groundwater through permeable paving or landscaping.	*source*	*Urban furniture projects. Orthophotographic images.*
		Assessment method	*Calculate the ratio of the permeable surface to the total.*
		Standard	*40% - UNI PdR_13 ITACA*
F1.11	***Albedo***	*Information source*	*Census territorial area. Urban furniture projects. Orthophotographic images.*
		Assessment method	*Calculate the ratio of the weighted surface according to the reflection coefficient and the total*
		Standard	*0% - UNI PdR_13 ITACA*
F2.3	***Ambient air quality with respect to particulates <10 µm (PM10) over a one-year period.***	*Information source*	*ARPA source data*
		Assessment method	*Annual average of the pollutant*
		Standard	*35 gg/year 40 µg / m3 - Law limit*
F3.1	***Green zones & recreation areas availability***	*Information source*	*Census scope General urban development plan Municipal registry office*
		Assessment method	*Divide the green area for the resident population*
		Standard	*ISTAT Index Municipality of Udine*
F3.9	***Presence or potential for wildlife corridors.***	*Information source*	*General urban development plan*
		Assessment method	*Evaluation of connections between the various green areas*
		Standard	*Few opportunities to establish natural corridors.*

G - SOCIAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G2.1	***Performance of the public transport.***	*Information source*	*Numeric Regional Technical Map - Road axes - House numbers - Municipal registry office. Public transport timetables.*
		Assessment method	*Percentage of the population at 400 m from the nearest public transport*
		Standard	*-*
G2.2	***Availability of car sharing services***	*Information source*	*List of users of the service*

		Assessment method	*Percentage of the population that used the service in a year*
		Standard	*1% Analogy with Bikesharing service*
		Information source	*Numeric Regional Technical Map - Axes - Signage survey*
G2.4	***Quality of pedestrian and bicycle network.***	*Assessment method*	*Ratio between the linear meters of the cycle/ pedestrian paths and inhabitants*
		Standard	*43 m/100 inhab - Average city data*
		Information source	*Technical Numeric Regional Map AGCOM mapping networks*
G3.1	***Availability of a broadband communication network***	*Assessment method*	*Ratio between the resident population and the population reached by the equivalent broadband according to the quality of the service.*
		Standard	*Italian broadband strategy*
		Information source	*Analysis of local services*
G4.2	***Availability and proximity of key services***	*Assessment method*	*Calculation of the population with a maximum of 800 meters walking distance from three services*
		Standard	-
		Information source	*Local analysis of services*
G4.6	***Availability and proximity of leisure facilities***	*Assessment method*	*Calculation of the population with a maximum of 1000 meters walking distance from at least one service for the two categories, cultural and sports*
		Standard	-
		Information source	*Project Urban gardens*
G5.2	***Residents' access to and use of urban agricultural plots.***	*Assessment method*	*Percentage of the population within 1 km from urban vegetable garden*
		Standard	-
		Information source	*Minutes of meetings, press articles, reports, initiatives*
G6.3	***Community involvement in urban planning activities***	*Assessment method*	*Activity comparison with Sherry Arnstein scale*
		Standard	-

REGIONAL TOOL

D.3.4.3 Regional Tool - EnvirobatBDM

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

URBAN SCALE ASSESSMENT

SNTool structure

A- BUILT URBAN SYSTEMS	
A1	**Built urban systems**
A1.7	*Conservation of land*

B- ECONOMY	
B3	**Cost and investment**
B3.3	*Operating energy costs for public buildings*

C- ENERGY	
C1	**Non renewable energy**
C1.1	*Total final thermal energy consumption for building*
C1.4	*Total final electrical energy consumption for building operations*
C1.7	*Total primary energy demand for building operations*
C2	**Renewable and decarbonised energy**
C2.1	*Share of renewable energy on-site, relative to total final energy consumption for building operations*
C2.7	*Share of renewable energy on-site, relative to final electric energy consumption*

D- ATMOSPHERIC EMISSIONS	
D1	**Atmospheric emissions**
D1.2	*Total GHG emissions from primary energy used in building operations*

E- NON - RENEWABLE RESOURCES	
E1	**Potable water, stormwater and greywater**
E1.6	*Consumption of potable water for residential population*
E1.7	*Consumption of potable water for public non-residential building systems*

F- ENVIRONMENT	
F1	**Environmental impacts**
F1.3	*Recharge of groundwater through permeable paving or lanscaping*
F2	**Outdoor environmental quality**
F2.3	*Ambient air quality with respect to particulates <10µg (PM10) over a one-year period*

G- SOCIAL ASPECTS	

G2	**Traffic and mobility services**
G2.1	*Performance of the public transport system*
G2.4	*Quality of pedestrian and bicycle network*
G4	**Public and private facilities and services**
G4.2	Availability and proximity of key services
G6	**Management and community involvment**
G6.3	Community involvement in urban planning activities

SNTool criteria selection rationale

A- BUILT URBAN SYSTEMS	
CRITERION	**REASON/MOTIVATION**
A1.7	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable neighborhood assessment – despite the different local approaches.*

B- ECONOMY	
CRITERION	**REASON/MOTIVATION**
B3.3	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable neighborhood assessment – despite the different local approaches.*

C- ENERGY	
CRITERION	**REASON/MOTIVATION**
C1.1 **C1.4** **C1.7** **C2.1** **C2.7**	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable neighborhood assessment – despite the different local approaches.*

D- ATMOSPHERIC EMISSIONS	
CRITERION	**REASON/MOTIVATION**
D1.2	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable neighborhood assessment*

	– despite the different local approaches.

E- NON - RENEWABLE RESOURCES	
CRITERION	REASON/MOTIVATION
E1.6 **E1.7**	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable neighborhood assessment – despite the different local approaches.*

F- ENVIRONMENT	
CRITERION	REASON/MOTIVATION
F1.3 **F2.3**	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable neighborhood assessment – despite the different local approaches.*

G- SOCIAL ASPECTS	
CRITERION	REASON/MOTIVATION
G2.1 **G2.4** **G4.2** **G6.3**	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable neighborhood assessment – despite the different local approaches.*

SNTool weights rationale

ISSUES WEIGHTS

ISSUE	WEIGHTING FACTOR (1 to 3)	MOTIVATION
A- BUILT URBAN SYSTEMS	2	Default values from CESBA MED PP were used
B- ECONOMY	2	Default values from CESBA MED PP were used
C- ENERGY	3	Default values from CESBA MED PP were used
D- ATMOSPHERIC EMISSIONS	3	Default values from CESBA MED PP were used

E- NON - RENEWABLE RESOURCES	2	Default values from CESBA MED PP were used
F- ENVIRONMENT	2	Default values from CESBA MED PP were used
G- SOCIAL ASPECTS	1	Default values from CESBA MED PP were used

CATEGORIES WEIGHTS

CATEGORIES	WEIGHT (%)
A1- Urban Structure and Form	6,3
A2- Transportation Infrastructure	12,6
SUB TOTAL	18,9
B1- Economic Structure and Value	0
B2- Economic activity	0
B3- Cost and Investment	5
SUB TOTAL	5
C1- Non-renewable energy	22
C2- Renewable and Decarbonised energy	8,5
C3- Energy recycling and storage	0
SUB TOTAL	30,5
D1- Atmospheric emissions	23,6
SUB TOTAL	23,6
E1- Potable water, stormwater and greywater	3,4
E2- Solid and Liquid Wastes	0
E3- Resource consumption, retention and maintenance	0
SUB TOTAL	3,4
F1- Environmental impacts	3,8
F2- Outdoor environmental quality	5,7
F3- Ecosystems and landscapes	0
SUB TOTAL	9.4
G1- Safety and Accessibility	0
G2- Traffic and Mobility Services	4,7
G3- Communication services	0
G4- Public and private facilities and services	1,9
G5- Local Food	0
G6- Management and community involvement	2,5
G7- Society, Culture and Heritage	0
G8- Perceptual	0
SUB TOTAL	9,1
TOTAL	100

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 Form

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A1.7 Conservation of land	*6,3*	*2*	*2*	*4*	*0*	*Default values from CESBA MED PP were used*
TOTAL		6,3				

B- ECONOMY

B3-Cost and investment

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B3.3 Running costs energy for public buildings	*5*	*1*	*2*	*3*	*1,8*	*Default values from CESBA MED PP were used*
TOTAL		5				

C- ENERGY

C1-Non-renewable energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C1.1 Total final thermal energy consumption for building operations	*9,4*	*3*	*2*	*3*	*5,4*	*Default values from CESBA MED PP were used*
C1.4 Total final electrical energy consumption for building operations	*6,3*	*3*	*2*	*2*	*3,6*	*Default values from CESBA MED PP were used*
C1.7 Total primary energy demand for building operations.	*6,3*	*3*	*2*	*2*	*3.6*	*Default values from CESBA MED PP were used*

C2 Renewable and Decarbonised energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	*5,7*	*3*	*2*	*3*	*8,1*	*Default values from CESBA MED PP were used*
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy	*2,8*	*1*	*3*	*3*	*2*	*Default values from CESBA MED PP were used*
TOTAL		30,5				

D- ATHMOSPHERIC EMISSIONS

D1- Athmospheric emissions

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

D1.2 Total GHG Emissions from primary energy used in building operations	*23,6*	*3*	*5*	*5*	*33,9*	*Default values from CESBA MED PP were used*
TOTAL		23,6				

E- NON-RENEWABLE RESOURCES

E1- Potable water, stormwater and greywater

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E1.6 Consumption of potable water for residential population	*2,5*	*3*	*2*	*2*	*3.6*	*Default values from CESBA MED PP were used*
E1.7 Consumption of potable water for non-residential building systems.	*0,8*	*1*	*2*	*2*	*1.2*	
TOTAL		3,4				

F- ENVIRONMENT

F1-Environmental impacts

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F1.3 Recharge of groundwater through permeable paving or landscaping	*3,8*	*1*	*2*	*3*	*1.8*	*Default values from CESBA MED PP were used*
F2-Outdoor environmental quality						
F2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period.	*5,7*	*3*	*3*	*3*	*8.1*	*Default values from CESBA MED PP were used*
TOTAL		9,4				

G- SOCIAL ASPECTS

G2- Traffic and Mobility Services

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G2.1 Performance of the public transport	*2,8*	*3*	*2*	*3*	*5.4*	*Default values from CESBA MED PP were used*
G2.4 Quality of pedestrian and bicycle network	*1,9*	*2*	*2*	*3*	*3.6*	*Default values from CESBA MED PP were used*
G4 - Public and private facilities and services						
G4.2 Availability and proximity of key public human services	*1,9*	*2*	*2*	*3*	*3.6*	*Default values from CESBA MED PP were used*
G6 - Management and community involvement						

G6.3 Community involvement in urban planning activities	*2,5*	*2*	*2*	*1*	*4.8*	*Default values from CESBA MED PP were used*
TOTAL		9,1				
TOTAL		100				

SNTool benchmarks rationale

A- URBAN STRUCTURE AND FORM				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
A1.7 Conservation of land	*The total area of undeveloped land considered to be of value for ecological or agricultural purposes by relevant authorities, as a percent of the total local area.*	%	*0: 15%*	
			3 : 20% *5: 30%*	Results of a study by the agricultural Chamber for the local master plan + report on ecological continuities led by Marseille municipality

B- ECONOMY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
B3.3 Running costs energy for public buildings	Running cost of energy aggregated	$Euro/m^2.y$ ear	*0: 14*	Hypothesis to establish the values of practices: a gymnasium of 2700 m² built with a high energy level, and a nursery of 900 m² new
			3 : 7 *5: 3,5*	Mid value

C- ENERGY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
C1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption / gross floor area of all buildings	kWh/m2/y ear	*0: 40*	
			3 : 15 *5: 0*	*Return on experience*
C1.4 Total final electrical energy consumption for building operations	Aggregated annual total final electric energy consumption / Total gross floor area of all buildings	kWh/m2/y ear	0 : 12	*Return on experience*

			3 : 3 5 : 0	
C1.7 Total primary energy demand for building operations.	Buildings total primary energy consumption / local minimum value	kWh/m2/year	0 : 40 3 : 15 5 : 0	Levels from the future national building regulation called E+C- (Energy+ Carbon -) The levels depend on the building typology and constraints (geographic…)
C2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Share of renewable thermal energy in final thermal energy consumptions	%	0 : 25 3 : 80 5 : 100	*Return on experience*
C2.7 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 : 25 3 : 100 5 : 200	*Return on experience*

D- ATMOSPHERIC EMISSIONS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
D1.2 Total GHG Emissions from primary energy used in building operations	CO2 equivalent emissions per useful internal floor area per year	kg CO2 eq./m2/yr	0 : 20 3 : 10 5 : 5	Regulation label

E- NON-RENEWABLE RESOURCES				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
E1.6 Consumption of potable water for residential population	Water consumption per occupant	m^3 per occupant *yr	0 : 40 3 : 30 5 : 20	From study of TRIBU-ADEME
E1.7 Consumption of potable water for non-residential building systems	Water consumption per m²	m^3 per occupant *yr	0 : 5 3 : 3 5 : 2	From study of TRIBU-ADEME

F- ENVIRONMENT

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
F1.3 Recharge of groundwater through permeable paving or landscaping	Permeable area / total area	%	0 : 20 3 : 50 5 : 70	AURA Montpellier
F2.3 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	n	0 : 30 3 : 18,6 5 : 11	ATMO Sud

G- SOCIAL ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
G2.1 Performance of the public transport service	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop.	%	0 : 50 3 : 90 5 : 100	Indi
G2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated pedestrian paths and meters of bicycle path per 100 inhabitants.	m/100 inhabitants	0 : 15 3 : 30 5 : 40	Study written by Frédéric Héran-CLERSE-CNRS pour le CVTC et la FUB - January 2011 – lines dedicated to soft compared to all lines (%)
G4.2 Availability and proximity of key public human services	Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services	%	0 : 30 3 : 75 5 : 100	Indi
G6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Level	0 : Symbolic participation (Arnstein correspondence: information and consultation): consultation (public register, survey ...) 3 : Shared diagnosis (Correspondence Arnstein: Degrees of citizen power): Methodology of shared diagnosis, call to a specialized provider, survey (s), Workshops	

	of construction and validation of the diagnosis 5 : Co-decision (Arnstein Correspondence: Degrees of Citizen Power): Methodology of the process, call for a specialized service provider, dedicated workshops, existence of scenarios for discussion, evolution of the project according to citizen feedback Source : Sherry Arnstein, Jegou & Chelzen, QDM approach

SNTool Criteria Specifications

A- BUILT URBAN SYSTEMS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.7 Conservation of land	The total area of undeveloped land considered	*Information source*	*Local study*
		Assessment method	*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.*
		Standard	*Default values*

B- ECONOMY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B3.3 Running costs energy for public buildings	Running cost of energy aggregated	*Information source*	*Models and simulation*
		Assessment method	In the calculation it is possible to use real or estimated costs. The calculation has to take in account one full year of operation.
		Standard	Sum of the running energy costs of each building in the area up to an aggregated running costs energy value. The total cost must be normalized per the total indoor useful area of buildings.

C- ENERGY

CRITERION	INDICATOR	SPECIFICATIONS	
C1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption / gross floor area of all buildings	*Information source*	*Models and simulation*
		Assessment method	Estimated data: 1. Calculate the annual total final thermal energy consumption for building operations (heating, cooling, domestic hot water), in kWh, for each building in the local area. 2. Calculate the aggregated annual total final thermal energy consumption for all buildings. 3. Calculate: Aggregated annual total final thermal energy consumption / Total gross area of all buildings. Calculations are based on EN 13790 using the quasi-steady state monthly method
		Standard	*ec.europa.eu/energy/en/topics/energy-efficiency/buildings* *https://www.iea.org/publications/freepublications/.../buildings_certification.pdf* *www.theicct.org/sites/default/files/.../ICCTupdate_EU-95gram_jan2014.pdf* *NF EN ISO 52016 Performance énergétiques des bâtiments*
C1.4 Total final electrical energy consumption for building operations	Aggregated annual total final electric energy consumption / Total gross floor area of all	Information source	*Models and simulation*
		Assessment method	Use of Estimated data: 1. Calculate the annual total final electric energy consumption for building operations (heating, cooling, ventilation, auxiliaries, domestic hot water and lighting), in kWh, for each building in the local area (i.e. residential and non-residential). 2. Calculate the aggregated annual total final electric energy consumption for all buildings. 3. Calculate: aggregated annual total final electric energy consumption / total gross area of all buildings Calculations are based on EN 13790 using the quasi-steady state monthly method.
		Standard	The terminals are computable with the national thermal regulation for this final energy indicator assuming that all the energy of the building is electric (even heating and domestic hot water). Soone : the new RE2020 regulation
C1.7 Total primary energy demand for building operations.	Buildings total primary energy consumption / local minimum value	Information source	*Models and simulation*
		Assessment method	1. Calculate the annual total primary energy consumption of non-renewable energy for building operations (heating, cooling, ventilation, auxiliaries, domestic hot water and

			lighting), in kWh/m2 of useful internal floor area for each building in the local area (i.e. residential and non-residential). 2. Calculate urban area total primary energy consumption as the weighted mean value of total primary energy consumption over the floor surfaces of all buildings in the area. 3. Calculate: Buildings total primary energy consumption / local minimum value x 100
		Standard	Calculations are based on EN 13790
C2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Share of renewable thermal energy in final thermal energy consumptions	Information source	*Models and simulation*
		Assessment method	Estimated data Calculate the annual total final thermal energy consumption for building operations (heating, cooling, domestic hot water), in kWh, for each building in the local area (i.e. residential and non-residential) including renewables, if applicable, in the existing condition. Calculate the aggregated annual total thermal final energy consumption for all buildings. Calculate the annual total final thermal energy consumption for building operations (heating, cooling, domestic hot water), in kWh, for each building in the local area (i.e. residential and non-residential) from on-site renewable energy sources. Calculate the aggregated annual total final thermal energy consumption from on-site renewable energy sources. Calculate: Aggregated annual total final thermal energy consumption from on-site renewable energy sources/ Aggregated annual total final thermal energy consumption.
		Standard	Calculations are based on EN 13790.
C2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation	Share of renewable energy in primary energy consumptions	Information source	Models and simulation
		Assessment method	1. Calculate the annual total primary energy consumption for building operations (heating, cooling, domestic hot water and lighting), in kWh, for each building in the local area (i.e. residential and non-residential) including renewables, if applicable, in the existing condition. 2. Calculate the aggregated annual total primary energy consumption for all buildings. 3. Calculate the annual total primary energy consumption for building operations (heating, cooling, domestic hot water and lighting), in kWh, for each building in the local area (i.e. residential and non-residential) from on-site renewable energy sources, if applicable. 4. Calculate the aggregated annual total primary energy consumption from on-site renewable energy sources for all buildings. 5. Calculate: Aggregated annual total primary

			energy consumption / Aggregated annual total primary energy consumption without the renewables.
		Standard	Calculations are based on EN 13790
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy	Share of renewable electric energy in final electric energy consumptions	Information source	Models and simulation
		Assessment method	Use of Estimated data: 1. Calculate the annual total final electric energy consumption for building operations (heating, cooling, domestic hot water, ventilation, lighting, auxiliaries), in kWh, for each building in the local area (i.e. residential and non-residential) including renewables, if applicable, in the existing condition. 2. Calculate the aggregated annual total electric final energy consumption for all buildings. 3. Calculate the annual total final electric energy consumption for building operations (heating, cooling, domestic hot water, lighting, ventilation, auxiliaries), in kWh, for each building in the local area (i.e. residential and non-residential) from on-site renewable energy sources, if applicable. 4. Calculate the aggregated annual total final electric energy consumption from on-site renewable energy sources. 5. Calculate: Aggregated annual total final electric energy consumption from on-site renewable energy sources/ Aggregated annual total final electric energy consumption. Calculations are based on EN 13790 using the quasi-steady state monthly method.
		Standard	Calculations are based on EN 13790

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	SPECIFICATIONS	
D1.2 Total GHG Emissions from primary energy used in building operations	CO2 equivalent emissions per useful internal floor area per year	*Information source*	Models and simulation
		Assessment method	*For each building in the area calculate the emissions of CO2 eq. with the following formula:* *E=[∑ (Qfuel,i x LHVi × Kem,i)+ (Qel × Kem,el)+(Qdh × Kem,dh)]* *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. Aggregate GHG emissions from primary energy (including fossil fuel used to generate electricity and used directly in building equipment) for all purposes in building operations in the local area, in kg of CO2-eq per 1000 m2 of surface area per year.
		Standard	*National Values of Emissions References Related to the Energy Mix*

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	SPECIFICATIONS	
E1.6 Consumption of potable water for residential population	Water consumption per occupant	*Information source*	Models and simulation
		Assessment method	*Calculate the estimated consumption of potable water used in residential households in the local area, in Litres per person per day (Lpp*yr.)* *1. For each building calculate the total water consumption. The principle of the per occupant water consumption calculation for taps, toilets and showers.* *2. Calculate the aggregated annual total water consumptions from all residential buildings / number of residentials' buildings occupants.*
		Standard	Tool "Water calculator"
E1.7 Consumption of potable water for non-residential building systems	Water consumption per occupant	Information source	Models and simulation
		Assessment method	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 (m 3). 2) Sum the annual water consumption of each building up to an aggregated annual total water consumption (m 3 /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.

		Standard	Tool "Water calculator"
E2.3 Solid waste from construction and demolition projects retained in the area for re-use or recycling	Volume of materials that may be re-used or recycled from the local area on the total solid waste from construction and demolition of building projects	Information source	Studies, data banks
		Assessment method	1. Identify the annual volume of construction/demolition waste generated over a 3-year period; 2. Sample the waste stream to identify the origin (type of building) for each sample and the approximate proportion of materials that could have been recycled or re-used; 3. Estimate the volume of material that could be re-used or recycled from future projects of the same type; 4. Aggregate the volume of materials that may be re-used or recycled per year from the local area, based on current rates of construction and demolition; 5. Calculate the volume of materials that may be re-used or recycled from the local area on the total solid waste from construction and demolition projects.
		Standard	Life cycle analysis tools, 2020 environmental regulation with carbon level assessment
E3.2 Consumption of non-renewable material resources for construction of infrastructure	Quantity of materials from non-renewable material resources for construction or renovation of infrastructures in the local area over a 5-year period	Information source	Studies, data banks
		Assessment method	Calculate the aggregate consumption of non-renewable material resources for construction or renovation of infrastructure in the local area over a 5-year period, in tonnes per 1,000 m2 of surface area (i.e roads, bridges, etc).
		Standard	Life cycle analysis tools, 2020 environmental regulation with carbon level assessment

F- ENVIRONMENT			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
F1.3 Recharge of groundwater through permeable paving or landscaping	Permeable area / total area	*Information source*	Area development plans
		Assessment method	*1. Calculate the size (Sa) of the urban area (m2).* *2. Calculate the size of the surfaces with a different paving or occupied by constructions in the urban area (i.e green areas, surfaces paved with asphalt, surfaces occupied by buildings, etc.).* *3. Calculate the real permeability of soil considering the permeability coefficient of each surface.* *4. Examples of permeability coefficients:* *Grass = 1* *Gravel = 0,9* *Permeable interlocking concrete pavement = 0,3*

			Asphalt = 0 *5. Value of the indicator = (Sa,perm/Sa) ×100*
		Standard	*Local context of the local plan of urban planning and habitat (PLU-H).*
F2.3 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	Information source	Measured data
		Assessment method	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.
		Standard	Observatory of the quality of the air www.atmo-auvergnerhonealpes.fr

G- SOCIAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G2.1 Performance of the public transport service	Percentage of inhabitants that are within 400 meters	*Information source*	Measured data
		Assessment method	*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).* *Note: to be considered valid for the calculation, a stop must have a daily total service frequency of at least 20 trips.*
		Standard	*Global Platform for Sustainable Cities - Urban Sustainability Framework*
G2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated	Information source	Estimated data
		Assessment method	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. Calculation of the indictor's value as (A+B)/(100 inhabitants) Bicycle paths and pedestrian paths have to be safe and physically separated to traffic roads to be considered in the calculation. A walkway adjacent to a traffic road is not acceptable.
		Standard	Global Platform for Sustainable Cities - Urban Sustainability Framework
G4.2 Availability	Percentage of	Information	Local implementation plans

and proximity of key public human services	inhabitants that are within 800	source	
		Assessment method	1. Identify locations of key services in the local area. 2. Calculate the percentage of the inhabitants that are within 800 meters walking distance from at least 3 key services. 3. Calculate the percent of residential population located within 600 m. of the 3 key human services. 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 10. Culture and leisure
		Standard	Global Platform for Sustainable Cities - Urban Sustainability Framework sustainable urban development in the Paris region: the light of participatory observation ", Development Sustainable Development and Territories [Online], Vol. 6, No. 2 | September 2015, posted on September 30, 2015 "
G6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Information source	Local informations from owner, developer
		Assessment method	Using the Sherry Arnstein ladder on citizen participation, rate the level of users' involvement on planning. The height rungs and 3 degrees of the ladder are provided on the picture.
		Standard	"Sherry Arnstein, article original paru en 1969 ""A Ladder Of Citizen Participation"", Journal of the American Institute of Planners 35 (4), p. 216-24: http://www.participatorymethods.org/sites/participatorymethods.org/files/Arnstein%20ladder%201969.pdf"

REGIONAL TOOL

D.3.4.3 Regional Tool – AURA-EE

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

URBAN SCALE ASSESSMENT

SNTool structure

A- BUILT URBAN SYSTEMS	
A1	**Urban Structure and Form**
A1.7	*Conservation of Land*

B- ECONOMY	
B3	**Cost and Investment**
B3.3	*Running costs energy for public buildings*

C- ENERGY	
C1	**Non-renewable energy**
C1.1	*Total final thermal energy consumption for building operations.*
C1.4	*Total final electrical energy consumption for building operations.*
C1.7	*Total primary energy demand for building operations.*
C2	**Renewable and Decarbonised energy**
C2.1	*Share of thermal energy generation from on-site renewable sources on final thermal energy.*
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for buildings operation.*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy.*

D- ATMOSPHERIC EMISSIONS	
D1	**Atmospheric emissions**
D1.2	*Total GHG Emissions from primary energy used in building operations*

E- NON - RENEWABLE RESOURCES	
E1	**Potable water, stormwater and greywater**
E1.6	*Consumption of potable water for residential population.*
E1.7	*Consumption of potable water for non-residential building systems.*
E2	**Solid and Liquid Wastes**
E2.3	Solid waste from construction and demolition projects retained in the area for re-use or recycling.
E3	**Resource consumption, retention and maintenance**
E3.2	Consumption of non-renewable material resources for construction of

infrastructure.

F- ENVIRONMENT	
F1	**Environmental impacts**
F1.3	Recharge of groundwater through permeable paving or landscaping.
F2	**Outdoor environmental quality**
F2.3	Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period.

G- SOCIAL ASPECTS	
G2	**Traffic and Mobility Services**
G2.1	*Performance of the public transport service.*
G2.4	*Quality of pedestrian and bicycle network.*
G4	**Public and private facilities and services**
G4.2	*Availability and proximity of key public human services*
G6	**Management and community involvement**
G6.3	Community involvement in urban planning activities

SNTool criteria selection rationale

A- BUILT URBAN SYSTEMS	
CRITERION	**REASON/MOTIVATION**
A1.7 Conservation of land	*KPI are mandatory; KPI were sufficient for local purposes.*

B- ECONOMY	
CRITERION	**REASON/MOTIVATION**
B3.3 Running costs energy for public buildings	*KPI are mandatory; KPI were sufficient for local purposes*

C- ENERGY	
CRITERION	**REASON/MOTIVATION**
C1.1 Total final thermal energy consumption for building operations	*KPI are mandatory; KPI were sufficient for local purposes*
C1.4 Total final electrical energy consumption for building operations	*KPI are mandatory; KPI were sufficient for local purposes*
C1.7 Total primary energy demand for building operations	*. KPI are mandatory; KPI were sufficient for local purposes*

C2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	*KPI are mandatory; KPI were sufficient for local purposes*
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy.	*KPI are mandatory; KPI were sufficient for local purposes*

D- ATMOSPHERIC EMISSIONS

CRITERION	REASON/MOTIVATION
D1.2 Total GHG Emissions from primary energy used in building operations	*KPI are mandatory; KPI were sufficient for local purposes*

E- NON - RENEWABLE RESOURCES

CRITERION	REASON/MOTIVATION
E1.6 Consumption of potable water for residential population.	*KPI are mandatory; KPI were sufficient for local purposes*
E1.7 Consumption of potable water for non-residential building systems.	*KPI are mandatory; KPI were sufficient for local purposes*

F- ENVIRONMENT

CRITERION	REASON/MOTIVATION
F1.3 Recharge of groundwater through permeable paving or landscaping	*KPI are mandatory; KPI were sufficient for local purposes*
F2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period	*KPI are mandatory; KPI were sufficient for local purposes*

G- SOCIAL ASPECTS

CRITERION	REASON/MOTIVATION
G2.1 Performance of the public transport service	*KPI are mandatory; KPI were sufficient for local purposes*
G2.4 Quality of pedestrian and bicycle network	*KPI are mandatory; KPI were sufficient for local purposes*
G4.2 Availability and proximity of key public human services	*KPI are mandatory; KPI were sufficient for local purposes*
G6.3 Community involvement in urban planning activities	*KPI are mandatory; KPI were sufficient for local purposes*

SNTool weights rationale

ISSUES WEIGHTS

ISSUE	WEIGHTING FACTOR (1 to 3)	MOTIVATION
A- BUILT URBAN SYSTEMS	1	Default values from CESBA MED PPs were relevant
B- ECONOMY	2	Default values from CESBA MED PPs were relevant
C- ENERGY	3	Default values from CESBA MED PPs were relevant
D- ATMOSPHERIC EMISSIONS	3	Default values from CESBA MED PPs were relevant
E- NON - RENEWABLE RESOURCES	2	Default values from CESBA MED PPs were relevant
F- ENVIRONMENT	2	Default values from CESBA MED PPs were relevant
G- SOCIAL ASPECTS	2	Default values from CESBA MED PPs were relevant

CATEGORIES WEIGHTS

Note: the categories weight results automatically from the criteria level

CATEGORIES	WEIGHT (%)
A1- Urban Structure and Form	0
A2- Transportation Infrastructure	0
SUB TOTAL	0
B1- Economic Structure and Value	0
B2- Economic activity	0
B3- Cost and Investment	1,8
SUB TOTAL	1.8
C1- Non-renewable energy	12,6
C2- Renewable and Decarbonised energy	15,6
C3- Energy recycling and storage	0
SUB TOTAL	28.2
D1- Atmospheric emissions	33,9
SUB TOTAL	33.9
E1- Potable water, stormwater and greywater	4,8
E2- Solid and Liquid Wastes	1,2
E3- Resource consumption, retention and maintenance	2,7
SUB TOTAL	8,7
F1- Environmental impacts	1,8
F2- Outdoor environmental quality	8,1
F3- Ecosystems and landscapes	0
SUB TOTAL	9.9
G1- Safety and Accessibility	0

G2- Traffic and Mobility Services	9
G3- Communication services	0
G4- Public and private facilities and services	3,6
G5- Local Food	0
G6- Management and community involvement	4,8
G7- Society, Culture and Heritage	0
G8- Perceptual	0
SUB TOTAL	17,4
TOTAL	100

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 Form

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A1.7 Conservation of land	*2,25*	*2*	*2*	*4*	*0*	*Default values from CESBA MED PPs were relevant*
TOTAL		2.25				

B- ECONOMY

B3-Cost and investment

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B3.3 Running costs energy for public buildings	*1,69*	*1*	*2*	*3*	*1,8*	*Default values from CESBA MED PPs were relevant*
TOTAL		1.69				

C- ENERGY

C1-Non-renewable energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C1.1 Total final thermal energy consumption for building operations	*5,06*	*3*	*2*	*3*	*5,4*	*Default values from CESBA MED PPs were relevant*
C1.4 Total final electrical energy consumption for building operations	*3,37*	*3*	*2*	*2*	*3,6*	*Default values from CESBA MED PPs were relevant*
C1.7 Total primary energy demand for building operations.	*3,37*	*3*	*2*	*2*	*3.6*	*Default values from CESBA MED PPs were relevant*

C2 Renewable and Decarbonised energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	*7,58*	*3*	*2*	*3*	*8,1*	*Default values from CESBA MED PPs were relevant*
C2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation	*5,06*	*2*	*2*	*3*	*5,4*	*Default values from CESBA MED PPs were relevant*
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy	*3,79*	*1*	*3*	*3*	*2*	*Default values from CESBA MED PPs were relevant*
TOTAL		28.23				

D- ATHMOSPHERIC EMISSIONS

D1- Athmospheric emissions

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.2 Total GHG Emissions from primary energy used in building operations	*31,6*	*3*	*5*	*5*	*33,9*	*Default values from CESBA MED PPs were relevant*
TOTAL		31.6				

E- NON-RENEWABLE RESOURCES

E1- Potable water, stormwater and greywater

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E1.6 Consumption of potable water for residential population	*3.37*	*3*	*2*	*2*	*3.6*	*Default values from CESBA MED PPs were relevant*
E1.7 Consumption of potable water for non-residential building systems.	*1.12*	*1*	*2*	*2*	*1.2*	

E2 Solid and Liquid Wastes

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E.2.3 Solid waste from construction and demolition projects retained in the area for re-use or recycling	*1.12*	*1*	*2*	*2*	*1.2*	*Default values from CESBA MED PPs were relevant*

E3 Resource consumption, retention and maintenance

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E3.2 Consumption of	**5,06**	**3**	**2**	**3**	**2.7**	*Default values from CESBA MED PPs were*

non-renewable material resources for construction of infrastructure						*relevant*
TOTAL	10.67					

F- ENVIRONMENT						
F1-Environmental impacts						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
F1.3 Recharge of groundwater through permeable paving or landscaping	*1.69*	*1*	*2*	*3*	*1.8*	*Default values from CESBA MED PPs were relevant*
F2-Outdoor environmental quality						
F2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period.	*7.58*	*3*	*3*	*3*	*8.1*	*Default values from CESBA MED PPs were relevant*
TOTAL	9.27					

G- SOCIAL ASPECTS						
G2- Traffic and Mobility Services						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G2.1 Performance of the public transport	*5.06*	*3*	*2*	*3*	*5.4*	*Default values from CESBA MED PPs were relevant*
G2.4 Quality of pedestrian and bicycle network	*3.37*	*2*	*2*	*3*	*3.6*	*Default values from CESBA MED PPs were relevant*
G4 - Public and private facilities and services						
G4.2 Availability and proximity of key public human services	*3.37*	*2*	*2*	*3*	*3.6*	*Default values from CESBA MED PPs were relevant*
G6 - Management and community involvement						
G6.3 Community involvement in urban planning activities	*4.49*	*2*	*2*	*1*	*4.8*	*Default values from CESBA MED PPs were relevant*
TOTAL	16.29					
TOTAL	100					

SNTool benchmarks rationale

.

A- URBAN STRUCTURE AND FORM				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE

A1.7 Conservation of land	*The total area of undeveloped land considered to be of value for ecological or agricultural purposes by relevant authorities, as a percent of the total local area.*	%	*0: 10%*	Local planning rules
			3 : 16% *5: 20%*	Mid value Local planning rules

B- ECONOMY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
B3.3 Running costs energy for public buildings	Running cost of energy aggregated	Euro/m2/year	*0: 14*	Hypothesis to establish the values of practices: a gymnasium of 2700 m² built with a high energy level, and a nursery of 900 m² new
			3 : 7,7 *5: 3,5*	Mid value

C- ENERGY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
C1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption / gross floor area of all buildings	kWh/m2/year	*0: 50*	*Default values from CESBA MED PPs were relevant*
			3 : 20 *5: 0*	Mid value *Default values from CESBA MED PPs were relevant*
C1.4 Total final electrical energy consumption for building operations	Aggregated annual total final electric energy consumption / Total gross floor area of all buildings	kWh/m2/year	0 : 55	Value Score 0 : Result new collective dwellings RT2012: New: Compliance with the new thermal regulations to come: RE 2020, level E1, respect for the share of electricity
			3 : 25 5 : 5	Mid value New: RE 2020, level E4, respect of the share of electricity
C1.7 Total primary energy demand for building operations.	Buildings total primary energy consumption / local minimum value	kWh/m2/year	0 : 140 3 : 56 5 : 0	Result new collective dwellings RT2012 Mid value Result new collective dwellings RT2012
C2.1 Share of thermal energy	Share of renewable	%	0 : 30 3 : 80	Sustainable Cities Guide

generation from on-site renewable sources on final thermal energy	thermal energy in final thermal energy consumptions		5 : 100	
C2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation	Share of renewable energy in primary energy consumptions	%	0 : 30 3 : 80 5 : 100	Sustainable Cities Guide
C2.7 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 : 35 3 : 59 5 : 75	Sustainable Cities Guide

D- ATMOSPHERIC EMISSIONS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
D1.2 Total GHG Emissions from primary energy used in building operations	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	0 : 30 3 : 18 5 : 10	Default values from CESBA MED PPs were relevant Mid value Default values from CESBA MED PPs were relevant

E- NON-RENEWABLE RESOURCES				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
E1.6 Consumption of potable water for residential population	Water consumption per occupant	m^3 per occupant* yr	0 : 68 3 : 50 5 : 30	187 liters, 365 days of presence 150 liters, no bath, lower tap flow, 335 days of presence 90 liters, 335 days of presence
E1.7 Consumption of potable water for non-residential building systems	Water consumption per m^2	m^3 per m^2	0 : 1,1 3 : 0,55 5 : 0,4	Use of the water calculator tool for offices, estimate with 200 users
E2.3 Solid waste from construction and demolition projects retained in the area for re-use or recycling	Volume of materials that may be re-used or recycled from the local area on the total solid waste from construction and demolition of building projects	%	0 : 50 3 : 68 5 : 80	Hypothesis: reuse of possible materials on projects Mid value Hypothesis: reuse of possible materials on projects
E3.2 Consumption of non-renewable	Quantity of materials from non-renewable	Tonnes/ 1000 m2	0 : 150 3 : 108	Default values from CESBA MED PPs were relevant

material resources for construction of infrastructure	material resources for construction or renovation of infrastructures in the local area over a 5-year period		5 : 80	

F- ENVIRONMENT				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
F1.3 Recharge of groundwater through permeable paving or landscaping	Permeable area / total area	%	0 : 20 3 : 68 5 : 100	The values given for practice are default values, to be adapted to the local context (local plan of urban planning and habitat PLU-H).
F2.3 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	n	0 : 30 3 : 18,6 5 : 11	Observatory of the quality of the air www.atmo-auvergnerhonealpes.fr

G- SOCIAL ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
G2.1 Performance of the public transport service	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop.	%	0 : 0 3 : 100 5 : 100	Global Platform for Sustainable Cities - Urban Sustainability Framework. Sustainable Cities Guide.
G2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated pedestrian paths and meters of bicycle path per 100 inhabitants.	m/100 inhabitants	0 : 200 3 : 110 5 : 50	Global Platform for Sustainable Cities - Urban Sustainability Framework
G4.2 Availability and proximity of key public human services	Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services	%	0 : 30 3 : 72 5 : 100	Global Platform for Sustainable Cities - Urban Sustainability Framework Sustainable Cities Guide

G6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Level	0 : Symbolic participation (Arnstein correspondence: information and consultation): consultation (public register, survey ...) 3 : Shared diagnosis (Correspondence Arnstein: Degrees of citizen power): Methodology of shared diagnosis, call to a specialized provider, survey (s), Workshops of construction and validation of the diagnosis 5 : Co-decision (Arnstein Correspondence: Degrees of Citizen Power): Methodology of the process, call for a specialized service provider, dedicated workshops, existence of scenarios for discussion, evolution of the project according to citizen feedback

SNTool Criteria Specifications

A- BUILT URBAN SYSTEMS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.7 Conservation of land	The total area of undeveloped land considered	*Information source*	*Local planning rules*
		Assessment method	*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.*
		Standard	*Default values*

B- ECONOMY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B3.3 Running costs energy for public buildings	Running cost of energy aggregated	*Information source*	*Models and simulation*
		Assessment method	In the calculation it is possible to use real or estimated costs. The calculation has to take in account one full year of operation.
		Standard	Sum of the running energy costs of each building in the area up to an aggregated running costs energy value. The total cost must be normalized per the total indoor useful area

of buildings.

C- ENERGY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
C1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption / gross floor area of all buildings	*Information source*	*Models and simulation*
		Assessment method	Estimated data: 1. Calculate the annual total final thermal energy consumption for building operations (heating, cooling, domestic hot water), in kWh, for each building in the local area. 2. Calculate the aggregated annual total final thermal energy consumption for all buildings. 3. Calculate: Aggregated annual total final thermal energy consumption / Total gross area of all buildings. Calculations are based on EN 13790 using the quasi-steady state monthly method
		Standard	*ec.europa.eu/energy/en/topics/energy-efficiency/buildings* *https://www.iea.org/publications/freepublications/.../buildings_certification.pdf* *www.theicct.org/sites/default/files/.../ICCTupdate_EU-95gram_jan2014.pdf* *NF EN ISO 52016 Performance énergétiques des bâtiments*
C1.4 Total final electrical energy consumption for building operations	Aggregated annual total final electric energy consumption / Total gross floor area of all	Information source	*Models and simulation*
		Assessment method	Use of Estimated data: 1. Calculate the annual total final electric energy consumption for building operations (heating, cooling, ventilation, auxiliaries, domestic hot water and lighting), in kWh, for each building in the local area (i.e. residential and non-residential). 2. Calculate the aggregated annual total final electric energy consumption for all buildings. 3. Calculate: aggregated annual total final electric energy consumption / total gross area of all buildings Calculations are based on EN 13790 using the quasi-steady state monthly method.
		Standard	The terminals are computable with the national thermal regulation for this final energy indicator assuming that all the energy of the building is electric (even heating and domestic hot water). Soone : the new RE2020 regulation

C1.7 Total primary energy demand for building operations.	Buildings total primary energy consumption / local minimum value	Information source	*Models and simulation*
		Assessment method	1. Calculate the annual total primary energy consumption of non-renewable energy for building operations (heating, cooling, ventilation, auxiliaries, domestic hot water and lighting), in kWh/m2 of useful internal floor area for each building in the local area (i.e. residential and non-residential). 2. Calculate urban area total primary energy consumption as the weighted mean value of total primary energy consumption over the floor surfaces of all buildings in the area. 3. Calculate: Buildings total primary energy consumption / local minimum value x 100
		Standard	Calculations are based on EN 13790
C2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Share of renewable thermal energy in final thermal energy consumptions	Information source	*Models and simulation*
		Assessment method	Estimated data Calculate the annual total final thermal energy consumption for building operations (heating, cooling, domestic hot water), in kWh, for each building in the local area (i.e. residential and non-residential) including renewables, if applicable, in the existing condition. Calculate the aggregated annual total thermal final energy consumption for all buildings. Calculate the annual total final thermal energy consumption for building operations (heating, cooling, domestic hot water), in kWh, for each building in the local area (i.e. residential and non-residential) from on-site renewable energy sources. Calculate the aggregated annual total final thermal energy consumption from on-site renewable energy sources. Calculate: Aggregated annual total final thermal energy consumption from on-site renewable energy sources/ Aggregated annual total final thermal energy consumption.
		Standard	Calculations are based on EN 13790.
C2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation	Share of renewable energy in primary energy consumptions	Information source	Models and simulation
		Assessment method	1. Calculate the annual total primary energy consumption for building operations (heating, cooling, domestic hot water and lighting), in kWh, for each building in the local area (i.e. residential and non-residential) including renewables, if applicable, in the existing condition. 2. Calculate the aggregated annual total primary energy consumption for all buildings. 3. Calculate the annual total primary energy consumption for building operations (heating,

			cooling, domestic hot water and lighting), in kWh, for each building in the local area (i.e. residential and non-residential) from on-site renewable energy sources, if applicable. 4. Calculate the aggregated annual total primary energy consumption from on-site renewable energy sources for all buildings. 5. Calculate: Aggregated annual total primary energy consumption / Aggregated annual total primary energy consumption without the renewables.
		Standard	Calculations are based on EN 13790
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy	Share of renewable electric energy in final electric energy consumptions	Information source	Models and simulation
		Assessment method	Use of Estimated data: 1. Calculate the annual total final electric energy consumption for building operations (heating, cooling, domestic hot water, ventilation, lighting, auxiliaries), in kWh, for each building in the local area (i.e. residential and non-residential) including renewables, if applicable, in the existing condition. 2. Calculate the aggregated annual total electric final energy consumption for all buildings. 3. Calculate the annual total final electric energy consumption for building operations (heating, cooling, domestic hot water, lighting, ventilation, auxiliaries), in kWh, for each building in the local area (i.e. residential and non-residential) from on-site renewable energy sources, if applicable. 4. Calculate the aggregated annual total final electric energy consumption from on-site renewable energy sources. 5. Calculate: Aggregated annual total final electric energy consumption from on-site renewable energy sources/ Aggregated annual total final electric energy consumption. Calculations are based on EN 13790 using the quasi-steady state monthly method.
		Standard	Calculations are based on EN 13790

D- ATMOSPHERIC EMISSIONS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
D1.2 Total GHG Emissions from primary energy used in building operations	CO2 equivalent emissions per useful internal floor area per year	*Information source*	Models and simulation
		Assessment method	*For each building in the area calculate the emissions of CO2 eq. with the following formula:* $E=[\sum (Q_{fuel,i} \times LHV_i \times K_{em,i}) + (Q_{el} \times K_{em,el}) + (Q_{dh} \times K_{em,dh})]$ *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.* *Aggregate GHG emissions from primary energy (including fossil fuel used to generate electricity and used directly in building equipment) for all purposes in building operations in the local area, in kg of CO2-eq per 1000 m2 of surface area per year.*
		Standard	*National Values of Emissions References Related to the Energy Mix*

E- NON-RENEWABLE RESOURCES			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
E1.6 Consumption of potable water for residential population	Water consumption per occupant	*Information source*	Models and simulation
		Assessment method	*Calculate the estimated consumption of potable water used in residential households in the local area, in Litres per person per day (Lpp*yr.)* *1. For each building calculate the total water consumption. The principle of the per occupant water consumption calculation for taps, toilets and showers.* *2. Calculate the aggregated annual total water consumptions from all residential buildings / number of residentials' buildings occupants.*
		Standard	Tool "Water calculator"
E1.7 Consumption of potable water for non-residential building systems	Water consumption per occupant	Information source	Models and simulation
		Assessment method	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 (m 3). 2) Sum the annual water consumption of each building up to an aggregated annual total water consumption (m 3 /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.
		Standard	Tool "Water calculator"
E2.3 Solid waste from construction and demolition projects retained in the area for re-use or recycling	Volume of materials that may be re-used or recycled from the local area on the total solid waste from construction and demolition of building projects	Information source	Studies, data banks
		Assessment method	1. Identify the annual volume of construction/demolition waste generated over a 3-year period; 2. Sample the waste stream to identify the origin (type of building) for each sample and the approximate proportion of materials that could have been recycled or re-used; 3. Estimate the volume of material that could be re-used or recycled from future projects of the same type; 4. Aggregate the volume of materials that may be re-used or recycled per year from the local area, based on current rates of construction and demolition; 5. Calculate the volume of materials that may be re-used or recycled from the local area on the total solid waste from construction and demolition projects.
		Standard	Life cycle analysis tools, 2020 environmental regulation with carbon level assessment
E3.2 Consumption of non-renewable material resources for construction of infrastructure	Quantity of materials from non-renewable material resources for construction or renovation of infrastructures in the local area over a 5-year period	Information source	Studies, data banks
		Assessment method	Calculate the aggregate consumption of non-renewable material resources for construction or renovation of infrastructure in the local area over a 5-year period, in tonnes per 1,000 m2 of surface area (i.e roads, bridges, etc).
		Standard	Life cycle analysis tools, 2020 environmental regulation with carbon level assessment

F- ENVIRONMENT

CRITERION	INDICATOR	SPECIFICATIONS	
F1.3 Recharge of groundwater through permeable paving or landscaping	Permeable area / total area	*Information source*	Area development plans
		Assessment method	*1. Calculate the size (Sa) of the urban area (m2).* *2. Calculate the size of the surfaces with a different paving or occupied by constructions in the urban area (i.e green areas, surfaces paved with asphalt,*

			surfaces occupied by buildings, etc.). *3. Calculate the real permeability of soil considering the permeability coefficient of each surface.* *4. Examples of permeability coefficients:* *Grass = 1* *Gravel = 0,9* *Permeable interlocking concrete pavement = 0,3* *Asphalt = 0* *5. Value of the indicator = (Sa,perm/Sa) ×100*
		Standard	*Local context of the local plan of urban planning and habitat (PLU-H).*
F2.3 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	Information source	Measured data
		Assessment method	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.
		Standard	Observatory of the quality of the air www.atmo-auvergnerhonealpes.fr

G- SOCIAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G2.1 Performance of the public transport service	Percentage of inhabitants that are within 400 meters	*Information source*	Measured data
		Assessment method	*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).* *Note: to be considered valid for the calculation, a stop must have a daily total service frequency of at least 20 trips.*
		Standard	*Global Platform for Sustainable Cities - Urban Sustainability Framework*
G2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated	Information source	Estimated data
		Assessment method	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. Calculation of the indictor's value as (A+B)/(100 inhabitants)

			Bicycle paths and pedestrian paths have to be safe and physically separated to traffic roads to be considered in the calculation. A walkway adjacent to a traffic road is not acceptable.
		Standard	Global Platform for Sustainable Cities - Urban Sustainability Framework
G4.2 Availability and proximity of key public human services	Percentage of inhabitants that are within 800	Information source	Local implementation plans
		Assessment method	1. Identify locations of key services in the local area. 2. Calculate the percentage of the inhabitants that are within 800 meters walking distance from at least 3 key services. 3. Calculate the percent of residential population located within 600 m. of the 3 key human services. 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 10. Culture and leisure
		Standard	Global Platform for Sustainable Cities - Urban Sustainability Framework sustainable urban development in the Paris region: the light of participatory observation ", Development Sustainable Development and Territories [Online], Vol. 6, No. 2 | September 2015, posted on September 30, 2015 "
G6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Information source	Local informations from owner, developer
		Assessment method	Using the Sherry Arnstein ladder on citizen participation, rate the level of users' involvement on planning. The height rungs and 3 degrees of the ladder are provided on the picture.
		Standard	"Sherry Arnstein, article original paru en 1969 ""A Ladder Of Citizen Participation"", Journal of the American Institute of Planners 35 (4), p. 216-24: http://www.participatorymethods.org/sites/participatorymethods.org/files/Arnstein%20ladder%201969.pdf"

REGIONAL TOOL

D.3.4.3 Regional Tool - GENCAT

Version 1.1

Date: March 2019

Generalitat de Catalunya
Departament de Territori i Sostenibilitat

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

URBAN SCALE ASSESSMENT

SNTool structure

A- BUILT URBAN SYSTEMS	
A1	**Urban Structure and Form**
A1.2	*Urban compactness.*
A1.4	*Residential density.*
A1.7	*Conservation of Land.*

B- ECONOMY	
B1	**Economic Structure and Value**
B1.1	*Affordability of housing property..*
B1.2	*Affordability of housing rental.*
B2	**Economic activity**
B2.5	*Economic contribution from tourism activity.*
B3	**Cost and Investment**
B3.2	*Public contribution in residential retrofitting investments.*
B3.3	*Operating energy costs for public buildings.*

C- ENERGY	
C1	**Non-renewable energy**
C1.1	*Total final thermal energy consumption for building operations.*
C1.4	*Total final electrical energy consumption for building operations.*
C1.7	*Total primary energy demand for building operations.*
C1.10	*Primary energy for heating - residential buildings.*
C1.12	*Primary energy for cooling - residential buildings.*
C1.20	*Energy consumption of public lighting.*
C2	**Renewable and Decarbonised energy**
C2.1	*Share of renewable energy on-site, on total final energy consumptions for buildings operation.*
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for buildings operation.*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy.*

D- ATMOSPHERIC EMISSIONS	
D1	**Atmospheric emissions**
D1.2	*GHG emissions from energy used for all purposes in building operations.*

E- NON - RENEWABLE RESOURCES	
E1	**Potable water, stormwater and greywater.**
E1.6	*Consumption of potable water for residential population.*

E1.7	*Consumption of potable water for non-residential building systems.*
E2	**Solid and Liquid Wastes**
E2.1	*Solid waste and recycling collection points.*

F- ENVIRONMENT	
F1	**Environmental impacts**
F1.3	*Recharge of groundwater through permeable paving or landscaping.*
F2	**Outdoor environmental quality**
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period.*
F2.10	*Ambient daytime noise conditions.*
F2.11	*Ambient night-time noise conditions.*
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.*

G- SOCIAL ASPECTS	
G1	**Safety and Accessibility**
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 service.*
G2.4	*Quality of pedestrian and bicycle network.*
G4	**Public and private facilities and services**
G4.2	*Availability and proximity of key public human services.*
G6	**Management and community involvement**
G6.3	*Community involvement in urban planning activities.*

SNTool criteria selection rationale

A- BUILT URBAN SYSTEMS		
CRITERION		**REASON/MOTIVATION**
A1.2	**Urban compactness**	*Assess the current use of the land*
A1.4	**Residential density**	*Assess the population density in the area to avoid great density zones*
A1.7	**Conservation of Land**	*Mandatory KPI*

B- ECONOMY		
CRITERION		**REASON/MOTIVATION**
B1.1	**Affordability of housing property**	*Assess the ratio between the income of the residents and the properties price to avoid an increase price*
B1.2	**Affordability of housing rental**	*Assess the ratio between the income of the residents and the rental price to avoid an increase price*
B2.5	**Economic contribution from tourism activity.**	*Assess the income from tourism activity in the*

	area
B3.2 Public contribution in residential retrofitting investments.	*Assess the public investment*
B3.3 Operating energy costs for public buildings.	*Mandatory KPI*

C- ENERGY

CRITERION	REASON/MOTIVATION
C1.1 Total final thermal energy consumption for building operations.	*Mandatory KPI*
C1.4 Total final electrical energy consumption for building operations.	*Mandatory KPI*
C1.7 Total primary energy demand for building operations.	*Mandatory KPI*
C1.10 Primary energy for heating - residential buildings.	*Assess the ratio of the thermal consumption for heating in residential buildings*
C1.12 Primary energy for cooling - residential buildings.	*Assess the ratio of the electric consumption for heating in residential buildings*
C1.20 Energy consumption of public lighting.	*Assess the energy consumption of the public lighting systems and the ratio between energy consumption and resident*
C2.1 Share of renewable energy on-site, on total final energy consumptions for buildings operation.	*Mandatory KPI*
C2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation.	*Mandatory KPI*
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy.	*Mandatory KPI*

D- ATMOSPHERIC EMISSIONS

CRITERION	REASON/MOTIVATION
D1.2 GHG emissions from energy used for all purposes in building operations.	*Mandatory KPI*

E- NON - RENEWABLE RESOURCES

CRITERION	REASON/MOTIVATION
E1.6 Consumption of potable water for residential population.	*Mandatory KPI*
E1.7 Consumption of potable water for non-residential building systems.	*Mandatory KPI*
E2.1 Solid waste and recycling collection points.	*Assess the availability of the recycling collection points for the residents in the area*

F- ENVIRONMENT

CRITERION	REASON/MOTIVATION

F1.3 Recharge of groundwater through permeable paving or landscaping.	*Mandatory KPI*
F2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period.	*Mandatory KPI*
F2.10 Ambient daytime noise conditions.	*Assess the day noise level in the area to avoid*
F2.11 Ambient night-time noise conditions.	*Assess the night noise level in the area*
F3.1 Green zones & recreation areas availability.	*Assess the availability of green zones*
F3.2 Green zones & recreation areas accessibility.	*Assess the accessibility of green zones*
F3.3 Green zones & recreation areas density.	*Assess the ratio between the green areas and the gross area*

G- SOCIAL ASPECTS	
CRITERION	**REASON/MOTIVATION**
G1.4 Ease of access to and use of public transport for physically disabled persons.	*Assess the reduction and elimination the architectonic barriers to access the public transport*
G2.1 Performance of the public transport service.	*Mandatory KPI*
G2.4 Quality of pedestrian and bicycle network.	*Mandatory KPI*
G4.2 Availability and proximity of key public human services.	*Mandatory KPI*
G6.3 Community involvement in urban planning activities.	*Mandatory KPI*

SNTool weights rationale

ISSUES WEIGHTS

ISSUE	WEIGHTING FACTOR (1 to 3)	MOTIVATION
A- BUILT URBAN SYSTEMS	1	Consultation with Local Committee Members
B- ECONOMY	2	Economically unsustainable cities. This point is important to improve it. Consultation with Local Committee Members
C- ENERGY	3	This is a strategic axis with greater opportunity for action and improvement of results and directly linked to CO_2 emissions to reduce in the Climate and energy framework 2030. It is considered top priority. Consultation with Local Committee Members
D- ATMOSPHERIC EMISSIONS	3	It is the environmental consequence of issue C. This axis closely linked to the axis C, with the same impact and possibilities of action (Climate and energy framework 2030). It is considered top priority. Consultation with Local Committee Members

E- NON - RENEWABLE RESOURCES	1	Consultation with Local Committee Members
F- ENVIRONMENT	3	It is very important due to directly affect the health of people. It is considered top priority. Consultation with Local Committee Members
G- SOCIAL ASPECTS	2	It is not considered priority, although it is important because it takes into consideration the relationship of people with the area. Consultation with Local Committee Members

CATEGORIES WEIGHTS

Note: the categories weight results automatically from the criteria level

CATEGORIES	WEIGHT (%)
A1- Urban Structure and Form	100
A2- Transportation Infrastructure	0
TOTAL	100
B1- Economic Structure and Value	40
B2- Economic activity	20
B3- Cost and Investment	40
TOTAL	100
C1- Non-renewable energy	66,67
C2- Renewable and Decarbonised energy	33,33
C3- Energy recycling and storage	0
TOTAL	100
D1- Atmospheric emissions	100
TOTAL	100
E1- Potable water, stormwater and greywater	66,67
E2- Solid and Liquid Wastes	33,33
E3- Resource consumption, retention and maintenance	0
TOTAL	100
F1- Environmental impacts	14,29
F2- Outdoor environmental quality	42,86
F3- Ecosystems and landscapes	42,86
TOTAL	100
G1- Safety and Accessibility	20
G2- Traffic and Mobility Services	40
G3- Communication services	0
G4- Public and private facilities and services	20
G5- Local Food	0
G6- Management and community involvement	20
G7- Society, Culture and Heritage	0
G8- Perceptual	0
TOTAL	**100**

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 Form

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A1.2	*1,94*	*3*	*2*	*4*	*1*	*Confirmed*
A1.4	*1,94*	*3*	*2*	*4*	*1*	*Confirmed*
A1.7	*2,58*	*2*	*4*	*4*	*1*	*Consultation with Local Committee Members*
TOTAL	6,46					

B- ECONOMY

B1- Economic Structure and Value

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B1.1	*2,91*	*3*	*2*	*3*	*1*	*Confirmed*
B1.2	*1,94*	*3*	*2*	*2*	*1*	*Confirmed*

B2- Economic activity

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B2.5	*1,29*	*2*	*2*	*2*	*1*	*Confirmed*

B3- Cost and Investment

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B3.2	*1,94*	*3*	*2*	*2*	*1*	*Confirmed*
B3.3	*0,97*	*3*	*2*	*1*	*1*	*Consultation with Local Committee Members*
TOTAL	9,05					

C- ENERGY

C1- Non-Renewable energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C1.1	*1,45%*	*2*	*3*	*3*	*1*	*Consultation with Local Committee Members*
C1.4	*2,18%*	*3*	*3*	*3*	*1*	*Consultation with Local Committee Members*
C1.7	*1,45%*	*2*	*3*	*3*	*1*	*Consultation with Local Committee Members*
C1.10	*2,42%*	*3*	*5*	*2*	*1*	Confirmed
C1.12	*2,42%*	*3*	*5*	*2*	*1*	Confirmed
C1.20	*0,81%*	*1*	*5*	*2*	*1*	Confirmed

C2- Renewable and Decarbonised energy

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C2.1	*4,36*	2	3	3	1	Consultation with Local Committee Members
C2.4	*2,91*	2	2	3	1	Confirmed
C2.7	*8,72*	3	4	3	1	Consultation with Local Committee Members
TOTAL	26,74					

D- ATHMOSPHERIC EMISSIONS

D1- Atmospheric emissions

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.2	*7,3*	*2*	*5*	*3*	*1*	*Consultation with Local Committee Members*
TOTAL	7,27					

E- NON-RENEWABLE RESOURCES

E1- Potable water, storm water and greywater

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E1.6	0,97	3	4	1	1	Consultation with Local Committee Members
E1.7	0,97	3	4	1	1	Consultation with Local Committee Members

E2- Solid and liquid wastes

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E2.1	1,94	2	2	2	1	Confirmed
TOTAL	7,27					

F- ENVIRONMENT

F1- Environmental impacts

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F1.3	5,82	2	4	3	1	Consultation with Local Committee Members

F2-

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F2.3	10,90	3	3	5	1	Consultation with Local Committee Members
F2.10	4,36	3	2	3	1	Confirmed
F2.11	4,36	3	2	3	1	Confirmed

F3-

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F3.1	1,94	2	2	2	1	Confirmed
F3.2	1,94	2	2	2	1	Confirmed
F3.3	1,94	2	2	2	1	Confirmed
TOTAL	31,26					

G- SOCIAL ASPECTS

G1- Safety and Accessibility

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G1.4	1,94	2	2	3	1	Confirmed

G2- Traffic and mobility services

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G2.1	1,94	3	3	2	1	Consultation with Local Committee Members
G2.4	5,82	3	4	3	1	Consultation with Local Committee Members

G4- Public and private facilities and services

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G4.2	5,17	2	4	4	1	Consultation with Local Committee Members

G6- Management and community involvement

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G6.3	0,48	1	3	1	1	Consultation with Local Committee Members
TOTAL	15,35					

SNTool benchmarks rationale

A- URBAN STRUCTURE AND FORM

CRITERION	INDICATOR	UNIT OF	BENCHMARK	RATIONALE

		MEASURE		
A1.2	*Urban compactness*	m^3/m^2	*0: 10*	*Minimum value*
			5: 40	*Increase the urban compactness in the area according to the Urban planning*
A1.4	*Residential density*	pp/ha	*0: 125*	--
			5: 350	*Reduce the residential density in the area according to the Urban planning*
A1.7	*Conservation of Land*	%	*0: 4*	*Minimum value desired*
			5: 15	*Increase the green zones in the area according to the Urban planning*

B- ECONOMY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
B1.1	*Affordability of housing property*	%	*0: 30*	--
			5: 20	*Maximum value desired*
B1.2	*Affordability of housing rental.*	%	*0: 30*	--
			5: 20	*Maximum value desired*
B2.5	*Economic contribution from tourism activity.*	€/resident	*0: 250*	--
			5: 1000	--
B3.2	*Public contribution in residential retrofitting investments.*	%	*0: 40*	--
			5: 25	--
B3.3	*Operating energy costs for public buildings.*	€/m^2/y	*0: 20*	*Maximum value desired*
			5: 10	*Passive or NZEB Building*

C- ENERGY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
C1.1	*Total final thermal energy consumption for building operations.*	kWh/m^2/y	*0: 75*	*Maximum value desired*
			5: 20	*Passive or NZEB Building*
C1.4	*Total final electrical energy consumption for building operations.*	kWh/m^2/y	*0: 70*	*Maximum value desired*
			5: 20	*Passive or NZEB Building*
C1.7	*Total primary energy*	kWh/m^2/y	*0: 225*	*Maximum value desired*

	demand for building operations.		*5: 70*	*Minimum value desired*
C1.10	*Primary energy for heating - residential buildings.*	%	*0: 100*	*Local minimum value*
			5: 70	*Value desired*
C1.12	*Primary energy for cooling - residential buildings.*	%	*0: 100*	*Local minimum value*
			5: 60	*Value desired*
C1.20	*Energy consumption of public lighting.*	kWp/pp	*0: 50*	Current index
			5: 20	*Value desired*
C2.1	*Share of renewable energy on-site, on total final energy consumptions for buildings operation.*	%	*0: 25*	*Value desired*
			5: 90	*Passive or NZEB Building*
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for buildings operation.*	%	*0: 30*	*Value desired*
			5: 80	*Passive or NZEB Building*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy.*	%	*0: 15*	*Value desired*
			5: 75	*Passive or NZEB Building*

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
D1.2	*GHG emissions from energy used for all purposes in building operations.*	kg CO_2 eq /m^2/y	*0: 30*	Current value
			5: 10	*Passive or NZEB Building*

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
E1.6	*Consumption of potable water for residential population.*	m^3 /occupant/ year	*0: 150*	Average regional value
			5: 40	Maximum value desired
E1.7	*Consumption of potable water for non-residential building systems.*	m^3 / m^2	*0: 15*	Average regional value
			5: 5	Maximum value desired
E2.1	*Solid waste and*	%	*0: 75*	--

	recycling collection points.		*5: 95*	Value desired

F- ENVIRONMENT				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
F1.3	*Recharge of groundwater through permeable paving or landscaping.*	%	*0: 20*	Minimum value desired
			5: 70	Maximum value desired
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period.*	days/year	*0: 15*	Maximum value desired
			5: 11	Minimum value desired
F2.10	*Ambient daytime noise conditions.*	%	*0: 30*	Maximum value desired
			5: 10	Minimum value desired
F2.11	*Ambient night-time noise conditions.*	%	*0: 20*	Maximum value desired
			5: 5	Minimum value desired
F3.1	*Green zones & recreation areas availability.*	m^2/inh	*0: 5*	Minimum value desired
			5: 50	Maximum value desired
F3.2	*Green zones & recreation areas accessibility.*	m	*0: 500*	Minimum value desired
			5: 100	Maximum value desired
F3.3	*Green zones & recreation areas density.*	%	*0: 20*	Minimum value desired
			5: 50	Maximum value desired

G- SOCIAL ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
G1.4	*Ease of access to and use of public transport for physically disabled persons.*	%	*0: 60*	--
			5: 100	Current value
G2.1	*Performance of the public transport service.*	%	*0: 30*	--
			5: 100	Current value
G2.4	*Quality of pedestrian and bicycle network.*	m / 100 inhabitants	*0: 20*	--
			5: 80	--

G4.2	*Availability and proximity of key public human services.*	%	*0: 30*	--
			5: 80	--
G6.3	*Community involvement in urban planning activities.*	Level	*0: 0*	Degrees of tokenism: Information / Consultation / Placation (in the Arnstein ladder).
			5:5	Degrees of citizen power: Partnership, delegated power and citizen power (in the Arnstein ladder), at every stages.

SNTool Criteria Specifications

A- BUILT URBAN SYSTEMS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.2	*Urban compactnes*	*Information source*	*Master Plan and Cadastre*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Urban planning*
A1.4	*Residential density.*	*Information source*	*Master Plan and Cadastre*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Urban planning*
A1.7	*Conservation of Land.*	*Information source*	*Master Plan and Cadastre*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Urban planning*

B- ECONOMY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.1	*Affordability of housing property..*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Tool*

		Standard	*Report ERD 2016 of Barcelona council Report 76 of Barcelona council*
B1.2	*Affordability of housing rental.*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Report ERD 2016 of Barcelona council Report 76 of Barcelona council*
B2.5	*Economic contribution from tourism activity.*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
B3.2	*Public contribution in residential retrofitting investments.*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
B3.3	*Operating energy costs for public buildings.*	*Information source*	*Bills*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*

C- ENERGY

CRITERION	INDICATOR	SPECIFICATIONS	
C1.1	*Total final thermal energy consumption for building operations.*	*Information source*	*Master plan (surveys) and bills*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
C1.4	*Total final electrical energy consumption for building operations.*	*Information source*	*Master plan (surveys) and bills*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
C1.7	*Total primary energy demand for building operations.*	*Information source*	*Master plan (surveys) and bills*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*IDEA, coefficients of primary energy passage of different final energy sources consumed*
C1.10	*Primary energy for*	*Information source*	*Master plan*

	heating - residential buildings.	*Assessment method*	*According its factsheet in the SN-Tool*
		Standard	*NA*
C1.12	*Primary energy for cooling - residential buildings.*	*Information source*	*Master plan*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
C1.20	*Energy consumption of public lighting.*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Municipal regulations*
C2.1	*Share of renewable energy on-site, on total final energy consumptions for buildings operation.*	*Information source*	*Master plan and bills*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Municipal regulations*
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for buildings operation.*	*Information source*	*Master plan and bills*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Municipal regulations*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy.*	*Information source*	*Master plan and bills*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Municipal regulations*

D- ATMOSPHERIC EMISSIONS

CRITERION	**INDICATOR**	**SPECIFICATIONS**	
D1.2	*GHG emissions from energy used for all purposes in building operations.*	*Information source*	Master plan and bills
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Factor GHG Emissions by Government of Catalonia*

E- NON-RENEWABLE RESOURCES

CRITERION	**INDICATOR**	**SPECIFICATIONS**

E1.6	*Consumption of potable water for residential population.*	*Information source*	*Master plan (surveys)*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
E1.7	*Consumption of potable water for non-residential building systems.*	*Information source*	*Master plan (surveys) and bills*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
E2.1	*Solid waste and recycling collection points.*	*Information source*	*Master plan*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Municipal regulations*

E- NON-RENEWABLE RESOURCES

CRITERION	**INDICATOR**	**SPECIFICATIONS**	
F1.3	*Recharge of groundwater through permeable paving or landscaping.*	*Information source*	*Google earths images*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period.*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Municipal regulations*
F2.10	*Ambient daytime noise conditions.*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Municipal regulations*
F2.11	*Ambient night-time noise conditions.*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Too*
		Standard	*Municipal regulations*
F3.1	*Green zones & recreation areas*	*Information source*	*Statistical data from Barcelona council and Google earth images*
		Assessment method	*According its factsheet in the SN-Tool*

	availability.	*Standard*	*Municipal regulations*
F3.2	*Green zones & recreation areas accessibility.*	*Information source*	*Statistical data from Barcelona council and Google earth images*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Municipal regulations*
F3.3	*Green zones & recreation areas density.*	*Information source*	*Statistical data from Barcelona council and Google earth images*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Municipal regulations*

G- SOCIAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G1.4	*Ease of access to and use of public transport for physically disabled persons.*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Mobility plan*
G2.1	*Performance of the public transport service.*	*Information source*	*Google maps*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
G2.4	*Quality of pedestrian and bicycle network.*	*Information source*	*Statistical data from Barcelona council*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*Mobility plan*
G4.2	*Availability and proximity of key public human services.*	*Information source*	*Google maps*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*
G6.3	*Community involvement in urban planning activities.*	*Information source*	*Master plan*
		Assessment method	*According its factsheet in the SN-Tool*
		Standard	*NA*

REGIONAL TOOL

D.3.4.3 Regional Tool – SANT CUGAT

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

URBAN SCALE ASSESSMENT

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*

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 easy to calculate*

relative to local population

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 fairly 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 the 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*	*It is a criterion that 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*	*It is a criterion that 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 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.*
G4.6 *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*	*The ability to access basic services (schools,*

winter use	*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*.

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 %**					

SNTool benchmarks rationale

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/m²/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/m²/yr*	*0: 29.85*	*The CLC didn't 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 didn't 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/m²/yr*	*0: 152*	*The CLC didn't 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 didn't 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/m²*	*0: 3*	*The CLC approved to change units and value because they weren't realistic (default value 20 cd/m²).*
			5: 0.4	*The CLC approved to change units and value because they weren't realistic (default value 20 cd/m²).*
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*	*m²/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.*

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	*CESBA assessment method:* *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.*
		Standard	
A2.1	*Walking distance to public transport for area residents*	*Information source*	*Mesured ddta from the local public transport map*
		Assessment method	*CESBA assessment method:* *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*
		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	*CESBA assessment method:* *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* *Comments from Sant Cugat:* *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	*CESBA assessment method:* *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.* *Comments from Sant Cugat:* *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 city 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).*
		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	*<u>CESBA assessment method:</u>* *To characterize the indicator's value,*

			use of estimated data or metered data. *<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*
C1.7	*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	*<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). *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*. *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*
C1.20	*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 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/102577937/126719106/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.* *<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/102577937/126719106/Metodologia+PAESC_MAIG_18.pdf/b0f51601-1866-4783-a547-e80c828eb20d*](https://www.diba.cat/documents/102577937/126719106/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	*<u>CESBA assessment method:</u>* *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:* $E = \left[\sum\left(Q_{fuel,i} \times LHV_i \times k_{em,i}\right) + \left(Q_{el} \times k_{em,el}\right) + \left(Q_{dh} \times k_{em,dh}\right)\right]$ *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)*
		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* *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	*<u>CESBA assessment method:</u>* *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* *<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*

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	*<u>CESBA assessment method:</u>* *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.*
		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/*](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.
		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*
		Standard	
E1.8	*Consumption of potable water for irrigation purposes*	*Information source*	*Mesured water supply data from Municipality*
		Assessment method	*CESBA assessment method:* *Calculate the estimated consumption of potable water used for irrigation purposes in the local area, in m3/1000 m2.*
		Standard	
E2.1	*Solid waste and recycling collection points*	*Information source*	*Solid waste and recycling collection points data from Municipality*
		Assessment method	*CESBA assessment method:* *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.*
		Standard	
E2.2	*Separate collection and disposal of solid waste and recycling*	*Information source*	*Solid waste and recycling data from Municipality*
		Assessment method	*CESBA assessment method:* *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.*
		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.*
		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>* *o characterize the indicator’s value:* *1. Calculate the size (Sa) of the urban area (m2).* *2. Calculate the size of the surfaces with a different paving or occupied by constructions in the urban area (i.e. green areas, surfaces paved with asphalt, surfaces occupied by buildings, etc.). Include all the surfaces in the urban area so that:* *Sa = total surface of the urban area* *Sa,i = surface i-th in the area (m2)* *3. Calculate the real permeability of soil considering the permeability coefficient of each surface.* *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 = 0,3* *Interlocking elements leaning on gravel = 0,3* *Interlocking elements leaning on concrete pavement = 0* *Continuous pavements leaning on concrete = 0* *Asphalt = 0*
		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.* *<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	*CESBA assessment method:* *Calculate (Green zones & Recreation areas m2 / Number of inhabitants)*
		Standard	
F3.2	*Green zones & recreation areas accessibility*	*Information source*	*Mesured data form Municipal Urban Planning*
		Assessment method	*CESBA assessment method* *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)*
		Standard	
F3.3	*Green zones & recreation areas density*	*Information source*	*Mesured data from Municipal Urban Planning*
		Assessment method	*CESBA assessment method* *Calculate (Green zones & Recreation areas m2 / Urban area square meters)*
		Standard	
F3.6	*Tree coverage for shade and management of local ambient temperatures*	*Information source*	*Mesured data from satellit map*
		Assessment method	*CESBA assessment method* *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.*
		Standard	
F3.9	*Presence or potencial for wildlife corridors*	*Information source*	*Mesured data from Municipal Urban Planning and from satellit map*
		Assessment method	*CESBA assessment method* *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.*

			Comments from Sant Cugat: *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	*CESBA assessment method* *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.*
		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).*

		Standard	
G2.3	*Measures to limit traffic of cars and trucks passing through the local area*	*Information source*	*Estimated data from Municipality*
		Assessment method	*<u>CESBA assessment method</u>* *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.*
		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.
		Standard	
G2.5	*Availability of sheltered bicyble parking facilities*	*Information source*	*Mesured data from Municipality*
		Assessment method	*CESBA assessment method* *Calculate the number of sheltered bicycle parking spaces relative to the total population of the local area.*
		Standard	
G3.1	*Availability of a broadband communication network*	*Information source*	*Mesured data from Municipality*
		Assessment method	*CESBA assessment method* Calculate the percentage of the local area in which a broadband communication network is available.
		Standard	
G3.2	*Access to a broadband communication network*	*Information source*	*Mesured data from Municipality*
		Assessment method	*CESBA assessment method* *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.*
		Standard	
G4.2	*Availability and proximity of key services*	*Information source*	*Mesured data from Municipality and satellit map*
		Assessment method	*CESBA assessment method* *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.*
		Standard	
G4.3	*Availability and proximity of a primary school*	*Information source*	*Mesured data from Municipality and satellit map*
		Assessment method	*CESBA assessment method* *Calculate the percentage of resident population with access to a primary school within a distance of 500 m.*
		Standard	
G4.4	*Availability and proximity of a secondary school*	*Information source*	*Mesured data from Municipality and satellit map*
		Assessment method	*CESBA assessment method* *Calculate the percentage of resident population with access to a secondary school within a distance of 1 km.*
		Standard	
G4.6	*Availability and proximity of leisure facilities*	*Information source*	*Mesured data from Municipality and satellit map*
		Assessment method	*CESBA assessment method* *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.*
		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.*
		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.*
		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 20152 which tends to take into consideration recent evolution in practices.* *<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	*CESBA assessment method* *Evaluate the compatibility of public open spaces in the local area with traditional cultural values in the region.*
		Standard	

REGIONAL TOOL

D.3.4.3 Regional Tool – University of Malta

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

URBAN SCALE ASSESSMENT

SNTool structure

A- BUILT URBAN SYSTEMS	
A1	**Urban Structure and Form**
A1.1	*Concentration of land parcels.*
A1.2	*Urban compactness*
A1.4	*Residential density*
A1.5	*Urban street canyons (H/W aspect ratio)*
A1.6	*Homogeneity of Land*
A1.7	*Conservation of Land*
A2	**Transportation Infrastructure**
A2.2	*Walking distance to public transport for area workers and students.*
A2.3	*Extent and connectivity of pedestrian streets and walkways.*
A2.9	*On-street and indoor parking spaces relative to local population.*

B- ECONOMY	
B1	**Economic Structure and Value**
B1.4	*Impact of land values on adjacent areas.*
B2	**Economic Activity**
B2.3	*Employment rate*
B3	**Cost and Investment**
B3.3	Operating energy costs for public building

C- ENERGY	
C1	**Non- Renewable Energy**
C1.1	*Total final thermal energy consumption for building operations.*
C1.3	*Total final thermal energy consumption for non residential building operations.*
C1.4	*Total final electrical energy consumption for building operations.*
C1.6	*Total final electrical energy consumption for non residential building operations.*
C1.7	*Total primary energy demand for building operations*
C2	***Renewable and Decarbonised Energy***
C2.1	*Share of renewable energy on-site, on total final energy consumptions for buildings operation.*
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for buildings operation.*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy./ Share of renewable energy on-site, on final electric energy consumptions.*

D- ATMOSPHERIC EMISSIONS	
D1	**Atmospheric Emissions**
D1.2	*GHG emissions from energy used for all purposes in building operations.*

E- NON - RENEWABLE RESOURCES	
E1	**Potable water, stormwater and greywater**
E1.1	*Availability of a public municipal water supply.*
E1.4	*Re-use of rainwater in non-residential building.*
E1.5	*Re-use of stormwater.*
E1.7	*Consumption of potable water for non-residential building systems.*
E2	**Solid and Liquid Wastes**
E2.1	*Solid waste and recycling collection points.*
E2.2	*Separate collection and disposal of solid waste and recycling.*
E2.3	*Solid waste from construction and demolition projects retained in the area for re-use or recycling.*

F- ENVIRONMENT	
F1	**Environmental Impacts**
F1.1	*Impact of construction activities on natural features*
F1.2	*Impact of construction activities or landscaping on soil stability or erosion.*
F1.3	*Recharge of groundwater through permeable paving or landscaping.*
F1.4	*Changes in biodiversity.*
F1.7	*Impact of local building user population on peak load capacity of public transport system.*
F1.8	*Impact of private vehicles used by the local population on peak load capacity of the local road system.*
F2	**Outdoor Environmental Quality**
F2.10	*Ambient daytime noise conditions.*
F2.11	*Ambient night-time noise conditions.*
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.*
F3.7	*Green roofs.*
F3.10	*Ecological diversity in the area*

G- SOCIAL ASPECTS	
G1	**Safety and Accessibility**
G1.1	*Buildings that are accessible for use by physically disabled persons.*
G1.2	*Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons.*
G1.3	*Barrier-free accessibility in local outdoor public areas.*
G1.4	*Ease of access to and use of public transport for physically disabled persons.*
G1.5	*Objective/subjective safety measures.*
G2	**Traffic and Mobility Services**
G2.1	*Performance of the public transport service..*
G2.4	*Quality of pedestrian and bicycle network.*
G2.5	*Availability of sheltered bicycle 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**

G4.1	*Availability and proximity of key food and retail services*
G4.2	*Availability and proximity of key public human services*
G6	**Management and community involvement**
G6.1	*Involvement of residents in community affairs.*
G6.3	*Community involvement in urban planning activities*
G7	**Society, Culture and Heritage**
G7.1	*Compatibility of urban design with local cultural values.*
G7.2	*Compatibility of public open space with local cultural values.*
G7.4	*Use of traditional local materials and techniques*
G7.5	*Maintenance of UNESCO or other protected landscapes*
G8	**Perceptual**
G8.2	*Panoramic and scenic routes or view points.*
G8.3	*Perceived safety of public areas for pedestrians.*
G8.4	*Impact of commercial signage on the visual environment.*
G8.5	*Impact of overhead electric distribution system on the visual environment.*
G8.6	*Perceptual quality of area development.*
G8.7	*Aesthetic quality of new facility exteriors.*

SNTool criteria selection rationale

A- BUILT URBAN SYSTEMS	
CRITERION	**REASON/MOTIVATION**
A1.1 ***Concentration of land parcels***	*Area in Malta is very limited with regards to the total population. This indicator is therefore vital for the conservation of space.*
A1.2 ***Urban compactness***	*It is important to maximise the use of land used for buildings due to the reason mentioned in A1.1.*
A1.4 ***Residential density***	*It is important to measure the density of buildings in the local area due to the reason mentioned in A1.1.*
A1.5 ***Urban street canyons (H/W aspect ratio)***	*The local Development Control Design Policy 2015 (DC 15) gives various examples of height to road width ratios. The averaged out number is: 2.31.*
A1.6 ***Homogenity of Land***	*Important to assess the voids of the urban fabric.*
A1.7 ***Conservation of Land***	*Undeveloped land considered to be of value for ecological or agricultural purposes. Locally these areas are named 'Outside Development Zone' (ODZ) where development is restricted.*
A2.2 ***Walking distance to public transport for area workers and students.***	*This indicator was chosen since public transport needs to be given a higher priority in order to discourage citizens in using their own private car. Locally, traffic is a number one issue.*
A2.3 ***Extent and connectivity of pedestrian streets and walkways.***	*Since traffic is a number one issue, more walkways and pedestrianized streets would discourage the citizens in using their own private vehicle.*
A2.9 ***On-street and indoor parking spaces relative to***	*Same reason mentioned in A2.2 and A2.3. Since*

local population.	*traffic is a number one issue, more parking spaces encourage people to use their own private car. Making it more difficult for people to find a parking space means a better chance that they will use public transport.*

B- ECONOMY

CRITERION	REASON/MOTIVATION
B1.4 *Impact of land values on adjacent areas*	*A certain level of external and internal capital investment in the local area is needed to ensure that the property market remains healthy and that business enterprises can function.*
B2.3 *Employment Rate*	*The employment rate of a country shows the economic situation. This indicator is therefore very important.*
B3.3 *Operating energy costs for public building*	*N.A*

C- ENERGY

CRITERION	REASON/MOTIVATION
C1.1 *Total final thermal energy consumption for building operations.*	*It is important to know how much of the energy usage is being driven towards thermal energy consumption (both heating and cooling).*
C1.3 *Total final thermal energy consumption for non residential building operations.*	
C1.4 *Total final electrical energy consumption for building operations.*	*It is important to know how much electrical energy is being used in the neighbourhood per m^2 of useful area.*
C1.6 *Total final electrical energy consumption for non residential building operations.*	
C1.7 *Total primary energy demand for building operations*	*This indicator was chosen specifically as it relates to primary energy, thus including losses in generation and transmission. This is useful as it is a measure in which energy demand for building operations may be reduced.*
C2.1 Share of renewable energy on-site, on total final energy consumptions for buildings operation.	*In Malta thermal energy is not treated separately from electrical energy when generated from renewable energy sources.*
C2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation.	*This is an important indicator to see whether the amount of energy used for building operation is coming from on-site renewables or from the grid.*
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy./ Share of renewable energy on-site, on final electric energy consumptions.	*Similar to above, this is an important indicator to find out whether enough energy is being generated on-site.*

D- ATMOSPHERIC EMISSIONS

CRITERION	REASON/MOTIVATION
D1.2 *GHG emissions from energy used for all purposes in building operations.*	*The main aim of this indicator is to estimate greenhouse gas (GHG) emissions resulting from*

	building operations in the local area. Since in Malta, energy is generated from one source (Enemalta Power Station), then the GHG emissions from energy is equal to that of the power station. This result is proportioned according to the energy used (calculated by Enemalta).

E- NON - RENEWABLE RESOURCES

CRITERION	REASON/MOTIVATION
E1.1 *Availability of a public municipal water supply.*	*The availability of a public water supply system, with water purity assured by appropriate purification systems and management, is essential to ensure public health in urban areas. This service is locally provided by Water Services Corporation (WSC).*
E1.4 *Re-use of rainwater in non-residential building.*	*The rainwater collected in our test site is usually not sufficient to cater for all the irrigation demand and thus the reservoirs have to be refilled by water from private operators. This indicator is crucial to highlight the importance of re-using water when possible.*
E1.5 *Re-use of stormwater.*	*Important to reduce the potable water consumption.*
E1.7 *Consumption of potable water for non-residential building systems.*	*Important to reduce the potable water consumption.*
E2.1 *Solid waste and recycling collection points.*	*Waste collection is currently being revamped in Malta. The organic bag has just recently been introduced and waste is collected everyday with a shedule for: organic waste, recycled waste and inorganic waste.*
E2.2 *Separate collection and disposal of solid waste and recycling.*	*Waste collection is currently being revamped in Malta. The organic bag has just recently been introduced and waste is collected everyday with a shedule for: organic waste, recycled waste and inorganic waste.*
E2.3 *Solid waste from construction and demolition projects retained in the area for re-use or recycling.*	*Construction and demolition waste is a problem in Malta especially since currently we have a construction boom. This waste is currently being disposed in quarries.*

F- ENVIRONMENT

CRITERION	REASON/MOTIVATION
F1.1 *Impact of construction activities on natural features*	*Since locally we have a construction boom this indicator is very important.*
F1.2 *Impact of construction activities or landscaping on soil stability or erosion.*	*Since locally we have a construction boom this indicator is very important.*
F1.3 *Recharge of groundwater through permeable paving or landscaping.*	*Important to improve permeability locally which therefore recharges the aquifers and reduces effluents.*

F1.4 ***Changes in biodiversity.***	*To promote the diversity of plants.*
F1.7 ***Impact of local building user population on peak load capacity of public transport system.***	*Important to evaluate the peak load capacity of the local public transport system. This evaluates the efficiency of the public transport system.*
F1.8 ***Impact of private vehicles used by the local population on peak load capacity of the local road system***	*Important to determine the impact of private vehicles used by the local population on the peak load capacity of the local road system.*
F2.10 ***Ambient daytime noise conditions.***	*Important to minimise daytime noise.*
F2.11 ***Ambient night-time noise conditions.***	*Important to minimise nightime noise.*
F3.1 ***Green zones & recreation areas availability***	*Important to measure the existing green zones and recreation areas as added value for quality of life of the citizens.*
F3.2 ***Green zones & recreation areas accessibility***	*Important to reduce the negative effects of urbanization.*
F3.3 ***Green zones & recreation areas density***	*Important to measure the existing green zones and recreation areas as added value for quality of life of the citizens.*
F3.6 ***Tree coverage for shade and management of local ambient temperatures.***	*Important to reduce the ambient temperatures.*
F3.7 ***Green roofs.***	*Important to reduce the ambient temperatures and retaining rainwater which thefore reduced flooding issues.*
F3.10 ***Ecological diversity in the area***	*Important to preserve and enhance the local ecological diversity.*

G- SOCIAL ASPECTS

CRITERION	REASON/MOTIVATION
G1.1 ***Buildings that are accessible for use by physically disabled persons.***	*Important to assess the ability of local residents, workers or visitors with physical disabilities to be able to have physical access to key buildings.*
G1.2 ***Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons.***	*Important to assess the ability of local residents, workers or visitors with physical disabilities to be able to make use of public outdoor facilities.*
G1.3 ***Barrier-free accessibility in local outdoor public areas.***	*Important to evaluate the accessibility of various urban resources using spatial data analysis.*
G1.4 ***Ease of access to and use of public transport for physically disabled persons.***	*Important to facilitate the access to public transport by physically disable persons.*
G1.5 ***Objective/subjective safety measures.***	*Important to provide objective and subjective safety to area users.*
G2.1 ***Performance of the public transport service.***	*Important to determine the performance of the public transportation system. Locally the government is providing incentives so that the citizens favour public transport.*
G2.4 ***Quality of pedestrian and bicycle network.***	*Important to promote cycling and walking instead of the use of private car which generates traffic.*
G2.5 ***Availability of sheltered bicycle parking facilities.***	*Important to promote cycling and walking instead of the use of private car which generates traffic.*
G3.1 ***Availability of a broadband communication network***	*Important to evaluate occupant access to broadband communication.*
G3.2 ***Access to a broadband communication network.***	*Important to ensure access to high-speed internet connections.*
G4.1 ***Availability and proximity of key food and retail***	*Important to assess the ability of the citizens to*

services	*walk to key food and retail services instead of using the private car.*
G4.2 ***Availability and proximity of key public human services***	*Important to assess the ability of the citizens to key public human services instead of using the private car.*
G6.1 ***Involvement of residents in community affairs.***	*Important to promote involvement of citizens in community affairs.*
G6.3 ***Community involvement in urban planning activities***	*Important to raise the level of community involvement in planning.*
G7.1 ***Compatibility of urban design with local cultural values.***	*Important to evaluate the compatibility or urban design with the local cultural values.*
G7.2 ***Compatibility of public open space with local cultural values.***	*Important to evaluate the compatibility of public open space with local cultural values.*
G7.4 ***Use of traditional local materials and techniques***	*Important to promote the use of local materials and techniques.*
G7.5 ***Maintenance of UNESCO or other protected landscapes***	*Important to preserve and maintain landscape heritage.*
G8.2 ***Panoramic and scenic routes or view points.***	*Important to evaluate interesting natural or urban scenery.*
G8.3 ***Perceived safety of public areas for pedestrians.***	*Important to improve safety of public places and pedestrian routes.*
G8.4 ***Impact of commercial signage on the visual environment.***	*Important to avoid visual environment obstruction through the integration of commercial signage.*
G8.5 ***Impact of overhead electric distribution system on the visual environment.***	*Important to avoid visual environment obstruction caused by an overhead electric distribution system.*
G8.6 ***Perceptual quality of area development.***	*Important to improve the perception of residents about quality of the urban area.*
G8.7 ***Aesthetic quality of new facility exteriors.***	*Important to improve quality of the exteriors of new buildings.*

SNTool weights rationale

ISSUES WEIGHTS

ISSUE	WEIGHTING FACTOR (1 to 3)	MOTIVATION
A- BUILT URBAN SYSTEMS	1	These weights were chosen specifically according to both local priorities, and the sustainable policy at the University of Malta.
B- ECONOMY	1	
C- ENERGY	2	
D- ATMOSPHERIC EMISSIONS	1	
E- NON - RENEWABLE RESOURCES	2	
F- ENVIRONMENT	2	
G- SOCIAL ASPECTS	1	

CATEGORIES WEIGHTS

CATEGORIES	WEIGHT (%)
A1- Urban Structure and Form	8.6%
A2- Transportation Infrastructure	4.9%
TOTAL	13.5%
B1- Economic Structure and Value	0.9%
B2- Economic activity	0.5%
B3- Cost and Investment	0.5%
TOTAL	1.8%
C1- Non-renewable energy	10.2%
C2- Renewable and Decarbonised energy	6%
C3- Energy recycling and storage	0%
TOTAL	16.2%
D1- Atmospheric emissions	5.8%
TOTAL	5.8%
E1- Potable water, stormwater and greywater	6.5%
E2- Solid and Liquid Wastes	2.5%
E3- Resource consumption, retention and maintenance	2.8%
TOTAL	11.7%
F1- Environmental impacts	9.5%
F2- Outdoor environmental quality	9.7%
F3- Ecosystems and landscapes	9.5%
TOTAL	28.7%
G1- Safety and Accessibility	4.6%
G2- Traffic and Mobility Services	3.2%
G3- Communication services	1.8%
G4- Public and private facilities and services	1.8%
G5- Local Food	0%
G6- Management and community involvement	1.8%
G7- Society, Culture and Heritage	5.5%
G8- Perceptual	3.4%
TOTAL	**22.3%**

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						
Ax-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
A1.1 Concentration of land parcels.	*0.92%*	2	2	3	1	N.A
A1.2 Urban compactness	*1.85%*	3	2	4	1	N.A
A1.4 Residential density	*1.85%*	3	2	4	1	N.A
A1.5 *Urban street*	*1.54%*	2	2	5	1	N.A

canyons (H/W aspect ratio)						
A1.6 *Homogeneity of Land*	*1.23%*	2	2	4	0.5	Data is not accurate.
A1.7 *Conservation of Land*	*1.23%*	2	2	4	1	N.A
A2.2 *Walking distance to public transport for area workers and students.*	*1.54%*	2	2	5	1.5	Encouraging the use of public transport is high on the local agenda.
A2.3 *Extent and connectivity of pedestrian streets and walkways.*	*1.54%*	2	2	5	1.5	Encouraging the use of public transport is high on the local agenda.
A2.9 *On-street and indoor parking spaces relative to local population.*	*1.85%*	3	4	2	1	N.A
TOTAL	13.5%					

B- ECONOMY						
Bx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B1.4 *Impact of land values on adjacent areas.*	*0.92%*	2	3	2	1	N.A
B2.3 *Employment rate*	0.46%	3	2	1	1	N.A
B3.3 Operating energy costs for public building	0.46%	1	2	3	1	N.A
TOTAL	1.8%					

C- ENERGY						
Cx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.1 *Total final thermal energy consumption for building operations.*	2.77%	3	2	3	1	N.A
C1.3 *Total final thermal energy consumption for non residential building operations.*	1.85%	**3**	**2**	**2**	1	N.A
C1.4 *Total final electrical energy consumption for building operations.*	1.85%	**3**	**2**	**2**	1	N.A

C1.6 *Total final electrical energy consumption for non residential building operations.*	1.85%	**3**	**2**	**2**	1	N.A
C1.7 *Total primary energy demand for building operations*	1.85%	**3**	**2**	**2**	1	N.A
C2.1 Share of renewable energy on-site, on total final energy consumptions for buildings operation.	2.77%	**3**	**2**	**3**	1	N.A
C2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation.	1.85%	**2**	**2**	**3**	1	N.A
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy./ Share of renewable energy on-site, on final electric energy consumptions.	1.38%	**1**	**3**	**3**	1	N.A
TOTAL						

D- ATHMOSPHERIC EMISSIONS						
Dx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D1.2 *GHG emissions from energy used for all purposes in building operations.*	5.77%	**3**	**5**	**5**	1	N.A
TOTAL	5.77%					

E- NON-RENEWABLE RESOURCES						
Ex-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**

E1.1 ***Availability of a public municipal water supply.***	2.77%	**3**	**2**	**3**	1	N.A
E1.4 ***Re-use of rainwater in non-residential building.***	0.62%	**1**	**2**	**2**	1	N.A
E1.5 ***Re-use of stormwater.***	*0.62%*	1	2	2	1	N.A
E1.7 ***Consumption of potable water for non-residential building systems.***	*0.62%*	1	2	2	1	N.A
E2.1 ***Solid waste & recycling collection points.***	*1.23%*	2	2	2	1	N.A
E2.2 ***Separate collection and disposal of solid waste and recycling.***	0.62%	1	2	2	1	N.A
E2.3 ***Solid waste from construction and demolition projects retained in the area for re-use or recycling.***	0.62%	1	2	2	1	N.A
TOTAL	11.7%					

F- ENVIRONMENT						
Fx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
F1.1 ***Impact of construction activities on natural features***	1.85%	2	2	3	1	N.A
F1.2 ***Impact of construction activities or landscaping on soil stability or erosion.***	1.85%	2	2	3	1	N.A
F1.3 ***Recharge of groundwater through permeable paving or landscaping.***	0.92%	1	2	3	1	N.A
F1.4 ***Changes in biodiversity.***	1.85%	2	2	3	1	N.A
F1.7 ***Impact of local building user population on peak load capacity of public transport system.***	0.92%	2	2	3	1	N.A
F1.8 ***Impact of private vehicles used by the local population on peak load capacity of the local road system***	2.08%	3	3	3	1	N.A
F2.10 ***Ambient daytime noise conditions.***	2.77%	3	2	3	1	N.A
F2.11 ***Ambient night-time noise conditions.***	2.77%	3	2	3	1	N.A
F3.1 ***Green zones & recreation areas availability***	1.23%	2	2	2	1	N.A
F3.2 ***Green zones & recreation areas accessibility***	1.23%	2	2	2	1	N.A
F3.3 ***Green zones & recreation areas density***	1.23%	2	2	2	1	N.A
F3.6 ***Tree coverage for shade***	2.77%	3	2	3	1	N.A

and management of local ambient temperatures.						
F3.7 ***Green roofs.***	1.23%	2	2	2	1	N.A
F3.10 ***Ecological diversity in the area***	1.85%	2	2	3	1	N.A
TOTAL					28.7%	

G- SOCIAL ASPECTS						
Gx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G1.1 ***Buildings that are accessible for use by physically disabled persons.***	0.92%	**2**	**2**	**3**	1	N.A
G1.2 ***Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons.***	0.92%	**2**	**2**	**3**	1	N.A
G1.3 ***Barrier-free accessibility in local outdoor public areas.***	0.92%	**2**	**2**	**3**	1	N.A
G1.4 ***Ease of access to and use of public transport for physically disabled persons.***	0.92%	2	2	3	1	N.A
G1.5 ***Objective/subjective safety measures.***	0.92%	2	2	3	1	N.A
G2.1 ***Performance of the public transport service.***	1.38%	3	2	3	1	N.A
G2.4 ***Quality of pedestrian and bicycle network.***	0.92%	2	2	3	1	N.A
G2.5 ***Availability of sheltered bicycle parking facilities.***	0.92%	2	2	3	1	N.A
G3.1 ***Availability of a broadband communication network***	0.92%	2	2	3	1	N.A
G3.2 ***Access to a broadband communication network.***	0.92%	2	2	3	1	N.A
G4.1 ***Availability and proximity of key food and retail services***	0.92%	2	2	3	1	N.A
G4.2 ***Availability and proximity of key public human services***	0.92%	2	2	3	1	N.A
G6.1 ***Involvement of residents in community affairs.***	0.62%	2	2	2	1	N.A
G6.3 ***Community involvement in urban planning activities***	1.23%	2	2	4	1	N.A
G7.1 ***Compatibility of urban design with local cultural values.***	0.92%	2	2	3	1	N.A
G7.2 ***Compatibility of public open space with local cultural values.***	0.92%	2	2	3	1	N.A
G7.4 ***Use of traditional local materials and techniques***	0.92%	2	2	3	1	N.A
G7.5 ***Maintenance of UNESCO or other protected landscapes***	1.85%	3	2	4	1	N.A

G8.2 *Panoramic and scenic routes or view points.*	0.62%	2	2	5	1	N.A
G8.3 *Perceived safety of public areas for pedestrians.*	0.62%	2	2	2	1	N.A
G8.4 *Impact of commercial signage on the visual environment.*	0.62%	2	2	2	1	N.A
G8.5 *Impact of overhead electric distribution system on the visual environment.*	0.62%	2	2	2	1	N.A
G8.6 *Perceptual quality of area development.*	0.62%	2	2	2	1	N.A
G8.7 *Aesthetic quality of new facility exteriors.*	0.31%	1	2	2	1	N.A
Total	22.3%					

SNTool benchmarks rationale

A- URBAN STRUCTURE AND FORM				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
A1.1 *Concentration of land parcels.*	Number of lots in the local area related to the total surface area.	*Building lots/ha*	*0: 4.2 5: 0*	*N.A*
A1.2 Urban compactness	*Relation between the usable space of the buildings (volume) and the urban space (area).*	Ratio	*0: 1.0 5: 3.0*	*N.A*
A1.4 Residential density	*The residential density of the local area, as measured in resident persons per hectare.*	*Persons/ hectare*	*0: 50 5: 200*	*N.A*
A1.5 *Urban street canyons (H/W aspect ratio)*	The ratio of typical building heights acompared to the distance between building facades on the other side of the street.	*Ratio*	*0: 2.0 5:4.0*	*N.A*
A1.6 *Homogeneity of Land*	Percentage of the perimeter of the area directly adjacent to urbanized areas.	%	0:10% 5:36%	*N.A*
A1.7 *Conservation of Land*	Area of undeveloped land with ecological or agricultural value / area of the neighborhood	%	0:10% 5:28%	*N.A*
A2.2 *Walking distance to public transport for area workers and students.*	Percent of workers and students who can reach a public trasnport stop within a 500m. distance.	m	0:550 5:150	*N.A*
A2.3 *Extent and*	Aggregate area of	%	0:10%	*N.A*

connectivity of pedestrian streets and walkways.	pedestrian streets and walkways in the local area relative to the total land area.		5:15%	
A2.9 *On-street and indoor parking spaces relative to local population.*	The ratio of on-street and indoor car parking spaces relative to the total resident and working population of the local area.	%	0:80% 5:25%	*N.A*

B- ECONOMY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
B1.4 *Impact of land values on adjacent areas.*	Average annual change in land values of properties immediately adjacent to the urban area, over a 5-year period.	%	0:3% 5:0%	*N.A*
B2.3 *Employment rate*	*Percent of working age adults in the local area who are employed or actively looking for work.*	%	*0: 3%* *5: 0%*	*N.A*
B3.3 Operating energy costs for public building	*Aggregated annual operating energy cost per aggregated internal useful floor area*	*Euro/m2/year*	*0:100* *5:0*	*N.A*

C- ENERGY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
C1.1 *Total final thermal energy consumption for building operations.*	Aggregated annual total final thermal energy consumption per aggregated internal useful floor area	kWh/m2/yr	0: >50 5:0	*N.A*
C1.3 *Total final thermal energy consumption for non residential building operations.*	*Urban thermal energy consumption of non-residential buildings (kWh/m2).*	kWh/m2/yr	*0: 50* *5: 10*	*N.A*
C1.4 *Total final electrical energy consumption for building operations.*	*Aggregated annual total final electric energy consumption per aggregated internal useful floor area*	kWh/m2/yr	*0:25* *5:5.0*	*N.A*
C1.6 *Total final electrical energy consumption for non residential building operations.*	Urban electrical energy consumption of non-residential buildings (kWh/m2).	kWh/m2	0:25 5:10	*N.A*
C1.7 *Total primary*	Aggregated annual total	kWh/m2/year	0:50	*N.A*

energy demand for building operations	primary energy consumption per aggregated internal useful floor area		5:15	
C2.1 Share of renewable energy on-site, on total final energy consumptions for buildings operation.	Annual total thermal energy consumption from on-site renewable energy sources / annual total final thermal energy consumption	%	0:25% 5:90%	*N.A*
C2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation.	Aggregated total annual primary energy consumption from on-site renewable energy sources / aggregated total annual primary energy consumption	%	0:30% 5:80%	*N.A*
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy./ Share of renewable energy on-site, on final electric energy consumptions.	Annual total electric energy consumption from on-site renewable energy sources / annual total final electric energy consumption	%	0:35% 5:75%	*N.A*

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
D1.2 ***GHG emissions from energy used for all purposes in building operations.***	CO2 equivalent emissions per useful internal floor area per year	kgCO2/m2	0:80 5:30	*N.A*

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
E1.1 ***Availability of a public municipal water supply.***	Availability of a public municipal water supply to all permanent buildings in the area.	%	0:90% 5:100%	*N.A*
E1.4 ***Re-use of rainwater in non-residential building.***	*Share of rainwater collected from roofs of non residential buildings.*	%	*0: 20%* *5: 70%*	*N.A*
E1.5 ***Re-use of stormwater.***	*Percent of annual stormwater that is re-used.*	%	*0:20%* *5:50%*	*N.A*
E1.7 ***Consumption of potable water for***	Annual water consumption per	m3/occupant/year	0:15 5:5.0	*N.A*

non-residential building systems.	occupant			
E2.1 *Solid waste & recycling collection points.*	Proximity of the resident population to the solid waste and recycling collection point.	%	0:75% 5:95%	*N.A*
E2.2 *Separate collection and disposal of solid waste and recycling.*	Separated collection and disposal of solid waste and recycling.	%	0:10% 5:80%	*N.A*
E2.3 *Solid waste from construction and demolition projects retained in the area for re-use or recycling.*	Volume of materials that will be re-used or recycled from the local area on the total solid waste from construction and demolition of building projects	%	0:10% 5:80%	*N.A*

F- ENVIRONMENT

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
F1.1 *Impact of construction activities on natural features*	Preservation of land during and pre construction phase.	Score	0: Building and infrastructure construction projects have had some negative impacts on pre-existing land forms and vegetation over the previous 3-year period. 5: Building and infrastructure construction projects have had no perceptible negative impacts on pre-existing land forms and vegetation over the previous 3-year period.	*N.A*
F1.2 *Impact of construction activities or landscaping on soil stability or erosion.*	*Impact degree of construction activities on soil stability.*	Score	*0: Building and infrastructure construction projects have had some negative impacts on landscaping and soil stability over the previous 3-year period.* *5: Building and infrastructure construction projects have had no perceptible negative impacts on landscaping and soil stability over the previous 3-year period.*	*N.A*
F1.3 *Recharge of groundwater through permeable paving or landscaping.*	*Area of permeable surfaces on total neighborhood area*	*%*	*0:20%* *5:100%*	*N.A*
F1.4 *Changes in biodiversity.*	Diversity of plant structures.	Score	0: Changes in plant or animal biodiversity in the local area over the last 3 year period appear to be somewhat impaired. 5: Changes in plant or animal biodiversity in the local area over the last 3 year period are positive.	*N.A*
F1.7 *Impact of local*	Diversity of plant	Local Factor	0:0.5	*N.A*

building user population on peak load capacity of public transport system.	structures.		5:1.0	
F1.8 *Impact of private vehicles used by the local population on peak load capacity of the local road system*	Impact degree of private vehicles on the population.	Score	0: It is estimated that the use of private vehicles by the local population reaches the peak load capacity of the local road system, with some negative impacts on traffic speeds, air quality, pedestrian and bicycling environments, and the function of adjacent buildings. *N.A* 5: It is estimated that the use of private vehicles by the local population is considerably less than the peak load capacity of the local road system, and there are no significant impacts on traffic speeds, air quality, pedestrian and bicycling environments, and the function of adjacent buildings.	*N.A*
F2.10 *Ambient daytime noise conditions.*	Percentage of building area over noise limit.	%	0:30% 5:0%	*N.A*
F2.11 *Ambient night-time noise conditions.*	Proportion of population exposed to non recommended levels of night noise.	%	0:20% 5:5%	*N.A*
F3.1 *Green zones & recreation areas availability*	Availability of green zones & recreation areas	m2/resident population	0:3.0 5:10.0	*N.A*
F3.2 *Green zones & recreation areas accessibility*	Accessibility of green spaces within the area.	Average distance,m	0:1000 5:250	*N.A*
F3.3 *Green zones & recreation areas density*	Density of green spaces within the area.	%	0:20% 5:50%	*N.A*
F3.6 *Tree coverage for shade and management of local ambient temperatures.*	Reduction of ambient temperatures through evapo-transpiration.	% of area	0:20% 5:80%	*N.A*
F3.7 *Green roofs.*	Aggregate area of building roofs covered with vegetated material.	%	0:10% 5:60%	*N.A*
F3.10 *Ecological diversity in the area*	Diversity of surface and aquatic biota in the local area.	Score	0: The level of ecological diversity in the local area is similar to the larger urban area. 5: The level of ecological diversity in the local area is considerably higherl than the larger urban area.	*N.A*

G- SOCIAL ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
G1.1 ***Buildings that are accessible for use by physically disabled persons.***	Percent of key public, commercial and residential buildings that are accessible for use by physically disabled persons.	%	0:50% 5:90%	*N.A*
G1.2 ***Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons.***	*Percent of sidewalks and other pedestrian ways that are accessible for use by physically disabled persons.*	%	*0: 50%* *5: 100%*	*N.A*
G1.3 ***Barrier-free accessibility in local outdoor public areas.***	*Adequacy of barrier-free accessible public outdoor areas compared to the total public area.*	*%*	*0:50%* *5:100%*	*N.A*
G1.4 ***Ease of access to and use of public transport for physically disabled persons.***	Features of public transport to facilitate access physically disabled persons, such as kneeling buses and wide entries..	%	0:60% 5:100%	*N.A*
G1.5 ***Objective/subjective safety measures.***	Adequacy of signage and traffic calming measures.	Score	0: A panel of residents and workers in the local area has determined that the objective and subjective measures taken to protect the safety of pedestrians, cyclists and drivers are consistent with measures taken in the urban region. 5: A panel of residents and workers in the local area has determined that the objective and subjective measures taken to protect the safety of pedestrians, cyclists and drivers are much more effective than measures taken in the urban region.	*N.A*
G2.1 ***Performance of the public transport service.***	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop	%	0:30% 5:100%	*N.A*
G2.4 ***Quality of pedestrian and bicycle network.***	Total walkway meters of dedicated pedestrian paths and meters of bicycle path per 100 inhabitants	m/100 inhabitants	0:5 5:40	*N.A*
G2.5 ***Availability of***	Sheltered bicycle	%	0:20%	*N.A*

sheltered bicycle parking facilities.	parking spaces.		5:60%	
G3.1 *Availability of a broadband communication network*	Local area with available broadband communication network .	%	0:80% 5:95%	*N.A*
G3.2 *Access to a broadband communication network.*	Percentage of population with access to broadband communication.	%	0:80% 5:95%	*N.A*
G4.1 *Availability and proximity of key food and retail services*	Percent of residential buildings located within a distance of 300 m. of basic food and household goods.	%	0:30% 5:80%	*N.A*
G4.2 *Availability and proximity of key public human services*	Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services.	%	0:50% 5:100%	*N.A*
G6.1 *Involvement of residents in community affairs.*	Percetage of resident population above 16 years having an involvement in community affairs.	%	0:5% 5:20%	*N.A*
G6.3 *Community involvement in urban planning activities*	Level of involvement of users in urban planning	Score	0: Degrees of tokenism: Information / Consultation / Placation (in the Arnstein ladder). 5: Degrees of citizen power: Partnership, delegated power and citizen power (in the Arnstein ladder), at every stages.	*N.A*
G7.1 *Compatibility of urban design with local cultural values.*	Compatibility with local area traditional values of street layouts and the character of urban spaces.	Score	0: Street layouts and the character of urban spaces in the local area are not compatible with traditional cultural values in the region. 5: Street layouts and the character of urban spaces in the local area are fully compatible with traditional cultural values in the region.	*N.A*
G7.2 *Compatibility of public open space with local cultural values.*	Compatibility with local area traditional values of local public open spaces, including major uses, dimensions and adjacent uses.	Score	0: The character of public open space in the local area are not compatible with traditional cultural values in the region. 5: The character of public open spaces in the local area are fully compatible with traditional cultural values in the region.	*N.A*
G7.4 *Use of traditional local materials and techniques*	Compatibility with local area traditional values of construction techniques and types of materials.	Score	0: The panel formed to assess the compatibility of construction techniques and types of materials now being used with traditional values in the local area considers that the level of compatibility is low. 5: The panel formed to assess the compatibility of construction	*N.A*

			techniques and types of materials now being used with traditional values in the local area considers that that the level of compatibility is high.	
G7.5 ***Maintenance of UNESCO or other protected landscapes***	Preventive maintenance and protection of UNESCO or other protected landscapes	Score	0:Preventive maintenance and protection measures for UNESCO or other protected landscapes appear to be barely adequate. 5: Preventive maintenance and protection measures for UNESCO or other protected landscapes appear to be excellent.	*N.A*
G8.2 ***Panoramic and scenic routes or view points.***	Prescence and quality of scenic routes and places.	Score	There are a few scenic routes and places in the locality that provide views of interetsting natural or urban vistas.	*N.A*
G8.3 ***Perceived safety of public areas for pedestrians.***	Perceived safety of public places and pedestrian routes, as determined by a sample of pedestrians.	Score	0:The perceived safety of public places and pedestrian routes, as determined by a sample of residents, is adequate, except at night. 5: The perceived safety of public places and pedestrian routes, as determined by a sample of residents, is very high during daytime and nightime conditions.	*N.A*
G8.4 ***Impact of commercial signage on the visual environment.***	Visual impact of exterior commercial signage.	Score	0: The aggregate visual impact of exterior commercial signage, based on the degree of integration with building exteriors, diversity in signage dimensions and illumination; as determined by a sample of the local area population, is at the same level as the region. 5:The aggregate visual impact of exterior commercial signage, based on the degree of integration with building exteriors, diversity in signage dimensions and illumination; as determined by a sample of the local area population, is very positive.	*N.A*
G8.5 ***Impact of overhead electric distribution system on the visual environment.***	Visual impact of above-grade electrical distribution systems.	Score	0: The aggregate visual impact of above-grade electrical distribution systems, based on degree of visual clutter; as determined by a sample of the local area population, somewhat negative. 5: The aggregate visual impact of above-grade electrical distribution systems, based on degree of visual clutter; as determined by a sample of the local area population, is positive.	*N.A*
G8.6 ***Perceptual***	Perceived quality of the	Score	0:The perceived quality of area	*N.A*

quality of area development.	urban area and natural development.		urban and natural development, as determined by a sample of residents, is negative. 5: The perceived quality of area urban and natural development, as determined by a sample of residents, is positive.	
G8.7 *Aesthetic quality of new facility exteriors.*	Perceived quality of the exteriors of new buildings.	Score	0: The perceived quality of the exteriors of new buildings in the local area, as determined by a sample of residents, is mediocre. 5: The perceived quality of the exteriors of new buildings in the local area, as determined by a sample of residents, is excellent.	*N.A*

SNTool Criteria Specifications

A- BUILT URBAN SYSTEMS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.1 *Concentration of land parcels.*	*Number of lots in the local area related to the total surface area.*	*Information source*	University Of Malta
		Assessment method	This indicator requires two types of data: The number of building lots and the total land area of the urban area. A ratio is then attained between these two values.
		Standard	*N.A*
A1.2 Urban compactness	*Relation between the usable space of the buildings (volume) and the urban space (area).*	*Information source*	University Of Malta
		Assessment method	This indicator requires two types of data: The gross volume of buildings and the total developed area. A ratio is then attained between these two values.
		Standard	*N.A*
A1.4 *Residential density*	*The residential density of the local area, as measured in resident persons per hectare.*	*Information source*	University Of Malta
		Assessment method	*N.A*
		Standard	*N.A*

Indicator	Description	Information source	Assessment method	Standard
A1.5 *Urban street canyons (H/W aspect ratio)*	The ratio of typical building heights acompared to the distance between building facades on the other side of the street.	University Of Malta	The main aim of this indicator is to assess the negative psychological effects that result from urban streets with a very small ratio of width to height. This requires a ratio between a typical building height and the distance between building facades.	Design Policy Guidance Document (DC15)
A1.6 *Homogeneity of Land*	Percentage of the perimeter of the area directly adjacent to urbanized areas.	University Of Malta	The main aim of this indicator is to find the percentage ratio between the length of the urban fabric parameter adjacent to urbanised areas and the overall perimeter of the area taken.	*N.A*
A1.7 *Conservation of Land*	Area of undeveloped land with ecological or agricultural value / area of the neighborhood	University Of Malta	1. Determine the surface area of the neighbourhood (including area developed for buildings). 2. Determine the aggregated surface area of land that is considered by authorities to be of ecological and agricultural value. 3. Calculate the ratio between the aggregate surface area of land that is considered by authorities to be of ecological/agricultural value and the surface area of the neighbourhood.	*N.A*
A2.2 *Walking distance to public transport for area workers and students.*	Percent of workers and students who can reach a public trasnport stop within a 500m. distance.	University Of Malta	1. Identifying of the public transport stops within the test area.	

			2. Identifying of major education, industrial or office buildings. 3. Calculation of the walking distance for a sample of typical routes.
		Standard	*Transport National Strategy 2020*
A2.3 ***Extent and connectivity of pedestrian streets and walkways.***	Aggregate area of pedestrian streets and walkways in the local area relative to the total land area.	*Information source*	University Of Malta
		Assessment method	The main aim is to find out the percentage area of pedestrian walkways, including also those dedicated to bicycles (if any).
		Standard	*N.A*
A2.9 ***On-street and indoor parking spaces relative to local population.***	The ratio of on-street and indoor car parking spaces relative to the total resident and working population of the local area.	*Information source*	University Of Malta
		Assessment method	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.
		Standard	

B- ECONOMY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.4 ***Impact of land values on adjacent areas.***	Average annual change in land values of properties immediately adjacent to the urban area, over a 5-year period.	*Information source*	University Of Malta
		Assessment method	The main aim of this indicator is to assess the increase of the cost of the land with regards to the

			increase of cost of living. This is assessed over a 5 year period. The data for this indicator can vary due to the fact that property increase could be subjective and could vary from one property to the other.
		Standard	*N.A*
B2.3 *Employment rate*		*Information source*	https://tradingeconomics.com/malta/employment-rate
	Percent of working age adults in the local area who are employed or actively looking for work.	*Assessment method*	The main aim of this indicator is to calculate the number of people in the labour force compared to the number of working age people and express result as a percentage. This indicator is needed to assess the labour market status, the economy development and the citizens' quality of life.
		Standard	*N.A*
B3.3 Operating energy costs for public building	*Aggregated annual operating energy cost per aggregated internal useful floor area*	*Information source*	
		Assessment method	
		Standard	

C- ENERGY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
C1.1 *Total final thermal energy consumption for building operations.*	*Aggregated annual total final thermal energy consumption per aggregated internal useful floor area*	*Information source*	VRF systems monitor.
		Assessment method	• Annual Total final thermal energy consumption, in kWh/year, for each building in the area which has to be estimated by taking an average over a 3-year period • Calculation of the

			aggregated annual total final thermal energy consumption for all buildings. • Dividing the aggregated thermal energy consumption by the total useful area of all buildings.
		Standard	*Data Collection for 3 years.*
C1.3 *Total final thermal energy consumption for non residential building operations.*	*Urban thermal energy consumption of non-residential buildings (kWh/m2).*	*Information source*	*Same as C1.1 as all buildings on campus are non-residential.*
		Assessment method	
		Standard	
C1.4 *Total final electrical energy consumption for building operations.*	*Aggregated annual total final electric energy consumption per aggregated internal useful floor area*	*Information source*	*Monitored data from electricity meters.*
		Assessment method	*1. Data collection of the monitored annual total final electric energy consumption for building operations in kWh, for each building in the local area. This was taken for a 3 year period.* *2. Calculation of the aggregated annual total final electric energy consumption for all buildings.* *3. The aggregated annual total final energy was divided by the area to obtain the result.*
		Standard	*Data collection.*
C1.6 *Total final electrical energy consumption for non residential building operations.*	Urban electrical energy consumption of non-residential buildings (kWh/m2).	*Information source*	
		Assessment method	
		Standard	
C1.7 *Total primary energy demand for building operations*	Aggregated annual total primary energy consumption per aggregated internal useful floor area	*Information source*	*Monitored data.*
		Assessment method	*1. The annual final energy consumption was calculated in kWh/year, and*

			summed 2. The aggregated annual final energy consumption was converted into primary energy consumption 3. The aggregated annual total primary energy consumption was divided by the aggregated internal useful area (kWh/m^2/year).
		Standard	*Data Collection.*
C2.1 Share of renewable energy on-site, on total final energy consumptions for buildings operation.	Annual total thermal energy consumption from on-site renewable energy sources / annual total final thermal energy consumption	*Information source*	*This indicator was not done as we do not treat thermal energy as separate from electrical energy when generated from renewable energy sources.*
		Assessment method	
		Standard	
C2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation.	Aggregated total annual primary energy consumption from on-site renewable energy sources / aggregated total annual primary energy consumption	*Information source*	*Metered Data from grid meter and renewables meter.*
		Assessment method	*The annual total primary energy consumption without renewables, was divided by the aggregated annual total primary energy consumption.*
		Standard	*N/A*
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy./ Share of renewable energy on-site, on final electric energy consumptions.	Annual total electric energy consumption from on-site renewable energy sources / annual total final electric energy consumption	*Information source*	*Metred Data.*
		Assessment method	*1. Collection of data of monitored annual total final electric energy consumption for building operations, in kWh, for each building, taking the average over a 3-year period.* *2. The annual total final electric energy consumption for building operations from on-site renewable energy sources is calculated.* *3. The aggregated annual total final electrical energy consumption from on-site*

			renewable sources was divided by the aggregated annual total final electrical energy consumption.
		Standard	*N/A*

D- ATMOSPHERIC EMISSIONS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
D1.2 *GHG emissions from energy used for all purposes in building operations.*	CO2 equivalent emissions per useful internal floor area per year	*Information source*	*Enemalta*
		Assessment method	In Malta, energy is generated from one source (Enemalta Power Station), then the GHG emissions from energy is equal to that of the power station. This result is proportioned according to the energy used (calculated by Enemalta).
		Standard	*N/A*

E- NON-RENEWABLE RESOURCES			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
E1.1 *Availability of a public municipal water supply.*	Availability of a public municipal water supply to all permanent buildings in the area.	*Information source*	*University Of Malta*
		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.
		Standard	*N.A*
E1.4 ***Re-use of rainwater in non-residential building.***	*Share of rainwater collected from roofs of non residential buildings.*	*Information source*	*University Of Malta & Team 2 Architects*
		Assessment method	The main aim of this indicator is to assess the collection of rainwater from roofs in non-residential buildings. Rainwater collection can be used as greywater to use for toilet or irrigation purposes. This reduces the demand for potable water.
		Standard	*N.A*
E1.5 ***Re-use of stormwater.***	*Percent of annual stormwater that is re-used.*	*Information source*	*University Of Malta*
		Assessment method	The main aim is to calculate the percentage of annual stormwater that is re-used in the local area
		Standard	*N.A*
E1.7 ***Consumption of potable water for non-residential building systems.***	Annual water consumption per occupant	*Information source*	*University Of Malta*
		Assessment method	This indicator calculated the amount of potable water used taking in consideration the total area of University (L/m2*yr.) The following is the method on how the result is obtained: 1. For each building the total water consumption was calculated. 2. The aggregated annual total water consumption from all non-residential buildings was

			calculated.
		Standard	*N.A*
E2.1 ***Solid waste & recycling collection points.***	Proximity of the resident population to the solid waste and recycling collection point.	*Information source*	*University Of Malta*
		Assessment method	Percentage of population located 50m from the waste collection points (%)
		Standard	*N.A*
E2.2 ***Separate collection and disposal of solid waste and recycling.***	Separated collection and disposal of solid waste and recycling.	*Information source*	*University Of Malta*
		Assessment method	The value needed for this indicator is the percentage of recycled waste. This was determined by finding the average weight of the black bag waste (tonnes) and the average weight of the grey bag waste (tonnes). The grey bag contains waste to be recycled like plastic and paper whilst the black bag contains solid waste which would not be recycled.
		Standard	*N.A*
E2.3 ***Solid waste from construction and demolition projects retained in the area for re-use or recycling.***	Volume of materials that will be re-used or recycled from the local area on the total solid waste from construction and demolition of building projects	*Information source*	*University Of Malta*
		Assessment method	Construction activities for new buildings and for demolition have traditionally resulted in large amounts of waste materials that have to be taken to solid waste sites. Much of this material is bulky and remains, but not useable, for long periods of time. Experience has shown that significant improvements can be made in reducing waste, either by recycling them or by re-using some of these materials in new projects. For re-use applications, testing or on-site certification by structural engineers may be required.

		Standard	*N.A*

F- ENVIRONMENT			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
F1.1 *Impact of construction activities on natural features*	Preservation of land during and pre construction phase.	*Information source*	*NSO (National Statistic Office)*
		Assessment method	This indicator assesses the degree to which construction activities over the last 5-years have had negative effects on natural features of the local area (minor, moderate or major). Building and infrastructure construction projects have had considerable negative impacts on pre-existing land forms and vegetation over the previous 3-year period.
		Standard	*N.A*
F1.2 *Impact of construction activities or landscaping on soil stability or erosion.*	*Impact degree of construction activities on soil stability.*	*Information source*	*NSO (National Statistic Office)*
		Assessment method	This indicator assesses the degree to which construction activities over the last 5-years have had negative effects on landscaping and soil stability (minor, moderate or major). Building and infrastructure construction projects have had some negative impacts on landscaping and soil stability over the previous 3-year period.
		Standard	*N.A*
F1.3 *Recharge of groundwater through permeable paving or landscaping.*	*Area of permeable surfaces on total neighborhood area*	*Information source*	*University Of Malta*
		Assessment method	To find the total percentage of water which is recharged back to

			the ground. This is done by assessing the different types of ground material found and using a permeability coefficient factor, according to the material.
		Standard	*N.A*
F1.4 Changes in biodiversity.	Diversity of plant structures.	*Information source*	*NSO (National Statistic Office)*
		Assessment method	This indicator aims to promote the diversity of plants and animal biodiversity.
		Standard	*N.A*
F1.7 ***Impact of local building user population on peak load capacity of public transport system.***	Diversity of plant structures.	*Information source*	https://goo.gl/P55vcP
		Assessment method	This indicator assesses how much the public transport is being used. The higher the load capacity, the more busses are being utilised. This was worked out using two methods: one method using the Peak passenger load per hour, whilst the other method using the passenger load per day.
		Standard	https://goo.gl/P55vcP
F1.8 ***Impact of private vehicles used by the local population on peak load capacity of the local road system***	Impact degree of private vehicles on the population.	*Information source*	https://www.publictransport.com.mt/
		Assessment method	To determine the impact of private vehicles used by the local population on the peak load capacity of the local road system. It is estimated that the use of private vehicles by the local population exceeds the peak load capacity of the local road system, with strongly negative impacts on traffic speeds, air quality, pedestrian and bicycling

			environments, and the function of adjacent buildings. The score given is therefore **-1.**
		Standard	https://www.publictransport.com.mt/
F2.10 *Ambient daytime noise conditions.*	Percentage of building area over noise limit.	*Information source*	ERA, Noise Action Plan , 2013
		Assessment method	The proposed onset levels, for assessment of noise mitigation measures due to exposure to road traffic noise is: L_{den} = 65 dB
		Standard	ERA, Noise Action Plan , 2013
F2.11 *Ambient night-time noise conditions.*	Proportion of population exposed to non recommended levels of night noise.	*Information source*	ERA, Noise Action Plan , 2013
		Assessment method	The proposed onset levels, for assessment of noise mitigation measures due to exposure to road traffic noise L_{night} = 55 dB
		Standard	ERA, Noise Action Plan , 2013
F3.1 *Green zones & recreation areas availability*	Availability of green zones & recreation areas	*Information source*	*University Of Malta*
		Assessment method	This indicator assess how much green space there is allocated per worker/student. The units used are m^2/inhabitant.
		Standard	*N.A*
F3.2 *Green zones & recreation areas accessibility*	Accessibility of green spaces within the area.	*Information source*	*University Of Malta*
		Assessment method	This indicator assesses the average distance to green zones and recreation area for a sample of key residential buildings.
		Standard	*N.A*
F3.3 *Green zones & recreation areas density*	Density of green spaces within the area.	*Information source*	*University Of Malta*
		Assessment method	This indicator assesses the area of green spaces relative to the total land area.
		Standard	*N.A*

F3.6 ***Tree coverage for shade and management of local ambient temperatures.***	Reduction of ambient temperatures through evapo-transpiration.	*Information source*	*University Of Malta*
		Assessment method	Deciduous trees can be very effective in shielding people and lower parts of buildings from excessive solar heat gain. The area of deciduous trees relative to the total area is calculated. This indicator seems to be a repeat of indicator F3.2.
		Standard	*N.A*
F3.7 ***Green roofs.***	Aggregate area of building roofs covered with vegetated material.	*Information source*	*University Of Malta*
		Assessment method	
		Standard	*N.A*
F3.10 ***Ecological diversity in the area***	Diversity of surface and aquatic biota in the local area.	*Information source*	*University Of Malta*
		Assessment method	
		Standard	*N.A*

G- SOCIAL ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
G1.1 ***Buildings that are accessible for use by physically disabled persons.***	Percent of key public, commercial and residential buildings that are accessible for use by physically disabled persons.	*Information source*	*University Of Malta*
		Assessment method	
		Standard	*N.A*
G1.2 ***Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons.***	*Percent of sidewalks and other pedestrian ways that are accessible for use by physically disabled persons.*	*Information source*	*University Of Malta*
		Assessment method	Key pedestrian paths were first and foremost identified. In total 13 routes were recognized, where 7 of them can be accessed by people with physical disabilities.

		Standard	*N.A*
G1.3 *Barrier-free accessibility in local outdoor public areas.*	*Adequacy of barrier-free accessible public outdoor areas compared to the total public area.*	*Information source*	*University Of Malta*
		Assessment method	Major outdoor public areas were first and foremost identified. In total, there are 8 outdoor public spaces, where 5 of them can be easily accessed by people with physical disabilities.
		Standard	*N.A*
G1.4 *Ease of access to and use of public transport for physically disabled persons.*	Features of public transport to facilitate access physically disabled persons, such as kneeling buses and wide entries..	*Information source*	*University Of Malta*
		Assessment method	
		Standard	*N.A*
G1.5 *Objective/subjective safety measures.*	Adequacy of signage and traffic calming measures.	*Information source*	*University Of Malta*
		Assessment method	By conducting interviews with students and workers it determined that the objective and subjective measures taken to protect the safety of pedestrians, cyclists and drivers are **more effective** than measures taken in the urban region. This would yield a score of **3**.
		Standard	*N.A*
G2.1 *Performance of the public transport service.*	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop	*Information source*	*University Of Malta*
		Assessment method	This indicator assesses the performance of the public transport service, but it asks for the percentage of the inhabitants in the area within 400 metres of walking distance to a bus stop. This doesn't make sense. The indicator should be asking about the

			efficiency/ inefficiency of the service of the public transport system.
		Standard	*N.A*
G2.4 ***Quality of pedestrian and bicycle network.***	Total walkway meters of dedicated pedestrian paths and meters of bicycle path per 100 inhabitants	*Information source*	*University Of Malta*
		Assessment method	
		Standard	*N.A*
G2.5 ***Availability of sheltered bicycle parking facilities.***	Sheltered bicycle parking spaces.	*Information source*	*University Of Malta*
		Assessment method	This indicator calculates the number of sheltered bicycle parking spaces relative to the total resident population of the locality.
		Standard	*N.A*
G3.1 ***Availability of a broadband communication network***	Local area with available broadband communication network .	*Information source*	*University Of Malta*
		Assessment method	Availability of a broadband communication service.
		Standard	*N.A*
G3.2 ***Access to a broadband communication network.***	Percentage of population with access to broadband communication.	*Information source*	*University Of Malta*
		Assessment method	Access to a broadband communication network seem to be quiet repetitive.
		Standard	*N.A*
G4.1 ***Availability and proximity of key food and retail services***	Percent of residential buildings located within a distance of 300 m. of basic food and household goods.	*Information source*	*University Of Malta*
		Assessment method	1. Estimate typical walking distances from centres of residential occupancy to key food and retail services. 2. Estimate the residential population living within 500 m. of shopping facilities and calculate the percent relative to the total residential population

			in the local area.
		Standard	*N.A*
G4.2 *Availability and proximity of key public human services*	Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services.	*Information source*	*University Of Malta*
		Assessment method	1. Identify locations of key services in the local area. 2. Calculate the percentage of the inhabitants that are within 800 meters walking distance from at least 3 key services. 3. Calculate the percent of residential population located within 600 m. of the 3 key human services.
		Standard	*N.A*
G6.1 *Involvement of residents in community affairs.*	Percetage of resident population above 16 years having an involvement in community affairs.	*Information source*	*University Of Malta*
		Assessment method	Calculate the percentage of resident population above 16 years in age having an on-going involvement in community or school associations.
		Standard	*N.A*
G6.3 *Community involvement in urban planning activities*	Level of involvement of users in urban planning	*Information source*	*University Of Malta*
		Assessment method	Using the Sherry Arnstein ladder on citizen participation, rate the level of users' involvement on planning. The height rungs and 3 degrees of the ladder are provided on the picture.
		Standard	*N.A*
G7.1 *Compatibility of urban design with local cultural values.*	Compatibility with local area traditional values of street layouts and the character of urban	*Information source*	*University Of Malta*
		Assessment method	Evaluate the compatibility of street layouts and the character of urban

	spaces.		spaces in the local area with traditional cultural values in the region.
		Standard	*N.A*
G7.2 *Compatibility of public open space with local cultural values.*	Compatibility with local area traditional values of local public open spaces, including major uses, dimensions and adjacent uses.	*Information source*	*University Of Malta*
		Assessment method	Evaluate the compatibility with local area traditional values of local public open spaces, including major uses, dimensions and adjacent uses.
		Standard	*N.A*
G7.4 *Use of traditional local materials and techniques*	Compatibility with local area traditional values of construction techniques and types of materials.	*Information source*	*University Of Malta*
		Assessment method	Evaluate the compatibility with local area traditional values of construction techniques and types of materials.
		Standard	*N.A*
G7.5 *Maintenance of UNESCO or other protected landscapes*	Preventive maintenance and protection of UNESCO or other protected landscapes	*Information source*	*University Of Malta*
		Assessment method	Evaluate the preventive maintenance and protection of UNESCO or other protected landscapes.
		Standard	*N.A*
G8.2 *Panoramic and scenic routes or view points.*	Presence and quality of scenic routes and places.	*Information source*	*University Of Malta*
		Assessment method	Calculate the presence and quality of scenic routes and places that provide views of interesting natural or urban vistas.
		Standard	*N.A*
G8.3 *Perceived safety of public areas for pedestrians.*	Perceived safety of public places and pedestrian routes, as determined by a sample of pedestrians.	*Information source*	*University Of Malta*
		Assessment method	Evaluate the perceived safety of public places and pedestrian routes, as determined by a sample of pedestrians.
		Standard	*N.A*

G8.4 ***Impact of commercial signage on the visual environment.***	Visual impact of exterior commercial signage.	*Information source*	*University Of Malta*
		Assessment method	Aggregate visual impact of exterior commercial signage, based on degree of integration with building exteriors, diversity in signage dimensions and illumination; as determined by a sample of the local area population.
		Standard	*N.A*
G8.5 ***Impact of overhead electric distribution system on the visual environment.***	Visual impact of above-grade electrical distribution systems.	*Information source*	*University Of Malta*
		Assessment method	Aggregate visual impact of above-grade electrical distribution systems, based on degree of visual clutter; as determined by a sample of the local area population.
		Standard	*N.A*
G8.6 ***Perceptual quality of area development.***	Perceived quality of the urban area and natural development.	*Information source*	*University Of Malta*
		Assessment method	Evaluate the perceived quality of area urban and natural development, as determined by a sample of residents.
		Standard	*N.A*
G8.7 ***Aesthetic quality of new facility exteriors.***	Perceived quality of the exteriors of new buildings.	*Information source*	*University Of Malta*
		Assessment method	Evaluate the perceived quality of the exteriors of new buildings in the local area, as determined by a sample of residents.
		Standard	*N.A*

REGIONAL TOOL

D.3.4.3 Regional Tool - NOA

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

URBAN SCALE ASSESSMENT

SNTool structure

A- BUILT URBAN SYSTEMS	
A1	**Urban Structure and Form**
A1.2	*Urban compactness*
A1.4	*Residential density*
A1.5	*Urban street canyons (H/W aspect ratio)*
A1.7	*Conservation of Land* *

B- ECONOMY	
B2	**Economic activity**
B2.3	*Unemployment rate*
B2.4	*Economic viability of commercial occupancies*
B2.5	*Energy poverty of households*
B3	**Cost and Investment**
B3.3	*Use stage energy cost for public office/educational buildings* *

C- ENERGY	
C1	**Non-renewable energy**
C1.1	*Total final thermal energy consumption for building operations* *
C1.3	*Total final thermal energy consumption for public office/educational building operations*
C1.4	*Total final electric energy consumption for building operations* *
C1.6	*Total final electric energy consumption for public office/educational building operations*
C1.7	*Total primary energy demand for building operations* *
C1.9	*Total primary energy demand for public office/educational building operations*
C1.20	*Energy consumption of public lighting*
C2	**Renewable and Decarbonised energy**
C2.1	*Share of renewable energy on-site, on total final thermal energy consumptions for buildings operation* *
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for buildings Operation* *
C2.6	*Share of renewable energy on-site, on total primary energy consumptions for public office/educational buildings operation*
C2.7	*Share of renewable energy on-site, on final electric energy consumptions* *
C2.8	*Share of renewable energy on-site, on final electric energy consumptions for public office/educational buildings operation*
C2.13	*Use of RES for thermal energy production in residential buildings*

D- ATMOSPHERIC EMISSIONS	
D1	**Atmospheric emissions**
D1.2	*Total GHG Emissions from primary energy used in building operations* *

E- NON - RENEWABLE RESOURCES	
E1	**Potable water, stormwater and greywater**

E1.6	*Consumption of potable water for residential population **
E1.7	*Consumption of potable water for public office/educational building systems **
E1.8	*Consumption of potable water in public spaces*
E2	**Solid and Liquid Wastes**
E2.1	*Solid waste and recycling collection points*

F- ENVIRONMENT	
F1	**Environmental impacts**
F1.3	*Recharge of groundwater through permeable paving or landscaping **
F1.10	*Light pollution caused by exterior public lighting systems*
F2	**Outdoor environmental quality**
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one year period **
F2.6	*Ambient air quality - ozone*
F3	**Ecosystems and landscapes**
F3.3	*Green zones & recreation areas density*
F3.5	*Flood protection*
F3.11	*Emergency response plan*

G- SOCIAL ASPECTS	
G1	**Safety and Accessibility**
G1.1	*Public buildings that are accessible for use by physically disabled persons*
G1.2	*Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons*
G2	**Traffic and Mobility Services**
G2.1	*Performance of the public transport **
G2.3	*Smart services*
G2.4	*Quality of pedestrian and bicycle network **
G4	**Public and private facilities and services**
G4.2	*Availability and proximity of key services **
G4.3	*Availability and proximity of public schools*
G4.6	*Availability and proximity of public leisure facilities*
G6	**Management and community involvement**
G6.3	*Community involvement in urban planning activities **
G8	**Perceptual**
G8.3	*Perceived safety of public areas for pedestrians*
G8.5	*Impact of overhead electric distribution system*

SNTool criteria selection rationale

A- BUILT URBAN SYSTEMS

CRITERION	REASON / MOTIVATION
A1.2 *Urban compactness*	*Useful and can be calculated*
A1.4 *Residential density*	*Useful and relatively easy to calculate*
A1.5 *Urban street canyons (H/W aspect ratio)*	*Very important parameter for the building performance, as it influences the microclimate and determines the solar and daylight access*
A1.7 *Conservation of Land **	*KPI*

B- ECONOMY

CRITERION	REASON / MOTIVATION
B2.3 *Unemployment rate*	*More easy to find data for unemployment rates of the specific area's inhabitants from social services of the Municipality*
B2.4 *Economic viability of commercial occupancies*	*Interesting and can be calculated*
B2.* *Energy poverty of households*	*Interesting and can be calculated*
B3.3 *Use stage energy cost for public office/educational buildings **	*KPI*

C- ENERGY

CRITERION	REASON / MOTIVATION
C1.1 *Total final thermal energy consumption for building operations **	*KPI*
C1.3 *Total final thermal energy consumption for public office/educational building operations*	*Municipalities are responsible for public/municipal buildings. Office and educational buildings are the majority of public buildings. More easy to find data. National policy. Programs for funding retrofit projects*
C1.4 *Total final electric energy consumption for building operations **	*KPI*
C1.6 *Total final electric energy consumption for public office/educational building operations*	*Municipalities are responsible for public/municipal buildings. Office and educational buildings are the majority of public buildings. More easy to find data. National policy. Programs for funding retrofit projects*
C1.7 *Total primary energy demand for building operations **	*KPI*
C1.9 *Total primary energy demand for public office/educational building operations*	*Municipalities are responsible for public/municipal buildings. Office and educational buildings are the majority of public buildings. More easy to find data. National policy. Programs for funding retrofit projects*
C1.20 *Energy consumption of public lighting*	*Useful. Municipalities have relevant data*
C2.1 *Share of renewable energy on-site, on total final thermal energy consumptions for buildings operation **	*KPI*
C2.4 *Share of renewable energy on-site, on total primary energy consumptions for buildings operation **	*Useful*
C2.6 *Share of renewable energy on-site, on total primary energy consumptions for public office/educational building operations*	*Municipalities are responsible for public/municipal buildings. Important to show the public authority's attitude towards environmental friendly strategies, More easy to find data. National policy. Programs for funding retrofit projects*
C2.7 *Share of renewable energy on-site, on final electric energy consumptions **	*KPI*
C2.8 *Share of renewable energy on-site, on final electric energy consumptions for public office/educational building operations*	*Municipalities are responsible for public/municipal buildings. Important to show the public authority's attitude towards environmental friendly strategies, More easy to find data. National policy. Programs for funding retrofit projects*

C2.13 *Use of RES for thermal energy production in residential buildings*	*Easy to calculate*

D- ATMOSPHERIC EMISSIONS

CRITERION	REASON / MOTIVATION
**D1.2 *Total GHG Emissions from primary energy used in building operations **	*KPI*

E- NON - RENEWABLE RESOURCES

CRITERION	REASON / MOTIVATION
**E1.6 *Consumption of potable water for residential population **	*KPI*
**E1.7 *Consumption of potable water for public office/educational building systems **	*KPI*
E1.8 *Consumption of potable water in public spaces*	*Significant for municipalities.*
E2.1 *Solid waste and recycling collection points*	*Recycling is becoming more and more popular. Easy to define.*

F- ENVIRONMENT

CRITERION	REASON / MOTIVATION
**F1.3 *Recharge of groundwater through permeable paving or landscaping **	*KPI*
F1.10 *Light pollution caused by exterior public lighting systems*	*This could be described through "minor, moderate, major" but it's better to be associated with the type of the street lights causing discomfort*
**F2.3 *Ambient air quality with respect to particulates <10 mu (PM10) over a one year period **	*KPI*
F2.6 *Ambient air quality - ozone*	*Significant criterion for urban areas*
F3.3 *Green zones & recreation areas density*	*Green areas are of vital importance for the sustainability*
F3.5 *Flood protection*	*Significant criterion for urban areas*
F3.11 *Emergency response plan*	*Significant criterion for urban areas*

G- SOCIAL ASPECTS

CRITERION	REASON / MOTIVATION
G1.1 *Public buildings that are accessible for use by physically disabled persons*	*Municipalities are responsible for public/municipal buildings. Important for public authority's to demonstrate "good practice"*
G1.2 *Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons*	*Significant criterion*
**G2.1 *Performance of the public transport **	*KPI*
G2.3 *Smart services*	*Significant criterion for the future*
**G2.4 *Quality of pedestrian and bicycle network **	*KPI*

G4.2 ***Availability and proximity of key services ****	*KPI*
G4.3 ***Availability and proximity of public schools***	*Better to evaluate puiblic schools in one indicator.*
G4.6 ***Availability and proximity of public leisure facilities***	*Better to evaluate public leisure facilities in one indicator.*
G6.3 ***Community involvement in urban planning activities****	*KPI*
G8.3 ***Perceived safety of public areas for pedestrians***	*Safety is significant for urban areas*
G8.5 ***Impact of overhead electric distribution system***	*Significant criterion since it affects human health*

SNTool weights rationale

ISSUES WEIGHTS

ISSUE	WEIGHTING FACTOR (1 to 3)	MOTIVATION
A- BUILT URBAN SYSTEMS	1	Consultation from National Local Committee Members
B- ECONOMY	2	Consultation from National Local Committee Members
C- ENERGY	3	Consultation from National Local Committee Members
D- ATMOSPHERIC EMISSIONS	3	Consultation from National Local Committee Members
E- NON - RENEWABLE RESOURCES	2	Consultation from National Local Committee Members
F- ENVIRONMENT	2	Consultation from National Local Committee Members
G- SOCIAL ASPECTS	3	Consultation from National Local Committee Members

CATEGORIES WEIGHTS

CATEGORIES	WEIGHT (%)
A1- Urban Structure and Form	4.6
TOTAL	**4.6**
B2- Economic activity	3.2
B3- Cost and Investment	0.7
TOTAL	**3.9**
C1- Non-renewable energy	15.3
C2- Renewable and Decarbonized energy	15.8
TOTAL	**31.1**
D1- Atmospheric emissions	13.6
TOTAL	**13.6**
E1- Potable water, stormwater and greywater	6.8
E2- Solid and Liquid Wastes	3.9
TOTAL	**10.7**
F1- Environmental impacts	4.2

F2- Outdoor environmental quality	6.2
F3- Ecosystems and landscapes	6.4
TOTAL	**16.8**
G1- Safety and Accessibility	1.5
G2- Traffic and Mobility Services	6.9
G4- Public and private facilities and services	4.4
G6- Management and community involvement	2.2
G8- Perceptual	4.4
TOTAL	**19.3**

CRITERIA WEIGHTS

CESBA MED GF-U, sheet WeightsA: B= Impact of the Potential Effect (1:minor, 2:moderate, 3:major), C=Extent of potential effect (1:block, 2:neighborhood, 3:district, 4:urban region, 5:global), D=Duration of potential effect (1:1-3years, 2:3-10 years, 3:10-30 years, 4:30-75 years, 5:>75 years)
CESBA MED SNTool, sheet WeightsB: LF = Local Factor

A- BUILT URBAN SYSTEMS

A1- Urban Structure and Form

CRITERION	Weight (%)	B	C	D	L.F.	REASON / MOTIVATION
A1.2	*1.2*	3	2	4	*1*	
A1.4	*1.2*	3	2	4	*1*	
A1.5	*0.8*	2	2	4	*1*	*The duration of potential effect is based on the life cycle of buildings*
A1.7	*0.6*	2	2	3	*1*	*The duration of potential effect is based on current practices*
TOTAL	3.8					

B- ECONOMY

B2- Economic activity

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
B2.3	*0.6*	*3*	*3*	*1*	*1*	*The extent of potential effect is based on common demographics that unemployment is not so localized*
B2.4	*0.8*	*2*	*2*	*2*	*1*	
B2.5	*1.8*	*2*	*2*	*2*	*1.5*	

B3- Cost and Investment

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
B3.3	*0.9*	1	*2*	*3*	*1.5*	
TOTAL	4.1					

C- ENERGY

C1- Non-renewable energy

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
C1.1	*2.69*	3	*2*	*3*	*1.5*	
C1.3	*2.69*	3	*2*	*3*	*1.5*	The duration of potential effect is based on the life cycle of mechanical system
C1.4	*2.69*	3	*2*	*3*	*1.5*	The duration of potential effect is based on the life cycle of mechanical system
C1.6	*2.69*	3	*2*	*3*	*1.5*	The duration of potential effect is based on the life cycle of mechanical system
C1.7	*2.69*	3	*2*	*3*	*1.5*	The duration of potential effect is based on the life cycle of mechanical system

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
C1.9	*2.69*	3	*2*	*3*	*1.5*	The duration of potential effect is based on the life cycle of mechanical system
C1.20	*2.69*	3	*2*	*3*	*1.5*	The impact of Potential Effect is based on a national average of 36% of the energy cost of municipalities for public lighting. The duration of potential effect is based on the life cycle of lighting systems

C2- Renewable and Decarbonized energy

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
C2.1	*2.7*	3	*3*	*3*	*1*	The extent of potential effect is based on common practices
C2.4	*2.7*	3	*3*	*3*	*1*	The impact of Potential Effect is instrumental in meeting the national/ regional objectives and goals. The extent of potential effect is based on common practices
C2.6	*0.9*	1	*3*	*3*	*1*	The impact of Potential Effect is limited due to the low number of public buildings. The extent of potential effect is based on common practices
C2.7	*6.1*	3	*3*	*3*	*1.5*	The impact of Potential Effect is instrumental in meeting the national/ regional objectives and goals
C2.8	*1.3*	1	*3*	*3*	*1.5*	The impact of Potential Effect is limited due to the low number of public buildings. The extent of potential effect is based on common practices
C2.13	*1.8*	2	*3*	*3*	*1*	The extent of potential effect is based on common practices
TOTAL	34.4					

D- ATHMOSPHERIC EMISSIONS

D1- Atmospheric emissions

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
D1.2	*16.8*	3	*5*	*5*	*1.5*	
TOTAL	16.8					

E- NON-RENEWABLE RESOURCES

E1- Potable water, stormwater and greywater

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
E1.6	*3.0*	3	*4*	*2*	*1.25*	The extent of potential effect is based on water availability which is (or maybe) a regional issue
E1.7	*2.0*	*2*	*4*	*2*	*1.25*	*The impact of Potential Effect depends on building use which is significant for hotels, hospitals, sports facilities. The extent of potential effect is based on water availability which is (or maybe) a regional issue*
E1.8	*1.6*	*2*	*4*	*2*	*1*	*The extent of potential effect is based on water availability which is (or maybe) a regional issue*

E2- Solid and Liquid Wastes

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
E2.1	*4.0*	2	*4*	*4*	*1.25*	The extent of potential effect is based on the impact scale. The duration of potential effect is based on the average lifetime of waste
TOTAL	10.6					

F- ENVIRONMENT

F1- Environmental impacts

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
F1.3	*2.7*	3	*3*	*3*	*1*	The impact of Potential Effect is instrumental in preventing floods. The extent of potential effect is based on the impacts that may extend beyond neighborhood boundaries to nearby districts
F1.10	*0.8*	*2*	*2*	*2*	*1*	

F2- Outdoor environmental quality

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
F2.3	*2.7*	3	*3*	*3*	*1*	
F2.6	*2.4*	*2*	*3*	*1*	*1*	*The extent of potential effect refers to the entire district not to the neighborhood scale, unless there are major topographic irregularities. The duration of potential effect is based on average lifetime of 0.05 years*

F3- Ecosystems and landscapes

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
F3.3	*0.8*	*2*	*2*	*2*	*1*	
F3.5	*3.4*	*3*	*3*	*3*	*1.25*	
F3.11	*1.8*	*3*	*3*	*2*	*1*	
TOTAL	14.5					

G- SOCIAL ASPECTS

G1- Safety and Accessibility

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
G1.1	*0.6*	2	*2*	*1*	*1*	The duration of potential effect is based on practical time frame for adapting existing infrastructures and buildings
G1.2	*0.6*	*2*	*2*	*1*	*1*	*The duration of potential effect is based on practical time frame for adapting existing infrastructures and buildings*

G2- Traffic and Mobility Services

CRITERION	Weight (%)	B	C	D	L.F.	REASON/MOTIVATION
G2.1	*2.7*	3	*2*	*3*	*1*	
G2.3	*1.2*	*2*	*2*	*2*	*1*	
G2.4	*1.8*	*2*	*2*	*3*	*1*	

G4- Public and private facilities and services

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G4.2	*1.2*	2	*2*	*2*	*1*	The duration of potential effect is based on practical time frame for reallocation of public services
G4.3	*1.2*	*2*	*2*	*2*	*1*	*The duration of potential effect is based on practical time frame for reallocation of public schools*
G4.6	*1.2*	*2*	*2*	*2*	*1*	*The duration of potential effect is based on practical time frame for reallocation of public sports and cultural infrastructures*

G6- Management and community involvement

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G6.3	*1.8*	2	*2*	*3*	*1*	The duration of potential effect is based on practical time frame for urban design plans

G8- Perceptual

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G8.3	*1.8*	3	*2*	*2*	*1*	The impact of Potential Effect is detrimental for the citizens' quality of life
G8.5	*1.8*	*2*	*3*	*2*	*1*	
TOTAL	15.9					

SNTool benchmarks rationale

A- URBAN STRUCTURE AND FORM

CRITERION	INDICATOR	UNIT	BENCHMARK	RATIONALE
A1.2	*Relation between the usable space of the buildings (volume) and the net developable area (area).*	m^3/ha	*0: 60,000* *5: 30,000*	*Based on the Hellenic New Building Regulation the ratio of the usable space of the buildings (volume) to the net developable area (area) ranges between 6 and 3 m^3/m^2.*
A1.4	*The ratio of total residential population relative to the total land area for all developed residential blocks within the local area.*	*pp/ha*	*0: 600* *5: 100*	*Values between 100-600 persons / ha are typical for most urban and semi-urban areas*
A1.5	*The ratio of typical building heights compared to the distance between building facades on the other side of the street*	-	*0: 0.1* *5: 0.5*	*In order to have efficient solar exposure during winter in urban areas, a typical value for the ratio of building heights compared to the distance between building facades on the other side of the street is 0.5*
A1.7	*Undeveloped land considered to be of value for ecological or agricultural purposes*	*%*	*0: 10* *5: 20*	*Indicative empirical values.*

B- ECONOMY

CRITERION	INDICATOR	UNIT	BENCHMARK	RATIONALE
B2.3	*Average unemployment rate, over a 5-year period*	%	*0: 10* *5: 5*	*Score 0 corresponds to statistical data*
B2.4	Ratio of vacancies in commercial buildings (offices, shops), over a 5-year period.	%	*0:25* *5: 5*	*Score 0 corresponds to statistical data*
B2.5	Ratio of households suffering from energy poverty	%	*0:10* *5: 5*	*Score 0 corresponds to statistical data*
B3.3.	Annual energy costs of public office/educational buildings	*Euro/m^2*	*0: 17.7* *5:4.1*	*Score 0 corresponds to the energy cost for the thermal and electrical energy consumption of the public office/ educationals building of the dominant energy class (as estimated in C1.3 and C1.6), while Score 5 to the energy cost for consumptions of energy class A+. It is assumed*

<table>
<tr><td></td><td></td><td>that thermal energy is covered by fuel oil. An increase of 20% is considered in order to take into account energy cost for equipment and installations.</td></tr>
</table>

<table>
<tr><th colspan="5">C- ENERGY</th></tr>
<tr><th>CRITERION</th><th>INDICATOR</th><th>UNIT</th><th>BENCHMARK</th><th>RATIONALE</th></tr>
<tr><td rowspan="3">C1.1</td><td rowspan="3">Urban thermal energy consumption of building operations</td><td rowspan="2">kWh/m2</td><td>0: 314.0 (323.2)</td><td rowspan="2">Very difficult to get metered data, especially for residential and privately owned non-residential buildings.
Use of statistical / calculated data.</td></tr>
<tr><td>5: 21.1 (16.1)</td></tr>
<tr><td colspan="3">Thermal energy consumption for all building uses, was defined as the weighted average for different building uses. The breakdown of whole buildings per building use in city Prefecture was defined using data from the Hellenic Statistical Authority (HSA). Due to lack of significant sample for a Municipality, the weighted average was not used for the local benchmarking.
The average thermal consumption for whole buildings per building use and energy class was defined using data from the Energy Performance Certificates (EPC) electronic repository (buildingcert). For this reason, calculated data for thermal consumption for space heating (SH) and Domestic Hot Water (DHW) from a single fuel (fuel oil, natural gas or biomass), were used, and also adapted for external (TEEKENAK) to internal (CESBAMED) dimensions.
For each building use, <u>score 0</u> corresponds to the consumption of the dominant energy class, while <u>score 5</u> to the consumption of energy class A+ (33% of class B).</td></tr>
<tr><td rowspan="3">C1.3</td><td rowspan="3">Urban thermal energy consumption of public office/educational building operations</td><td rowspan="2">kWh/m2</td><td>0: 68.1 (62.3)</td><td rowspan="2">Very difficult to get metered data.
Use of statistical / calculated data.</td></tr>
<tr><td>5: 11.5 (10.5)</td></tr>
<tr><td colspan="3">No weighted average for building uses. Averages from EPC for office/ educational building uses, similar to C1.1.</td></tr>
<tr><td rowspan="3">C1.4</td><td rowspan="3">Urban electrical energy consumption of building operations</td><td rowspan="2">kWh/m2</td><td>0: 64.2 (67.6)</td><td rowspan="2">Very difficult to get metered data, especially for residential and privately owned non-residential buildings.
Use of statistical / calculated data.</td></tr>
<tr><td>5: 7.9 (10.8)</td></tr>
<tr><td colspan="3">Similar to C1.1 with the exception that all end uses (space heating, space cooling and domestic hot water) were taken into account.</td></tr>
<tr><td rowspan="3">C1.6</td><td rowspan="3">Urban electrical energy consumption of public office/ educational building operations</td><td rowspan="2">kWh/m2</td><td>0: 90.1 (100.5)</td><td rowspan="2">Very difficult to get metered data.
Use of statistical / calculated data.</td></tr>
<tr><td>5: 24.1 (32.6)</td></tr>
<tr><td colspan="3">No weighted average for building uses. Averages from EPC for office/ educational building uses, similar to C1.4.</td></tr>
</table>

C1.7	*Annual total primary energy consumption per internal useful floor area*	*kWh/m2*	*0: 461.9 (528.2)* *5: 38.2 (41.9)*	*Very difficult to get metered data, especially for residential and privately owned non-residential buildings. Use of statistical / calculated data.*
		Similar to C1.1, with the exception that all end uses (space heating, space cooling and domestic hot water) were taken into account.		
C1.9	*Annual total primary energy consumption per internal useful floor area of public office/ educational buildings*	*kWh/m2*	*0: 286.4 (346.9)* *5: 74.5 (94.4)*	*Very difficult to get metered data. Use of statistical / calculated data.*
		Similar to C1.3, with the exception that all end uses (space heating, space cooling and domestic hot water) were taken into account.		
C1.20	*Annual electrical consumption by outdoor public lighting systems*	*kWh/m2*	*0: 0.72* *5: 0.50*	*For calculated data.*
		From discussions with a member of Local Committee, expert on lighting, Score 0 the consumption for a typical public lighting planning for neighborhoods during 1990. Score 5¨about 30% decrease for new led lighting fixtures		
C2.1	*Ratio of on-site renewable thermal energy consumption to the total thermal energy consumptions of all buildings*	*%*	*0: 4* *5: 14*	*Very difficult to get metered data. Use of statistical/ estimated/ calculated data.*
		<u>Score 0</u> corresponds to 50% of the buildings covering 60% of their DHW energy consumption from on-site renewable energy sources. *<u>Score 5</u> corresponds to 100% of the buildings covering 100% of their DHW energy consumption from on-site renewable energy sources.* *The average ratio of the DHW energy consumption to the thermal energy consumption for whole buildings was defined using calculated data from the Energy Performance Certificates (EPC) electronic repository (buildingcert). (Buildings with fuel oil, natural gas or biomass for space heating and electricity, fuel oil, natural gas or biomass for DHW).*		
C2.7	*Ratio of on-site renewable electrical energy consumption to the total electrical energy consumption of all buildings*	*%*	*0: 1* *5: 47*	*Very difficult to get metered data. Use of statistical/ estimated data.*

		The breakdown of whole buildings in residential and non-residential was defined using data from the Hellenic Statistical Authority (HAS) (the breakdown is almost similar for the Municipality of Fylis). Score 0 corresponds to 5% of the residential buildings covering 25% of their electrical energy consumption from on-site renewable energy sources, Score 5 corresponds to 50% of the residential and 20% of the non-residential buildings covering 100% of their electrical energy consumption from on-site renewable energy sources.		
C2.8	*Ratio of on-site renewable electrical energy consumption to the total electrical energy consumption of public office/ educational building*	*%*	*0: 0* *5: 20*	*Very difficult to get metered data.* *Use of statistical/ estimated data*
		Score 0 corresponds to 0% of the public office/ educational buildings covering a part of their electrical energy consumption from on-site renewable energy sources, *Score 5 corresponds to 20% of the public office/ educational buildings covering 100% of their electrical energy consumption from on-site renewable energy sources.*		
C2.13	*Ratio of residential buildings with renewable systems for thermal energy production*	*%*	*0: 38* *5: 100*	*Score 0 corresponds to the average number of households with solar collectors (data from the Hellenic Statistical Authority)*

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	UNIT	BENCHMARK	RATIONALE
D1.2	*CO_2 equivalent emissions per useful internal floor area per year*	*kg CO_2 eq./m2/yr*	*0: 46* *5: 5*	
		Score 0 corresponds to CO_2 equivalent emissions for the thermal and electrical energy consumption of the buildings of the dominant energy class *Score 5 corresponds to the CO_2 equivalent emissions for consumptions of energy class A+ (as estimated in C1.1 and C1.4). It is assumed that thermal energy is covered by fuel oil.*		

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	UNIT	BENCHMARK	RATIONALE
E1.6	*Water consumption per inhabitant in residential buildings (annually)*	*m^3 / occupant*	*0: 62.1* *5: 18.6*	Use of statistical/ estimated data
			Score 0 based on statistical data from ELSTAT. *Score 5 corresponds to a reduction up to 70%*	

				of the typical consumption, based on a published article.
E1.7	*Water consumption per m^2 in public office/educational buildings (annually)*	m^3 / m^2	*0: 0.65* *5: 0.33*	
		Score 0 corresponds to the weighted average of the water consumption for school and educational buildings, based on their surface. Score 5 corresponds to a reduction up to 50%, based on discussions with National Local Committee Members.		
E1.8	*Water consumption in public spaces*	m^3 / m^2 watered surface	*0: 0.73* *5: 0.51*	
		Score 0 corresponds to the weighted average of the water consumption for school and educational buildings, based on their surface. Score 5 corresponds to a reduction up to 30%, based on discussions with National Local Committee Members.		
E2.1	*Ratio of residents located within a walking distance of 100 m from solid waste and recycling collection point.*	%	*0: 60* *5: 100*	*Based on discussions with National Local Committee Members*

F- ENVIRONMENT				
CRITERION	INDICATOR	UNIT	BENCHMARK	RATIONALE
F1.3	*Percentage of water flowing through the ground*	%	*0: 15* *5: 80*	*Based on discussions with National Local Committee Members*
F1.10	*Ratio of cut-off public lighting fixtures*	%	*0: 10* *5: 100*	*Based on discussions with National Local Committee Members*
F2.3	*Number of days exceeding the daily limits for PM10 in a year*	days	*0: 35* *5: 0*	*Score 0 based on European Air quality Standards*
F2.6	*Number of days exceeding the daily limits for ozone in a year*	days	*0: 25* *5: 0*	*Score 0 European Air quality Standards*
F3.3	*Ratio of green spaces to the total area*	%	*0: 5* *5: 30*	Based on discussions with National Local Committee Members
F3.5	*Flood protection*	*Text*	*0:*	*There is an implemented flood protection plan, but it hasn't been tested yet*
			5:	*There is an implemented flood protection plan, it has been successfully tested*

F3.11	*Emergency response plan*	*Text*	*0:*	*There is an emergency response plan on a local level. No operational exercises*
			5:	*There is an emergency response plan on a local level. Scheduled operational exercises*

G- SOCIAL ASPECTS

CRITERION	INDICATOR	UNIT	BENCHMARK	RATIONALE
G1.1	*Percent of key public, buildings that are accessible for use by physically disabled persons*	*%*	*0: 50*	*Based on discussions with National Local Committee Members*
			5: 100	
G1.2	*Sidewalks and other pedestrian ways that are accessible for use by physically disabled persons*	*Text*	*0:*	*Sidewalks and pedestrian ways of the main network, accessible by physically disabled persons*
			5:	*All sidewalks and pedestrian ways accessible by physically disabled persons. Traffic lights with sound in all main roads.*
G2.1	*Percent of inhabitants that are within 400 meters walking distance of at least one public transportation stop*	*%*	*0: 50*	*Based on discussions with National Local Committee Members*
			5: 100	
G2.3	*Availability of smart services*	*Text*	*0:*	*Automated bicycle rental system*
			5:	*Free charging station for electric or plug-in hybrid vehicle*
G2.4	*Total walkway meters of dedicated pedestrian paths and meters of bicycle path per 100 inhabitants*	*m/100 inhabitants*	*0:2*	*Based on statistical data (https://www.smu.gr/greece_cycle_map/)*
			5: 20	*Based on data from a generic Municipality which is considered as good example*
G4.2	*Percentage of inhabitants within 800m walking distance of at least 3 key services*	*%*	*0: 50*	*Based on discussions with National Local Committee Members*
			5: 90	
G4.3	*Percent of inhabitants within 700m walking distance from at least one public school*	*%*	*0: 70*	*Based on discussions with National Local Committee Members*
			5: 100	
G4.6	*Percent of inhabitants located within a distance of 1000 m from at least one public leisure facility*	*%*	*0: 50*	*Based on discussions with National Local Committee Members*
			5: 100	

G6.3	*Level of involvement of users in urban planning.*	*Text*	*0:*	*Degree of tokenism. Providing inhabitants and users mainly with the information about the urban project*
			5:	*Degree of citizens power at all stages of the project*
G8.3	*Perceived safety of public places and pedestrian routes*	*Text*	*0:*	*Adequate safety only during daytime.*
			5:	*Very high safety during daytime and night*
G8.5	*Health and safety risks from overhead electric distribution system*	*Text*	*0:*	Overhead high power cables at least 100m from the buildings or/and overhead MV power cables with voltage transformers close to the buildings
			5:	No overhead electric distribution system

SNTool Criteria Specifications

A- BUILT URBAN SYSTEMS			
CRITERION	INDICATOR	SPECIFICATIONS	
		Information source	*Measured data, studies*
A1.2	*Urban compactness*	*Assessment method*	*CESBAMED calculation steps:* *1. Calculate the aggregate gross volume of all buildings in the local area, m^3.* *2. Calculate the net developable area by subtracting the surface area used for parks, streets, parking and pedestrian areas from the gross surface area of the local area, ha.* *3. Determine the ratio of the aggregate volume of buildings to the net local developable area, m^3/ha.* *NOA pilot steps/comments:* *Define the number of buildings included in the selected area. Define the land area covered by buildings. Define the number of floors for each building. Assuming typical floor height about 3.5 m, calculate the volume of each building above ground. Calculate the ratio of the total volume of the buildings above ground to the land area covered by buildings (27909 m3/ha)*
		Standard	*Insert text here*

A1.4	***Residential density***	***Information source***	***Measured data, studies, statistical data***
		Assessment method	*CESBAMED calculation steps:* *1. Identify ground surface area of properties being used for residential purposes,m^2.* *2. Identify the total residential population for the relevant residential buildings.* *3. Calculate the residential density.* *NOA pilot steps/comments:* *From an on-site audit in the testing area, the number of residential buildings, the land area covered by residential buildings, as well as the number of households were defined. According to ELSTAT, the typical number of persons in the average household of West Region of Attica Prefecture, is 3. The total number of residents in the selected area was calculated. The ratio of the number of residents to the land area covered by residential buildings was calculated. (151 residents/ha)*
		Standard	*Insert text here*
A1.5	***Urban street canyons (H/W aspect ratio)***	***Information source***	***Measured data, estimations***
		Assessment method	*CESBAMED calculation steps:* *Calculate the ratio of typical building heights compared to the distance between building facades on opposite sides of the street* *NOA pilot steps/comments:* *From an on-site audit in the testing area, the width of the roads, as well as the number of floors for all buildings were defined. Define the typical road width (8m). For these roads define the number of floors of the typical building (2). Assuming typical floor height about 3.5 m, calculate the ratio height to width (0.9)*
		Standard	*Insert text here*
A1.7	*Conservation of Land **	***Information source***	***Measured data, studies***
		Assessment method	*CESBAMED calculation steps:* *1. Determine the gross surface area of the neighbourhood* *2. Determine the aggregate surface area of land that is considered by authorities to be of ecological and agricultural value* *3. Subtract the aggregate undeveloped area from the gross surface area of the urban area, which should equal to the total area developed for buildings, streets, vehicle parking and other infrastructures*

			NOA pilot steps/comments: *From maps of the area, the land that is considered as ecological and agricultural was defined. (0%)*
		Standard	*Insert text here*

B- ECONOMY

CRITERION	INDICATOR	SPECIFICATIONS	
B2.3	*Unemployment rate*	*Information source*	*Statistical data*
		Assessment method	*CESBAMED calculation steps:* *Define the number of unemployed persons within the area. Calculate the ratio of unemployed to the total persons living in the area* *NOA pilot steps/comments:* *From the corresponding department of the Municipality, the average unemployment rate was not officially reported, but estimated. (22%)*
		Standard	
B2.4	*Economic viability of commercial occupancies*	*Information source*	*Measured data*
		Assessment method	*CESBAMED calculation steps:* *Define the number of commercial occupancies within the selected area. Define the number of empty commercial occupancies. Calculate the ratio empty to total commercial occupancies* *NOA pilot steps/comments:* *From an on-site audit in the testing area, the number of number of commercial occupancies as well as the number of empty commercial occupancies were defined (29%)*
		Standard	*Insert text here*
B2.5	*Energy poverty of households*	*Information source*	*Estimated – Statistical data*
		Assessment method	*CESBAMED calculation steps:* *1. Define the number of households in the area.* *2. Define the number of households claiming inability to keep home adequately warm during winter* *3. Calculate the ratio of households claiming inability to keep home adequately warm to the total number of households (x100).* *NOA pilot steps/comments:*

			From the Hellenic Statistical Authority (HSA) the average percentage of households with inadequate heating during winter period was defined on a national basis. (26%)
		Standard	*Insert text here*
B3.3	*Use stage energy cost for public office/educational buildings **	*Information source*	*Estimated -Statistical data*
		Assessment method	*CESBAMED calculation steps:* Sum of the running energy costs of each public building in the area up to an aggregated running costs energy value. The total cost must be normalized per the total indoor useful area of public buildings *NOA pilot steps/comments:* *From an energy study carried out for the Municipal Unit of Ano Liosia, based on the national calculation method for the energy efficiency of buildings,, data for the operational cost for the municipal office/educational buildings within the pilot area were available. An increase of 20% was taken into account in order to take into account other electrical consumptions not considered in the national method (20.4 Euro/m^2)* **COMMENT**: **All uses are taken into account, including equipment and installations (unlike energy related indicators). Usefull area with internal dimensions is used.**
		Standard	*Insert text here*

C- ENERGY

CRITERION	INDICATOR	SPECIFICATIONS	
C1.1	*Total final thermal energy consumption for building operations **	*Information source*	*Calculated – Monitored data. 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 should be used.*
		Assessment method	*CESBAMED calculation steps:* *The following energy uses are considered: heating, cooling, domestic hot water.* *<u>Use of calculated data</u>:* *1. Calculate the annual total final thermal energy consumption,for each building in the local area, kWh* *2. Calculate the aggregated annual total final thermal energy consumption for all buildings* *3. Calculate: Aggregated annual total final thermal energy consumption / Total internal area of all buildings*

			Calculations are based on EN 13790 using the quasi-steady state monthly method *<u>Use of monitored/ metered data</u>:* *1. Data collection of the monitored annual total final thermal energy consumption, for each building in the local area, kWh. The consumption data have to be estimated taking the average over 3 years period* *2. Calculate the aggregated annual total final thermal energy consumption for all buildings* *3. Calculate: Aggregated annual total final thermal energy consumption / Total internal area of all buildings* *Note: Cooling and lighting are included in order to consider the potential use of, for example, CHP or trigeneration for generating electricity that may then be used for lighting and heat for sorption cooling.* *NOA pilot steps/comments:* From calculated - statistical data. The average thermal consumption for buildings within the testing area was defined based on the average thermal consumption for residential and non residential buildings in Attica Prefecture using data for whole buildings from the Energy Performance Certificates (EPC) electronic repository (buildingcert), as well as calculated data for the public offce/educational buildings from an energy study carried out for the Municipal Unit of Ano Liosia. From EPC database, calculated data for thermal consumption for space heating (SH) and Domestic Hot Water (DHW) from a single fuel (fuel oil, natural gas or biomass), were used, and also adapted for external (TEEKENAK) to internal (CESBAMED) dimensions. From an on-site audit in the testing area, the total floor area of all buildings as well as of residential buildings (internal dimensions) were estimated. (155.4 kWh/m^2)
		Standard	*EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling)* *ec.europa.eu/energy/en/topics/energy-efficiency/buildings* *https://www.iea.org/publications/freepublications/.../buildings_certification.pdf* *www.theicct.org/sites/default/files/.../ICCTupdate_EU95gram_jan2014.pdf*
C1.3	*Total final thermal energy consumption for public office/educational building operations*	*Information source*	*Calculated – Monitored data. 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 should be used.*
		Assessment method	*CESBAMED calculation steps:* *The following energy uses are considered: heating, cooling, domestic hot*

			water. *<u>Use of calculated data</u>:* *1. Calculate the annual total final thermal energy consumption for each public building in the local area, kWh* *2. Calculate the aggregated annual total final thermal energy consumption for all public buildings* *3. Calculate: Aggregated annual total final thermal energy consumption / Total internal area of all public buildings* *Calculations are based on EN 13790 using the quasi-steady state monthly method* *<u>Use of monitored/ metered data</u>:* *1. Data collection of the monitored annual total final thermal energy consumption for each public building in the local area, kWh. The consumption data have to be estimated taking the average over 3 years period* *2. Calculate the aggregated annual total final thermal energy consumption for all public buildings* *3. Calculate: Aggregated annual total final thermal energy consumption / Total internal area of all public buildings* *Note: Cooling and lighting are included in order to consider the potential use of, for example, CHP or trigeneration for generating electricity that may then be used for lighting and heat for sorption cooling.* *NOA pilot steps/comments:* *From calculated data. From an energy study carried out for the Municipal Unit of Ano Liosia, data for thermal consumption and heated area (external dimensions) for the public buildings within testing area were available, and also adapted for external to internal (CESBAMED) dimensions. Calculate the ratio of total thermal energy consumption to the total internal area for all public buildings in the area with thermal energy consumption. (73.6 kWh/m^2)*
		Standard	*EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling)* *ec.europa.eu/energy/en/topics/energy-efficiency/buildings* *https://www.iea.org/publications/freepublications/.../buildings_certification.pdf* *www.theicct.org/sites/default/files/.../ICCTupdate_EU95gram_jan2014.pdf*
C1.4	*Total final electric energy consumption for building operations **	*Information source*	*Calculated – Monitored data. 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 should be used.*
		Assessment method	*CESBAMED calculation steps:* *The following energy uses are considered:*

			heating, cooling, ventilation, auxiliaries, domestic hot water and lighting *Use of calculated data:* *1. For each building in the local area, calculate the annual final electric energy consumption in kilowatt hours, kWh.* *2. Sum the annual final electric energy consumption of each building.* *3. Sum the internal useful area of each building in the area, m2.* *4. Calculate the indicator's value as: aggregated annual total final electric energy consumption/ aggregated internal useful area, kWh/m2* *Calculations are based on EN 13790 using the quasi-steady state monthly method* *Use of monitored/ metered data:* *1. For each building in the local area, collect the metered annual final electric energy consumption, kWh* *2. Sum the annual final electric energy consumption of each building* *3. Sum the internal useful area of each building in the area, m2.* *4. Calculate the indicator's value as: aggregated annual total final electric energy consumption/ aggregated internal useful area, kWh/m2* *The metered energy consumption is suitable for the indicator's calculation only if the building has been in use for 3-years* *NOA pilot steps/comments:* *From calculated - statistical data. The average electric energy consumption for buildings within the testing area was defined based on the average electric energy consumption for residential and non residential buildings in Attica Prefecture using data for whole buildings from the Energy Performance Certificates (EPC) electronic repository (buildingcert), as well as calculated data for the public offce/educational buildings from an energy study carried out for the Municipal Unit of Ano Liosia, and also adapted for external (TEEKENAK) to internal (CESBAMED) dimensions. From an on-site audit in the testing area, the total floor area of all buildings as well as of residential buildings (internal dimensions) were estimated. (77.7 kWh/m^2)*
		Standard	*EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling)*
C1.6	*Total final electric energy consumption for public office/educational building operations*	*Information source*	*Calculated – Monitored data. 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 should be used.*
		Assessment	*CESBAMED calculation steps:*

		method	*The following energy uses are considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting.* *Use of calculated data:* *1. For each public building in the local area, calculate the annual final electric energy consumption, kWh* *2. Sum the annual final electric energy consumption of each public building* *3. Sum the internal useful area of each public building in the area, m2* *4. Calculate the indicator's value as: aggregated annual total final electric energy consumption/ aggregated internal useful area, kWh/m2* *Calculations are based on EN 13790 using the quasi-steady state monthly method* *Use of monitored/ metered data:* *1. For each public building in the local area, collect the metered annual final electric energy consumption, kWh/year* *2. Sum the annual final electric energy consumption of each public building* *3. Sum the internal useful area of each public building in the area, m2* *4. Calculate the indicator's value as: aggregated annual total final electric energy consumption/ aggregated internal useful area, kWh/m2* *The metered energy consumption is suitable for the indicator's calculation only if the building has been in use for 3-years* *NOA pilot steps/comments:* *From calculated data. From an energy study carried out for the Municipal Unit of Ano Liosia, data for electric energy consumption and heated area (external dimensions) for the public buildings within testing area were available, and also adapted for external to internal (CESBAMED) dimensions. Calculate the ratio of total electric energy energy consumption to the total internal area for all public buildings in the area with electric energy consumption. (145.1 kWh/m²)*
		Standard	*Insert text here*
C1.7	*Total primary energy demand for building operations **	*Information source*	*Calculated data..*
		Assessment method	*CESBAMED calculation steps:* *The following energy uses are considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting.* *1. For each building in the local area, calculate the annual final (thermal and electric) energy consumption per energy carrier, kWh* *3. Sum the annual final energy consumption of*

			each building per energy carrier 4. Using the national conversion factors, convert the aggregated annual final energy consumption per energy carrier in annual primary energy consumption, kWh 5. Sum the annual primary energy consumption 6. Sum the internal useful area of each building in the area, m2 7. Calculate the indicator's value as: aggregated annual total primary energy consumption / aggregated internal useful area, kWh/m2 Calculations are based on EN 13790 using the quasi-steady state monthly method. NOA pilot steps/comments: From calculated - statistical data. Based on the Total final thermal energy consumption for building operations (C.1.1) and the Total final electrical energy consumption for building operations (C1.4) that have been calculated. Taking into account the conversion factors for fuel oil and electricity the total primary enerrgy consumption was calculated (396.3 kWh/m^2)
		Standard	*EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling)*
C1.9	*Total primary energy demand for public office/educational building operations*	*Information source*	*Estimated data*
		Assessment method	*CESBAMED calculation steps: The following energy uses are considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting. 1. For each public building in the local area, calculate the annual final (thermal and electric) energy consumption per energy carrier, kWh 3. Sum the annual final energy consumption of each public building per energy carrier 4. Using the national conversion factors, convert the aggregated annual final energy consumption per energy carrier in annual primary energy consumption, kWh 5. Sum the annual primary energy consumption 6. Sum the internal useful area of each public building in the area, m2 7. Calculate the indicator's value as: aggregated annual total primary energy consumption / aggregated internal useful area, kWh/m2 Calculations are based on EN 13790 using the quasi-steady state monthly method. NOA pilot steps/comments: From calculated data. Based on the Total final thermal energy consumption for public office/educational building operations (C.1.3)*

			and the Total final electrical energy consumption for public office/educational building operations (C1.6) that have been calculated. Taking into account the conversion factors for fuel oil and electricity the total primary enerrgy consumption for public office/educational building was calculated (501.8 kWh/m²)
		Standard	*EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling)*
C1.20	*Energy consumption of public lighting*	*Information source*	*Calculated - Metered data*
		Assessment method	*CESBAMED calculation steps:* *1. Calculate the total annual energy consumption for public lighting in the area, kWh* *2. Calculate the ratio of total energy consumption for public lighting to the total gross surface of the area, kWh/m²* *NOA pilot steps/comments:* *From calculated data. From an energy study carried out for the Municipal Unit of Ano Liosia, data for the installed power of the lighting fixtures for public lighting within testing area were available. Based on the energy study, public lighting is turned on for 11 hours per day for 365 days per year. Calculate the ratio of total energy consumption for public lighting to the total gross surface of the area. (0.57 kWh/m²)*
		Standard	*Insert text here*
C2.1	*Share of renewable energy on-site, on total final thermal energy consumptions for buildings operation **	*Information source*	*Calculated – Monitored data. 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 should be used.*
		Assessment method	*CESBAMED calculation steps:* *The following energy uses are considered: heating, cooling, domestic hot water.* *<u>Use of estimated data</u>:* *1. For each building in the local area, calculate the annual final thermal energy consumption, kWh* *2. Sum the annual final thermal energy consumption of each building* *3. For each building in the local area, calculate the annual final thermal energy consumption from on-site renewable energy sources, kWh* *4. Sum the annual final thermal energy consumption from on-site renewable sources of each* *building* *6. Calculate the indicator as: annual total final thermal energy consumption from on-site renewable sources / annual total final thermal energy consumption.*

		Calculations are based on EN 13790 using the quasi-steady state monthly method. *Use of metered data:* *1. For each building in the local area, collect the metered annual final thermal energy consumption, kWh* *2. Sum the annual final thermal energy consumption of each building* *3. For each building in the local area, collect the monitored annual final thermal energy consumption from on-site renewable sources, kWh* *4. Sum the annual final thermal energy consumption from on-site renewable sources of each* *building* *5. Calculate the indicator as: annual total thermal energy generation from on-site renewable* *energy sources / annual total final thermal energy consumption.* *The metered energy consumption is suitable for the indicator's calculation only if the building has been in use for 3-years* *NOA pilot steps/comments:* *From calculated - statistical – estimated data. From an on-site audit in the testing area, the total number of households and the number of solar collectors were defined. Assuming that each solar collector corresponds to one household, the percentage of households with solar collectors was defined. The total floor area of all buildings as well as of households with solar collectors (internal dimensions) was estimated. The average thermal consumption for domestic hot water in residential buildings within the testing area, was defined based on the average thermal consumption for buildings in Attica Prefecture, using data for whole buildings from the Energy Performance Certificates electronic repository (buildingcert). Assuming that households with solar collector cover 60% of their energy consumption for domestic hot water (according to KENAK), the total thermal energy consumption from on-site renewable energy sources was defined as the 60% of the product of the average thermal energy consumption for DHW with the total floor area of households with solar collectors in the area. The thermal consumption for all buildings within testing area, was defined as the product of the average thermal energy consumption (from C1.1) with the total floor area of all buildings in the area. The ratio of the total thermal energy consumption from on-site renewable energy sources to the total thermal consumption for all*

			buildings was calculated (3.4%) ***COMMENT: If the denominators was not defined by the average thermal energy then it should be calculated as the thermal consumption (non renewable) plus the total thermal energy consumption from on-site renewable energy sources***
		Standard	*EN 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling)* *2013/114/EU: Commission Decision of 1 March 2013.*
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for buildings operation.*	*Information source*	*Calculated – Monitored data. 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 should be used.*
		Assessment method	*CESBAMED calculation steps:* *The following energy uses are considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting* *1. For each building in the local area, calculate or collect the metered annual final (thermal and electric) energy consumption, kWh* *2. Sum the annual final energy consumption of each building up to an aggregated annual final energy consumption per energy carrier* *3. For each building in the local area, calculate the annual final thermal energy consumption from on-site renewable energy sources, kWh* *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.* *5. Sum the annual primary energy consumption per energy carrier up to an aggregated annual total primary energy consumption, kWh.* *6. For each building in the local area, calculate the annual final (thermal and electric) energy consumption per on-site renewable energy source (P.V, solar thermal panels), kWh* *7. Sum the annual final energy consumption from on-site renewable energy sources of each building up to an aggregated annual final energy consumption per on-site renewable energy source, kWh.* *8. Using the national conversion factors, convert the aggregated annual final energy consumption per on-site renewable energy source in annual primary energy consumption per on-site renewable energy source, kWh. Estimate the total primary energy from RES for each energy carrier displaced, e.g. electricity from PVs that displaces electricity from the grid or thermal energy from solar collectors that displaces the use of heating oil* *9. Sum the annual primary energy consumption*

			per on-site renewable energy source up to an aggregated annual total primary energy consumption from on-site renewable energy sources (kWh/year). *10. Calculate the indicator's value as: aggregated total annual primary energy consumption from on-site renewable energy sources / aggregated total annual primary energy consumption.* *The metered energy consumption is suitable for the indicator's calculation only if the building has been in use for 3-years.* *NOA pilot steps/comments:* *From calculated - statistical – estimated data. The average thermal energy consumption from on-site renewable energy sources was defined in C2.1. From the Energy Performance Certificates for Attica Prefecture, the breakdown of fuelas used in domestic hot water was defined and the corrsponding percentages were used to define the breakdown of the fuels replaced by energy from sollar collectos. The total electric energy production from PV panels was defined in C2.7. Taking into account the conversion factors for fuel oil and electricity the total primary enerrgy from on site RES was calculated. the total primary energy for all buildings was defined in C1.7. The ratio of the total primary enerrgy from on site RES, to the total primary energy consumptions for buildings was calculated. (5.0%)* ***COMMENT: If the denominators was not defined by the average primary energy then it should be calculated as the total primary energy consumption (non renewable), plus the total primary enerrgy from on site RES***
		Standard	*EN 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling)* *2013/114/EU: Commission Decision of 1 March 2013.*
C2.6	*Share of renewable energy on-site, on total primary energy consumptions for public ofice/ educational buildings operation.*	*Information source*	*Calculated – Monitored data. 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 should be used.*
		Assessment method	*CESBAMED calculation steps:* *The following energy uses are considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting* *1. For each public ofice/ educational building in the local area, calculate or collect the metered annual final (thermal and electric) energy consumption, kWh* *2. Sum the annual final energy consumption of each building up to an aggregated annual final*

			energy consumption per energy carrier 3. For each building in the local area, calculate the annual final thermal energy consumption from on-site renewable energy sources, kWh 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. 5. Sum the annual primary energy consumption per energy carrier up to an aggregated annual total primary energy consumption, kWh. 6. For each building in the local area, calculate the annual final (thermal and electric) energy consumption per on-site renewable energy source (P.V, solar thermal panels), kWh 7. Sum the annual final energy consumption from on-site renewable energy sources of each building up to an aggregated annual final energy consumption per on-site renewable energy source, kWh. 8. Using the national conversion factors, convert the aggregated annual final energy consumption per on-site renewable energy source in annual primary energy consumption per on-site renewable energy source, kWh. Estimate the total primary energy from RES for each energy carrier displaced, e.g. electricity from PVs that displaces electricity from the grid or thermal energy from solar collectors that displaces the use of heating oil 9. Sum the annual primary energy consumption per on-site renewable energy source up to an aggregated annual total primary energy consumption from on-site renewable energy sources (kWh/year). 10. Calculate the indicator's value as: aggregated total annual primary energy consumption from on-site renewable energy sources / aggregated total annual primary energy consumption. The metered energy consumption is suitable for the indicator's calculation only if the building has been in use for 3-years. NOA pilot steps/comments: From calculated - statistical – estimated data. From an on-site audit in the testing area, the number of solar collectors and PV panels on public office/educational buildings were defined. (0%)
		Standard	*EN 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling) 2013/114/EU: Commission Decision of 1 March 2013.*
C2.7	*Share of renewable*	*Information*	*Metered or estimated data*

	*energy on-site, on final electric energy consumptions **	*source*	*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*
		Assessment method	*CESBAMED calculation steps:* *The following energy uses are considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting.* *<u>Use of estimated data:</u>* *1. For each building in the local area, calculate the annual final electric energy consumption, kWh* *2. Sum the annual final electric energy consumption of each building* *3. For each building in the local area, calculate the annual final electric energy consumption from on-site renewable energy sources, kWh* *4. Sum the annual final electric energy consumption from on-site renewable sources of each building* *5. Calculate the indicator as: annual total final electric energy consumption from on-site renewable sources / annual total final electric energy consumption. Calculations are based on EN 13790 using the quasi-steady state monthly method* *<u>Use of metered data:</u>* *1. For each building in the local area, collect the metered annual final electric energy consumption, kWh* *2. Sum the annual final electric energy consumption of each building.* *3. For each building in the local area, collect the monitored annual final electric energy consumption from on-site renewable sources, kWh* *4 Sum the annual final electric energy consumption from on-site renewable sources of each* *building* *5. Calculate the indicator as: annual total electric energy generation from on-site renewable energy sources / annual total final electric energy consumption.* *The metered energy consumption is suitable for the indicator's calculation only if the building has been in use for 3-years* *NOA pilot steps/comments:* *From calculated – estimated - statistical data. From an on-site audit in the testing area, the number of photovoltaic panels were defined. Additionally, the total floor area of all buildings (internal dimensions) was estimated. From an energy study carried out in the area, each PV panel produces about 1030kWh as an average.It was assumed that all the produced energy was*

			consumed from the buildings. *The total electric energy consumption of the buildings was defined as the product of the average electric energy consumption (from C1.4) with the total floor area of all buildings in the area. The share of renewable energy on-site on final electric energy consumption was calculated as the ratio of total electric energy production from PV panels consumed within the buildings to the total electric energy consumption.(2.4%)* ***COMMENT: If the denominators was not defined by the average electric energy then it should be calculated as the electric energy (non renewable) plus the total electric energy production from PV***
		Standard	*EN 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling)* *2013/114/EU: Commission Decision of 1 March 2013.*
		Information source	*Metered or estimated data* *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*
C2.8	*Share of renewable energy on-site, on final electric energy consumption for public office/educational buildings operation*	*Assessment method*	*CESBAMED calculation steps:* *The following energy uses are considered: heating, cooling, ventilation, auxiliaries, domestic hot water and lighting.* *<u>Use of estimated data:</u>* *1. For each public building in the local area, calculate the annual final electric energy consumption, kWh* *2. Sum the annual final electric energy consumption of each public building* *3. For each public building in the local area, calculate the annual final electric energy consumption* *from on-site renewable energy sources, kWh* *4. Sum the annual final electric energy consumption from on-site renewable sources of each public* *building* *5. Calculate the indicator as: annual total final electric energy consumption from on-site renewable sources / annual total final electric energy consumption. Calculations are based on EN 13790 using the quasi-steady state monthly method* *<u>Use of metered data:</u>* *1. For each public building in the local area, collect the metered annual final electric energy consumption, kWh* *2. Sum the annual final electric energy consumption of each public building.* *3. For each public building in the local area,*

			collect the monitored annual final electric energy consumption from on-site renewable sources, kWh *4 Sum the annual final electric energy consumption from on-site renewable sources of each public* *building* *5. Calculate the indicator as: annual total electric energy generation from on-site renewable energy sources / annual total final electric energy consumption.* *The metered energy consumption is suitable for the indicator's calculation only if the building has been in use for 3-years* *NOA pilot steps/comments:* *From calculated - statistical – estimated data. From an on-site audit in the testing area, the number of solar collectors and PV panels on public office/educational buildings were defined. (0%)*
		Standard	*EN 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling)* *2013/114/EU: Commission Decision of 1 March 2013.*
C2.13	*Use of RES for thermal energy production in residential buildings*	*Information source*	Metered data
		Assessment method	*CESBAMED calculation steps:* *Define the number of households with solar collectors. Calculate the ratio of households with solar collectors to the total number of households.* *NOA pilot steps/comments:* *From metered - estimated data. From an on-site audit in the testing area, the total number of households and the number of solar collectors were defined. Assuming that each solar collector corresponds to one household, the ratio of households with solar collectors to the total number of households was defined.(65%)*
		Standard	

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	SPECIFICATIONS	
D1.2	*Total GHG Emissions from primary energy used in building operations **	*Information source*	*Estimated data*
		Assessment method	*CESBAMED calculation steps:* *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)* *2. Calculate the aggregated annual total CO2 equivalent emissions from all buildings / total useful internal floor area of all buildings* *NOA pilot steps/comments:* *From calculated - statistical – estimated data. From an on-site audit in the testing area, the total floor area of all buildings (internal dimensions) was estimated. Using data for whole buildings from the Energy Performance Certificates electronic repository for the Municipal Unit of Ano Liossia, the average thermal consumption and the average electric energy consumption for buildings were defined. Thermal energy is only from fuel oil. Based on the national conversion factors to COeq (20704.1 kg/GWh for fuel oil and 61123.9 kg/GWh for electricity), total CO2 equivalent emissions from all buildings to total useful internal floor area of all buildings was calculated (10.9 kg/m^2)*
	Standard	*EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings)*

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	SPECIFICATIONS	
E1.6	*Consumption of potable water for residential population **	*Information source*	*Metered data. The use of estimated data is preferable for scenarios' evaluation or if metered data is not available.*
		Assessment method	*CESBAMED calculation steps:* *The following water uses are considered: drinking water; water for sanitation; domestic hot water;* *water for cleaning, water for washing machine, water for dishwasher* *1. For each residential building, collect the*

			monitored annual potable water consumptions for building operation. The consumption data must be estimated taking the average over 3 years period, m^3. *2. Sum the annual potable water consumption of each building up to an aggregated annual total potable water consumption, m^3/year.* *3. Estimate the number of residential buildings' occupants.* *4. Calculate the indicator's value as: aggregated annual total potable water consumption / number of occupants.* *NOA pilot steps/comments:* *From calculated - statistical – estimated data. From an on-site audit in the testing area, the number of households was defined. According to ELSTAT, the typical number of persons in the average household of West Region of Attica Perfecture, is 3. From statistica ldata (http://eekp.gr/wp-content/uploads/2013/09/arxeio12.2.pdf) the daily water consumption per (3-persons) household is 0.489m3. The ratio of the annual water consumption for the households of the testing area to the residents was calculated. (59.5 m^3/occupant)*
		Standard	
E1.7	*Consumption of potable water for public office/ educational building systems **	*Information source*	*Metered data. The use of estimated data is preferable for scenarios' evaluation or if metered data is not available.*
		Assessment method	*CESBAMED calculation steps:* *The following water uses are considered: drinking water; water for sanitation; domestic hot water;* *water for cleaning, water for washing machine, water for dishwasher* *1. For each public office/ educational building, collect the monitored annual water consumptions for building operation, m^3. The consumption data must be estimated taking the average over 3 years period* *2. Sum the annual water consumption of each building up to an aggregated annual total water consumption* *3) Estimate the total useful internal floor area of all buildings.* *4) Calculate the indicator's value as: aggregated annual total water consumption / total useful internal floor area of all buildings.* *NOA pilot steps/comments:* *Metered data not available for the public buildings of the Municipality. From the*

			*corresponding department of the Municipality, the annual water consumption was not officially reported, but estimated. From an energy study carried out for the Municipal Unit of Ano Liosia, the total internal surface of all publicbuildings was available. The ratio of annual total water consumption to the **total useful internal floor area** of all buildings was calculated (0.65 m^3/m^2)* ***COMMENT: The units should be m^3/person***
		Standard	
E1.8	*Consumption of potable water in public spaces*	*Information source*	*Estimated or metered data.*
		Assessment method	*CESBAMED calculation steps:* *1. Calculate the annual water consumption of potable water in public spaces (for cleaning / watering purposes)* *2. Calculate the total cleaned / watered area.* *3. Calculate the ratio of annual water consumption to the cleaned / watered area.* *NOA pilot steps/comments:* *Metered data not available for the public buildings of the Municipality. From the corresponding department of the Municipality, the annual water consumption was not officially reported, but estimated (0.99 m^3/m^2)*
		Standard	
E2.1	*Percentage of buildings close to recycling collection points*	*Information source*	*Calculated data*
		Assessment method	*CESBAMED calculation steps:* *1. Identify the location of ecological areas or individual recycling bins in the area* *2. Calculate the radius between these nodes and the entrance of the buildings.* *3. Calculate the percentage of the buildings located more than 100 meters from the recycling points.* *NOA pilot steps/comments:* *From calculated - statistical – estimated data. From an on-site audit in the testing area, the number of buildings, the total number of recycling bins as well as their location were defined. The percentage of buildings within a 100m distance from recycling bins was calculated. (65%)*
		Standard	

F- ENVIRONMENT

CRITERION	INDICATOR	SPECIFICATIONS	
		Information source	*Thematic map – Geographic Information System. Estimated data*
F1.3	*Recharge of groundwater through permeable paving or landscaping **	*Assessment method*	*CESBAMED calculation steps:* *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.* $S_{a,per} = \Sigma S_{a,i} \times \alpha_i$ $S_{a,i}$ *= i-th surface in the area, m2* α_i *= 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.* *NOA pilot steps/comments:* *From calculated - estimated data. From an on-site audit in the testing area, the size of the surfaces with a different paving or occupied by constructions was defined. The real permeability of the area was calculated, using the default values for the permeability coefficient of various surfaces. The ratio of the real permeability to the total area was calculated. (31%)*
		Standard	
		Information source	*Calculated data*
F1.10	*Ratio of cut-off lighting fixtures for public lighting*	*Assessment method*	*CESBAMED calculation steps:* *1. Define the number of cut-off lighting fixtures for public lighting in the area* *2. Define the total number of lighting fixtures for public lighting in the area* *3. Calculate the ratio of the number of cut-off lighting fixtures to the total number of lighting fixtures for public lighting* *NOA pilot steps/comments:* *From calculated data. From the corresponding department of the Municipality, the ratio was*

			defined (70%)
		Standard	
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one year period **	*Information source*	*Metered - Estimated data*
		Assessment method	*CESBAMED calculation steps:* *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.* *NOA pilot steps/comments:* *From metered data. From an Aerosols Monitoring Station located in the Municipal Union of Ano Liossia, data for hourly PM10 concentrations for one year were obtained. Daily averages were calculated. The number of days within a year that the daily averages exceed the limit of 50 μg/m^3 was defined, extracting the days with dust events. (38)*
		Standard	
F2.6	*Ambient air quality - ozone*	*Information source*	*Metered - Estimated data*
		Assessment method	*CESBAMED calculation steps:* *1. Hourly data for O3, either from a nearby monitoring station or from test air samples in accordance with national or regional procedures, over a period of one year.* *2. Calculate daily rolling 8-hour averages* *2. Calculate the number of days exceeding even once the daily limit (120μ/m3) in a year.* *NOA pilot steps/comments:* *From metered data. From an Aerosols Monitoring Station located in the Municipal Union of Ano Liossia, data for hourly O_3 concentrations for one year were obtained. Daily rolling 8-hour averages were calculated. The number of days within a year that even once the daily rolling averages exceed the limit of 120 μg/m^3 was defined. (37)*
		Standard	
F3.3	*Green zones & recreation areas density*	*Information source*	*Metered or Estimated data*
		Assessment method	*CESBAMED calculation steps:* *Calculate the ratio Green zones & Recreation areas (m^2) to Urban area (m^2)* *NOA pilot steps/comments:*

			From metered data. From an on-site audit in the testing area, the total area and the area of green zones and reacreation zones were defined. (3.2%)
		Standard	
F3.5	*Flood protection*	*Information source*	*Documantation data*
		Assessment method	*CESBAMED calculation steps:* *Evaluation of the existance of a flood protection plan, the implementation and the testing* *NOA pilot steps/comments:* *From the civil protection department of the Municipality. There is an implemented flood protection plan, but it hasn't been tested yet*
		Standard	
F3.11	*Emergency response plan*	*Information source*	*Documantation*
		Assessment method	*CESBAMED calculation steps:* *Evaluation of the existance of an emergency response plan, the implementation and the testing* *NOA pilot steps/comments:* *From the civil protection department of the Municipality. There is an emergency response plan on a local level. No operational exercises*
		Standard	

G- SOCIAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G1.1	*Public office/ educational buildings that are accessible for use by physically disabled persons*	*Information source*	*Metered data*
		Assessment method	*CESBAMED calculation steps:* *1.Define the number of public office/ educational buildings with full accessibility of exterior parking and pedestrian access areas, considering all major disability types.* *2. Calculate the percent of public buildings that may be considered accessible by physically disabled persons.* *NOA pilot steps/comments:* *From the corresponding department of the Municipality, the percent of public office/ educational buildings that may be considered*

			accessible by physically disabled persons, was defined. (30%)
		Standard	
G1.2	Sidewalks and other pedestrian paths that are accessible for use by physically disabled persons	Information source	Metered data
		Assessment method	CESBAMED calculation steps: Evaluation of the extend to which the sidewalks and pedestrian ways of the main and the secondary network are accessible by physically disabled persons NOA pilot steps/comments: From an on-site audit in the testing area. Sidewalks and pedestrian ways of the main network are not accessible by physically disabled persons.
		Standard	
G2.1	Performance of the public transport *	Information source	Estimated data
		Assessment method	CESBAMED calculation steps: For the calculation of the indicator only residents (and not working people in the area) are considered Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop To be considered valid for the calculation, a stop must have a daily total service frequency of at least 20 trips. NOA pilot steps/comments: From metered data. From a study carried out by the Municipality for the public transport, the number and location of public transport stops was defined. (100%)
		Standard	Global Platform for Sustainable Cities – Urban Sustainability Framework
G2.3	Smart services	Information source	Estimated data
		Assessment method	CESBAMED calculation steps: Evaluation of the presence of smart services NOA pilot steps/comments: From the corresponding department of the Municipality, there is free wifi network in some public spaces.
		Standard	

		Information source	*Metered data*
G2.4	*Quality of pedestrian and bicycle network **	*Assessment method*	*CESBAMED calculation steps:* *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. Calculation of the meters of shared spaces (C)* *5. Calculation of the indictor's value as (A+B+C)/(100 inhabitants)* *Bicycle paths and pedestrian paths have to be safe and physically separated to traffic roads to be considered in the calculation. A walkway adjacent to a traffic road is not acceptable. A "shared space" is an urban design approach that minimizes the segregation between modes of road user (car, pedestrian, bicycle, etc.)* *NOA pilot steps/comments:* *From metered data. From an on-site audit in the testing area, the total length of dedicated pedestrian and bicycle paths and "shared space" per 100 inhabitants. was defined.(188.8 m/100 inhabitants)* ***COMMENT: This indicator is biased, especially when the area is underpopulated, the calculated value is high even with small pedestrian and bicycle networks. Maybe the unit should be the length of pedestrian and bicycle paths and shared areas to the total street length of teh area. An other issue that should be taken into account, is the connectivity of these paths, i.e. bicycle paths are connected with bicycle paths from suurounding areas, or are circular.***
		Standard	
		Information source	*Metered data*
G4.2	*Availability and proximity of key services **	*Assessment method*	*CESBAMED calculation steps:* *1. Identify locations of key services in the local area.* *2. Calculate the percentage of the inhabitants that are within 800 meters walking distance from at least 3 key services coming from the nine categories below.* *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 Consider only one key service from each of the nine categories. Private services can be considered. NOA pilot steps/comments: From metered data. From an on-site audit in the testing area, the location of key services and the number of housdeholds were defined. According to ELSTAT, the typical number of persons in the average household of West Region of Attica Perfecture, is 3. The total number of residents in the selected area was estimated. The percentage of the inhabitants that are within 800 meters walking distance from at least 3 key services was calculated (100%) **COMMENT: Key services are not of equal importance. The categories should be regrouped, into 4: Education, Health center, Law enforcement areas, Other**
		Standard	Global Platform for Sustainable Cities – Urban Sustainability Framework
G4.3	Availability and proximity of public schools	Information source	Metered - Estimated data
		Assessment method	CESBAMED calculation steps: 1. Identify the public schools. 2. Calculate the radius between the buildings and the schools 3. Calculate the percentage of inhabitants that are within a radius of 700 meters from at least one public school NOA pilot steps/comments: From metered and estimated data. From an on-site audit in the testing area, the location of public schools and the number of housdeholds were defined. According to ELSTAT, the typical number of persons in the average household of West Region of Attica Perfecture, is 3. The total number of residents in the selected area was estimated. The percentage of inhabitants that are within a radius of 700 meters from at least one public school was calculated (100%)
		Standard	
G4.6	Availability and proximity of public leisure facilities	Information source	Metered - Estimated data
		Assessment	CESBAMED calculation steps:

		method	*1. Identify the facilities for leisure in the area, distinguishing in sports and cultural structures.* *2. Calculate the radius between the buildings and these nodes* *3. Calculate the percentage* of inhabitants that are within a radius of 1000 meters from at least one public sports and one cultural facility *NOA pilot steps/comments:* *From metered and estimated data. From an on-site audit in the testing area, the location of public schools and the number of housdeholds were defined. According to ELSTAT, the typical number of persons in the average household of West Region of Attica Perfecture, is 3. The total number of residents in the selected area was calculated. (100%)*
		Standard	
G6.3	*Community involvement in urban planning activities **	*Information source*	*Process documentation*
		Assessment method	*CESBAMED calculation steps:* *Level of involvement of users in urban planning* *NOA pilot steps/comments:* *Not available for existing neighborhoods*
		Standard	*Arnstein S., 1969, "A Ladder Of Citizen Participation", Journal of the American Institute of Planners 35 (4), p. 216-24.* *Chelzen Hélène and Jégou Anne, « À la recherche de l'habitant dans les dispositifs participatifs deprojets urbains durables en région parisienne : les éclairages de l'observation participante »,Développement durable et territoires [En ligne], Vol. 6, n°2 | Septembre 2015, mis en ligne le 30 septembre 2015.* *Quartiers Durables Méditerranéens (Sustainable Mediterranean Neighbourhood) , an approach towards sustainable Mediterranean neighbourhoods in the Provence-Alpes-Côté d'Azur Region, envirobatBDM.*
G8.3	*Perceived safety of public areas for pedestrians*	*Information source*	*Metered data*
		Assessment method	*CESBAMED calculation steps:* *Perceived safety of public areas during daytime and nighttime* *NOA pilot steps/comments:* *From metered data. From a study carried out by the Municipality.*
		Standard	
☑ ***G8.5***	*Impact of overhead electric distribution system*	*Information source*	*Metered data*
		Assessment	*CESBAMED calculation steps:*

	method	*Distance of overhead electric distribution system from buildings.* *NOA pilot steps/comments:* *From metered data. From a study carried out by the Municipality. (Overhead high power cables over 100m from the buildings)*
	Standard	

REGIONAL TOOL

D.3.4.3 Regional Tool - EIHP

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

URBAN SCALE ASSESSMENT

SNTool structure

A- BUILT URBAN SYSTEMS	
A1	Urban structure and form
A1.2	*Urban compactness*
A1.4	*Residential density*
A1.7	*Conservation of Land*
A2	Transportation infrastructure
A2.2	*Walking distance to public transport for area workers and students*
A2.9	*On-street and indoor parking spaces relative to local population*
A2.10	*Intermodality facilities*
B- ECONOMY	
B1	Economic Structure and Value
B1.1	Affordability of housing property
B1.6	*Percent of residential units in the neighbourhood that are vacant*
B2	Economic activity
B2.2	*Average annual per-capita income of residents*
B3	Cost and Investment
B3.3	*Use stage energy cost for public buildings*
B3.4	*Levels of total public and private investment*
C- ENERGY	
C1	Non-renewable energy
C1.1	*Total final thermal energy consumption for building operations*
C1.4	*Total final electrical energy consumption for building operations*
C1.7	*Total primary energy demand for building operations*
C2	Renewable and Decarbonised energy
C2.1	*Share of renewable energy on-site, on total final thermal energy consumption for buildings operation*
C2.4	*Share of renewable energy on-site, relative to total primary energy consumption for building operations*
C2.7	*Share of renewable energy on-site, on final electric energy consumption*
D- ATMOSPHERIC EMISSIONS	
D1	Atmospheric emmissions
D1.2	*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
E1.6	*Consumption of potable water for residential population*
E1.7	*Consumption of potable water for public non-residential building systems*
E2	Solid and Liquid Wastes
E2.1	*Solid waste and recycling collection points*
E2.3	*Solid waste from construction and demolition projects retained in the area for re-use or recycling*
E2.5	*Composting and re-use of organic sludge*
E3	Resource consumption, retention and maintenance

E3.2	*Consumption of non-renewable material resources for construction of infrastructure*
F- ENVIRONMENT	
F1	Environmental impacts
F1.1	*Impact of construction activities on natural features*
F1.3	*Recharge of groundwater through permeable paving or landscaping*
F1.8	*Impact of private vehicles used by the local population on peak load capacity of the local road system*
F2	Outdoor environmental quality
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*
F3	Ecosystems and landscapes
F3.6	Tree coverage for shade and management of local ambient temperatures
F3.10	*Ecological diversity in the area*
G- SOCIAL ASPECTS	
G2	Traffic and Mobility Services
G2.1	Public transport service
G2.4	Quality of pedestrian and bicycle network
G3	Communication services
G3.1	Availability of a broadband communication network
G4	Public and private facilities and services
G4.2	Availability and proximity of key public services
G5	Local Food
G5.1	Local production of food
G6	Management and community involvement
G6.3	Community involvement in urban planning activities
G7	Society, Culture and Heritage
G7.1	Compatibility of urban design with local cultural values

SNTool criteria selection rationale

A - BUILT URBAN SYSTEMS		
	CRITERION	REASON/MOTIVATION
A1	Urban structure and form	*Comment here*
A1.2	*Urban compactness*	*To improve current urban design rules and visual appearance of the neighborhood*
A1.4	*Residential density*	*To determine if residential density*
A1.7	*Conservation of land*	*To determine if all undeveloped land is needed for future residential use as defined by urban development plan*
A2	Transportation infrastructure	
A2.2	*Walking distance to public transport for area workers and students*	*To determine sufficient number of bus stops*
A2.9	*On-street and indoor parking spaces relative to local population*	*To determine required number of parking lots and avoid parking on the roads*
A2.10	*Intermodality facilities*	*To improve mobility for the inhabitants and induce use of alternative mobility principles*

B - ECONOMY		
	CRITERION	REASON/MOTIVATION

B1	Economic Structure and Value	
B1.1	*Affordability of housing property*	*To determine if local population have financial resources for future residential development*
B1.6	*Percent of residential units in the neighbourhood that are vacant*	*To determine if there are housing properties still unused*
B2	Economic activity	
B2.2	*Average annual per-capita income of residents*	*To determine financial capacities of local population*
B3	Cost and Investment	
B3.3	*Use stage energy costs for public buildings*	*To determine if energy costs are entered in the national energy management software and the amount of costs*
B3.4	*Levels of total public and private investment*	*To determine levels of investments and if there is a potential to use them more targeted. No tracking of data for private investment*
C - ENERGY		
	CRITERION	REASON/MOTIVATION
C1	Non-renewable energy	
C1.1	*Total final thermal energy consumption for building operations*	*To determine energy demand of the area – modeled energy used*
C1.4	*Total final electrical energy consumption for building operations*	*To determine energy demand of the area – actual energy consumption used*
C1.7	*Total primary energy demand for building operations*	*To determine energy demand of the area, typical fuels used and assess the potential of on-site RES energy consumption – modeled energy used for thermal energy, actual energy consumption used for electricity*
C2	Renewable and Decarbonised Energy	
C2.1	*Share of renewable energy on-site relative to total final energy consumption for building operations*	*To assess current and future on-site RES energy production to reduce fossil fuel use*
C2.4	*Share of renewable energy on-site, relative to total primary energy consumption for building operations*	*To assess current and future on-site RES energy production and reduce dependence on grid supply and reduce fossil fuel use*
C2.7	*Share of renewable energy on-site, on final electric energy consumption*	*To assess current and future on-site RES electricity production and reduce dependence on grid supply*
D - ATMOSPHERIC EMISSIONS		
	CRITERION	REASON/MOTIVATION
D1	Atmospheric emmissions	*Comment here*
D1.2	*GHG emissions from primary energy used in building operations*	*To assess current and future emissions related to energy consumption if energy refurbishment and RES measures are implemented*
D1.7	*Total GHG Emissions from buildings, private and public mobility*	*To assess current and future emissions related to energy consumption if energy refurbishment, RES and e-mobility measures are implemented*
E - NON - RENEWABLE RESOURCES		

	CRITERION	REASON/MOTIVATION
E1	Potable water, stormwater and greywater	
E1.6	*Consumption of potable water for residential population*	*To assess level of water consumption*
E1.7	*Consumption of potable water for public non-residential building systems*	*To assess level of water consumption in non-residential buildings*
E2	Solid and Liquid Wastes	
E2.1	*Solid waste and recycling collection points*	*To determine availability of recycling collection points for solid waste and future needs*
E2.3	*Solid waste from construction and demolition projects retained in the area for re-use or recycling*	*To determine the local practice of construction waste management*
E2.5	*Composting and re-use of organic sludge*	*To determine the local practice of organic sludge re-use*
E3	Resource consumption, retention and maintenance	
E3.2	*Consumption of non-renewable material resources for construction of infrastructure*	*To determine if re-use or recycling of construction materials is a practice in the construction sector and if not, what are the obstacles*

F - ENVIRONMENT

CRITERION		REASON/MOTIVATION
F1	Environmental impacts	
F1.1	*Impact of construction activities on natural features*	*To determine the impacts of construction on natural features of the area and to define mitigation measures for future development*
F1.3	*Recharge of groundwater through permeable paving or landscaping*	*To determine the impacts of construction on soul permeability and to define mitigation measures for future development*
F1.8	*Impact of private vehicles used by the local population on peak load capacity of the local road system*	*To determine local road traffic intensity*
F2	Outdoor environmental quality	
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	*To determine air quality measurement levels close to the neighborhood and compare measured values to allowed values*
F3	Ecosystems and landscapes	
F3.6	*Tree coverage for shade and management of local ambient temperatures*	*To determine existence of private and public green areas quantity and shading capacity*
F3.10	*Ecological diversity in the area*	*To determine the qualitative features of ecological elements and to assess the impact of forest fire hazard*

G- SOCIAL ASPECTS

CRITERION		REASON/MOTIVATION
G2	Traffic and Mobility Services	
G2.1	Public transport service	*To compare mobility demand of residents to availability of public transport*
G2.4	Quality of pedestrian and bicycle network	*To promote cycling and walking as an alternative to vehicle use by providing a safe and efficient mobility networks*
G3	Communication services	

G3.1	Availability of a broadband communication network	*To determine the percentage of households already connected to internet and future demand for broadband connection*
G4	Public and private facilities and services	
G4.2	Availability and proximity of key services	*To enable better access to key public human services through better mobility or use of communication network*
G5	Local Food	
G5.1	Local production of food	*To introduce concept of local food production as local construction rules in physical planning documents*
G6	Management and community involvement	
G6.3	Community involvement in urban planning activities	*To involve residents in formulation of local construction rules and projects in the neighborhoods*
G7	Society, Culture and Heritage	
G7.1	Compatibility of urban design with local cultural values	*To introduce more traditional construction features in the local construction rules and improve visual appearance of the neighborhood*

SNTool weights rationale

ISSUES WEIGHTS

ISSUE	WEIGHTING FACTOR (1 to 3)	MOTIVATION
A- BUILT URBAN SYSTEMS	1	Improvement of the built urban system needs to be initiated from the residents to improve upgrade and development of infrastructure
B- ECONOMY	1	It is aimed to improve management of the existing resources not only to increase the investments
C- ENERGY	3	Increase the rate of households to be involved in energy retrofit, on-site RES systems and EV
D- ATMOSPHERIC EMISSIONS	1	Improvement of air quality will be achieved by activities in other areas - energy refurbishment, on-site RES and e-mobility
E- NON - RENEWABLE RESOURCES	3	Improve local management of non-renewable resources
F- ENVIRONMENT	1	Improve ambient value and traditional features of the landscape
G- SOCIAL ASPECTS	3	Encourage local capacities and participation for future development of the neighborhood

CATEGORIES WEIGHTS

CATEGORIES	WEIGHT (%)
A1- Urban Structure and Form	5,7
A2- Transportation Infrastructure	6,1
TOTAL	**12,2**
B1- Economic Structure and Value	2,0

B2- Economic activity	1,1
B3- Cost and Investment	1,6
TOTAL	**4,6**
C1- Non-Renewable energy	11,2
C2- Renewable and Decarbonised energy	10,4
C3- Energy recycling and storage	0
TOTAL	**21,5**
D1- Atmospheric emissions	13,3
TOTAL	**13,3**
E1- Potable water, stormwater and greywater	4,3
E2- Solid and Liquid Wastes	5,3
E3- Resource consumption, retention and maintenance	4,8
TOTAL	**14,3**
F1- Environmental impacts	4
F2- Outdoor environmental quality	2,4
F3- Ecosystems and landscapes	2,7
TOTAL	**9**
G1- Safety and Accessibility	0
G2- Traffic and Mobility Services	8
G3- Communication services	3,2
G4- Public and private facilities and services	3,2
G5- Local Food	3,2
G6- Management and community involvement	4,3
G7- Society, Culture and Heritage	3,2
G8- Perceptual	0
TOTAL	**25**

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 form							
	CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
A1.2	*Urban compactness*	*2,14*	*3*	*2*	*4*		
A1.4	*Residential density*	*2,14*	*3*	*2*	*4*		
A1.7	*Conservation of land*	*1,42*	*3*	*2*	*4*		
	TOTAL	***5,7***					
A2	**Transportation infrastructure**						
	CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
A2.2	*Walking distance to public transport for area workers and students*	*1,78*	*2*	*2*	*5*		
A2.9	*On-street and indoor parking spaces relative to local population*	*2,14*	*3*	*4*	*2*		
A2.10	*Intermodality facilities*	*2,14*	*3*	*4*	*2*		
	TOTAL	**6,1**					

B- ECONOMY

B1 - Economic Structure and Value

	CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B1.1	*Affordability of housing property*	1,60					
B1.6	*Percent of residential units in the neighbourhood that are vacant*	0,36					
	TOTAL	**2,0**					

B2 - Economic activity

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B2.2	*Average annual per-capita income of residents*	1,06					
	TOTAL	**1,1**					

B3 - Cost and Investment

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B3.3	*Use stage energy costs for public buildings*	*0,53*					
B3.4	*Levels of total public and private investment*	*1,07*					
	TOTAL	1,6					

C- ENERGY

C1 - Non-renewable energy

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C1.1	*Total final thermal energy consumption for building operations*	*4,81*	*3*	*2*	*3*		
C1.4	*Total final electrical energy consumption for building operations*	*3,21*	*3*	*2*	*2*		
C1.7	*Total primary energy demand for building operations*	*3,21*	*3*	*2*	*2*		
	TOTAL	**11,2**					

C2 - Renewable and Decarbonised Energy

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C2.1	*Share of renewable energy on-site, relative to total final thermal energy consumption for building operations*	*4,81*	*3*	*2*	*3*		
C2.4	*Share of renewable energy on-site, relative to total primary energy consumption for building operations*	*3,21*	*2*	*2*	*3*		
C2.7	*Share of renewable energy on-site, on final electric energy consumption*	*2,40*	*1*	*3*	*3*		
	TOTAL	**10,4**					

D- ATHMOSPHERIC EMISSIONS

D 1 – Atmospheric emissions

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.2	*GHG emissions from primary energy used in building operations*	*6,68*	*3*	*5*	*5*		
D1.7	*Total GHG Emissions from buildings,*	*6,68*	*3*	*5*	*5*		

	private and public mobility						
TOTAL		**13,3**					

E- NON-RENEWABLE RESOURCES

E1 - Potable water, stormwater and greywater

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E1.6	*Consumption of potable water for residential population*						
E1.7	*Consumption of potable water for public non-residential building systems*						

E2 - Solid and Liquid Wastes

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E2.1	*Solid waste and recycling collection points*						
E2.3	*Solid waste from construction and demolition projects retained in the area for re-use or recycling*						
E2.5	*Composting and re-use of organic sludge*						

E3 Resource consumption, retention and maintenace

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E3.2	*Consumption of non-renewable material resources for construction of infrastructure*	*4,8*	*3*	*2*	*3*		
TOTAL		**4,8**					

F- Environment

F1 - Environmental impacts

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F1.1	*Impact of construction activities on natural features*	*1,07*	*2*	*2*	*3*		
F1.3	*Recharge of groundwater through permeable paving or landscaping*	*0,53*	*1*	*2*	*3*		
F1.8	*Impact of private vehicles used by the local population on peak load capacity of the local road system.*	*2,40*	*3*	*3*	*3*		
TOTAL		**4,0**					

F2 - Outdoor environment quality

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	*2,40*	*3*	*3*	*3*		
TOTAL		**2,4**					

F3 - Ecosystems and landscapes

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

F3.6	*Tree coverage for shade and management of local ambient temperatures*	*1,60*	*3*	*2*	*3*
F3.10	*Ecological diversity in the area*	*1,07*	*2*	*2*	*3*
TOTAL		**2,7**			

G- SOCIAL ASPECTS

G2 – Traffic and Mobility Services

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G2.1	Public transport service	*4,81*	*3*	*2*	*3*		
G2.4	Quality of pedestrian and bicycle network.	*3,21*	*2*	*2*	*3*		
TOTAL		**8,0**					

G3 - Communication Services

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G3.1	Availability of a broadband communication network	*3,21*	*2*	*2*	*3*		
TOTAL		**3,2**					

G4 - Public and private facilities and services

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G4.2	Availability and proximity of key services	*3,2*	*2*	*2*	*3*		
TOTAL		**3,2**					

G5 - Local Food

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G5.1	Local production of food	*3,2*	*2*	*2*	*3*		
TOTAL		**3,2**					

G6 - Management and community involvement

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G6.3	Community involvement in urban planning activities	*4,27*	*2*	*2*	*4*		
TOTAL		**4,3**					

G7 - Society, Culture and Heritage

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G7.1	Compatibility of urban design with local cultural values	*3,21*	*2*	*2*	*3*		
TOTAL		**3,2**					

SNTool benchmarks rationale

A- URBAN STRUCTURE AND FORM

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE

A1.2	*Urban compactness*	m3/ha	*0:* *5:*	
A1.4	*Residential density*	pers/ha	*0: 75* *5: 110*	
A1.7	*Conservation of land*	%	*0: 2* *5: 10*	
A2.2	*Walking distance to public transport for area workers and students*	m	*0: 500* *5: 150*	
A2.9	*On-street and indoor parking spaces relative to local population*	%	*0: 50* *5: 100*	
A2.10	*Intermodality facilities*		*0: 2* *5: 1*	

B- ECONOMY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
B1.1	*Affordability of housing property*	%	*0: 12* *5: 50*	
B1.6	*Percent of residential units in the neighbourhood that are vacant*	%	*0: 4* *5: 2*	
B2.2	*Average annual per-capita income of residents*	%	*0: 60* *5: 120*	
B3.3	*Operating energy costs for public buildings*	euro/m^2/year	*0: 100* *5: 0*	
B3.4	*Levels of total public and private investment*	100 Eur/resident	*0: 1* *5: 2*	

C- ENERGY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
C1.1	Total final thermal energy consumption for building operations	kWh/m^2	*0: 100* *5: 50*	
C1.4	*Total final electric energy consumption for building operations*	kWh/m^2	*0: 75* *5: 50*	
C1.7	*Total primary energy demand for building operations*	kWh/m^2/y	*0: 100* *5: 70*	
C2.1	*Share of renewable energy on-site, relative to total final thermal energy consumption for building operations*	%	*0: 5* *5: 30*	
C2.4	*Share of renewable energy on-site, relative to total primary energy*	%	*0: 5* *5: 10*	

	consumption for building operations			
C2.7	*Share of renewable energy on-site, on final electric energy consumptions*	%	*0: 20*	
			5: 35	

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
D1.2	*GHG emissions from primary energy used in building operations*	kg CO2 eq./m2/yr	*0: 22*	
			5: 15	
D1.7	*Total GHG Emissions from buildings, private and public mobility*	%	*0: 150*	
			5: 50	

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
E1.6	*Consumption of potable water for residential population*	m^3/pp*day	*0: 250*	
			5:100	
E1.7	*Consumption of potable water used in public non-residential buildings*	m^3/m^2	*0: 5*	
			5: 3	
E2.1	*Solid waste and recycling collection points*	%	*0: 85*	
			5: 90	
E2.3	*Percent of solid waste from construction and demolition projects retained annually in the area for re-use or recycling*	%	*0: 50*	
			5: 80	
E2.5	*Percent of organic sludge that is composted and re-used within the local area*	%	*0: 30*	
			5: 100	
E3.2	*Consumption of non-renewable material resources for construction of infrastructure.*	tonnes per 1,000 m2 of built area	*0: 150*	
			5: 80	

F- ENVIRONMENT

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
F1.1	*Preservation of land during and pre-construction phase*	descript	*0: Building and infrastructure construction projects have had some negative impacts on pre-existing land forms and vegetation over the previous 3-year period*	

			5: Building and infrastructure construction projects have had no perceptible negative impacts on pre-existing land forms and vegetation over the previous 3-year period
F1.3	*Recharge of groundwater through permeable paving or landscaping*	%	*0: 20* *5: 80*
F1.8	*Impact of private vehicles used by the local population on peak load capacity of the local road system.*	descript	*0: It is estimated that the use of private vehicles by the local population reaches the peak load capacity of the local road system, with some negative impacts on traffic speeds, air quality, pedestrian and bicycling environments, and the function of adjacent buildings.* *5: It is estimated that the use of private vehicles by the local population is considerably less than the peak load capacity of the local road system, and there are no significant impacts on traffic speeds, air quality, pedestrian and bicycling environments, and the function of adjacent buildings.*
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	Days/yr	*0: 20* *5: 15*
F3.6	*Tree coverage for shade and management of local ambient temperatures*	%	*0: 20* *5: 75*
F3.10	*Ecological diversity in the area*	%	*0: The level of ecological diversity in the local area is like the larger urban area* *5: The level of ecological diversity in the local area is considerably higher than the larger urban area*

G- SOCIAL ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCH MARK	RATIONALE
G2.1	*Public transport service.*	%	*0: 5* *5: 40*	
G2.4	*Quality of pedestrian and bicycle network*	*m/100 inhabitants*	0: 0 5: 500	
G3.1	*Availability of a broadband communication network*	%	0: 50 5: 65	
G4.2	*Availability and proximity of key public human services*	%	0: 20 5: 70	
G5.1	*Local production of food.*	m^2/100	0: 100	

		residents	5: 600
G6.3	*Community involvement in urban planning activities*	descript	0: 0 5: 3
G7.1	*Compatibility of urban design with local cultural values*	descript	0: 5:

SNTool Criteria Specifications

A- BUILT URBAN SYSTEMS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.2	*Urban compactness*	*Information source*	*Model*
		Assessment method	*Max constructed area (above ground):* • *1,6 (residential use)* • *2,0 (mixed use)* *x height 3 m = 4,8 – 6* • *40% = developed* • *10% = Green area + streets + parking* *Total constructed area 2,4 - 3*
		Standard	*Local physical plan, Art 23 (PPUG)*
A1.4	*Residential density*	*Information source*	*Model*
		Assessment method	*"Mravince 280 ha/ 1.628 stanovnika. = 0,17 residents / ha*
		Standard	*National Census 2011 for number of residents* *Local physical plan for neighborhood surface*
A1.7	*Conservation of land*	*Information source*	*Measured data*
		Assessment method	*Total neighborhood area/ecological land area = 2%*
		Standard	*Local physical plan for surfaces* *No specific reference on ecological land*
A2.2	*Walking distance to public transport for area workers and students*	*Information source*	*measured*
		Assessment method	*https://geoportal.dgu.hr*
		Standard	*Development program of the city 2018-2025*
A2.9	*On-street and indoor parking spaces relative*	*Information source*	*Measured data*

	to local population	*Assessment method*	• *Counting the number of parking spaces in the neighborhood* • *National Census 2011 for number of residents*
		Standard	*Local physical plan (PPUG)*
A2.10	*Intermodality facilities*	*Information source*	Measured data
		Assessment method	https://geoportal.dgu.hr
		Standard	*No specific standard, estimation is given*

B- ECONOMY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.1	*Affordability of housing property*	*Information source*	
		Assessment method	
		Standard	*Annual report on average income per resident in the city* *Current market price for housing property* *National Census 2011 for average size of housing property*
B1.6	*Percent of residential units in the neighbourhood that are vacant*	*Information source*	Site visit
		Assessment method	Site visit
		Standard	-
B2.2	*Average annual per-capita income of residents*	*Information source*	*statistics*
		Assessment method	*Revenue per worker/number of residents in the neighborhood*
		Standard	*Development program of the city 2018-2025*
B3.3	*Use stage energy costs for public buildings*	*Information source*	*Partly data bank, partly measured*
		Assessment method	*Energy consumption collected from energy providers / EMIS system used to collect data on area public buildings;*
		Standard	-
B3.4	*Levels of total public and private investment*	*Information source*	*Monitored*

		Assessment method	*(Expenses for the acquisition of long-term assets / number of residents) x percentage of residents of the neighborhood*
		Standard	*City budget, Expenses for the acquisition of long-term assets; National Census 2011 for number of residents*

C- ENERGY

CRITERION	INDICATOR	SPECIFICATIONS	
C1.1	*Total final thermal energy consumption for building operations*	*Information source*	*Modeled*
		Assessment method	*Definition of year of construction of buildings – three categories are prevailing, built before 1940, after 1970 and after 2006. For each category specific thermal energy demand is defined according Strategy for long-term energy refurbishment of building sector in Croatia. Total surface of buildings = number of households x average surface of household.*
		Standard	*Strategy for long-term energy refurbishment of buildings sector in Croatia*
C1.4	*Total final electrical energy consumption for building operations*	*Information source*	*Measured data*
		Assessment method	*Report from energy distributor*
		Standard	-
C1.7	*Total primary energy demand for building operation*	*Information source*	*Measured data*
		Assessment method	*Report from energy distributor*
		Standard	-
C2.1	*Share of renewable energy on-site relative to total final thermal energy consumption for building operations*	*Information source*	*Modeled*
		Assessment method	*Calculation of energy produced from on-site systems / specific final energy consumption (for specific construction period) x total surface of buildings).*
		Standard	*Strategy for long-term energy refurbishment of buildings sector in Croatia*
C2.4	*Share of renewable energy on-site, relative to total primary energy consumption for building*	*Information source*	*Modeled*
		Assessment method	*(Calculation of energy produced from on-site systems x primary energy factor) / (specific*

	operations		*final energy consumption (for specific construction period) x total surface of buildings) x primary energy factor)*
		Standard	*Strategy for long-term energy refurbishment of buildings sector in Croatia* *Primary energy factors in Croatia*
C2.7	*Share of renewable energy on-site, on final electric energy consumption*	*Information source*	*Modeled*
		Assessment method	*(Calculation of electric energy produced from on-site systems x primary energy factor) / total electricity consumption*
		Standard	*Data on electricity consumption from energy distributor*

D- ATMOSPHERIC EMISSIONS

CRITERION	INDICATOR	SPECIFICATIONS	
D1.2	*GHG emissions from primary energy used for in building operations*	*Information source*	*Modeled*
		Assessment method	*Total energy consumption per fuel x GHG factor for specific fuel*
		Standard	*GHG emissions factors in Croatia*
D1.7	*Total GHG Emissions from buildings, private and public mobility*	*Information source*	*Modeled*
		Assessment method	*Total energy consumption per fuel x GHG factor for specific fuel*
		Standard	*GHG emissions factors in Croatia*

E- NON-RENEWABLE RESOURCES

CRITERION	INDICATOR	SPECIFICATIONS	
E1.6	*Consumption of potable water for residential population*	*Information source*	*Measured data*
		Assessment method	*Water consumption / number of inhabitants*
		Standard	*Data on water consumption from water distributor* *National Census 2011 for number of residents*
E1.7	*Consumption of potable water for public non-residential building systems*	*Information source*	*Measured data*
		Assessment method	*Annual water consumption / surface of buildings*

		Standard	-
E2.1	*Solid waste and recycling collection points*	*Information source*	*Site visit*
		Assessment method	*Inserting positions of waste bins in Google Earth tool and measuring distance from houses*
		Standard	-
E2.3	*Solid waste from construction and demolition projects retained in the area for re-use or recycling*	*Information source*	*Site visit*
		Assessment method	*Esitmation*
		Standard	-
E3.2	*Consumption of non-renewable material resources for construction of infrastructure*	*Information source*	-
		Assessment method	-
		Standard	-

F- ENVIRONMENT

CRITERION	INDICATOR	SPECIFICATIONS	
F1.1	*Impact of construction activities on natural features*	*Information source*	*Questionnaire for residents*
		Assessment method	-
		Standard	*Assessment criteria for the KPI*
F1.3	*Recharge of groundwater through permeable paving or landscaping*	*Information source*	*Measured data*
		Assessment method	Calculation of surfaces of different finishing x permeability factor
		Standard	*Assessment criteria for the KPI*
F1.8	*Impact of private vehicles used by the local population on peak load capacity of the local road system*	*Information source*	*Questionnaire for residents*
		Assessment method	-
		Standard	*Assessment criteria for the KPI*

F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	*Information source*	*Data from measuring station*
		Assessment method	*Annual measurement*
		Standard	*National standard*
F3.6	*Tree coverage for shade and management of local ambient temperatures.*	*Information source*	*Measured data*
		Assessment method	Calculation of shaded surfaces of different finishing / total public surface
		Standard	-
F3.10	*Ecological diversity in the area*	*Information source*	*Questionnaire for residents*
		Assessment method	*Estimation*
		Standard	-

G- SOCIAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G2.1	*Public transport service*	*Information source*	*Measurement on a map*
		Assessment method	*Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop*
		Standard	-
G2.4	*Quality of pedestrian and bicycle network.*	*Information source*	*Measurement on a map*
		Assessment method	*Total walkway meters of dedicated pedestrian paths and meters of bicycle path and "shared space" per 100 inhabitants.*
		Standard	-
G3.1	*Availability of a broadband communication network*	*Information source*	*Modeled data*
		Assessment method	*Esitmated number of users*
		Standard	*Plan for development of broadband infrastructure in the city*
G4.2	*Availability and proximity of key public human services*	*Information source*	*Modeled data*
		Assessment	*Percentage of inhabitants in radius of 800 m*

		method	*from key public services*
		Standard	*-*
G5.1	*Local production of food*	*Information source*	*Modeled data*
		Assessment method	*Calculation of area of vegetable gardens in the area*
		Standard	*-*
G6.3	*Community involvement in urban planning activities*	*Information source*	*Questionnaire for residents*
		Assessment method	*Described based on the type of response / total number of responses*
		Standard	*Assessment criteria for the KPI*

COMPARATIVE ANALYSIS – URBAN SCALE

Total number of criteria calculated

N° Criteria TOT	City of Turin	City of Udine	EVBDM	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP	Average
Urban	34	46	16	19	33	59	66	44	38	**32,83**

Table1: Number of criteria that compose the 9 Regional Tools.

A first information derived from the analysis of the 9 Regional reports collected concerns the number of criteria selected by the partners to compose their Regional Tools. Obviously each of them has had to calculate the 16 mandatory KPIs and, to these criteria, others have been added to be calculated, depending on their regional needs.

The average value deriving from the analysis is equal to 33 criteria, obviously, as anticipated, it is an average value, in fact, some partners have limited the calculation to those which are mandatory or a little more, while others have composed regional instruments with over 60 criteria. The bar chart below shows the numerical distribution of the criteria one by one, for all the nine partners involved in the task; the range of fluctuation of values has as minimum value the 16 criteria selected by EnvirobatBDM and reaches the maximum value of 66 criteria selected and calculated by the University of Malta.

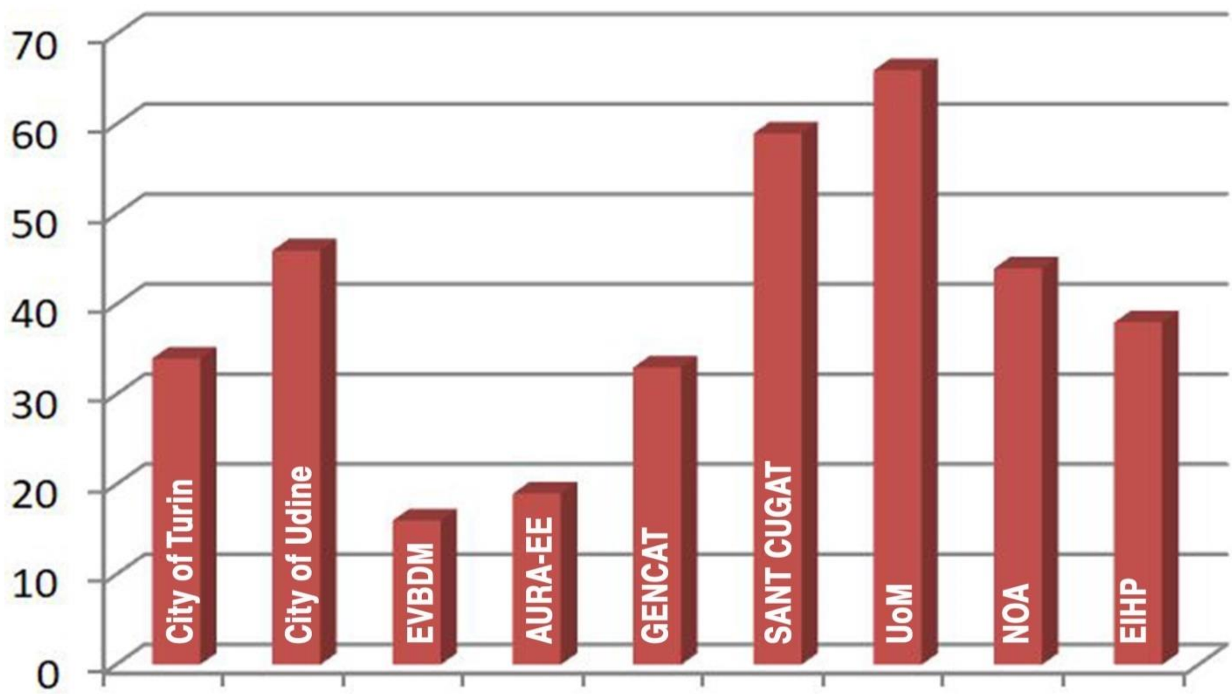

Chart1: Bar chart showing the numerical distribution of criteria selected by each partner.

Number of criteria per area

After quantifying the number of criteria selected by each partner, a distribution analysis of them was conducted so as to understand which areas are the most densely populated.

Thanks to the distributive analysis of the criteria within the different seven areas, it can be stated that the area most densely populated of criteria is Area G, related to Social Aspects, to follow Area C, related to Energy Aspects. Compared to the latter area, it is interesting to note that the number of selected criteria is quite homogeneous unlike the situation for Area G, where the disparity in the number of selected criteria is definitely clear.

N° of Criteria per Areas	**City of Turin**	**City of Udine**	**EVBDM**	**AURA-EE**	**GEN CAT**	**Sant Cugat**	**UoM**	**NOA**	**EIHP**	***Average***
A	4	5	1	1	3	3	9	4	6	**4,0**
B	2	5	1	1	5	3	3	4	5	**3,2**
C	12	7	5	6	9	9	8	13	6	**8,3**
D	1	2	1	1	1	2	1	1	2	**1,3**
E	4	8	2	4	3	8	7	4	6	**5,1**
F	4	8	2	2	7	8	14	7	6	**6,4**
G	7	11	4	4	5	16	24	11	7	**9,9**

Table2: Numerical distribution of criteria making up the 9 Regional Tools, distributed in the seven areas. In the last column there are the weighted average values of this distribution.

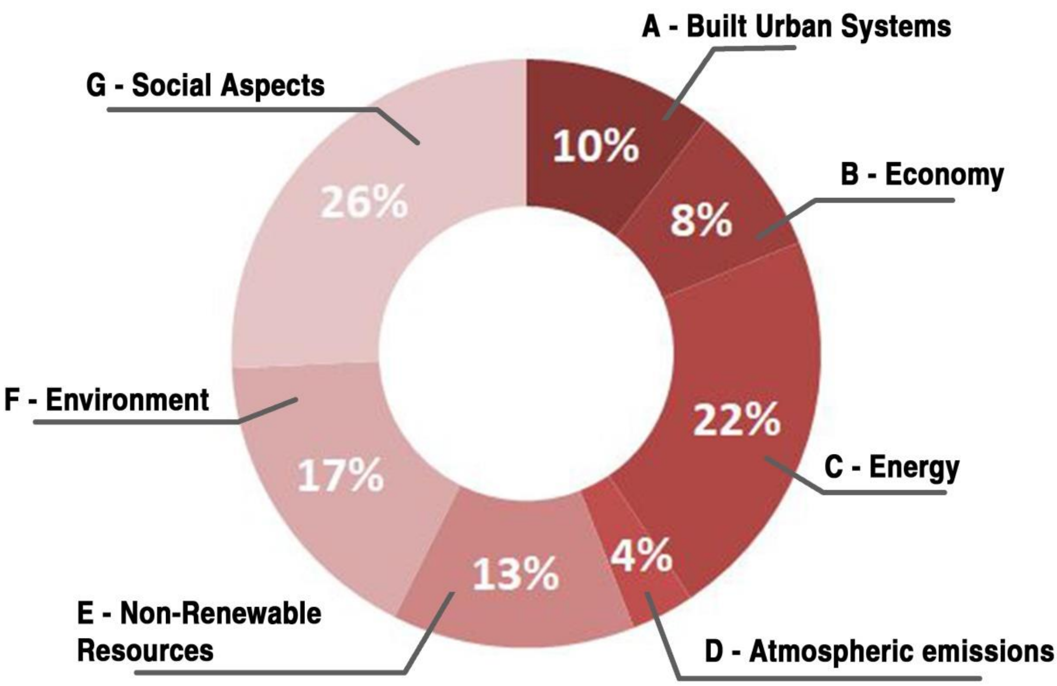

Chart2: Pie chart showing the percentage distribution of the criteria within the 7 areas making up the tool, resulting from the weighted average of the individual values of the 9 Regional Tools.

Almost similarly populated are Area E - Non - Renewable Resources and Area F - Environment, which have reciprocally the 13% and 17% of the total criteria. The remaining two areas, respectively named Area B - Economy and Area D - Atmospheric Emissions, are the least populated in term of criteria, among the reasons there is certainly the fact that these areas have already a small number of indicators within the Generic Framework, compared to the others, moreover, with regard to Area B - Economy, this appears to be generically less priority and relevant than the others.

Areas	Generic Framework	Average in Regional Tools
A	17	4
B	15	3,2
C	39	8,3
D	7	1,3
E	24	5,1
F	39	6,4
G	37	9,9

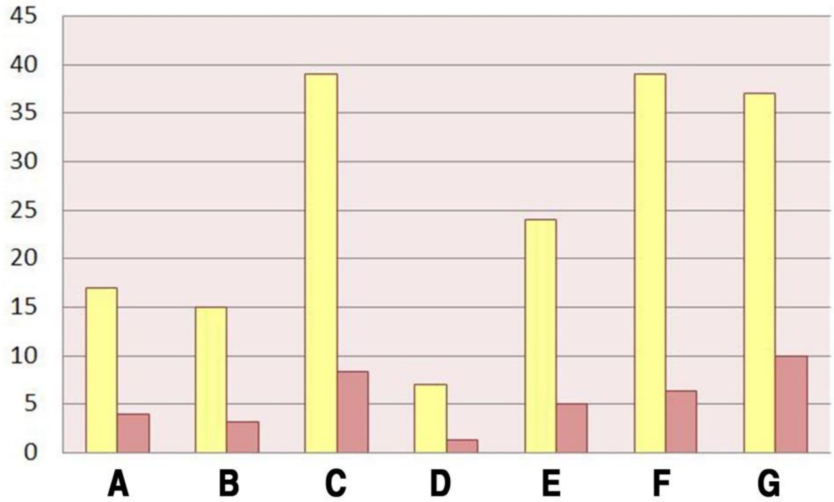

Chart3: On the left, the table shows the number of criteria existing in the Generic Framework broken down by area, subsequently compared with the average value obtained from the analysis of the 9 Regional Tools. On the right, the bar chart that graphically translates the results.

As can be seen by looking at the image above, the ratio between the total number of criteria in a specific area of the Generic Framework and the average of those calculated in the different Regional Tools is often not proportional. However, this graph allows us to understand that the most crowded areas are often those that already contain a large number of selectable criteria in the Generic Framework.

Average value of Priority factors per KPIs

For each criterion included within the Regional Tool it was necessary to assign a priority factor concerning the Impact, the Extent and the Duration of the effect of that specific criterion , with the purpose of defining an order of importance and relevance between the criteria, being able to more easily complete the weighing operation.

The table below summarizes the average values obtained from the analysis of the 9 Regional Tools for each of the 16 KPIs, in relation to:

- B= Impact of the Potential effect (1-3)
- C= Extent of potential effect (1-5)
- D= Duration of potential effect (1-5)
-

Code	**Criterion**	***Value***	***Average***
A1.7	Conservation of Land	*B= Impact*	**2**
		C=Extent	**3**
		D=Duration	**4**
B3.3	Use stage energy cost for public buildings	*B= Impact*	**2**
		C=Extent	**2**
		D=Duration	**3**
C1.1	Total final thermal energy consumption for building operations	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**3**
C1.4	Total final electric energy consumption for building operations	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**2**
C1.7	Total primary energy demand for building operations	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**3**
C2.1	Share of renewable energy on-site, relative to total final thermal energy consumption for building operations	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**3**
C2.7	Share of renewable energy on-site, on final electric energy consumptions	*B= Impact*	**2**
		C=Extent	**3**
		D=Duration	**3**
D1.2	Total GHG Emissions from primary energy used in building operations	*B= Impact*	**3**
		C=Extent	**5**
		D=Duration	**5**
E1.6	Consumption of potable water for residential population	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**2**

E1.7	Consumption of potable water for public non-residential building systems	*B= Impact*	**2**
		C=Extent	**3**
		D=Duration	**2**
F1.3	Recharge of groundwater through permeable paving or landscaping	*B= Impact*	**2**
		C=Extent	**3**
		D=Duration	**3**
F2.3	Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**4**
G2.1	Public transport service	*B= Impact*	**3**
		C=Extent	**2**
		D=Duration	**3**
G2.4	Quality of pedestrian and bicycle network	*B= Impact*	**2**
		C=Extent	**3**
		D=Duration	**3**
G4.2	Availability and proximity of key services	*B= Impact*	**2**
		C=Extent	**3**
		D=Duration	**3**
G6.3	Community involvement in urban planning activities	*B= Impact*	**2**
		C=Extent	**2**
		D=Duration	**2**

Weight per area

The weighting is one of the crucial aspect in the all process, it consists in the assignment of a weight to each criterion, category and issue. The weight is expressed as a percentage. This process allows to align the assessment tool to local environmental, social and economic priorities. The table below shows the percentage distribution of the weights assigned by the partners to the seven areas of the Generic Framework. As for the previous analyzes, also in this case we proceeded by averaging the values obtained by each single partner.

Weight of Areas	City of Turin	City of Udine	EVBDM	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP	*Average*
A	11,6%	10,4%	18,9%	0,0%	6,5%	10,2%	13,5%	4,6%	12,2%	**9,8%**
B	1,7%	6,6%	5,0%	1,8%	9,1%	3,6%	1,8%	3,9%	4,6%	**4,2%**
C	41,1%	18,4%	30,5%	28,2%	26,7%	25,9%	16,2%	31,1%	21,5%	**26,5%**
D	6,9%	14,3%	23,6%	33,9%	7,3%	12,7%	5,8%	13,6%	13,3%	**14,6%**
E	6,9%	14,1%	3,4%	8,7%	7,3%	10,1%	11,7%	10,7%	14,3%	**9,6%**
F	18,3%	15,7%	9,4%	9,9%	31,3%	23,8%	28,7%	16,8%	9,0%	**18,1%**
G	13,4%	20,5%	9,1%	17,4%	15,4%	13,6%	22,3%	19,3%	25,0%	**17,2%**

Table3: Percentage distribution of the weights assigned by the partners to the seven Areas of the Tool. Cells in yellow represent the lower weight given while the green ones represent the higher weight.

The importance of the Area C - Energy within the Tool is immediately visible from the underlying horizontal bar chart. Almost all the partners attributed the greater weight to this area than all the others, justifying this choice precisely because of the importance that energy aspects have in the world in terms of environmental sustainability.

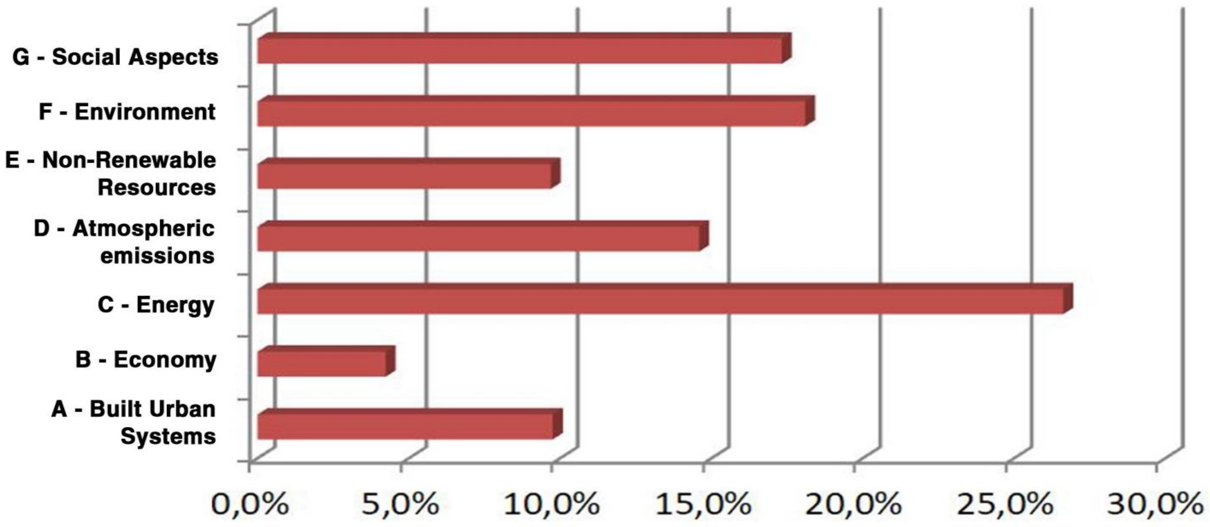

Chart4: Bar chart showing the average percentage weight obtained for each Area.

The average value attributed to Area C, which comes from the analysis conducted, corresponds to 26.5% over the total. In terms of percentage weight, immediately after Area C there is Area F - Environment, with an average of 18.1%. Not far from this last value there is the Area G - Social Aspects, which reaches an average of 17.2%, even in this case, the result is fairly homogeneous, in fact there were no significant numerical fluctuations between scores given by partners.

As is evident from the analysis carried out in the previous paragraph, despite the fact that the Area D - Atmospheric Emissions has few criteria taken into consideration, these still have a significant weight in the Tool, in fact, following the allocation of weights by the partners, the Area D is in any case enough influential in term of percentage, with 14.6% of importance compared to the total.

Area A - Built Urban Systems and Area E - Non-Renewable Resources, have achieved a similar percentage score, they appear to be less significant than the areas analyzed above but still have a percentage relevance within the Tool of about 10% each.

As shown in the paragraph dedicated to the number of criteria per area, few criteria of Area B - Economy have been taken into consideration to compose the Regional Tools; in the same way, it appears how this category of criteria is kept less in consideration than the others also regarding the priority in terms of weight of the area. The Area B - Economy has in fact a percentage weight of only 4.2% in the Tool.

Average value of Minimum/Best value

Code	Criterion	Unit of Measure	*Value*	City of Turin	City of Udine	nvirobatBD	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP	*Average*
A1.7	Conservation of Land	%	*Minimum*	0,5	7	15	10	4	10	10	10	2	**7,6**
			Best Value	2	42	30	20	15	20	28	20	10	**20,8**
B3.3	Use stage energy cost for public buildings	€/m^2/yr	*Minimum*	7,4	10	14	14	20	13,56	100	17,7	100	**33,0**
			Best Value	4	3	3,5	3,5	10	3,33	0	4,1	0	**3,5**
C1.1	Total final thermal energy consumption for building operations	kWh/m^2/yr	*Minimum*	70	80	40	50	75	76,23	50	314	100	**95,0**
			Best Value	30	10	0	0	20	33,8	0	21,1	50	**18,3**
C1.4	Total final electric energy consumption for building operations	kWh/m^2/yr	*Minimum*	50	23	12	55	70	29,85	25	64,2	75	**44,9**
			Best Value	20	5	0	5	20	10,88	5	7,9	50	**13,8**
C1.7	Total primary energy demand for building operations	kWh/m^2/yr	*Minimum*	322	72	40	140	225	152	50	461,9	100	**173,7**
			Best Value	242	50	0	0	70	15	15	38,2	70	**55,6**
C2.1	Share of renewable energy on-site, relative to total final thermal energy consumption for building operations	%	*Minimum*	20	25	25	30	25	25	25	4	5	**20,4**
			Best Value	100	50	100	100	90	90	90	14	30	**73,8**
C2.7	Share of renewable energy on-site, on final electric energy consumptions	%	*Minimum*	20	35	25	35	15	15	35	1	20	**22,3**
			Best Value	100	75	200	75	75	75	75	47	35	**84,1**
D1.2	Total GHG Emissions from primary energy used in building operations	kg CO_2 eq./m^2/yr	*Minimum*	22,5	13	20	30	30	30	80	46	22	**32,6**
			Best Value	0	11	5	10	10	10	30	5	15	**10,7**
E1.6	Consumption of potable water for residential population	m^3/occupant/yr	*Minimum*	65	47,45	40	68	150	150	15	62,1	250	**94,2**
			Best Value	61	23,7	20	30	40	60	5	18,6	100	**39,8**
E1.7	Consumption of potable water for public non-residential building systems	m^3/m^2	*Minimum*	1	1,3	5	1,1	15	15		0,65	5	**5,5**
			Best Value	0,5	0,6	2	0,4	5	5		0,33	3	**2,1**
F1.3	Recharge of groundwater through permeable paving or landscaping	%	*Minimum*	20	40	20	20	20	20	20	15	20	**21,7**
			Best Value	40	60	70	100	70	70	100	80	80	**74,4**
F2.3	Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	days/yr	*Minimum*	35	35	30	30	15	15		35	20	**26,9**
			Best Value	25	0	11	11	11	11		0	15	**10,5**
G2.1	Public transport service	%	*Minimum*	70	60	50	0	30	30	30	50	5	**36,1**
			Best Value	100	100	100	100	100	100	100	100	40	**93,3**
G2.4	Quality of pedestrian and bicycle network	m/100 inhabitants	*Minimum*	14	43	15	200	20	5	5	2	0	**33,8**
			Best Value	42	129	40	50	80	40	40	20	500	**104,6**
G4.2	Availability and proximity of key services	%	*Minimum*	80	30	30	30	30	50	50	50	20	**41,1**
			Best Value	100	80	100	100	80	100	100	90	70	**91,1**
G6.3	Community involvement in urban planning activities	level (score)	*Minimum*	0	3	0	0	0	0	0	0	0	**0,3**
			Best Value	5	5	5	5	5	5	5	5	3	**4,8**

Table4: Benchmark e Best values set out by each partners for all the 16 KPIs.

Benchmarking consists in the definition of the scoring scale for each selected criterion. The benchmark is a quantification of the indicator's value corresponding to the minimum acceptable performance and the one that is considered the best at regional level. Benchmarks can't be the same at transnational level because the local conditions of each region are different (climate, building practice, standards, level of advancement in the sustainability field, etc..). The scoring scale used in CESBA MED Urban Tool ranges from -1 to 5, where zero represents the minimum acceptable performance, 5 the excellence, 3 the best practice and -1 a negative performance.

The assignment of a reference value for the benchmark and also for the best performance is not at all a simple matter. For some criteria, there are legal limits to refer to, or national or regional regulations but finding these values is not always easy. Each partner has defined a benchmark and a best practice value for each of the 16 KPIs of the Tool, the previous table summarizes them, trying to identify even an average value which, in most cases, is not particularly meaningful, since, the reference values are definitely different between one country and another.

The rationale adopted by partners and the data sources investigated to define the reference values for the analyzed KPIs are summarized below.

Code	Criterion	Benchmark Rationale/Data source
A1.7	Conservation of Land	-Local planning rules. -Study by the agricultural Chamber for the local master plan.
B3.3	Use stage energy cost for public buildings	-Hypothesis. -Passive or NZEB Building. -National Institute of Energy. -National Agency for new technologies, energy and sustainable economic development (ENEA).
C1.1	Total final thermal energy consumption for building operations	-Passive or NZEB Building. -The average thermal consumption defined using data from the Energy Performance Certificates (EPC) electronic repository (buildingcert). -ec.europa.eu/energy/en/topics/energy-efficiency/buildings. -International Energy Agency. -EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling). -National Institute of Energy. -(PAES), Sustainability and Energy Action Plan. -National Agency for new technologies, energy and sustainable economic development(ENEA). -TABULA EU Project: http://episcope.eu/building-typology/ -UNI 11300.

C1.4	Total final electric energy consumption for building operations	RT2012: New: Compliance with the new thermal regulations to come: RE 2020, level E1, respect for the share of electricity -Passive or NZEB Building. -EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling). -National Institute of Energy. -(PAES), Sustainability and Energy Action Plan. -EURAC Study http://www.eurac.edu/en/research/technologies/renewableenergy/publications/Documents/EURAC.
C1.7	Total primary energy demand for building operations	-RT2012. -Levels from the future national building regulation called E+C- (Energy+ Carbon -). -EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling). -National Institute of Energy. -(PAES) Sustainability and Energy Action Plan.
C2.1	Share of renewable energy on-site, relative to total final thermal energy consumption for building operations	-Scores based on the City of Lyon Sustainable Cities Guide. -Passive or NZEB Building. -The average ratio of the DHW energy consumption to the thermal energy consumption defined using calculated data from the Energy Performance Certificates (EPC) electronic repository (buildingcert). -EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling). -2013/114/EU: Commission Decision of 1 March 2013. -2020 EU Strategy. -Association of Renewable Energy Professionals. -(PAES), Sustainability and Energy Action Plan. -National Legislative Decree.
C2.7	Share of renewable energy on-site, on final electric energy consumptions	-Scores based on the City of Lyon Sustainable Cities Guide. -Passive or NZEB Building. -EN ISO 13790 (Energy performance of buildings. Calculation of energy use for space heating and cooling). -2013/114/EU: Commission Decision of 1 March 2013. -(PAES), Sustainability and Energy Action Plan. -2020 EU Strategy.

D1.2	Total GHG Emissions from primary energy used in building operations	-Regulation label. -Passive or NZEB Building. -EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings). -(PAES) Sustainability and Energy Action Plan.
E1.6	Consumption of potable water for residential population	-Environmental Agency. -National Statistical Authority. -Municipal sustainability report concerning management of water. -Standard UNI PdR ITACA.
E1.7	Consumption of potable water for public non-residential building systems	-Environmental Agency. -National Statistical Authority. -Municipal sustainability report concerning management of water. -Standard UNI PdR ITACA.
F1.3	Recharge of groundwater through permeable paving or landscaping	-Local plan of urban planning and habitat. -Municipal Regulation. -UNI PdR ITACA.
F2.3	Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	-Observatory of the quality of the air. -Statistical data. -Municipal regulations. -European Air quality Standards. -EU Directive limits. -Regional Agency for Environment Protection. -Eco-Management and Audit Scheme (EMAS).
G2.1	Public transport service	-Global Platform for Sustainable Cities - Urban Sustainability Framework. -Sustainable Cities Guide. -Specific study on the topic. -Mobility plan. -Technical study carried out by the Municipality for the public transport.
G2.4	Quality of pedestrian and bicycle network	-Global Platform for Sustainable Cities - Urban Sustainability Framework. -Sustainable Cities Guide. -Statistical Data.
G4.2	Availability and proximity of key services	-Global Platform for Sustainable Cities - Urban Sustainability Framework. -Sustainable Cities Guide.
G6.3	Community involvement in urban planning activities	Arnstein Method.

Standard for calculation

Exactly how it was important to define, in the previous paragraph, the reference data sources of the criteria in order to extrapolate benchmark and best practice data, in the same way, it is fundamental to identify the support tools useful to perform the calculations for the quantification of the value of the indicators.

The table below summarizes the main information sources and tools used by the partners to perform the calculations.

Code	Criterion	Information sources
A1.7	Conservation of Land	-Measured data: Local physical plan for surfaces. -Municipal Urban Plan. -Thematic map – Geographic Information System.
B3.3	Use stage energy cost for public buildings	-Data bank. -Models and simulation. -Energy cost from Bills. -Estimated, Statistical data.
C1.1	Total final thermal energy consumption for building operations	-Modeled: Definition of year of construction of buildings. For each category specific thermal energy demand is defined according Strategy for long-term energy refurbishment of building sector. -VRF systems monitor. -Data from SEAP, Sustainability and Energy Action Plan. -Overall city consumptions (Database from Covenant of Majors).
C1.4	Total final electric energy consumption for building operations	-Measured: report from energy distributor. -National thermal regulation. -RE2020 regulation. -Data from (PAES), Sustainability and Energy Action Plan. -Overall city consumptions (Database from Covenant of Majors). -Monitored data.
C1.7	Total primary energy demand for building operations	-Measured: Report from energy distributor. -Calculations are based on EN 13790. -Data from (PAES), Sustainability and Energy Action Plan. -Overall city consumptions (Database from Covenant of Majors). -Monitored data. -(APE) Energy Performance Certification.
C2.1	Share of renewable energy on-site, relative to total final thermal energy consumption for building operations	-Modeled. -Calculations are based on EN 13790. -Municipal regulations. -Data from (PAES), Sustainability and Energy Action Plan. -Data from GSE – Manager Energy Services. -(APE) Energy Performance Certification.
C2.7	Share of renewable energy on-site, on final electric energy consumptions	-Data on electricity consumption from energy distributor. -Calculations are based on EN 13790. -Municipal regulations. -Data from (PAES), Sustainability and Energy Action Plan. -Data from GSE – Manager Energy Services.

D1.2	Total GHG Emissions from primary energy used in building operations	-Modeled: GHG emissions factors in the country. -National Values of Emissions References Related to the Energy Mix. -National factors concerning emissions. -Estimated data. -National Energy Power Station. -Overall city consumptions (Database from Covenant of Majors). -(APE) Energy Performance Certification.
E1.6	Consumption of potable water for residential population	-Measured data: Data on water consumption from water distributor. National Census 2011 for number of residents. -(French) Tool “Water calculator”. -Estimated data: Statistical data. -UNI PdR ITACA.
E1.7	Consumption of potable water for public non-residential building systems	-Measured data. - (French) Tool “Water calculator”. -Estimated data: Statistical data. -UNI PdR ITACA.
F1.3	Recharge of groundwater through permeable paving or landscaping	-Measured data. -Thematic map – Geographic Information System. -Local context of the local plan of urban planning and habitat. -Google earths images.
F2.3	Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	-Data from measuring station. -Observatory of the quality of the air. -Statistical data.
G2.1	Public transport service	-Measurement on a map. -Google Maps. -Thematic map – Geographic Information System.
G2.4	Quality of pedestrian and bicycle network	-Measurement on a map. -Thematic map – Geographic Information System. -Municipal Satellite maps.
G4.2	Availability and proximity of key services	-Thematic map – Geographic Information System. -Google Maps. -Municipal Satellite maps.
G6.3	Community involvement in urban planning activities	http://www.participatorymethods.org/sites/ participatorymethods.org/files/Arnstein%20ladder%201969.pdf

KPIs value

Code	Criterion	City of Turin	City of Udine	EnvirobatBDM	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP
A1.7	Conservation of Land	0,5	7,2	7	0	0	2,74	28	0	2
B3.3	Use stage energy cost for public buildings	8,2	9,7	no data	5,9	16,57	7,1	18	20,4	8
C1.1	Total final thermal energy consumption for building operations	235	76,26	no data	41	54,82	47,51	16,1	155,4	64
C1.4	Total final electric energy consumption for building operations	78,2	17,43	no data	7	53,28	33,26	103,2	77,7	194
C1.7	Total primary energy demand for building operations	403	181,06	no data	53	172,16	124,63	233,8	396,3	147
C2.1	Share of renewable energy on-site, relative to total final thermal energy consumption	0,00003	3,01	no data	32	1,25	1,59	65	3,4	3
C2.7	Share of renewable energy on-site, on final electric energy consumptions	1,23	3,11	no data	0	0,73	0,03	16	2,4	0
D1.2	Total GHG Emissions from primary energy used in building operations	86	34,36	no data	8	26,39	31,23	77	10,9	22
E1.6	Consumption of potable water for residential population	63,5	48,68	50	62	35,8	49,12	166	59,5	49
E1.7	Consumption of potable water for public non-residential building systems	0,8	0,924	no data	0,5	0,58	4.95	8	0,65	3,82
F1.3	Recharge of groundwater through permeable paving or landscaping	17,19	61,03	no data	30	0,12	15,37	25	31	79
F2.3	Ambient air quality with respect to particulates <10 mu (PM10) over a one year	118	22	8	11,5	5	6,67	11,5	38	N.A.
G2.1	Public transport service	100	90,08	97	80	100	100	60	100	40
G2.4	Quality of pedestrian and bicycle network	12,07	84,89	63,43	9400	115,54	16,18	2,3	188,8	138,9
G4.2	Availability and proximity of key services	100	97,33	100	100	100	100	100	100	0
G6.3	Community involvement in urban planning activities	0	0	3,5	3	2	2	3	N.A.	0

KPIs score

Code	Criterion	City of Turin	City of Udine	EnvirobatBDM	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP
A1.7	Conservation of Land	0	0,1	-1	-1	-1	-1	5	-1	0
B3.3	Use stage energy cost for public buildings	-1	0,2	no data available	3	1,72	3,2	-	-1	0,01
C1.1	Total final thermal energy consumption for building operations	-1	0,6	no data available	3	1,83	3,4	3,4	2,7	0,17
C1.4	Total final electric energy consumption for building operations	-1	1,5	no data available	3	1,67	-1	-1	-1	-0,03
C1.7	Total primary energy demand for building operations	-1	-1	no data available	3	1,7	1,4	-1	0,8	-0,03
C2.1	Share of renewable energy on-site, relative to total final thermal energy consumption for	-1	-1	no data available	0	-1	-1	-	-1	-0,02
C2.7	Share of renewable energy on-site, on final electric energy consumptions	-1	-1	no data available	-1	-1	-1	-1	0,2	-0,02
D1.2	Total GHG Emissions from primary energy used in building operations	-1	-1	no data available	5	0,9	-1	0,4	4,3	0
E1.6	Consumption of potable water for residential population	1,9	-1	1	0	5	5	-	0,3	0,16
E1.7	Consumption of potable water for public non-residential building systems	2	2,7	1	0	5	5	3,5	0,65	-0,01
F1.3	Recharge of groundwater through permeable paving or landscaping	0,4	5	no data available	0	-1	-1	0,3	1,2	0,03
F2.3	Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	-1	1,9	0	3	5	5	-	-1	0
G2.1	Public transport service	5	3,8	5	0	5	5	2,1	5	-0,05
G2.4	Quality of pedestrian and bicycle network	-1	2,4	1,5	3	5	1,6	-0,4	5	0,08
G4.2	Availability and proximity of key services	5	5	5	5	5	5	5	5	-0,03
G6.3	Community involvement in urban planning activities	0	0	3,5	3	3	2	3	N.A.	0

Testing activity has been very useful for the understanding of the feasibility of the KPIs calculation and of course, to figure out the potential problems arising from data acquisition and the ones related to the performing of the calculation. There are criteria whose data have been very difficult to be acquired by the partners involved in the activity, like for example the data related to the share of renewable energy on-site, relative to total final thermal and electric energy consumption for building operations, to the consumption of potable water for residential population, the use stage energy cost for public buildings and so on.

It’s important to underline that this difficulty is strictly related to the fact that it’s not easy to get data about existing buildings, may be built many years ago, on the contrary, for new buildings this aspect appears less problematic.

After the testing activity, all the Key Performance Indicators have been kept in the list.

With regard to the minimum and the best values proposed by partners for all the KPIs at Urban scale, in most cases they are very different from each other. This happens because the data sources used are not the same and consequently the benchmarks fixed are different one country from another. Sometimes, also when the data sources taken into account are the same, values set out are not so similar. For that reason, the average value calculated for each minimum and best value of every KPIs is not always so significant.

There are, however, few cases in which the results are very close to each other, for example, the criterion related to the permeability F1.3 - Recharge of groundwater through permeable paving or landscaping has achieved from partners minimum and best values absolutely similar, using in most case as data source local urban plan of the municipal regulation. Also criteria F2.3 - Ambient air quality with respect to particulates <10 mu (PM10) over a one year period obtained comparable values

On the contrary, the energy criterion C1.7 - Total primary energy demand for building operations and the criterion E1.6 - Consumption of potable water for residential population, have obtained minimum and best values completely different and non-comparable and the same inconsistency is visible also for criterion G2.4 - Quality of pedestrian and bicycle network.

The section related to the standard for the calculation helps to understand what are the differences in the choice of the data source to be used to set benchmark and also the different tools used to perform the calculation of the criteria, justifying sometimes the numerical misalignments among partners.

REGIONAL TOOL

D.3.4.3 Regional Tool – TORINO

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

BUILDING SCALE ASSESSMENT

SBTool structure

B – ENERGY AND RESOURCES CONSUMPTION	
	Name of the Category
B1.1	*Primary energy demand **
B1.2	*Delivered thermal energy demand **
B1.3	*Delivered electric energy demand **
B1.5	*Energy from renewable sources in total thermal energy consumption **
B1.6	*Energy from renewable sources in total electrical energy consumption **
B1.11	*Embodied non renewable primary energy*

C- ENVIRONMENTAL LOADINGS	
C1	**Greenhouses gas emission**
C1.3	**Global warming potential**
C.3	Solid an liquid waste
C3.1	Construction and demolition waste
C3.2	Solid waste from building operations

D- INDOOR ENVIRONMENTAL QUALITY	
D1	Indoor air quality and ventilation
D1.3	Formalndeyde concentration
D1.4	TVOC concentration in indoor air
D1.5	CO2 concentration in indoor air
D2.1	Time outside of the thermal comfort rang
D2.2	Thermal comfort index

G- COST AND ECONOMIC ASPECTS	
G1	**Coat and economics**
G1.4	Use stage energy cost
G1.5	Use stage water cost

SBTool criteria selection rationale

B – ENERGY AND RESOURCES CONSUMPTION

CRITERION		REASON/MOTIVATION
B1.1	***Primary energy demand***	*Relevant for the new development Plan of the city*
B1.2	*Delivered thermal energy demand*	*Relevant for the new development Plan of the cit*
B1.3	*Delivered electric energy demand*	*Relevant for the new development Plan of the city*
B1.5	*Energy from renewable sources in total thermal energy consumption*	*Relevant for the new development Plan of the city*
B1.6	*Energy from renewable sources in total electrical energy consumption*	*Relevant for the new development Plan of the cityy*

C- ENVIRONMENTAL LOADINGS

CRITERION	REASON/MOTIVATION
C	
C3.1 Construction and demolition waste	*Relevant for the new development Plan of the city*
C3.2 Solid waste from building operations	*Relevant for the new development Plan of the city*

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	REASON/MOTIVATION
D	
D1.3 Formaldehyde concentration	General Safety issue
D1.4 TVOC concentration in indoor air	*Important for occupants' safety*
D1.5 CO2 concentration in indoor air	*Important for occupants' air quality*
D2.1 Time outside of the thermal comfort rang	*Important for occupants' confort*
D2.2 Thermal comfort index	*Important for occupants' confort*

G- COST AND ECONOMIC ASPECTS		
CRITERION		**REASON/MOTIVATION**
G1.4	*Use stage energy cost **	*KPI*
G1.5	*Use stage water cost **	*KPI*

SBTool weights rationale

ISSUE	WEIGHT (1 to 3)	MOTIVATION
B – ENERGY AND RESOURCES CONSUMPTION	**3**	**The Municipality considers Sustainable Urban Planning very relevant** ***Consistency with the draft revision of the general regulation plan (P.R.G.) of the City***
C- ENVIRONMENTAL LOADINGS	3	The Municipality considers Sustainable Urban Planning very relevant *Consistency with the draft revision of the general regulation plan (P.R.G.) of the City*
D- INDOOR ENVIRONMENTAL QUALITY	2	Relevant parameter linked with external air quality and health aspects
G- COST AND ECONOMIC ASPECTS	2	It is important to reduce the municipal budget

CATEGORIES	
B1- Total life cycle non renewable energy	45,0
B3- Use of materials	5,0
B4 – Use of water, stormwater and greywater	8,0
TOTAL	58
C1- Greenhouse gas emissions	15,0
C3- Solid and liquid waste	8,0
TOTAL	23,0
D1- Indoor air quality and ventilation	8,0
D2- Thermal comfort	3,0
TOTAL	11
G1- Cost	8,0
TOTAL	8,0

CRITERIA WEIGHTS

SBTool file A – WeightA-G

B - ENERGY AND RESOURCES CONSUMPTION							
B1	**Energy**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B1.1	*Primary energy demand*	*8*	*5*	*5*	*2*	*3*	*Give significant weight to energy issues*
B1.2	*Delivered thermal energy demand*	*8*	*5*	*5*	*2*	*3*	*Give significant weight to energy issues*
B1.3	*Delivered electric energy demand*	*5*	*5*	*5*	*2*	*3*	*Give significant weight to energy issues*
B1.5	*Energy from renewable sources in total thermal energy consumption*	*8*	*5*	*5*	*2*	*3*	*Give significant weight to energy issues*
B1.6	*Energy from renewable sources in total electrical energy consumption*	*8*	*5*	*5*	*2*	*3*	*Importance of renewable energy (covenant of Majors) for the Municipality*
B1.11	*Embodied energy*	*8*	*5*	*5*	*2*	*3*	*Important criterium, but limitate action in existing building*
B3	**Use of Materials**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B3.5	Recycled materials	*5*	*4*	*3*	*2*	*3*	*Important criterium, but limitate action in existing building*
B4	**Use of potable water, stormwater and greywater**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B4.5	*Water consumption for indoor uses*	*8*	*4*	*3*	*3*	*3*	*Importance of saving water*
TOTAL		**58**					

C- ENVIRONMENTAL LOADINGS							
C1	**Greenhouse Gas Emissions**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.3	*Greenhouse Gas Emissions from building's operations*	*15*	*5*	*5*	*3*	*3*	*Reduction of CO2 is strictly linked to energy use: important*
C3	**Solid and Liquid Waste**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C3.1	*Construction and demolition waste*	*4*	*4*	*3*	*2*	*3*	*Increase reuse of local material in refurbishment*
C3.2	*Solid waste from building operations*	*4*	*4*	*3*	*2*	*3*	*Increase reuse of local material in refurbishment*
TOTAL		**23**					

D- INDOOR ENVIRONMENTAL QUALITY							
D1	**Indoor Air Quality and Ventilation**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D1.4	*TVOC concentration in indoor air*	*4*	*1*	*3*	*3*	*2*	*Air quality is important for health issues*
D1.10	*Ventilation rate*	*4*	*1*	*3*	*3*	*2*	
D2	**Air Temperature and Relative Humidity**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D2.2	*Thermal comfort index*	*3*	*1*	*3*	*3*	*2*	*Thermal comfort play significant role in energy saving*
TOTAL		**11**					

G- COST AND ECONOMIC ASPECTS							
G1	**Cost**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G1.4	*Use stage energy cost*	*4*	*2*	*3*	*3*	*2*	*Energy cost reduction can be used for other investments*
G1.5	*Use stage water cost*	*4*	*2*	*3*	*1*	*2*	*Water cost reduction can be used for other investments*
TOTAL		**8**					

a. SBTool benchmarks rationale

B- ENERGY AND RESOURCES CONSUMPTION				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
B.1.1	**Primary energy demand**	kWh/m2 y	*0: 80*	*Close to actual value/TABULA*
			5: 30	*Values from CasaClima ed ENEA*
B.1.2	Delivered thermal energy demand	*kWh/m2 y*	*0: 70*	*Values from CasaClima ed ENEA*
			5: 20	*Values from CasaClima ed ENEA*
B.1.3	**Delivered electric energy demand**	*kWh/m2 y*	*0: 30*	*Close to actual value*
			5: 20	*EURAC Study*
B.1.5	**Energy from renewable sources in total thermal energy consumption**	*%*	*0: 30*	*20% objectives 2020 from EU strategies*
			5: 100	*Excellent and ideal target*

B.1.6	**Energy from renewable sources in total electrical energy consumption**	*%*	*0: 40*	*20% objectives 2020 from EU strategies + increase for public building*
			5: 100	*Excellent and ideal target*
B.1.11	**Embodied energy**	*MJ/m2*	*0: 2500*	*Estimated actual value (IUAV, prof. Carbonari)*
			5: 1000	*Estimated reduction*
B.3.5	Recycled materials	*%*	*0: 15*	*Estimated actual value (from existing examples) CAM edilizia, DM 11/10/2017*
			5: 50	*Insert your comment here*
B.4.5	*Water consumption for indoor uses*	*m3/occupant/year*	*0: 40*	*From EURAC, ENEA (reduction for non residential)*
			5: 25	*<50% reduction from actual estimated from EURAC*

C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
C 1.3	*Greenhouse Gas Emissions from building's operations*	*kgCO2eq/ m2 y*	*0: 30*	*technical evaluation*
			5: 0	*Ideal target*
C 3.1	*Construction and demolition waste*	*Kg/m2*	*0: 100*	*Usual practice*
			5: 20	*Reduction of waste in a renovation situation*
C 3.2	*Solid waste from building operations*	*%*	*0: 50*	*Actual analytical analisys*
			5: 80	*Target value*

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
D 1.4	*TVOC concentration in indoor air*	*µg/m3*	*0: 5000*	*Measured data operating buildingshttp://www.minerva.unito.it/Chimica&Industria/MonitoraggioAmbientale/A4/Confinati7.htm*
			5: 1000	*ECA report*
D 1.10	*Ventilation rate*	*l/s m2*	*0: 10*	*Standard UNI 10339*
			5: 20	*Technical evaluation*

D 2.2	*Thermal comfort index*	*%*	*0: 10*	*Literature value*
			5: 0	*Optimal value*

G- COST AND ECONOMIC ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
G1.4	*Use stage energy cost*	*€/m2 y*	*0: 20*	*Linked to energy target consumption*
			5: 10	*Linked to energy target consumption*
G1.5	*Use stage water cost*	*€/m2 y*	*0: 5*	*Linked to energy target consumption*
			5: 1	*Linked to energy target consumption*

b. SBTool Criteria Specifications

B- ENERGY AND RESOURCES CONSUMPTION			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.1	*Primary energy demand **	*Information source*	*Calculated data - Estimations*
		Assessment method	Calculated on average values of similar buildings, Various EU project as reference and Covenant of majors
		Standard	*UNI11300*
B1.2	*Delivered thermal energy demand*	*Information source*	*Calculated data - Estimations*
		Assessment method	Calculated on average values of similar buildings, Various EU project as reference and Covenant of majors
		Standard	*UNI 11300*
B1.3	*Delivered electric energy demand **	*Information source*	*Calculated data - Estimations*
		Assessment method	Covenant of Majors; parametric calculation for specific values

		Standard	*No standards*
B1.5	*Energy from renewable sources in total thermal energy consumption*	*Information source*	*Calculated data - Estimations*
		Assessment method	*No Energy from RES*
		Standard	*UNI 11300*
B1.6	*Energy from renewable sources in total electrical energy consumption **	*Information source*	*Calculated data - Estimations*
		Assessment method	CESBA Tool
		Standard	*Directive 2009/28/EC (RES Directive)* *Decreto legislativo 28/2011, when usable.*
B1.11	*Embodied energy*	*Information source*	*Calculated data - Estimations*
		Assessment method	***Literature data***
		Standard	*EN 15978 "Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method".* *ISO 14040/44* *EN 15804 (Sustainability of construction* *works. Environmental product declarations. Core rules for the product category of construction products)* ***CAM Decreto***
B3.5	***Recycled materials***	*Information source*	*Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps*
		Standard	*EN ISO 14021 (Environmental labels and declarations - Self-declared environmental claims - Type II environmental labelling)* ***CAM Decreto***
B4.5	*Water consumption for indoor use*	*Information source*	*Metered data – Estimations*
		Assessment method	*CESBAMED calculation steps* *Calculation from SMAT (local water distribution) and Covenant of Majors*

		Standard	*Local Addendum for Building code (allegati Energetici al regolamento edilizio)*

C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	SPECIFICATIONS	
C1.3	*Greenhouse Gas Emissions from building's operations **	*Information source*	*Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps; D.M. 26/6/2015*
		Standard	*UNI 11300 and D.M. 26/6/2015*
C3.1	*Construction and demolition waste*	*Information source*	*Estimations, literature*
		Assessment method	*Estimated actual value (IUAV, prof. Carbonari)*
		Standard	*----- no standards*
C3.2	*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 **	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps* *The seven reference categories of solid waste are: Paper, Plastic, Metal, Glass, Wet waste, Textiles, Special hazardous waste.* *Calculated from data collected by the Municipality and IREN*
		Standard	

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	SPECIFICATIONS	
D1.4	*TVOC concentration in indoor air*	*Information source*	*Metered data*
		Assessment method	Literature data

		Standard	*EU Commision Report n 19, 1997*
D1.10	*Ventilation rate **	*Information source*	*Metered data – Calculated data*
		Assessment method	*Estimated values for natural ventilation*
		Standard	*UNI 10339, (UNI EN 823), UNI 11300*
D2.2	*Predicted Percentage Dissatisfied (PPD) **	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment method	Estimation, Fanger law
		Standard	

G- COST AND ECONOMIC ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
G1.4	*Energy annual cost per usable floor area*	*Information source*	*Metered data – Estimations*
		Assessment method	Calculation based on actual energy cost and consumption from criteria B
		Standard	----
G1.5	*Water annual cost per usable floor area*	*Information source*	*Metered data – Estimations*
		Assessment method	Average consumption and usable surface (data from Municipal GIS data base)
		Standard	---

REGIONAL TOOL

D.3.4.3 Regional Tool – City of Udine

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

BUILDING SCALE ASSESSMENT

SBTool structure

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**
A2.1	*Maximizing efficiency of land use through development density*
A3	**Project Infrastructure and Services**
A3.12	*Provision of on-site communal transportation system(s)*

B - ENERGY AND RESOURCES CONSUMPTION	
B1	**Total Life Cycle Non-Renewable Energy**
B1.1	*Primary energy demand*
B1.2	*Delivered thermal energy demand*
B1.3	*Delivered electric energy demand*
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 non-renewable primary energy*
B2	**Embodied Energy**
B3	**Use of Materials**
B3.1	*Degree of re-use of suitable existing structure(s) where available*
B3.5	*Recycled materials*
B3.7	*Easy of disassembly, re-use or recycling*
B4	**Use of potable water, stormwater and greywater**
B4.3	*Use of water for irrigation purposes*
B4.5	*Potable water consumption for indoor uses*

C - ENVIRONMENTAL LOADINGS	
C1	**Greenhouse Gas Emissions**
C1.3	*Global Warming potential*
C3	**Solid and Liquid Wastes**
C3.1	*Construction and demolition waste.*
C3.2	*Solid waste from building operation.*
C4	**Impacts on Project Site**
C4.1	*Recharge of groundwater through permeable paving or landscaping.*
C5	**Other Local and Regional Impacts**
C5.7	*Contribution to Heat Island Effect from roofing, landscaping and paved areas.*

D - INDOOR ENVIRONMENTAL QUALITY	
D1	**Indoor Air Quality and Ventilation**
D1.4	*TVOC concentration in indoor air*

D1.10	*Ventilation rate*
D2	**Air Temperature and Relative Humidity**
D2.2	*Thermal comfort index*
D3	**Daylighting and Illumination**
D3.1	*Appropriate daylighting in primary occupancies areas*
D4	**Noise and Acoustics**
D4.1	*Noise attenuation through the exterior envelope*

E - SERVICE QUALITY	
E5	**Optimization and Maintenance of Operating Performance**
E5.5	*On-going monitoring and verification of performance-*

F - SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
F1	**Social AspectsSocial Aspects**
F1.1	*Universal access on site and within the building*
F2	**Culture and Heritage**
F2.4	*Use of traditional local materials and techniques*

G - COST AND ECONOMIC ASPECTS	
G1	**Cost and Economics**
G1.4	*Use stage energy cost*
G1.5	*Use stage water cost*

SBTool criteria selection rationale

A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE

CRITERION	REASON/MOTIVATION
A1.8 – *Use of native plant types*	*Reduce water consumption using native plants*
A1.10 – *Provision and quality of children's play area(s)*	*Evaluate the quality of children's playing areas*
A1.12 – *Provision and quality of bicycle pathways and parking*	*Incentive use of bicycle*
A2.1 – *Maximizing efficiency of land use through development density*	*Reduce land consumption*
A3.12 – *Provision of on-site communal transportation system(s)*	*Evaluate the public transport service*

B – ENERGY AND RESOURCES CONSUMPTION

CRITERION	REASON/MOTIVATION
B1.1 – *Primary energy demand*	*Criterion is mandatory*
B1.2 – *Delivered thermal energy demand*	*Criterion is mandatory*
B1.3 – *Delivered electric energy demand*	*Criterion is mandatory*
B1.5 – *Energy from renewable sources in total thermal energy consumption*	*Criterion is mandatory*

B1.6 – *Energy from renewable sources in total electric energy consumption*	*Criterion is mandatory*
B1.11 – *Embodied non-renewable primary energy*	*Not applicable*
B3.1 – *Degree of re-use of suitable existing structure(s) where available*	*Encourage the reuse of existing volumes*
B3.5 – *Recycled materials*	*Not applicable*
B3.7 – *Easy of disassembly, re-use or recycling*	*Evaluate the degree of ease of reuse*
B4.3 – *Use of water for irrigation purposes*	*Evaluate the consumption of irrigation water*
B4.5 – *Potable water consumption for indoor uses*	*Criterion is mandatory*

C – ENVIRONMENTAL LOADINGS

CRITERION	REASON/MOTIVATION
C1.3 – *Global Warming potential*	*Criterion is mandatory*
C3.1 – *Construction and demolition waste.*	*Not applicable*
C3.2 – *Solid waste from building operation.*	*Criterion is mandatory*
C3.3 - *Liquid effluents from building operations that are sent off the site.*	*To minimize the volume of waste water*
C4.1 - *Recharge of groundwater through permeable paving or landscaping.*	*To assess the extent to which natural groundwater in the site is recharged.*
C5.7 - *Contribution to Heat Island Effect from roofing, landscaping and paved areas.*	*Reduce the heat island effect*

D – INDOOR ENVIRONMENTAL QUALITY

CRITERION	REASON/MOTIVATION
D1.4 – T*VOC concentration in indoor air*	*Criterion is mandatory*
D2.2 – *Thermal comfort index*	*Criterion is mandatory*
D3.1 - *Appropriate daylighting in primary occupancies areas*	*To ensure an adequate level of daylighting in all primary occupied spaces.*
D4.1 - *Noise attenuation through the exterior envelope*	*Evaluate the quality with respect to noise sources*

E – SERVICE QUALITY

CRITERION	REASON/MOTIVATION
E3.1 - *Effectiveness of facility management control system*	*Evaluate the level of building control*
E5.5 - *On-going monitoring and verification of performance*	*Incentive monitoring of buildings*

F – SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	REASON/MOTIVATION
F1.1 - *Universal access on site and within the building*	*To assess the relative ease of access and use of facilities for persons with mobility or perceptual disabilities.*
F2.4 - *Use of traditional local materials and techniques*	*To assess the extent to which traditional local materials and construction techniques will used in the execution of the project.*

G – COST AND ECONOMIC ASPECTS	
CRITERION	**REASON/MOTIVATION**
G1.4 – *Use stage energy cost*	*Criterion is mandatory*
G1.5 – *Use stage water cost*	*Criterion is mandatory*

SBTool weights rationale

ISSUE	WEIGHT (1 to 3)	MOTIVATION
A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	**1**	Rigidity of the system
B – ENERGY AND RESOURCES CONSUMPTION	**3**	Political priority; PAC - PAES - EMAS
C – ENVIRONMENTAL LOADINGS	**3**	Political priority; PAC - PAES - EMAS
D – INDOOR ENVIRONMENTAL QUALITY	**2**	Reduced power of intervention - Reduced intervention domain
E – SERVICE QUALITY	**3**	Political priority; PAC - PAES - EMAS
F – SOCIAL CULTURAL AND PERCEPTUAL ASPECTS	**2**	Reduced power of intervention - Reduced intervention domain
G – COST AND ECONOMIC ASPECTS	**2**	Reduced power of intervention - Reduced intervention domain

CATEGORIES	WEIGHT (%)
B1 – In use energy consumptions	87
B3 – Use of materials	0
B4 – Use of water, stormwater and greywater	13
TOTAL	100
C1 – Greenhouse gas emissions	56
C3 – Solid and liquid waste	44
TOTAL	100
D1 – Indoor air quality and ventilation	0
D2 – Thermal comfort	100
TOTAL	100
G1 – Cost and economics	100
TOTAL	100

CRITERIA WEIGHTS

SBTool file A – WeightA-G

B - ENERGY AND RESOURCES CONSUMPTION						
B1 – In use energy consumptions						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B1.1	*9,0*	*5*	*4*	*2*		*Criterion is mandatory*
B1.2	*9,0*	*5*	*4*	*2*		*Criterion is mandatory*
B1.3	*9,0*	*5*	*4*	*2*		*Criterion is mandatory*
B1.5	*9,0*	*5*	*4*	*2*		*Criterion is mandatory*
B1.6	*9,0*	*5*	*4*	*2*		*Criterion is mandatory*
B1.11	*11,3*	*5*	*5*	*2*	*0*	*Not applicable*
B3 – Use of materials						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B3.5	*5,4*	*4*	*3*	*3*	*0*	*Not applicable*
B4 – Use of water, stormwater and greywater						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B4.5	*8,1*	*4*	*3*	*3*		*Criterion is mandatory*

C - ENVIRONMENTAL LOADINGS						
C1 - Greenhouse gas emissions						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.3	*13,5*	*5*	*4*	*3*		*Criterion is mandatory*
C3 - Solid and liquid waste						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C3.1	*5,4*	*4*	*3*	*2*	*0*	*Not applicable*
C3.2	*5,4*	*4*	*3*	*2*		*Criterion is mandatory*

D - INDOOR ENVIRONMENTAL QUALITY						
D1 - Indoor air quality and ventilation						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D1.4	*1,4*	*1*	*3*	*3*	*0*	*Not applicable*
D1.10	*1,4*	*1*	*3*	*3*	*0*	*Not applicable*
D2 – Thermal comfort						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D2.2	*1,4*	*1*	*3*	*3*		*Criterion is mandatory*

G - COST AND ECONOMIC ASPECTS						
G1 - Cost and economics						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G1.4	*0.9*	*2*	*3*	*1*		*Criterion is mandatory*
G1.5	*0.9*	*2*	*3*	*1*		*Criterion is mandatory*
TOTAL	**100**					

SBTool benchmarks rationale

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
A1.8	*The extent of vegetated landscaped area that is planted with native plants.*	*%*	*0: 45*	*UNI PdR 13 ITACA*
			5: 70	*UNI PdR 13 ITACA*
A1.10	*The existence and type of facilities for children's play and the quality of service provided*	-	*0: 0*	*UNI PdR 13 ITACA*
			5: 5	*UNI PdR 13 ITACA*
A1.12	*Amount of sheltered and unsheltered bicycle parking, location of bicycle parking facilities relative to building entrances*	-	*0: 0*	*UNI PdR 13 ITACA*
			5: 5	*UNI PdR 13 ITACA*
A2.1	*Development density of the project, expressed as the ratio of gross floor area above grade of the Design relative to the maximum permitted gross floor area on the site.*	*%*	*0: 35*	*Current level*
			5: 100	*Maximum exploitation*
A3.12	*Existence and type of an on-site public or communal transportation system*	-	*0: 0*	-
			5: 5	-

B - ENERGY AND RESOURCES CONSUMPTION				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
B1.1	*Primary energy demand*	*kWh/m2/y*	*0: 140*	-
			5: 23	*Energy regulation*
B1.2	*Delivered thermal energy demand*	*kWh/m2/y*	*0: 80*	-
			5: 10	*Energy regulation*
B1.3	*Delivered electric energy demand*	*kWh/m2/y*	*0: 23*	-
			5: 5	-
B1.5	*Energy from renewable sources in total thermal energy consumption*	*%*	*0: 25*	-
			5: 50	*D.Leg. 28/11*
B1.6	*Energy from renewable sources in total electric energy consumption*	*%*	*0: 35*	-
			5: 75	-
B1.11	*Embodied non-renewable primary energy*	*kWh/m^2/yr*	*0: -*	*Non applicable*
			5: -	*Non applicable*
B3.1	*Degree of re-use of suitable existing structure(s) where available*	*%*	*0: 0*	*UNI PdR 13 ITACA*
			5: 100	*UNI PdR 13 ITACA*

B3.5	*Recycled materials*	%	*0: 15*	*UNI PdR 13 ITACA*
			5: 50	*UNI PdR 13 ITACA*
B3.7	*Easy of disassembly, re-use or recycling*	-	*0: 0*	*Scenario*
			5: 5	*Scenario*
B4.3	*Use of water for irrigation purposes*	*m^3/m^2 year*	*0: 0,20*	*UNI PdR 13 ITACA*
			5: 0,05	-
B4.5	*Water consumption for indoor uses*	*m^3/occupant/year*	*0: 47*	*UNI PdR 13 ITACA*
			5: 23	-

C - ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
C1.3	*Global Warming potential*	*kg CO2 eq./m^2/yr*	*0: 28*	-
			5: 5	*Energy regulation*
C3.1	*Construction and demolition waste.*	*kg/m^2/life cycle stage*	*0: -*	*Non applicable*
			5: -	*Non applicable*
C3.2	*Solid waste from building operation.*	%	*0: 14*	*At least one*
			5: 100	*All the services*
C3.3	*Liquid effluents from building operations that are sent off the site.*	*m3 / pp*yr*	*0: 0,13*	*UNI PdR 13 ITACA*
			5: 0	*UNI PdR 13 ITACA*
C4.1	*Recharge of groundwater through permeable paving or landscaping.*	%	*0: 40*	*UNI PdR 13 ITACA*
			5: 60	*UNI PdR 13 ITACA*
C5.7	*Contribution to Heat Island Effect from roofing, landscaping and paved areas.*	%	*0: 0*	*UNI PdR 13 ITACA*
			5: 100	*UNI PdR 13 ITACA*

D - INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
D1.4	*TVOC concentration in indoor air*	*µg per cube meter*	*0: 2000*	*UNI PdR 13 ITACA*
			5: 1000	*<1500 limit CAM = 3*
D1.10	*Ventilation rate*	$l/s/m^2$	*0: 0,35*	*UNI EN 15251 Table B.5 Cat III*
			5: 0,49	*UNI EN 15251 Table B.5 Cat I*
D2.2	*Thermal comfort index*	-	*0: 10*	*UNI EN ISO 7730 Class B*
			5: 6	*UNI EN ISO 7730 Class A*

D3.1	*Appropriate daylighting in primary occupancies areas*	*%*	*0: 100*	*Reference law*
			5: 125	*UNI PdR 13 ITACA*
D4.1	*Noise attenuation through the exterior envelope*	*STC-Rw*	*0: 37*	*Standard window*
			5: 45	*Best window*

E - SERVICE QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
E3.1	*Effectiveness of facility management control system*	-	*0: 0*	*Scenario*
			5: 5	*Scenario*
E5.5	*On-going monitoring and verification of performance*	-	*0: 0*	*Scenario*
			5: 5	*Scenario*

F - SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
F1.1	*Universal access on site and within the building*	-	*0: 0*	*Scenario*
			5: 5	*Scenario*
F2.4	*Use of traditional local materials and techniques*	*%*	*0: 30*	*UNI PdR 13 ITACA*
			5: 80	*UNI PdR 13 ITACA*

G - COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
G1.4	*Use stage energy cost*	€/m2/yr	*0: 10,70*	-
			5: 1,75	*Energy regulation*
G1.5	*Use stage water cost*	*€/m2/yr*	*0: 1,55*	-
			5: 0,70	*Energy regulation*

SBTool Criteria Specifications

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE

CRITERION	INDICATOR	SPECIFICATIONS	
A1.8	*The extent of vegetated landscaped*	*Information source*	*Assessment by landscape architect*

	area that is planted with native plants	*Assessment method*	*The percent of landscaped area (excuding paved areas) planted with native species*
		Standard	*UNI PdR 13 ITACA*
A1.10	*The existence and type of facilities for children's play and the quality of service provided*	*Information source*	*Assessment by landscape architect*
		Assessment method	*Evaluation scenario*
		Standard	*UNI PdR 13 ITACA*
A1.12	*Amount of sheltered and unsheltered bicycle parking, location of bicycle parking facilities relative to building entrances*	*Information source*	*Rilievo*
		Assessment method	*Evaluation scenario*
		Standard	*UNI PdR 13 ITACA*
A2.1	*Development density of the project, expressed as the ratio of gross floor area above grade of the Design relative to the maximum permitted gross floor area on the site.*	*Information source*	*PRGC*
		Assessment method	*The ratio of gross floor area above grade of the Design relative to the maximum permitted gross floor area on the site*
		Standard	*Current situation*
A3.12	*Existence and type of an on-site public or communal transportation system.*	*Information source*	*Hours of public service*
		Assessment method	*Evaluation scenario*
		Standard	*Scenario*

B - ENERGY AND RESOURCES CONSUMPTION

CRITERION	INDICATOR	SPECIFICATIONS	
B1.1	*Primary energy demand per internal useful floor area per year*	*Information source*	*Consumption bills*
		Assessment method	*Calculated using the measured values*
		Standard	*Energy regulation*
B1.2	*Delivered thermal energy demand per internal useful floor area per year*	*Information source*	*Energy bills*
		Assessment method	*Calculated using the measured values*

B1.3	*Delivered electric energy demand per internal useful floor area per year*	*Standard*	*Energy regulation*
		Information source	*Energy bills*
		Assessment method	*Calculated using the measured values*
B1.5	*Share of renewable energy in final thermal energy consumptions*	*Standard*	*Reference of the law*
		Information source	*Monitoring of produced energy*
		Assessment method	*Calculated using the measured values*
B1.6	*Share of renewable energy in final electric energy consumption*	*Standard*	*Reference of the law*
		Information source	*Monitoring of produced energy*
		Assessment method	*Calculated using the measured values*
B1.11	*Embodied non-renewable primary energy*	*Standard*	-
		Information source	*Non applicable*
		Assessment method	-
B3.1	*Degree of re-use of suitable existing structure(s) where available*	*Standard*	-
		Information source	*Executive projects*
		Assessment method	*The percentage (by area) of existing sound structures that is planned to be re-used as part of the project*
B3.5	*Wight of recycled materials on total weight of materials.*	*Standard*	*UNI PdR 13 ITACA*
		Information source	*Non applicable*
		Assessment method	-
B3.7	*Easy of disassembly, re-use or recycling*	*Standard*	*UNI PdR 13 ITACA*
		Information source	*Executive projects*
		Assessment method	*Scenario*
B4.3	*Use of water for irrigation purposes*	*Standard*	*Scenario*
		Information source	*Consumption bills*
		Assessment method	*Volume of water on gross surface*
B4.5	*Potable water consumption per occupant per year*	*Standard*	*UNI PdR 13 ITACA*
		Information source	*Consumption bills*

		Assessment method	*Calculated using the measured values*
		Standard	*UNI PdR 13 ITACA*

C – ENVIRONMENTAL LOADINGS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
C1.3	*CO2 equivalent emissions per internal useful floor area per year*	*Information source*	*Energy bills*
		Assessment method	*Calculated using the estimate based on the measures*
		Standard	*Energy regulation*
C3.1	*Weight of waste and materials generated per 1 m2 of useful floor area demolished or constructed*	*Information source*	*Non applicable*
		Assessment method	*-*
		Standard	*UNI PdR 13 ITACA*
C3.2	*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*	*Information source*	*Relief and georeferencing containers*
		Assessment method	*Calculated using the measured values*
		Standard	*-*
C3.3	*Liquid effluents from building operations that are sent off the site.*	*Information source*	*Bills*
		Assessment method	*The predicted volume of liquid waste per year to be sent off the site for treatment*
		Standard	*UNI PdR 13 ITACA*
C4.1	*Recharge of groundwater through permeable paving or landscaping.*	*Information source*	*Design documents and on-site surveys*
		Assessment method	*The predicted percentage of precipitation that is able to recharge groundwater through permeable paving or landscaping.*
		Standard	*UNI PdR 13 ITACA adapted*

C5.7	*Contribution to Heat Island Effect from roofing, landscaping and paved areas.*	*Information source*	*Design documents and on-site surveys*
		Assessment method	*Percentage of surface with a high reflection index*
		Standard	*UNI PdR 13 ITACA*

D – INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	SPECIFICATIONS	
D1.4	*TVOC concentration in indoor air*	*Information source*	*Not applicable*
		Assessment method	-
		Standard	*UNI PdR 13 ITACA*
D1.10	*Ventilation rate normalized per useful floor area*	*Information source*	*Not applicable*
		Assessment method	
		Standard	*UNI EN 15251*
D2.2	*Predicted Percentage Dissatisfied (PPD)*	*Information source*	-
		Assessment method	-
		Standard	*UNI EN ISO 7730 Class B*
D3.1	Daylighting and Illumination	*Information source*	Design documents
		Assessment method	*Rapporto fra DF e DF lim*
		Standard	*UNI PdR 13 ITACA*
D4.1	Noise attenuation through the exterior envelope	*Information source*	Design documents
		Assessment method	*Ratio between DF and DF lim*
		Standard	*Standard window*

E – SERVICE QUALITY

CRITERION	INDICATOR	SPECIFICATIONS	
E3.1	*Effectiveness of facility management control system*	*Information source*	*Design documents*
		Assessment method	*Scenario*
		Standard	*Scenario*
E5.5	*On-going monitoring and verification of performance*	*Information source*	*Contract documentation.*
		Assessment method	*Scenario*
		Standard	*Scenario*

F – SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
F1.1	*Universal access on site and within the building*	*Information source*	*Design documents*
		Assessment method	*Scenario*
		Standard	*Scenario*
F2.4	*Use of traditional local materials and techniques*	*Information source*	*Design documents*
		Assessment method	*The estimated percentage of traditional local materials*
		Standard	*UNI PdR 13 ITACA*

G – COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G1.4	*Energy annual cost per usable floor area*	*Information source*	*Consumption bills*
		Assessment method	*Energy annual cost per usable floor area*
		Standard	*Energy regulation*

G1.5	*Water annual cost per usable floor area*	*Information source*	*Consumption bills*
		Assessment method	*Water annual cost per usable floor area*
		Standard	*Energy regulation*

REGIONAL TOOL

D.3.4.3 Regional Tool - EnvirobatBDM

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

BUILDING SCALE ASSESSMENT

SBTool structure

A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	

B – ENERGY AND RESOURCES CONSUMPTION	
B1	**Total life cycle non-renewable energy**
B1.1	Primary energy demand
B.1.2	Delivered thermal energy demand
B.1.3	Delivered electric energy demand
B.1.5	Energy from renewable sources in total thermal energy consumption
B.1.6	Energy from renewable sources in total electric energy consumption
B.1.11	Embodied non-renewable primary energy
B3	**Use of Material**
B3.5	Recycled materials
B4	**Use of potable water, stormwater and greywater**
B4.5	Potable water consumption for indoor uses

C- ENVIRONMENTAL LOADINGS	
C1	**Greenhouse Gas Emissions**
C1.3	Global Warming potential
C3	**Solid and Liquid Wastes**
C3.1	Construction and demolition waste
C3.2	Solid waste from building operation

D- INDOOR ENVIRONMENTAL QUALITY	
D1	**Indoor Air Quality and Ventilation**
D1.4	TVOC concentration in indoor air
D1.10	Ventilation rate
D2	**Air Temperature and Relative humidity**
D.2.2	Thermal comfort index

E- SERVICE QUALITY	

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS

G- COST AND ECONOMIC ASPECTS	
G1	**Cost and Economics**
G.1.4	*Use stage energy cost*
G.1.5	Use stage water cost

SBTool criteria selection rationale

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
CRITERION	**REASON/MOTIVATION**

B – ENERGY AND RESOURCES CONSUMPTION	
CRITERION	**REASON/MOTIVATION**
B1.1 Primary energy demand	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
B1.2 Delivered thermal energy demand	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
B1.3 Delivered electric energy demand	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
B1.5 Energy from renewable sources in total thermal energy consumption	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
B1.6 Energy from renewable sources in total electric energy consumption	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
B1.11 Embodied non-renewable primary energy	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment –*

	despite the different local approaches.
B3.5 Recycled materials	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
B4.5 Potable water consumption for indoor uses	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*

C- ENVIRONMENTAL LOADINGS

CRITERION	REASON/MOTIVATION
C1.3 Global Warming potential	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
C3.1 Construction and demolition waste	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
C3.2 Solid waste from building operation	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	REASON/MOTIVATION
D1.4 TVOC concentration in indoor air	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
D1.10 Ventilation rate	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
D2.2 Thermal comfort index	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*

E- SERVICE QUALITY

CRITERION	REASON/MOTIVATION
/	

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
CRITERION	REASON/MOTIVATION
/	

G- COST AND ECONOMIC ASPECTS	
CRITERION	REASON/MOTIVATION
G1.4 Use stage energy cost	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*
G1.5 Use stage water cost	*KPI are mandatory; KPI were sufficient for local purposes. The motivation is to share with partners a Passport that will allow us to discuss issues related to sustainable building assessment – despite the different local approaches.*

SBTool weights rationale

ISSUE	WEIGHT (1 to 3)	MOTIVATION
A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	**1**	**Default values from CESBA MED PP were used**
B – ENERGY AND RESOURCES CONSUMPTION	3	Default values from CESBA MED PP were used
C- ENVIRONMENTAL LOADINGS	3	Default values from CESBA MED PP were used
D- INDOOR ENVIRONMENTAL QUALITY	2	Default values from CESBA MED PP were used
E- SERVICE QUALITY	1	Default values from CESBA MED PP were used
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS	1	Default values from CESBA MED PP were used
G- COST AND ECONOMIC ASPECTS	2	Default values from CESBA MED PP were used

CATEGORIES	WEIGHT (%)
A1- Site regeneration and Development	0
A2- Urban design	0
A3- Project Infrastructure and Services	0
SUB TOTAL- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	0
B1- Total life cycle non renewable energy	60
B2- Embodied energy	0
B3- Use of materials	5
B4 – Use of water, stormwater and greywater	7
SUB TOTAL ENERGY AND RESOURCES CONSUMPTION	72
C1- Greenhouse gas emissions	15
C2- Other atmospheric emissions	0
C3- Solid and liquid waste	10
C4- Impact on project site	0
C5- Other local and regional impacts	0
SUB TOTAL- ENVIRONMENTAL LOADINGS	25
D1- Indoor air quality and ventilation	1
D2- Thermal comfort	1
D3– Visual comfort	0
D4– Acoustic comfort	0
SUB TOTAL- INDOOR ENVIRONMENTAL QUALITY	2
E1- Safety and Security	0
E2- Functionality and efficiency	0
E3- Controllability	
E4– Flexibility and adaptability	0
E5- Optimization and maintenance of operating performance	
SUB TOTAL - SERVICE QUALITY	0
F1- Social aspects	0
F2- Culture and heritage	0
F3- Perceptual	0
SUB TOTAL - SOCIAL CULTURAL AND PERCEPTUAL ASPECTS	0
G1- Cost and economics	2
SUB TOTAL - COST AND ECONOMIC ASPECTS	2
TOTAL	100

CRITERIA WEIGHTS

sheet WeightsA: B= Intensity 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

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 Primary energy demand	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PP were used*
B1.2 Delivered	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PP were used*

thermal energy demand						
B1.3 Delivered electric energy demand	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PP were used*
B1.5 Energy from renewable sources in total thermal energy consumption	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PP were used*
B1.6 Energy from renewable sources in total electric energy consumption	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PP were used*
B1.11 Embodied non-renewable primary energy	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PP were used*
B2- Electrical peak demand						
B3- Use of Material						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B3.5 Recycled materials	*5%*	*2*	*4*	*3*	*5%*	*Default values from CESBA MED PP were used*

B4- Use of potable water, stormwater and greywater						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B4.5 Potable water consumption for indoor uses	7%	3	4	3		

C- ENVIRONMENTAL LOADINGS						
C1- Greenhouse Gas Emissions						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.3 Global Warming potential	*15%*	*3*	*5*	*5*	*15%*	*Default values from CESBA MED PP were used*
C3 - Solid and Liquid Wastes						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C3.1 Construction and demolition waste	5%	2	4	3	5%	Default values from CESBA MED PP were used
C3.2 Solid waste from building operation	5%	2	4	3	5%	Default values from CESBA MED PP were used

D- INDOOR ENVIRONMENTAL QUALITY						
D1- Indoor Air Quality and Ventilation						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D1.4 TVOC concentration in indoor air	*0,5%*	3	*1*	*3*	*1%*	*Default values from CESBA MED PP were used*
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**

D1.10 Ventilation rate	*0,5%*	3	*3*	*3*	*1%*	*Default values from CESBA MED PP were used*

D2 - Air Temperature and Relative humidity						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D2.2 Thermal comfort index	*1%*	3	*1*	*3*	*1%*	*Default values from CESBA MED PP were used*

G- COST AND ECONOMIC ASPECTS						
G1- Cost and Economics						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G1.4 Use stage energy cost	1%	3	2	3	1%	*Default values from CESBA MED PP were used*
G1.5 Use stage water cost	*0.4%*	1	*2*	*3*	*0.4%*	*Default values from CESBA MED PP were used*

SBTool benchmarks rationale

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/m2/y*	*0: 48* *3: 15* 5 : 0	Building regulation (2020)
B1.2 Delivered thermal energy demand	*Delivered thermal energy demand per area per year*	*kWh/m2/y*	*0: 40* *3: 15* 5 : 0	consultant feedback
B1.3 Delivered electric energy demand	Delivered electric energy demand per area per year	*kWh/m2/y*	*0: 40* *3:15* *5 : 0*	consultant feedback
B1.5 Energy from renewable sources in total thermal energy consumption	Share of renewable energy in final thermal energy consumptions	*%*	*0: 25* *3: 80* 5 : 100	consultant feedback
B1.6 Energy from renewable sources in total electric energy	*Share of renewable energy in final electric energy consumption*	*%*	*0: 10* *3: 100*	consultant feedback

consumption			5 : 200	
B1.11 Embodied non-renewable primary energy	*Embodied primary non-renewable energy*	*MJ/m2*	*0: 180* *3: 108* 5 : 90	values A1 to A3 on future building regulation E+C- or calcul on Elodie. Other sources from HQE performance 2011 and the guide_bio_tech_l_energie_grise_des_materiaux_et_des_ouvrages
B3.5 Recycled materials	Weight of recycled materials on total weight of materials	*%*	*0: 5* *3: 45* 5 : 75	*Aura and Indi*
B4.5 Potable water consumption for indoor uses	*Water consumption per occupant per year*	*m3/occupant/year*	*0: 40* *3: 25* 5 : 20	Study Tribu/Ademe

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./m2/yr*	*0: 20* *3: 10* *5: 5*	Regulatory labels
C3.1 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*	*0: 1400* 3: 1000 *5: 600*	Figures given in the CESBA protocol
C3.2 Solid waste from building operation	*Ratio of the number of collectable solid waste types within a 100 m distance from the building's entrance to the reference solid waste categories*	%	*0: 0,4* *3: 0,7* *5: 1*	Criteria based on local practices in dense urban areas

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS

D1.4 TVOC concentration in indoor air	TVOC concentration in indoor air	µg/ m3	*0: 300* *3: >200* *5 : <200*	HQE Performance
D1.10 Ventilation rate	Ventilation rate normalized per useful floor area	*l/s.m2*	*0 : 0,5* *3 : 0,7* *5 : 0,9*	*Annex B of EN15251*
D2.2 Thermal comfort index	Predicted Percentage Dissatisfied	*%*	0: 10 3: 7 5 : 5	Annex A of ISO 7730

G- COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
G1.4 Use stage energy cost	Energy annual cost per usable floor area	€/m2.yr	*0: 15* *3: 7* *5: 5*	*consultant feedback*
G1.5 Use stage water cost	Water annual cost per usable floor area	€/m2.yr	*0: 10* *3: 5* *5: 3*	*consultant feedback*

SBTool Criteria Specifications

B- ENERGY AND RESOURCES CONSUMPTION

CRITERION	INDICATOR	SPECIFICATIONS	
B1.1 Primary energy demand	Primary energy demand per area per year	*Information source*	*Models and simulation*
		Assessment method	*The calculation methods for each sub-indicator are given by the CEN standards that support the implementation of the Directive on the Energy Performance of Buildings (EPBD) in the European Union. The CEN standards that form the basis of the calculation methods of most national regulations are: EN 15603 (Energy performance of buildings.* *Overall energy consumption and definition of energy assessments) and EN ISO 52000 (Energy performance of buildings - Calculation of energy requirements for space heating and*

			cooling). In fact, the national calculation methods used to produce the energy performance certificates can be used here. Interior lighting is not always covered by national regulations. As a result, the evaluator must clearly mention in his report that the consumptions were discarded or detail the specific method used. 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).
		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	Delivered thermal energy demand per year	*Information source*	*Models and simulation*
		Assessment method	*The calculation method for this indicator is given by the CEN standards that support the implementation of the Directive on the energy performance of buildings (EPBD) in the European Union. The CEN standards that form the basis of the calculation methods of most national regulations are: EN 52000 (Energy performance of buildings. Overall energy consumption and definition of energy assessments) and EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). In fact, the national calculation methods used to produce the energy performance certificates can be used here.*
		Standard	*Level (s) EN 52000 (Energy performance of buildings. Overall energy consumption and definition of energy assessments) and EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). In fact, the national calculation methods used to produce the energy performance certificates can be used here.*
B1.3 Delivered electric energy demand	Delivered electric energy demand per area per year	*Information source*	*Models and simulation*
		Assessment method	*The calculation method for this indicator is given by the CEN standards that support the implementation of the Directive on the energy performance of buildings (EPBD) in the European Union. The CEN standards which form the basis of the calculation methods of most national regulations are: EN 52000 (Energy performance of*

			buildings. Overall energy consumption and definition of energy assessments) and EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). In fact, the national calculation methods used to produce the energy performance certificates can be used here. In the case of existing buildings, the electrical energy delivered must be evaluated preferentially from the data collected.
		Standard	*EN 52000 (Energy performance of buildings. Overall energy consumption and definition of energy assessments) and EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling)*
B1.5 Energy from renewable sources in total thermal energy consumption	Share of renewable energy in final thermal energy consumptions	*Information source*	*Models and simulation*
		Assessment method	*The calculation method for this indicator is given by the CEN standards which support the implementation of the Directive on the energy performance of buildings.*
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments*
B1.6 Energy from renewable sources in total electric energy consumption	*Share of renewable energy in final electric energy consumption*	*Information source*	*Models and simulation*
		Assessment method	*The calculation method for this indicator is given by the CEN standards which support the implementation of the Directive on the energy performance of buildings. In the case of existing buildings, the share of renewable energy in total electricity consumption should be assessed from measurements. References and standards*
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments*
B1.11 Embodied non-renewable primary energy	*Embodied primary non-renewable energy*	*Information source*	*Models and simulation*
		Assessment method	*The main reference standards for this indicator are ISO 14040/44, EN 15804 (Contribution of construction works to sustainable development - Environmental product declarations - Rules governing categories of construction products) and EN 1578 (Contribution of construction works to sustainable development - Evaluation of the environmental performance of buildings - Calculation method). The calculation of this indicator is based on the inventory of the different materials that make up the building (enkg), the nomenclature of material surveys. The document lists the quantities of different materials by type of constructive elements. The starting point is the DQE, estimated quantitative detail, which details the various elements of the project (foundations, columns ...). The*

			nomenclature of material records describes the different materials that make up the elements of the building. Once the material survey has been completed, the indicator can be calculated. The different stages of the calculation are the following: -Compiling the masses of different materials; this compilation work must be at least 99% of the total mass of the building; -Identify the different elements of the buildings. A decomposition by material must be carried out. And the mass of each of the materials estimated: - Aggregate by material: the masses by type of elements must be added so as to obtain the total mass per material. Once the nomenclature of the material surveys carried out, it is possible to calculate the indicator by associating each material (in kg) with the corresponding gray energy factor (in MJ / kg). The total value of gray energy of non-renewable origin is then reported to the surface.
		Standard	*EN 15978 (Contribution of construction works to sustainable development - Evaluation of the environmental performance of buildings - Calculation method)*

B3.5 Recycled materials	Weight of recycled materials on total weight of materials	*Information source*	*Models and simulation or material documents*
		Assessment method	*To calculate the value of the indicator it is necessary to compile a Bill of Materials (BoM) that is a mass-based inventory of the different materials (kg) that compose a building. The BoM is organised according to main elements that a building is composed of. The starting point is the Bill of Quantities (BoQ) that specifies the elements of a building (e.g. foundations, columns). The BoQ comprises different categories of elements, which can have different functional performance characteristics. A BoM differs from a BoQ in that it describes the different materials (e.g. wood, steel, aluminium) that are contained in the various building elements. Once the BoM has been compiled, it is possible to calculate the value of the indicator. The following steps should be followed in order to characterize the indicator: - Compile the Bill of Quantities: A BoQ is compiled which comprises the building elements accounting for at least 99% of the mass of the building. - Identify the basic composition of each building element. A breakdown of its constituent materials has to elaborated. The mass of each constituent material has to be estimated; - Aggregation by material: the mass of all constituent material should thereafter be aggregated to obtain the total mass of materials used in the building (A); - Identify the recycled content of each constituent material (in mass); - Aggregation by material: the recycled mass of*

			all constituent materials should thereafter be aggregated to obtain the total recycled mass of materials (B) used in the building; *- The indicator's value is calculated as B/A (total mass of recycled materials on the total mass of materials).*
		Standard	*/*

B4.5 Potable water consumption for indoor uses	*Water consumption per occupant per year*	*Information source*	*Models and simulation*
		Assessment method	*The evaluator should include sanitary equipment (ie toilets, taps and showers) that consume water (ie dishwashers, washing machines). The unit consumptions of the different devices are determined from the industrial data. The specific factors of use must be established, as well as the number of days of occupation per year.* *The principle of calculating the consumption per occupant for faucets and showers is as follows:* *Total consumption (L / n of day of occ.) =? Unit consumption (L / min) x utilization factor x (min / nb of day of occ.)* *The calculation is the same for the consumptions related to the use of the toilets (the flushes replace the minutes).* *For hygiene, the bases of calculation are as follows:* *Total consumption (L / year) = unit consumption (L / m²) area (m2) × annual washing number (year - 1)* *Total consumption (m3 / occupant. year) = total consumption (L / year) x 0.001 (m3 / L) + occupancy time (occupant) Non-potable water consumption must be specified (eg reclaimed water used for In the case of existing buildings, the indicator should be calculated from measured data. The measured consumption must be averaged over a period of 3 years.*
		Standard	Tool "Water calculator"

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C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	SPECIFICATIONS	
C1.3 Global Warming potential	*CO2 equivalent emissions per area per year*	*Information source*	*Models and simulation*
		Assessment method	*Calculation of CO2eq emissions. for each building can be realized thanks to this formula:* *E = [Σ (Qfuel, i x LHVi × Kem, i) + (Qel × Kem, el) + (Qdh × Kem, dh)] / SuQfuel, I = annual quantity of i-th fuel (m3 or kg)* *Qel = annual quantity of electricity from the grid (kWh)* *Qdh = annual amount of energy from the district heating or cooling network (kWh)* *LHVi = lower calorific value of i-th fuel (kWh / m3 or kWh / kg)* *Kem, i = CO2 emission factor eq. i-th fuel (kg CO2 / kWh)* *Kem, el = CO2 emission factor eq. electrical*

			energy from the grid (kg CO2 / kWh) *Kem, dh = CO2 emission factor eq. of the urban heat or cold network (kg CO2 / kWh)* *Su = total usable area of buildings*
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments)*
C3.1 Construction and demolition waste	Weight of waste and materials generated per 1 m2 of useful floor area demolished or constructed	*Information source*	*Models and simulation*
		Assessment method	*1. Design phase (based on estimates): Estimates based on surveys of existing buildings that will undergo a major renovation or whose structure will be reused (life cycle stage B5). Estimates based on building deconstruction and demolition scenarios beyond the end of building use (life cycle stages C1 / 3, D).* *2. Construction (based on data collected on site): Data of deconstruction and demolition of a building to make room for a new construction (as part of the life cycle stages) .Data of partial deconstruction of a building for on-site reuse. On-site construction data for a new building and / or prefabrication / construction of some off-site elements (Life Cycle Steps A3 / 5)* *3. Completion (based on estimates supported by compliant plans): Estimates based on deconstruction and demolition scenarios of the building beyond the end of use of the building (life cycle stages C1 / 3, D)* *4 Post-delivery (based on commissioning and testing)* *5. Occupation (based on measured performance)* *6.End of life (based on the envisaged performance): Details the measures taken in the design phase to facilitate the construction, reuse and recycling (stages of the C1 / 3, D life cycle).*
		Standard	*/*
C3.2 Solid waste from building operation	*Ratio of the number of collectable solid waste types within a 100 m distance from the building's entrance to the reference solid waste categories*	*Information source*	*Plans of the area with the location of containers*
		Assessment method	*The seven solid waste reference categories are:* *-Paper* *-Plastic* *-Metal* *-Glass* *-Wet waste* *-Textiles* *-Dangerous* *Identify the availability and location of dedicated containers for each of the 7 categories of solid waste. Calculate the walking distance (m) of the main building door for each sorting equipment. Evaluate which of the 7 categories of solid waste can be collected within a 50m perimeter from the main entrance of the building (A) .The value of the indicator is given by the ratio: A / 7*

		Standard	/
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D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	SPECIFICATIONS	
D1.4 TVOC concentration in indoor air	TVOC concentration in indoor air	*Information source*	*Measured data*
		Assessment method	*The value of the indicator must be given by measurements in situ in occupancy (and after delivery). Measurements must be carried out on at least 10% of the apartments. These must be representative of the different types of housing, configurations and materials used. The samples must be taken from the living room and the smallest room of each apartment. The measuring equipment must be placed in the center of the room so as not to be too much influenced by the doors and windows and the air inlets.* *The sampling method shall be in accordance with ISO 16000-6 (Indoor Air - Part 6: Determination of Volatile Organic Compounds in Indoor Air and Active Sampling Chambers on Tenax TA (R) Sorbent, Desorption thermal and gas chromatographic using MS or MS / FID) or equivalent.* *In the design phase, product testing can be used as a simplified data source. These emissions must be evaluated over a period of 28 days. They must be established in accordance with standard NF EN 16516 (Construction products - evaluation of the emission of dangerous substances - Determination of indoor air emissions).* *Test data is then required from the manufacturers and suppliers of the products concerned. All tests must be on compliant finished products.* *References and Standards EN 15251 (Indoor Environment Criteria for the Design and Evaluation of the Energy Performance of Buildings covering Indoor Air Quality, Thermal, Lighting and Acoustics)* *Resources:* *VOC and housing (up to 35 substances): "In the gas phase, the chemical compounds present are mainly Volatile Organic Compounds (VOCs) containing a multitude of substances of different chemical families, and are thus detected in the indoor environments in a more significant way than some aldehydes (including formaldehyde mainly and almost systematically), certain aromatic hydrocarbons including benzene, toluene, ethylbenzene and xylenes commonly called BTEX, but also VOCs belonging to the families of terpenes, ketones, alcohols, ethers of*

			Glycol ... "For information, the United States recommends a total VOC concentration of less than 200 µg / m3 as the comfort threshold and Germany recommends a target value of 300 µg / m3. measures of_19 "Air Atmo Alsace http: //www.atmo-alsace.net/medias/products/Campagne_de_measures_de_19.pdf
		Standard	*ISO 16000-6 (Indoor Air - Part 6: Determination of Volatile Organic Compounds in Indoor Air and Active Sampling Chambers on Tenax TA (R) Sorbent, Desorption thermal and gas chromatographic using MS or MS / FID) or equivalent.* *NF EN 16516 (Construction products - evaluation of the emission of dangerous substances - Determination of indoor air emissions).*

D1.10 Ventilation rate	Ventilation rate normalized per useful floor area	*Information source*	*Estimation or measured method*
		Assessment method	*Project stage: design* *A design simulation of the building's ventilation strategy in accordance with EN 16798-7 (Energy performance of buildings - Ventilation for buildings - Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration) shall be used to calculate the ventilation rate. According to Directive 2010/31/EU for the Energy Performance of buildings, a ventilation system is part of the technical building system. The simulation shall therefore always form part of the performance assessment for the typical use of a building as a whole.* *The ventilation rate (l/s/m2) must be calculated in all the main rooms, excluding circulation spaces and service rooms (i.e. toilets).* *The indicator must be calculated as weighted sum all the calculated ventilation rates:* *Indicator=* $\left(\sum V_i \times S_{u,i}\right)/\left(\sum S_{u,i}\right)$ *Vi = Ventilation rate calculated in the i-th room (l/s/m2)* *Su,i = useful floor area of the i-th room (m2)* *Project stage: post completion* *The ventilation rate shall be tested as part of the commissioning process on site according to the methods described in Annex D of EN 12599. The average ventilation rate shall be reported. Measurements can be taken at a number of points in a system. The measurements shall be made for the related ducts and/or air terminals that supply air to the internal spaces as identified according to the guidance in section 2.1.2.2 of the reference standard.*

		Standard	*EN 16798-7 - Energy performance of buildings - Ventilation for buildings - Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration.* *EN 12599 - Ventilation for buildings - Test procedures and measurement methods to hand over air conditioning and ventilation systems.*
D2.2 Thermal comfort index	Predicted Percentage Dissatisfied	Information source	*Models and simulation or measured method*
		Assessment method	*In the design phase, PPD estimation can be done using simulation software. In the operation phase, the PPD can be measured.* *The value of the PPD shall be calculated or measured in accordance with EN 7730 (Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort by calculation of the PMV and PPD indices and by local thermal comfort criteria) for the seasonal and winter conditions.* *The PDP must be evaluated in all main living rooms and bedrooms. In the case of a collective dwelling, each configuration and orientation must be evaluated.* *The measuring point should be placed one meter from the center of the main window of each room. The following parameters must be used to characterize the value of the PDP:* *-clothing thermal resistance (clo) = 0.5-metabolic energy (met) = 1.2* *To evaluate the value of the PDP on a building as a whole, the PPD values estimated or measured in each room must be aggregated by a weighted average: PPDm = Sum PPDi x Au, i / Sum Au, where:* *PPDi = PPD for the coin-th* *Au, i = useful area of the i-th room*
		Standard	*EN 7730 (Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort by calculation of the PMV and PPD indices and by local thermal comfort criteria*

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G- COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G1.4 Use stage energy cost	Energy annual cost per usable floor area	Information source	*Models and simulation*
		Assessment method	*The calculation can be based on estimates in the design phase. It must be based on consumption monitoring during the exploitation phase. The indicator can be used by different actors for different purposes. In the design phase, it can be used to estimate future operating costs. In the operating phase, it can be used to compare the real performance of the building with the estimated estimates. For existing buildings, the total annual cost of*

			thermal and electrical consumption from energy bills must be realized over an average of 3 years.
		Standard	/
G1.5 Use stage water cost	Water annual cost per usable floor area	*Information source*	*Models and simulation*
		Assessment method	*The calculation can be based on estimates in the design phase. It must be based on consumption monitoring during the operation phase. The indicator can be used by different actors for different purposes. In the design phase, it can be used to estimate future operating costs. In the operation phase, it can be used to compare the real performance of the building with the estimated estimates.* *For existing buildings, the total annual cost of water consumption from the invoices must be realized over an average of 3 years.*
		Standard	/

REGIONAL TOOL

D.3.4.3 Regional Tool – AURA-EE

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

BUILDING SCALE ASSESSMENT

SBTool structure

A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE
/

B – ENERGY AND RESOURCES CONSUMPTION	
B1	**Total life cycle non-renewable energy**
B1.1	Primary energy demand
B.1.2	Delivered thermal energy demand
B.1.3	Delivered electric energy demand
B.1.5	Energy from renewable sources in total thermal energy consumption
B.1.6	Energy from renewable sources in total electric energy consumption
B.1.11	Embodied non-renewable primary energy
B3	**Use of Material**
B3.5	Recycled materials
B4	**Use of potable water, stormwater and greywater**
B4.5	**Potable water** consumption for indoor uses

C- ENVIRONMENTAL LOADINGS	
C1	**Greenhouse Gas Emissions**
C1.3	Global Warming potential
C3	**Solid and Liquid Wastes**
C3.1	Construction and demolition waste
C3.2	Solid waste from building operation

D- INDOOR ENVIRONMENTAL QUALITY	
D1	**Indoor Air Quality and Ventilation**
D1.4	TVOC concentration in indoor air
D2	**Air Temperature and Relative humidity**
D.2.2	Thermal comfort index

E- SERVICE QUALITY
/

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS
/

G- COST AND ECONOMIC ASPECTS	
G1	**Cost and Economics**
G.1.4	*Use stage energy cost*
G.1.5	Use stage water cost

SBTool criteria selection rationale

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
CRITERION	**REASON/MOTIVATION**
/	

B – ENERGY AND RESOURCES CONSUMPTION	
CRITERION	**REASON/MOTIVATION**
B1.1 Primary energy demand	*KPI are mandatory; KPI were sufficient for local purposes*
B1.2 Delivered thermal energy demand	KPI are mandatory; KPI were sufficient for local purposes
B1.3 Delivered electric energy demand	KPI are mandatory; KPI were sufficient for local purposes
B1.5 Energy from renewable sources in total thermal energy consumption	KPI are mandatory; KPI were sufficient for local purposes
B1.6 Energy from renewable sources in total electric energy consumption	KPI are mandatory; KPI were sufficient for local purposes
B1.11 Embodied non-renewable primary energy	KPI are mandatory; KPI were sufficient for local purposes
B3.5 Recycled materials	KPI are mandatory; KPI were sufficient for local purposes
B4.5 Potable water consumption for indoor uses	KPI are mandatory; KPI were sufficient for local purposes

C- ENVIRONMENTAL LOADINGS	
CRITERION	**REASON/MOTIVATION**
C1.3 Global Warming potential	KPI are mandatory; KPI were sufficient for local purposes
C3.1 Construction and demolition waste	KPI are mandatory; KPI were sufficient for local purposes

C3.2 Solid waste from building operation	KPI are mandatory; KPI were sufficient for local purposes

D- INDOOR ENVIRONMENTAL QUALITY	
CRITERION	**REASON/MOTIVATION**
D1.4 TVOC concentration in indoor air	KPI are mandatory; KPI were sufficient for local purposes
D2.2 Thermal comfort index	KPI are mandatory; KPI were sufficient for local purposes

E- SERVICE QUALITY	
CRITERION	**REASON/MOTIVATION**
/	

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
CRITERION	**REASON/MOTIVATION**
/	

G- COST AND ECONOMIC ASPECTS	
CRITERION	**REASON/MOTIVATION**
G1.4 Use stage energy cost	KPI are mandatory; KPI were sufficient for local purposes
G1.5 Use stage water cost	KPI are mandatory; KPI were sufficient for local purposes

SBTool weights rationale

ISSUE	WEIGHT (1 to 3)	MOTIVATION
A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	**1**	**Default values from CESBA MED PPs were relevant**
B – ENERGY AND RESOURCES CONSUMPTION	3	Default values from CESBA MED PPs were relevant
C- ENVIRONMENTAL LOADINGS	3	Default values from CESBA MED PPs were relevant
D- INDOOR ENVIRONMENTAL QUALITY	2	Default values from CESBA MED PPs were relevant
E- SERVICE QUALITY	1	Default values from CESBA MED PPs were relevant
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS	1	Default values from CESBA MED PPs were relevant
G- COST AND ECONOMIC ASPECTS	2	Default values from CESBA MED PPs were relevant

CATEGORIES	WEIGHT (%)
A1- Site regeneration and Development	0
A2- Urban design	0
A3- Project Infrastructure and Services	0
SUB TOTAL	0
B1- Total life cycle non renewable energy	60
B2- Embodied energy	0
B3- Use of materials	5
B4 – Use of water, stormwater and greywater	7
SUB TOTAL	72
C1- Greenhouse gas emissions	15
C2- Other atmospheric emissions	0
C3- Solid and liquid waste	10
C4- Impact on project site	0
C5- Other local and regional impacts	0
SUB TOTAL	25
D1- Indoor air quality and ventilation	1
D2- Thermal comfort	1
D3– Visual comfort	0
D4– Acoustic comfort	0
SUB TOTAL	2
E1- Safety and Security	0
E2- Functionality and efficiency	0

E3- Controllability **E4– Flexibility and adaptability** **E5- Optimization and maintenance of operating performance**	0
SUB TOTAL	0
F1- Social aspects	0
F2- Culture and heritage	0
F3- Perceptual	0
SUB TOTAL	0
G1- Cost and economics	2
SUB TOTAL	2
TOTAL	100

CRITERIA WEIGHTS

sheet WeightsA: B= Intensity 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

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 Primary energy demand	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PPs were relevant*
B1.2 Delivered thermal energy demand	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PPs were relevant*
B1.3 Delivered electric energy demand	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PPs were relevant*
B1.5 Energy from renewable sources in total thermal energy consumption	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PPs were relevant*
B1.6 Energy from renewable sources in total electric energy consumption	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PPs were relevant*
B1.11 Embodied non-renewable primary energy	*10%*	*2*	*5*	*5*	*10%*	*Default values from CESBA MED PPs were relevant*
B2- Electrical peak demand						
B3- Use of Material						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B3.5 Recycled materials	*5%*	*2*	*4*	*3*	*5%*	*Default values from CESBA MED PPs were relevant*
B4- Use of potable water, stormwater and greywater						

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B4.5 Potable water consumption for indoor uses	7%	3	4	3		

C- ENVIRONMENTAL LOADINGS

C1- Greenhouse Gas Emissions

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C1.3 Global Warming potential	*15%*	*3*	*5*	*5*	*15%*	*Default values from CESBA MED PPs were relevant*

C3 - Solid and Liquid Wastes

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
C3.1 Construction and demolition waste	5%	2	4	3	5%	*Default values from CESBA MED PPs were relevant*
C3.2 Solid waste from building operation	5%	2	4	3	5%	*Default values from CESBA MED PPs were relevant*

D- INDOOR ENVIRONMENTAL QUALITY

D1- Indoor Air Quality and Ventilation

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.4 TVOC concentration in indoor air	*1%*	3	*1*	*3*	*1%*	*Default values from CESBA MED PPs were relevant*

D2 - Air Temperature and Relative humidity

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D2.2 Thermal comfort index	*1%*	3	*1*	*3*	*1%*	*Default values from CESBA MED PPs were relevant*

G- COST AND ECONOMIC ASPECTS

G1- Cost and Economics

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G1.4 Use stage energy cost	1%	3	2	3	1%	*Default values from CESBA MED PPs were relevant*
G1.5 Use stage water cost	*0.4%*	1	*2*	*3*	*0.4%*	*Default values from CESBA MED PPs were relevant*

SBTool benchmarks rationale

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/m2/y*	*0: 140*	Result new collective dwellings RT2012
			3: 50	Mid value
			5 : 0	Result new collective dwellings RT2012
B1.2 Delivered thermal energy demand	*Delivered thermal energy demand per area per year*	*kWh/m2/y*	*0: 130*	Result new collective dwellings RT2012
			3: 45	Mid value
			5 : 30	Result new collective dwellings RT2012
B1.3 Delivered electric energy demand	Delivered electric energy demand per area per year	*kWh/m2/y*	*0: 140*	Result new collective dwellings RT2012
			3: 50	Mid value
			5 : 0	Result new collective dwellings RT2012
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: 10*	*The minimum value given corresponds to the criteria given in the Greater Lyon Sustainable Habitat framework, which requires an active renewable energy production with a minimum*
			3: 80	high-performance building
			5 : 100	*Autonomous building*
B1.5 Energy from renewable sources in total thermal energy consumption	Share of renewable energy in final thermal energy consumptions	*%*	*0: 10*	The minimum value given corresponds to the criteria given in the Greater Lyon Sustainable Habitat framework, which requires an active renewable energy production with a minimum
			3: 80	High-performance building
			5 : 100	Autonomous building
B1.6 Energy from renewable sources in total electric energy consumption	*Share of renewable energy in final electric energy consumption*	*%*	*0: 10*	The minimum value given corresponds to the criteria given in the Greater Lyon Sustainable Habitat

				framework, which requires an active renewable energy production with a minimum
			3: 80	High-performance building
			5 : 100	Autonomous building for electricity
B1.11 Embodied non-renewable primary energy	*Embodied primary non-renewable energy*	*MJ/m2*	*0: 900*	Sources: CSTB report "Capitalization of the results of the HQE Performance experimentation, Statistical analysis, Action 22" of October 2013. 250kWhep/m²shon/an toute typologie confondue
			3: 630	*175 kWhep / m²shon / year any typology taken together*
			5 : 504	140 kWhep / m²shon / year any typology taken together
B3.5 Recycled materials	Weight of recycled materials on total weight of materials	*%*	*0: 5*	*Actual professional* practice
			3: 45	*objective of professional practice*
			5 : 75	objective of professional best practice
B4.5 Potable water consumption for indoor uses	*Water consumption per occupant per year*	*m3/occupant/year*	*0: 90*	Assumptions: for all dwellings, people present every day of the year, heavy use of all water uses, consumer equipment, over-occupancy - see Water Calculator tool - for 3121 m² SHAB, with 3 occupants per dwelling and 50 dwellings
			3: 30	*Water Calculator - 3121 m² SHAB, with 2.3 occupants per dwelling and 50 dwellings*
			5 : 20	Water Calculator - 3121 m² SHAB with 2.3 occupants per dwelling and 50 dwellings

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./m2/yr*	*0: 80*	Emissions from the regulatory calculation
			3: 10	Emissions from the regulatory calculation

			5: 5	Emissions from the regulatory calculation
C3.1 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*	*0: 1700*	Figures given in the CESBA protocol
			3: 1200	Figures given in the CESBA protocol
			5: 600	Figures given in the CESBA protocol
C3.2 Solid waste from building operation	*Ratio of the number of collectable solid waste types within a 100 m distance from the building's entrance to the reference solid waste categories*	%	*0: 0,4*	Criteria based on local practices in dense urban areas
			3: 0,7	Criteria based on local practices in dense urban areas
			5: 1	Criteria based on local practices in dense urban areas

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
D1.4 TVOC concentration in indoor air	TVOC concentration in indoor air	µg/ m3	*0: 300*	Recommendation of German Federal Agency
			3: 200	*Local value*
			5 : 100	*Local objective*
D2.2 Thermal comfort index	Predicted Percentage Dissatisfied	*%*	0: 10	CESBA Default value
			3: 5	Mid Value
			5 : 0	Good quality

G- COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
G1.4 Use stage energy cost	Energy annual cost per usable floor area	€/m2/yr	*0: 15*	*Hypothesis: Collective building, cep <96 kWhep / m².year, collective gas boiler*
			3: 7	*Hypothesis: Collective building with efficient thermal envelope, collective gas boiler*
			5: 5	*Hypothesis: Collective building with high performance thermal envelope, collective gas boiler*
G1.5 Use stage water cost	Water annual cost per usable floor area	€/m2/yr	*0: 13*	*Assumptions: for all dwellings, people present every day of the year, strong use of all*

			water uses, consumer equipment, - see Water Calculator tool - 90 m3 / occupant / year, for 3121 m² SHAB, with 3 occupants per dwelling and 50 dwellings
		3: 3,5	*Water Calculator - 30 m3 / occupant / year, for 3121 m² SHAB, with 2.3 occupants per dwelling and 50 dwellings*
		5: 2,3	*Water Calculator - 20 m3 / occupant / year, for 3121 m² SHAB, with 2.3 occupants per dwelling and 50 dwellings*

SBTool Criteria Specifications

B- ENERGY AND RESOURCES CONSUMPTION			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.1 Primary energy demand	Primary energy demand per area per year	*Information source*	*Models and simulation*
		Assessment method	*The calculation methods for each sub-indicator are given by the CEN standards that support the implementation of the Directive on the Energy Performance of Buildings (EPBD) in the European Union. The CEN standards that form the basis of the calculation methods of most national regulations are: EN 15603 (Energy performance of buildings. Overall energy consumption and definition of energy assessments) and EN ISO 52000 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). In fact, the national calculation methods used to produce the energy performance certificates can be used here. Interior lighting is not always covered by national regulations. As a result, the evaluator must clearly mention in his report that the consumptions were discarded or detail the specific method used. 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).*
		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	Delivered thermal energy demand per year	*Information source*	*Models and simulation*
		Assessment method	*The calculation method for this indicator is given by the CEN standards that support the implementation of the Directive on the energy performance of buildings (EPBD) in the European Union. The CEN standards that form the basis of the calculation methods of most national regulations are: EN 52000 (Energy performance of buildings. Overall energy consumption and definition of energy assessments) and EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). In fact, the national calculation methods used to produce the energy performance certificates can be used here.*
		Standard	*Level (s) EN 52000 (Energy performance of buildings. Overall energy consumption and definition of energy assessments) and EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). In fact, the national calculation methods used to produce the energy performance certificates can be used here.*
B1.3 Delivered electric energy demand	Delivered electric energy demand per area per year	*Information source*	*Models and simulation*
		Assessment method	*The calculation method for this indicator is given by the CEN standards that support the implementation of the Directive on the energy performance of buildings (EPBD) in the European Union. The CEN standards which form the basis of the calculation methods of most national regulations are: EN 52000 (Energy performance of buildings. Overall energy consumption and definition of energy assessments) and EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). In fact, the national calculation methods used to produce the energy performance certificates can be used here. In the case of existing buildings, the electrical energy delivered must be evaluated preferentially from the data collected.*
		Standard	*EN 52000 (Energy performance of buildings. Overall energy consumption and definition of energy assessments) and EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling)*
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	*Information source*	*Models and simulation*
		Assessment method	*The calculation method for this indicator is given by the CEN standards that support the implementation of the Directive on the Energy*

	demand		*Performance of Buildings (EPBD) in the European Union. The CEN standards which form the basis of the calculation methods of most national regulations are: EN 52000 (Energy performance of buildings. Overall energy consumption and definition of energy assessments) and EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling).*
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments)*
B1.5 Energy from renewable sources in total thermal energy consumption	Share of renewable energy in final thermal energy consumptions	*Information source*	*Models and simulation*
		Assessment method	*The calculation method for this indicator is given by the CEN standards which support the implementation of the Directive on the energy performance of buildings.*
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments*
B1.6 Energy from renewable sources in total electric energy consumption	*Share of renewable energy in final electric energy consumption*	*Information source*	*Models and simulation*
		Assessment method	*The calculation method for this indicator is given by the CEN standards which support the implementation of the Directive on the energy performance of buildings. In the case of existing buildings, the share of renewable energy in total electricity consumption should be assessed from measurements. References and standards*
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments*
B1.11 Embodied non-renewable primary energy	*Embodied primary non-renewable energy*	*Information source*	*Models and simulation*
		Assessment method	*The main reference standards for this indicator are ISO 14040/44, EN 15804 (Contribution of construction works to sustainable development - Environmental product declarations - Rules governing categories of construction products) and EN 1578 (Contribution of construction works to sustainable development - Evaluation of the environmental performance of buildings - Calculation method). The calculation of this indicator is based on the inventory of the different materials that make up the building (enkg), the nomenclature of material surveys. The document lists the quantities of different materials by type of constructive elements. The starting point is the DQE, estimated quantitative detail, which details the various elements of the project (foundations, columns ...). The nomenclature of material records describes the different materials that make up the elements of the building. Once the material survey has been*

			completed, the indicator can be calculated. The different stages of the calculation are the following: *-Compiling the masses of different materials; this compilation work must be at least 99% of the total mass of the building;* *-Identify the different elements of the buildings. A decomposition by material must be carried out. And the mass of each of the materials estimated:* *- Aggregate by material: the masses by type of elements must be added so as to obtain the total mass per material. Once the nomenclature of the material surveys carried out, it is possible to calculate the indicator by associating each material (in kg) with the corresponding gray energy factor (in MJ / kg).* *The total value of gray energy of non-renewable origin is then reported to the surface.*
		Standard	*EN 15978 (Contribution of construction works to sustainable development - Evaluation of the environmental performance of buildings - Calculation method)*
B3.5 Recycled materials	Weight of recycled materials on total weight of materials	*Information source*	*Models and simulation or material documents*
		Assessment method	*To calculate the value of the indicator it is necessary to compile a Bill of Materials (BoM) that is a mass-based inventory of the different materials (kg) that compose a building. The BoM is organised according to main elements that a building is composed of.* *The starting point is the Bill of Quantities (BoQ) that specifies the elements of a building (e.g. foundations, columns). The BoQ comprises different categories of elements, which can have different functional performance characteristics. A BoM differs from a BoQ in that it describes the different materials (e.g. wood, steel, aluminium) that are contained in the various building elements. Once the BoM has been compiled, it is possible to calculate the value of the indicator. The following steps should be followed in order to characterize the indicator:* *- Compile the Bill of Quantities: A BoQ is compiled which comprises the building elements accounting for at least 99% of the mass of the building.* *- Identify the basic composition of each building element. A breakdown of its constituent materials has to elaborated. The mass of each constituent material has to be estimated;* *- Aggregation by material: the mass of all constituent material should thereafter be aggregated to obtain the total mass of materials used in the building (A);* *- Identify the recycled content of each constituent material (in mass);* *- Aggregation by material: the recycled mass of all constituent materials should thereafter be aggregated to obtain the total recycled mass of materials (B) used in the building;*

			- The indicator's value is calculated as B/A (total mass of recycled materials on the total mass of materials).
		Standard	*/*
B4.5 Potable water consumption for indoor uses	*Water consumption per occupant per year*	*Information source*	*Models and simulation*
		Assessment method	*The evaluator should include sanitary equipment (ie toilets, taps and showers) that consume water (ie dishwashers, washing machines). The unit consumptions of the different devices are determined from the industrial data. The specific factors of use must be established, as well as the number of days of occupation per year. The principle of calculating the consumption per occupant for faucets and showers is as follows: Total consumption (L / n of day of occ.) =? Unit consumption (L / min) x utilization factor x (min / nb of day of occ.) The calculation is the same for the consumptions related to the use of the toilets (the flushes replace the minutes). For hygiene, the bases of calculation are as follows: Total consumption (L / year) = unit consumption (L / m²) area (m2) × annual washing number (year - 1) Total consumption (m3 / occupant. year) = total consumption (L / year) x 0.001 (m3 / L) + occupancy time (occupant) Non-potable water consumption must be specified (eg reclaimed water used for In the case of existing buildings, the indicator should be calculated from measured data. The measured consumption must be averaged over a period of 3 years.*
		Standard	Tool "Water calculator"

C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	SPECIFICATIONS	
C1.3 Global Warming potential	*CO2 equivalent emissions per area per year*	*Information source*	*Models and simulation*
		Assessment method	*Calculation of CO2eq emissions. for each building can be realized thanks to this formula: E = [Σ (Qfuel, i x LHVi × Kem, i) + (Qel × Kem, el) + (Qdh × Kem, dh)] / SuQfuel, I = annual quantity of i-th fuel (m3 or kg) Qel = annual quantity of electricity from the grid (kWh) Qdh = annual amount of energy from the district heating or cooling network (kWh) LHVi = lower calorific value of i-th fuel (kWh / m3 or kWh / kg) Kem, i = CO2 emission factor eq. i-th fuel (kg CO2 / kWh) Kem, el = CO2 emission factor eq. electrical energy from the grid (kg CO2 / kWh) Kem, dh = CO2 emission factor eq. of the urban*

			heat or cold network (kg CO2 / kWh) *Su = total usable area of buildings*
		Standard	*EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments)*
C3.1 Construction and demolition waste	Weight of waste and materials generated per 1 m2 of useful floor area demolished or constructed	*Information source*	*Models and simulation*
		Assessment method	*1. Design phase (based on estimates): Estimates based on surveys of existing buildings that will undergo a major renovation or whose structure will be reused (life cycle stage B5). Estimates based on building deconstruction and demolition scenarios beyond the end of building use (life cycle stages C1 / 3, D).* *2. Construction (based on data collected on site): Data of deconstruction and demolition of a building to make room for a new construction (as part of the life cycle stages) .Data of partial deconstruction of a building for on-site reuse. On-site construction data for a new building and / or prefabrication / construction of some off-site elements (Life Cycle Steps A3 / 5)* *3. Completion (based on estimates supported by compliant plans): Estimates based on deconstruction and demolition scenarios of the building beyond the end of use of the building (life cycle stages C1 / 3, D)* *4 Post-delivery (based on commissioning and testing)* *5. Occupation (based on measured performance)* *6.End of life (based on the envisaged performance): Details the measures taken in the design phase to facilitate the construction, reuse and recycling (stages of the C1 / 3, D life cycle).*
		Standard	*/*
C3.2 Solid waste from building operation	*Ratio of the number of collectable solid waste types within a 100 m distance from the building's entrance to the reference solid waste categories*	*Information source*	*Plans of the area with the location of containers*
		Assessment method	*The seven solid waste reference categories are:* *-Paper* *-Plastic* *-Metal* *-Glass* *-Wet waste* *-Textiles* *-Dangerous* *Identify the availability and location of dedicated containers for each of the 7 categories of solid waste. Calculate the walking distance (m) of the main building door for each sorting equipment. Evaluate which of the 7 categories of solid waste can be collected within a 50m perimeter from the main entrance of the building (A) .The value of the indicator is given by the ratio: A / 7*
		Standard	*/*

D- INDOOR ENVIRONMENTAL QUALITY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
D1.4 TVOC concentration in indoor air	TVOC concentration in indoor air	*Information source*	*Measured data*
		Assessment method	*The value of the indicator must be given by measurements in situ in occupancy (and after delivery). Measurements must be carried out on at least 10% of the apartments. These must be representative of the different types of housing, configurations and materials used. The samples must be taken from the living room and the smallest room of each apartment. The measuring equipment must be placed in the center of the room so as not to be too much influenced by the doors and windows and the air inlets. The sampling method shall be in accordance with ISO 16000-6 (Indoor Air - Part 6: Determination of Volatile Organic Compounds in Indoor Air and Active Sampling Chambers on Tenax TA (R) Sorbent, Desorption thermal and gas chromatographic using MS or MS / FID) or equivalent. In the design phase, product testing can be used as a simplified data source. These emissions must be evaluated over a period of 28 days. They must be established in accordance with standard NF EN 16516 (Construction products - evaluation of the emission of dangerous substances - Determination of indoor air emissions). Test data is then required from the manufacturers and suppliers of the products concerned. All tests must be on compliant finished products. References and Standards EN 15251 (Indoor Environment Criteria for the Design and Evaluation of the Energy Performance of Buildings covering Indoor Air Quality, Thermal, Lighting and Acoustics) Resources: VOC and housing (up to 35 substances): "In the gas phase, the chemical compounds present are mainly Volatile Organic Compounds (VOCs) containing a multitude of substances of different chemical families, and are thus detected in the indoor environments in a more significant way than some aldehydes (including formaldehyde mainly and almost systematically), certain aromatic hydrocarbons including benzene, toluene, ethylbenzene and xylenes commonly called BTEX, but also VOCs belonging to the families of terpenes, ketones, alcohols, ethers of Glycol ... "For information, the United States recommends a total VOC concentration of less than 200 µg / m3 as the comfort threshold and*

			Germany recommends a target value of 300 µg / m3. measures of_19 "Air Atmo Alsacehttp: //www.atmo-alsace.net/medias/products/Campagne_de_mesures_de_19.pdf
		Standard	*ISO 16000-6 (Indoor Air - Part 6: Determination of Volatile Organic Compounds in Indoor Air and Active Sampling Chambers on Tenax TA (R) Sorbent, Desorption thermal and gas chromatographic using MS or MS / FID) or equivalent.* *NF EN 16516 (Construction products - evaluation of the emission of dangerous substances - Determination of indoor air emissions).*

D2.2 Thermal comfort index	Predicted Percentage Dissatisfied	*Information source*	*Models and simulation or measured method*
		Assessment method	*In the design phase, PPD estimation can be done using simulation software. In the operation phase, the PPD can be measured.* *The value of the PPD shall be calculated or measured in accordance with EN 7730 (Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort by calculation of the PMV and PPD indices and by local thermal comfort criteria) for the seasonal and winter conditions.* *The PDP must be evaluated in all main living rooms and bedrooms. In the case of a collective dwelling, each configuration and orientation must be evaluated.* *The measuring point should be placed one meter from the center of the main window of each room. The following parameters must be used to characterize the value of the PDP:* *-clothing thermal resistance (clo) = 0.5-metabolic energy (met) = 1.2* *To evaluate the value of the PDP on a building as a whole, the PPD values estimated or measured in each room must be aggregated by a weighted average: PPDm = Sum PPDi x Au, i / Sum Au, where:* *PPDi = PPD for the coin-th* *Au, i = useful area of the i-th room*
		Standard	*EN 7730 (Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort by calculation of the PMV and PPD indices and by local thermal comfort criteria*

G- COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G1.4 Use stage energy cost	Energy annual cost per usable floor area	*Information source*	*Models and simulation*
		Assessment	*The calculation can be based on estimates in*

		method	the design phase. It must be based on consumption monitoring during the exploitation phase. The indicator can be used by different actors for different purposes. In the design phase, it can be used to estimate future operating costs. In the operating phase, it can be used to compare the real performance of the building with the estimated estimates. For existing buildings, the total annual cost of thermal and electrical consumption from energy bills must be realized over an average of 3 years.
		Standard	/
G1.5 Use stage water cost	Water annual cost per usable floor area	Information source	*Models and simulation*
		Assessment method	*The calculation can be based on estimates in the design phase. It must be based on consumption monitoring during the operation phase. The indicator can be used by different actors for different purposes. In the design phase, it can be used to estimate future operating costs. In the operation phase, it can be used to compare the real performance of the building with the estimated estimates. For existing buildings, the total annual cost of water consumption from the invoices must be realized over an average of 3 years.*
		Standard	/

REGIONAL TOOL

D.3.4.3 Regional Tool - GENCAT

Version 1.1

Date: March 2019

Generalitat de Catalunya
Departament de Territori i Sostenibilitat

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

BUILDING SCALE ASSESSMENT

SBTool structure

A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
A1	**Site regeneration and development**
A1.12	Provision and quality of bicycle pathways and parking
A2	**Urban Design**
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
A3.13	Provision of on-site parking facilities for private vehicles

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 electrical energy consumption
B1.7	Consumption of renewable energy for all building operations
B1.11	Embodied non-renewable primary energy – Not applicable
B2	**Electrical peak demand**
B2.1	Electrical peak demand for building operations
B2.2	Scheduling of building operations to reduce peak loads on generating facilities.
B3	**Use of Material**
B3.5	Recycled materials – Not applicable
B4	**Use of potable water, stormwater and greywater**
B4.5	Potable water consumption for indoor uses.

C- ENVIRONMENTAL LOADINGS	
C1	**Greenhouse Gas Emissions**
C1.3	Global Warming Potential
C3	**Solid and Liquid Wastes**

C3.1	Construction and demolition waste – Not applicable
C3.2	Solid waste from building operations
C5	**Other Local and Regional Impacts**
C5.8	Degree of atmospheric light pollution caused by project exterior lighting systems

D- INDOOR ENVIRONMENTAL QUALITY	
D1	**Indoor Air Quality and Ventilation**
D1.4	TVOC concentration in indoor air – Not applicable
D1.5	CO2 concentration in indoor air
D1.10	Ventilation rate
D2	**Air Temperature and Relative humidity**
D2.1	Time outside of the thermal comfort range
D2.2	Thermal comfort index

E- SERVICE QUALITY	
E1	**Safety and Security**
E1.3	Risk to occupants and facilities from flooding
E1.6	Maintenance of core building functions during power outages
E2	**Functionality and Efficiency**
E2.5	Service quality and efficiency of vertical or horizontal transportation systems in building.
E3	**Controllability**
E3.1	Effectiveness of facility management control system
E3.2	Capability for partial operation of facility technical systems
E3.3	Degree of local control of lighting systems
E3.4	Degree of personal control of techinical systems by occupants
E4	**Flexibility and Adaptability**
E4.5	Adaptability to future changes in type of energy supply
E5	**Optimization and Maintenance of Operating Performance**
E5.1	Operating functionality and efficiency of key facility systems
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

G- COST AND ECONOMIC ASPECTS	
G1	**Cost and Economics**
G1.4	Use stage energy cost
G1.5	Use stage water cost – Only for Residential occ.

SBTool criteria selection rationale

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE		
CRITERION		**REASON/MOTIVATION**
A1.12	Provision and quality of bicycle pathways and parking	*Assess the quality of bicycle pathways*
A2.3	Impact of orientation on the passive solar potential of building(s)	*Assess the passive solar solutions potential*
A3.6	Provision of solid waste collection and sorting services	*Assess the capacity of recycled*
A3.13	Provision of on-site parking facilities for private vehicles	*Assess the use of private vehicle in the workers*

B – ENERGY AND RESOURCES CONSUMPTION		
CRITERION		REASON/MOTIVATION
B1.1	Primary energy demand	*Assess the energy consumption*
B1.2	Delivered energy demand	*Assess the energy consumption*
B1.3	Delivered electric demand	*Assess the energy consumption*
B1.4	Energy from renewable sources in total primary energy consumption	*Assess the potential of the implementation renewable energy*
B1.5	Energy from renewable sources in total thermal energy consumption	*Assess the potential of the implementation renewable energy*
B1.6	Energy from renewable sources in total electrical energy consumption	*Assess the potential of the implementation renewable energy*
B1.7	Consumption of renewable energy for all building operations	*Assess the potential of the implementation renewable energy*
B2.1	Electrical peak demand for building operations	*Assess the required power for building operations*
B2.2	Scheduling of building operations to reduce peak loads on generating facilities.	*Assess the reduce the energy power*
B4.5	Potable water consumption for indoor uses.	*Assess the water consumption for the building operations*

C- ENVIRONMENTAL LOADINGS

	CRITERION	REASON/MOTIVATION
C1.3	Global Warming Potential	*Assess the GHG emissions to reduce*
C3.2	Solid waste from building operations	*Assess the capacity of recycled*
C5.8	Degree of atmospheric light pollution caused by project exterior lighting systems	*Assess the lighting polution*

D- INDOOR ENVIRONMENTAL QUALITY

	CRITERION	REASON/MOTIVATION
D1.5	CO_2 concentration in indoor air	*Assess the quality of interior air*
D1.10	Ventilation rate	*Assess the quality of interior air*
D2.1	Time outside of the thermal comfort range	*Assess the thermal comfort*
D2.2	Thermal comfort index	*Assess the thermal comfort*

E- SERVICE QUALITY

	CRITERION	REASON/MOTIVATION
E1.3	Risk to occupants and facilities from flooding	*Assess the risk of flooding*
E1.6	Maintenance of core building functions during power outages	*Assess the auto-energy-capacity of the building*
E2.5	Service quality and efficiency of vertical or horizontal transportation systems in building.	*Assess the work properly of the lift*
E3.1	Effectiveness of facility management control system	*Assess the management system of facilities*
E3.2	Capability for partial operation of facility technical systems	*Assess the management system of facilites*
E3.3	Degree of local control of lighting systems	*Assess the management system of facilites*
E3.4	Degree of personal control of techinical systems by occupants	*Assess the management system of facilites*
E4.5	Adaptability to future changes in type of energy supply	*Assess the management system of facilites*
E5.1	Operating functionality and efficiency of key facility systems	*Assess the management system of facilites*
E5.6	Retention of as-built documentation	*Assess the management*

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	REASON/MOTIVATION
F1.1 Universal access on site and within the building	*Assess the universal access of the building*

G- COST AND ECONOMIC ASPECTS

CRITERION	REASON/MOTIVATION
G1.4 Use stage energy cost	*Assess the cost of the energy*

SBTool weights rationale

ISSUE	WEIGHT (1 to 3)	MOTIVATION
A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	1	This is an existing building and therefore there is not much scope of action to influence in its design. Consultation with Local Committee Members
B – ENERGY AND RESOURCES CONSUMPTION	3	This is a strategic axis with greater opportunity for action and improvement of results and directly linked to CO_2 emissions to reduce in the Climate and energy framework 2030. It is considered top priority. Consultation with Local Committee Members
C- ENVIRONMENTAL LOADINGS	3	This is a strategic axis with greater opportunity for action and improvement of results and directly linked to CO_2 emissions to reduce in the Climate and energy framework 2030. It is considered top priority. Consultation with Local Committee Members
D- INDOOR ENVIRONMENTAL QUALITY	2	It is very important due to directly affect the health of people. Consultation with Local Committee Members
E- SERVICE QUALITY	2	It is not considered priority, although it is important because it takes into consideration the relationship of people with that studied building. Consultation with Local Committee Members
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS	3	It is considered top priority due to directly affect the quality of the workers. Consultation with Local Committee Members
G- COST AND ECONOMIC ASPECTS	2	This is a strategic axis with greater opportunity for action and improvement of results and directly linked to CO_2 emissions to reduce in the Climate and energy framework 2030. Consultation with Local Committee Members

CATEGORIES	WEIGHT (%)
A1- Site regeneration and Development	25,00
A2- Urban design	25,00
A3- Project Infrastructure and Services	50,00
TOTAL	**100**
B1- In use energy consumptions	77,78
B2- Embodied energy	11,11
B3- Use of materials	0,00
B4 – Use of water, stormwater and greywater	11,11
TOTAL	**100**
C1- Greenhouse gas emissions	33,33
C2- Other atmospheric emissions	0,00

C3- Solid and liquid waste	33,33
C4- Impact on project site	0,00
C5- Other local and regional impacts	33,33
TOTAL	**100**
D1- Indoor air quality and ventilation	50,00
D2- Thermal comfort	50,00
D3– Visual comfort	0,00
D4– Acoustic comfort	0,00
TOTAL	**100**
E1- Safety and Security	20,00
E2- Functionality and efficiency	10,00
E3- Controllability	40,00
E4– Flexibility and adaptability	10,00
E5- Optimization and maintenance of operating performance	20,00
TOTAL	**100**
F1- Social aspects	100
F2- Culture and heritage	0
F3- Perceptual	0
TOTAL	**100**
G1- Cost and economics	100
TOTAL	**100**

CRITERIA WEIGHTS

SBTool file A – WeightA-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**
A1.12	*0,84*	*2*	*3*	*2*	*1*	*Confirmed*
A2- Urban Design						
A2.3	*2,11*	*1*	*5*	*3*	*1*	*Confirmed*
A3- Project Infrastructure and Services						
A3.6	*0,28*	*2*	*3*	*2*	*1*	*Confirmed*
A3.13	*1,69*	*2*	*2*	*3*		*Confirmed*
TOTAL	**4.92%**					

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	*7,02*	*5*	*5*	*2*	*1*	*Confirmed*
B1.2	*7,02*	*5*	*5*	*2*	*1*	*Confirmed*
B1.3	*7,02*	*5*	*5*	*2*		*Confirmed*
B1.4	*7,02*	*5*	*5*	*2*		*Confirmed*
B1.5	*7,02*	*5*	*5*	*2*		*Confirmed*
B1.6	*7,02*	*5*	*5*	*2*		*Confirmed*

B1.7	*10,53*	*5*	*5*	*3*		*Confirmed*
B2-Electrical Peak Demand						
B2.1	*6,32*	*5*	*5*	*3*	*1*	*Confirmed*
B4-Use of potable water, stormwater and greywater						
B1.1	*3,79*	*4*	*3*	*3*	*1*	*Confirmed*
TOTAL	**62,78%**					

C- ENVIRONMENTAL LOADINGS						
C1-Greenhouse Gas Emissions						
CRITERION	**Weight(%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.3	*13,2*	*5*	*5*	*3*	*1*	*Confirmed*
C3-Solid and Liquid Wastes						
C3.2	*2,53*	*4*	*3*	*2*	*1*	*Confirmed*
C5-Other Local and Regional Impacts						
C5.8	*3,37*	*4*	*3*	*2*	*1*	*Confirmed*
TOTAL	**19,07%**					

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*	*Confirmed*
D1.10	*0,21*	*1*	*3*	*2*	*1*	*Confirmed*
D2-Air Temperature and Relative Humidity						
D2.1	*0,63*	*1*	*3*	*3*	*1*	*Confirmed*
D2.2	*0,63*	*1*	*3*	*3*	*1*	*Confirmed*
TOTAL	**2,11%**					

E- Service Quality						
E1-Safety and Security						
CRITERION	**Weight(%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D1.3	*2,53*	*2*	*4*	*3*		*Confirmed*
D1.6	*1,90*	*2*	*3*	*3*		*Confirmed*
E2-Functionality and efficiency						
D2.15	*0,63*	*1*	*3*	*3*		*Confirmed*
E3-Controllability						
E3.1	*0,14*	*1*	*2*	*2*		*Confirmed*
E3.2	*0,14*	*1*	*2*	*2*		*Confirmed*
E3.3	*0,14*	*1*	*2*	*2*		*Confirmed*
E3.4	*0,28*	*1*	*2*	*2*		*Confirmed*
E4-Flexibility and Adaptability						
E3.1	*1,26*	*1*	*3*	*3*		*Confirmed*
E5-Optimization and Manteinance of Operating Performance						
E5.1	*0,21*	*1*	*2*	*3*		*Confirmed*
E5.6	*0,11*	*1*	*1*	*3*		*Confirmed*
TOTAL	**7,97%**					

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*		*Confirmed*
TOTAL	1,9%					

G- COST AND ECONOMIC ASPECTS

G1-Cost and Economics

CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G.1.4	*0,63*	*2*	*3*	*3*		*Confirmed*
G1.5	*0,21*	*2*	*3*	*1*		*Confirmed*
TOTAL	0,84%					

SBTool benchmarks rationale

A- URBAN STRUCTURE AND FORM

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
A1.12	Provision and quality of bicycle pathways and parking	--	*0: 0*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
A2.3	Impact of orientation on the passive solar potential of building(s)	--	*0: 0*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
A3.6	Provision of solid waste collection and sorting services	--	*0: 0*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
A3.13	Provision of on-site parking facilities for private vehicles	Spaces / $100m^2$	*0: 1,50*	*Confirmed by CLC members*
			5: 0,50	*Confirmed by CLC members*

B- ENERGY AND RESOURCES CONSUMPTION

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
B1.1	Primary energy demand	$kWh/m^2/y$	*0: 225*	*Confirmed by CLC members*
			5: 70	*Confirmed by CLC members*
B1.2	Delivered energy demand	$kWh/m^2/y$	*0: 22*	*Confirmed by CLC members*
			5: 12	*Confirmed by CLC members*
B1.3	Delivered electric demand	$kWh/m^2/y$	*0: 75*	*Confirmed by CLC members*
			5: 20	*Confirmed by CLC members*

B1.4	Energy from renewable sources in total primary energy consumption	%	*0: 25*	*Confirmed by CLC members*
			5: 90	*Confirmed by CLC members*
B1.5	Energy from renewable sources in total thermal energy consumption	%	*0: 30*	*Confirmed by CLC members*
			5: 100	*Confirmed by CLC members*
B1.6	Energy from renewable sources in total electrical energy consumption	%	*0: 40*	*Confirmed by CLC members*
			5: 100	*Confirmed by CLC members*
B1.7	Consumption of renewable energy for all building operations	$kWh/m^2/y$	*0: 2*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
B2.1	Electrical peak demand for building operations	W/m^2	*0: 100*	*Confirmed by CLC members*
			5: 20	*Confirmed by CLC members*
B4.5	Water consumption for indoor uses (in use stage)	m^3/per/y	*0: 100*	*Confirmed by CLC members*
			5: 20	*Confirmed by CLC members*

C- ENVIRONMENTAL LOADINGS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
C.1.3.	Global Warming potential - GHG emissions from primary energy	$kgCO_2eq/m2/y$	*0: 30*	*Confirmed by CLC members*
			5: 10	*Confirmed by CLC members*
C.3.2.	Solid waste from building operations	*%*	*0: 15*	*Confirmed by CLC members*
			5: 100	*Confirmed by CLC members*
C.5.8	Degree of atmospheric light pollution caused by project exterior lighting systems	*%*	*0: 25*	*Confirmed by CLC members*
			5: 0	*Confirmed by CLC members*

D- INDOOR ENVIRONMENTAL QUALITY				
CRITERION	INDICATOR	UNIT OF MEASUR E	BENCHMARK	DERIVATIONS
D.1.5	CO_2 concentrations in indoor air	ppm	*0: 600*	*Confirmed by CLC members*
			5: 500	*Confirmed by CLC members*
D.1.10	Ventilation rate	$l/s/m^2$	*0: 6*	*Confirmed by CLC members*

			5: 12	*Confirmed by CLC members*
D.2.1.	Time outside of thermal comfort range	%	*0: 30*	*Confirmed by CLC members*
			5: 10	*Confirmed by CLC members*
D.2.2.	Thermal comfort index - PMV/PPD	%	*0: 25*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*

E- SERVICE QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
E1.3	Risk to occupants and facilities from flooding	--	*0: 0*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
E1.6	Maintenance of core building functions during power outages	Days	*0: 1*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
E2.5	Service quality and efficiency of vertical or horizontal transportation systems in building.	Minutes	*0: 0*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
E3.1	Effectiveness of facility management control system	--	*0: 0*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
E3.2	Capability for partial operation of facility technical systems	--	*0: 0*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
E3.3	Degree of local control of lighting systems	m^2	*0: 25*	*Confirmed by CLC members*
			5: 10	*Confirmed by CLC members*
E3.4	Degree of personal control of techinical systems by occupants	--	*0: 0*	*Confirmed by CLC members*
			5:5	*Confirmed by CLC members*
E4.5	Adaptability to future changes in type of energy supply	--	*0: 0*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
E5.1	Operating functionality and efficiency of key facility systems	--	*0: 0*	*Confirmed by CLC members*
			5: 5	*Confirmed by CLC members*
E5.6	Retention of as-built documentation	--	*0: 0*	*Confirmed by CLC members*
			5:5	*Confirmed by CLC members*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
F1.1	Universal access on site and within the building.	--	*0: 0*	*Insert your comment here*
			5: 5	*Insert your comment here*

G- COST AND ECONOMIC ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
G.1.4.	Use stage energy cost	€/m^2/y	*0: 60*	*Insert your comment here*
			5: 40	*Insert your comment here*

SBTool Criteria Specifications

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.12	Provision and quality of bicycle pathways and parking	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
A2.3	Impact of orientation on the passive solar potential of building(s)	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
A3.6	Provision of solid waste collection and sorting services	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
A3.13	Provision of on-site parking facilities for private vehicles	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

B- ENERGY AND RESOURCES CONSUMPTION			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.1	Primary energy demand	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
B1.2	Delivered energy demand	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

B1.3	Delivered electric demand	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
B1.4	Energy from renewable sources in total primary energy consumption	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
B1.5	Energy from renewable sources in total thermal energy consumption	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
B1.6	Energy from renewable sources in total electrical energy consumption	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
B1.7	Consumption of renewable energy for all building operations	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
B2.1	Electrical peak demand for building operations	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
B4.5	Water consumption for indoor uses (in use stage)	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

C- ENVIRONMENTAL LOADINGS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
C.1.3.	Global Warming potential - GHG emissions from primary energy	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
C.3.2.	Solid waste from building operations	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

C.5.8	Degree of atmospheric light pollution caused by project exterior lighting systems	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	**INDICATOR**	**SPECIFICATIONS**	
D.1.5	CO_2 concentrations in indoor air	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
D.1.10	Ventilation rate	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
D.2.1.	Time outside of thermal comfort range	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
D.2.1.	Time outside of thermal comfort range	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

E- SERVICE QUALITY

CRITERION	**INDICATOR**	**SPECIFICATIONS**	
E1.3	Risk to occupants and facilities from flooding	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
E1.6	Maintenance of core building functions during power outages	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
E2.5	Service quality and efficiency of vertical or horizontal transportation systems in building.	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

E3.1	Effectiveness of facility management control system	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
E3.2	Capability for partial operation of facility technical systems	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
E3.3	Degree of local control of lighting systems	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
E4.5	Adaptability to future changes in type of energy supply	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
E5.1	Operating functionality and efficiency of key facility systems	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*
E5.6	Retention of as-built documentation	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
F1.1	Universal access on site and within the building.	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

G- COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
1.4	Use stage energy cost	*Information source*	*Maintenance staff*
		Assessment method	*According its factsheet in the SB-Tool*
		Standard	*NA*

REGIONAL TOOL

D.3.4.3 Regional Tool – SANT CUGAT

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

BUILDING SCALE ASSESSMENT

SBTool structure

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*

SBTool criteria selection rationale

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** **B2 Electric peak demand** **B2.2 *Electrical peak demand for building operations***	*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.*
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**	*2018 new local water saving ordinance has a specific rule to improve the recharge of*

paving or landscaping	*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** **F2 Culture and Heritage** **F2.3 Impact of the design on existing streetscapes**	*It is important for the city to control the impact of existing, refurbished and new buildings in the city landscape.*

F3 Perceptual
F3.7 Access to exterior views from interior

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.*

SBTool weights rationale

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					

SBTool benchmarks rationale

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*

			5 : 60	*Current results*
A3.15	*Provision of access roads and facilities for freight or delivery*	text	*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/m²/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/m²/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/m²/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^2year*	*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*	*kg/m^2/life cycle stage*	*0: 1700*	Figures given in the CESBA protocol

	calculated)			
			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*
E4.5 Adapting the building to a new fuel source will be possible with a		*text*	0:0	CESBA MED default value

moderate level of renovations, but installing photovoltaics will require major renovations.				
			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*

SBTool Criteria Specifications

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*
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*
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*
	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*

A2.2			*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 rainwater, stormwater and greywater*	*Information 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*	*Information source*	*City Hall: Electricity and gas bills for a year of each building and information extracted*

	area per year		*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*
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 of the city. 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	*Information source*	*Check property (Town Hall) and check through the existing buildings plans.*
		Assessment method	*Determine the degree of viability to install a*

	renovations, but installing photovoltaics will require major renovations.		*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*

REGIONAL TOOL

D.3.4.3 Regional Tool – University of Malta

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

BUILDING SCALE ASSESSMENT

SBTool structure

A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
A1	**Site regeneration and development**
A1.7	*Use of vegetation to provide ambient outdoor cooling*
A1.8	*Use of native plant types*
A1.9	*Provision of public open space(s)*
A1.12	*Provision and quality of bicycle pathways and parking*
A1.13	*Provision and quality of walkways for pedestrian use*
A2	Urban Design
A2.1	*Maximizing efficiency of land use through development density*
A2.3	*Impact of orientation on the passive solar potential of building(s)*
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*
B1.6	*Energy from renewable sources in total electric energy consumption*
B4	***Use of potable water, stormwater and greywater***
B4.2	*Water consumption for indoor uses*

C- ENVIRONMENTAL LOADINGS	
C1	**Greenhouse Gas Emissions**
C1.3	*Global Warming Potential*
C3.2	*Solid waste from building operations*
C5.1	*Impact on access to daylight or solar energy potential of adjacent property*
C5.8	*Degree of atmospheric light pollution caused by project exterior lighting systems*

D- INDOOR ENVIRONMENTAL QUALITY	
D1	**Indoor Air Quality and Ventilation**
D1.4	*TVOC concentration in indoor air*
D1.5	*CO2 concentration in indoor air*
D2.2	*Thermal Comfort Index*

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*

E1.7	*Personal security for building users during normal operations*
E2	**Functionality and Efficiency**
E2.2	*Functionality of layout(s) for required functions*
E2.4	*Provision of exterior access and unloading facilities for freight or delivery*
E2.5	*Efficiency of vertical or horizontal transportation systems in building*
E2.6	*Spatial efficiency*
E2.7	*Volumetric efficiency*
E3	**Controllability**
E3.3	*Degree of local control of lighting systems*
E3.4	*Degree of personal control of technical systems by occupants*

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
F2	**Culture and Heritage**
F2.2	*Provision of public open space compatible with local cultural values*
F2.3	*Impact of the design on existing streetscapes*
F2.4	*Use of traditional local materials and techniques*

G- COST AND ECONOMIC ASPECTS	
G1	**Cost and Economics**
G1.1	*Construction cost*
G1.4	*Use stage energy cost*
G1.6	*Investment Risk*

SBTool criteria selection rationale

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
CRITERION	**REASON/MOTIVATION**
A1.7 ***Use of vegetation to provide ambient outdoor cooling***	*Since Malta is densely populated, vegetation needs to be protected more and introduced more in new projects.*
A1.8 ***Use of native plant types***	*Using native plant types would reduce the need for irrigation which will safeguard water as a resource.*
A1.9 ***Provision of public open space(s)***	*Since Malta is densely populated, public open spaces are something which need to be safeguarded. To provide public space for gathering, relaxation and recreation of the population within the project and neighbourhood.*
A1.12 ***Provision and quality of bicycle pathways and parking***	*Important to promote cycling and walking instead of the use of private car which generates traffic.*
A1.13 ***Provision and quality of walkways for pedestrian use***	*Since traffic is a number one issue, more walkways and pedestrianized streets would discourage the citizens in using their own private vehicle.*
A2.1 ***Maximizing efficiency of land use through***	*Area in Malta is very limited with regards to the*

development density	*total population. This indicator is therefore vital for the conservation of space.*
A2.3 *Impact of orientation on the passive solar potential of building(s)*	*Solar Energy is the best clean energy resource for Malta, since Malta has lots of sunny days. It is the most common type of renewable energy used by the Maltese. Grants are currently being given to the citizens to encourage the installation of solar panels.*

B – ENERGY AND RESOURCES CONSUMPTION

CRITERION	REASON/MOTIVATION
B1.1 *Primary energy demand*	*Important to know the primary energy requirements per year to be able to reduce them.*
B1.2 *Delivered thermal energy demand*	*The amount of energy that is being used for thermal energy is an important factor.*
B1.3 *Delivered electric demand*	*Same as in B1.2, this is a very important indicator to be able to reduce electrical energy consumption.*
B1.4 *Energy from renewable sources in total primary energy consumption*	*Renewable energy, specifically solar energy is given a high priority by the government. Grants are currently being given to the citizens to encourage the installation of solar panels.*
B1.6 *Energy from renewable sources in total electric energy consumption*	*Renewable energy, specifically solar energy is given a high priority by the government. Grants are currently being given to the citizens to encourage the installation of solar panels.*
B4 *Use of potable water, stormwater and greywater*	*Important to reduce the potable water consumption. This indicator is crucial to highlight the importance of re-using water when possible.*
B4.2 *Water consumption for indoor uses*	*Preservation of water is vital.*

C- ENVIRONMENTAL LOADINGS

CRITERION	REASON/MOTIVATION
C1.3 *Global Warming Potential*	*Reduction of CO2 emissions is one the government's priorities to meet the relevant targets.*
C3.2 *Solid waste from building operations*	*Waste collection is currently being revamped in Malta. The organic bag has just recently been introduced and waste is collected every day with a schedule for: organic waste, recycled waste and inorganic waste.*
C5.1 *Impact on access to daylight or solar energy potential of adjacent property*	*To ensure that the height, bulk or location on the site of the Design does not significantly degrade the access to direct daylight of an existing or future building on adjacent properties.*
C5.8 *Degree of atmospheric light pollution caused by project exterior lighting systems*	*To minimize the spillage of light into the atmosphere from ground-level sources.*

D- INDOOR ENVIRONMENTAL QUALITY	
CRITERION	**REASON/MOTIVATION**
D1.4 *TVOC concentration in indoor air*	*Important to assess the Total Volatile Organic Compounds concentration in the building for the health of occupants.*
D1.5 *CO2 concentration in indoor air*	*Important to assess the amount of CO2 in air to check whether enough air is being circulated.*
D2.2 *Thermal Comfort Index*	*This was done via a short questionnaire and it is important to know whether the occupants feel comfortable with the thermal setting of the environment.*

E- SERVICE QUALITY	
CRITERION	**REASON/MOTIVATION**
E1.2 *Risk to occupants and facilities from fire*	*Important to assess the risk exposure of occupants and users of the building from fire and smoke.*
E1.3 *Risk to occupants and facilities from flooding*	*Important to assess the risk to lives and property of potential flooding incidents.*
E1.7 *Personal security for building users during normal operations*	*Important to assess the extent to which building users are relatively secure in accessing and using the building.*
E2.2 *Functionality of layout(s) for required functions*	*Important to assess the appropriateness of interior layouts to functional requirements of tenancies or occupants.*
E2.4 *Provision of exterior access and unloading facilities for freight or delivery*	*Important to do an assessment of access and unloading facilities for delivery and removal of goods and waste material.*
E2.5 *Efficiency of vertical or horizontal transportation systems in building*	*To assess the service quality and functional efficiency of vertical and horizontal transportation systems within a building.*
E2.6 *Spatial efficiency*	*Important to assess the efficiency of space utilization within buildings.*
E2.7 *Volumetric efficiency*	*Important to encourage the efficient utilization of space within buildings.*
E3.3 *Degree of local control of lighting systems*	*Important to ensure that lighting control system zones in non-residential occupancies are sufficiently small to ensure a satisfactory level of occupant control over lighting conditions.*
E3.4 *Degree of personal control of technical systems by occupants*	*Important to ensure a maximum degree of personal control over heating, ventilation and illumination systems.*

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
CRITERION	**REASON/MOTIVATION**
F2.2 *Provision of public open space compatible with local cultural values*	*Important to ensure that public open space compatible with local cultural values is provided in large projects.*
F2.3 *Impact of the design on existing streetscapes*	*Important to assess the degree to which the*

	architectural design of the building exterior is harmonious relative to adjacent buildings.
F2.4 *Use of traditional local materials and techniques*	*Important to assess the extent to which traditional local materials and construction techniques will used in the execution of the project.*

G- COST AND ECONOMIC ASPECTS	
CRITERION	**REASON/MOTIVATION**
G1.1 *Construction cost*	*Important to assess the difference between the capital cost of the Design with that of a reference building designed according to standards of Acceptable Practice.*
G1.4 *Use stage energy cost*	*Important to optimize the operating cost of buildings to reflect the potential for long term performance.*
G1.6 *Investment Risk*	*Important to assess the extent to which the construction of the project has affected nearby property values and the investment risk.*

SBTool weights rationale

ISSUE	WEIGHT (1 to 3)	MOTIVATION
A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	**1**	**N.A**
B – ENERGY AND RESOURCES CONSUMPTION	1	N.A
C- ENVIRONMENTAL LOADINGS	1	N.A
D- INDOOR ENVIRONMENTAL QUALITY	1	N.A
E- SERVICE QUALITY	1	N.A
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS	1	N.A
G- COST AND ECONOMIC ASPECTS	1	N.A

CATEGORIES	WEIGHT (%)
A1- Site regeneration and Development	4.4
A2- Urban design	2.2
A3- Project Infrastructure and Services	0
TOTAL	7
B1- In use energy consumptions	29
B2- Embodied energy	0
B3- Use of materials	0
B4 – Use of water, stormwater and greywater	2.6
TOTAL	31.6
C1- Greenhouse gas emissions	11.6
C2- Other atmospheric emissions	0
C3- Solid and liquid waste	0
C4- Impact on project site	0
C5- Other local and regional impacts	10
TOTAL	23.6
D1- Indoor air quality and ventilation	1.3
D2- Thermal comfort	0.7
D3– Visual comfort	0
D4– Acoustic comfort	0
TOTAL	2
E1- Safety and Security	13.4
E2- Functionality and efficiency	2.4
E3- Controllability	0.7
E4– Flexibility and adaptability	2.2
E5- Optimization and maintenance of operating performance	1.9

TOTAL	20.7
F1- Social aspects	3.5
F2- Culture and heritage	6.4
F3- Perceptual	2.2
TOTAL	12
G1- Cost and economics	3.1
TOTAL	3.1

CRITERIA WEIGHTS

SBTool file A – WeightA-G

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE						
Ax-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
A1.7 *Use of vegetation to provide ambient outdoor cooling*	**0.87**	**3**	**2**	**2**	**3**	N.A
A1.8 *Use of native plant types*	**1.31**	**3**	**2**	**3**	**3**	N.A
A1.9 *Provision of public open space(s)*	**0.44**	**3**	**1**	**2**	**3**	N.A
A1.12 *Provision and quality of bicycle pathways and parking*	**0.87**	**3**	**2**	**2**	**3**	N.A
A1.13 *Provision and quality of walkways for pedestrian use*	**0.87**	**3**	**2**	**2**	**3**	N.A
A2.3 *Impact of orientation on the passive solar potential of building(s)*	**2.19**	**5**	**3**	**4**	**3**	N.A

B- ENERGY AND RESOURCES CONSUMPTION						
Bx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B1.1 *Primary energy demand*	**0**	**5**	**2**	**4**	**3**	N.A
B1.2 *Delivered energy demand*	**7.29**	**5**	**2**	**4**	**3**	N.A
B1.3 *Delivered electric demand*	**7.29**	**5**	**2**	**4**	**3**	N.A
B1.4 *Energy from renewable sources in total primary energy consumption*	**7.29**	**5**	**2**	**4**	**3**	N.A
B1.6 *Energy from renewable sources in total electric energy consumption*	**7.29**	**5**	**2**	**4**	**3**	N.A

B4.2 *Water consumption for indoor uses*	**2.62**	**3**	**2**	**3**	**3**	N.A

C- ENVIRONMENTAL LOADINGS						
Cx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.3 *Global Warming Potential*	**13.66**	**5**	**3**	**5**	**3**	N.A
C3.2 *Solid waste from building operations*	**0**	**3**	**2**	**3**	**3**	N.A
C5.1 *Impact on access to daylight or solar energy potential of adjacent property*	**6.56**	**5**	**3**	**4**	**3**	N.A
C5.8 *Degree of atmospheric light pollution caused by project exterior lighting systems*	**3.50**	**3**	**2**	**4**	**3**	N.A

D- INDOOR ENVIRONMENTAL QUALITY						
Dx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D1.4 *TVOC concentration in indoor air*	**0.66**	**3**	**3**	**2**	**3**	N.A
D1.5 *CO2 concentration in indoor air*	**0.66**	**3**	**3**	**2**	**3**	N.A
D2.2 *Thermal Comfort Index*	**0.66**	**3**	**3**	**2**	**3**	N.A

E- SERVICE QUALITY						
Ex-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
E1.2 *Risk to occupants and facilities from fire*	**2.54%**	**3**	**3**	**3**	**3**	N.A
E1.3 *Risk to occupants and facilities from flooding*	**3.39**	**4**	**3**	**3**	**3**	N.A
E1.7 *Personal security for building users during normal*	**2.12**	**5**	**3**	**3**	**3**	N.A

operations						
E2.2 *Functionality of layout(s) for required functions*	**0.28**	**3**	**2**	**1**	**3**	N.A
E2.4 *Provision of exterior access and unloading facilities for freight or delivery*	**0.14**	**3**	**1**	**1**	**3**	N.A
E2.5 *Efficiency of vertical or horizontal transportation systems in building*	**1.69**	**3**	**3**	**4**	**3**	N.A
E2.6 *Spatial efficiency*	**0.28**	**3**	**2**	**1**	**3**	N.A
E2.7 *Volumetric efficiency*	**0.28**	**3**	**2**	**1**	**3**	N.A
E3.3 *Degree of local control of lighting systems*	**0.19**	**2**	**2**	**1**	**3**	N.A
E3.4 *Degree of personal control of techinical systems by occupants*	**0.38**	**2**	**2**	**2**	**3**	N.A

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS						
Fx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
F2.2 *Provision of public open space compatible with local cultural values*	**1.13**	**3**	**2**	**2**	**3**	N.A
F2.3 *Impact of the design on existing streetscapes*	**1.13**	**3**	**2**	**2**	**3**	N.A
F2.4 *Use of traditional local materials and techniques*	**1.13**	**3**	**2**	**2**	**3**	N.A

G- COST AND ECONOMIC ASPECTS						
Gx-………						
CRITERION	**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G1.1 *Construction cost*	**0.85**	**3**	**3**	**1**	**3**	N.A
G1.4 *Use stage energy cost*	**0.85**	**3**	**3**	**1**	**3**	N.A
G1.6 *Investment Risk*	**0.38**	**3**	**3**	**1**	**3**	N.A

SBTool benchmarks rationale

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
A1.7 Use of vegetation to provide ambient outdoor cooling	Ratio of total vegetated surface area (on ground and on roofs, and including trees), divided by total site area. The result is known as or Leaf Area Index.	*Ratio*	*0: 0.4*	*N.A*
			5: 1.0	*N.A*
A1.8 Use of native plant types	The percentage of landscaped area (excluding paved areas) planted with native species.	*%*	*0:40%*	*N.A*
			5:100%	*N.A*
A1.9 Provision of public open space(s)	To provide public space for gathering, relaxation and recreation of the population within the project and neighbourhood. (Score)	Score	*0*	*N.A*
			5	*N.A*
A1.12 Provision and quality of bicycle pathways and parking	Underground Sheltered bicycle path- 12 spaces + showers	Score	*0*	*N.A*
			5	*N.A*
A1.13 Provision and quality of walkways for pedestrian use	To assess the extent and quality of walkways for occupants and users. Pedestrian walkways shaded by trees, bridges connecting to building, parking spaces leading directly to the building	Score	*0*	*N.A*
			5	*N.A*
A2.3 Impact of orientation on the passive solar potential of building(s)	Deviation, in degrees (º) of main building axis from East-West (to ensure a maximum possible insolation).	Score	*0*	*N.A*
			5	*N.A*

B- ENERGY AND RESOURCES CONSUMPTION				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
B1.1 Primary energy demand		*%*	*0: value*	*N.A*
			5: value	*N.A*
B1.2 Delivered energy			*0:*	*N.A*

demand			*5:*	*N.A*
B1.3 ***Delivered electric demand***			*0:*	*N.A*
			5:	*N.A*
B1.4 ***Energy from renewable sources in total primary energy consumption***			*0:*	*N.A*
			5:	*N.A*
B1.6 ***Energy from renewable sources in total electric energy consumption***			*0:*	*N.A*
			5:	*N.A*
B4.2 ***Water consumption for indoor uses***			*0:*	*N.A*
			5:	*N.A*

C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
C1.3 ***Global Warming Potential***	*CO_2 equivalent emissions per internal useful floor area per year*	*%*	*0: value*	*N.A*
			5: value	*N.A*
C3.2 ***Solid waste from building operations***	*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*		*0:*	*N.A*
			5:	*N.A*
C5.1 ***Impact on access to daylight or solar energy potential of adjacent property***	*Percentage of nearest face of an existing building, or a future building designed on an adjacent site in accordance with existing regulations that will be shaded by the subject building.*	*%*	*0:*	*N.A*
			5:	*N.A*
C5.8 ***Degree of atmospheric light pollution caused by project exterior lighting systems***	*Percentage of total exterior light output that lies outside a vertical 120 degree cone, as indicated by drawings and specifications.*	*%*	*0:*	*N.A*
			5:	*N.A*

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
D1.4 ***TVOC concentration in indoor air***	*TVOC concentration in indoor air*	*%*	*0: value*	*N.A*
			5: value	*N.A*

D1.5 ***CO2 concentration in indoor air***	*Designs for HVAC systems that conform to ASHRAE, CIBSE or other acceptable protocol during design phase; actual monitoring results during operations phase.*		*0:*	*N.A*
			5:	*N.A*
D2.2 ***Thermal Comfort Index***			*0:*	*N.A*
			5:	*N.A*

E- SERVICE QUALITY

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
E1.2 ***Risk to occupants and facilities from fire***	*Risk level for occupants in the most vulnerable part of the building.*	*Score*	*0*	*N.A*
			5	*N.A*
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 or other foreseeable flood risk.*	*Score*	*0*	*N.A*
			5	*N.A*
E1.7 ***Personal security for building users during normal operations***	*Measures that are likely to assure adequate levels of actual and perceived personal security, according to design documentation.*	*Score*	*0*	*N.A*
			5	*N.A*
E2.2 ***Functionality of layout(s) for required functions***	*Goodness of fit of provided layouts (shape, ease of access) with functional requirements.*	*Score*	*0*	*N.A*
			5	*N.A*
E2.4 ***Provision of exterior access and unloading facilities for freight or delivery***	*Adequacy of the facility unloading and temporary storage capacity and measures to prevent excessive noise and visual pollution from disturbing occupants.*	*Score*	*0*	*N.A*
			5	*N.A*
E2.5 ***Efficiency of vertical or horizontal transportation systems in building***	*Availability of lifts for occupant use, taking into account down-time for service and moving needs, and the time required to travel from the ground floor to the top floor (or vice versa) during peak periods;*	*Score*	*0:*	*N.A*
			5:	*N.A*

	provision, capacity and speed of horizontal passenger conveying systems.			
E2.6 ***Spatial efficiency***	*The ratio of directly functional net areas to total net area in each occupancy. Total Net Areas exclude only structure and building envelope areas; Net Functional Areas (NFA) exclude interior garages, vertical circulation and building mechanical rooms.*	*%*	*0:60%*	*N.A*
			5:90%	*N.A*
E2.7 ***Volumetric efficiency***	*The ratio of directly functional net areas to total net area in each occupancy. Total Net Areas exclude only structure and building envelope areas; Net Functional Areas (NFA) exclude interior garages, vertical circulation and building mechanical rooms.*	*%*	*0:60%*	*N.A*
			5:90%	*N.A*
E3.3 ***Degree of local control of lighting systems***	*The area of typical lighting control zones in perimeter areas in m2, as shown in design documentation.*	*Score*	*0*	*N.A*
			5	*N.A*
E3.4 ***Degree of personal control of technical systems by occupants***	*The degree of control over key indoor environment systems that can be exercised by occupants, according to design documentation.*	*Score*	*0*	*N.A*
			5	*N.A*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
F2.2 ***Provision of public open space compatible with local cultural values***	*Expert assessment of the degree to which public open space provided in the project is consistent with local cultural values.*	*%*	*0: value*	*N.A*
			5: value	*N.A*
F2.3 ***Impact of the design on existing streetscapes***	*Expert assessment of the harmony of the Design with adjacent existing buildings, in*	*Score*	*0*	*N.A*
			5	*N.A*

	features such as height, bulk, set-back from the street, window size and height, colour or type of materials.			
F2.4 ***Use of traditional local materials and techniques***	*Architect's estimate of the percent of the non-structural elements of the building will be constructed using traditional local materials and construction techniques.*	*%*	*0:*	*N.A*
			5:	*N.A*

G- COST AND ECONOMIC ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
G1.1 ***Construction cost***	*Predicted construction cost per unit area, according to design documentation.*	*%*	*0: value*	*N.A*
			5: value	*N.A*
G1.4 ***Use stage energy cost***	*Energy annual cost per usable floor area*	*E/m^2*	*0:*	*N.A*
			5:	*N.A*
G1.6 ***Investment Risk*** **Etc.**	*Percent change in market value of properties within 200 m of the project boundaries, 12 months after the start of construction.*	*Score*	*0*	*N.A*
			5	*N.A*

SBTool Criteria Specifications

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.7 ***Use of vegetation to provide ambient outdoor cooling***	Ratio of total vegetated surface area (on ground and on roofs, and including trees), divided by total site area. The result is known as or Leaf Area Index.	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
A1.8 ***Use of native plant types***	The percentage of landscaped area (excluding paved areas)	*Information source*	*Plans of building*

	planted with native species.	*Assessment method*	*Desk Analysis*
		Standard	*N.A*
A1.9 *Provision of public open space(s)*	To provide public space for gathering, relaxation and recreation of the population within the project and neighbourhood. (Score)	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
A1.12 *Provision and quality of bicycle pathways and parking*	Underground Sheltered bicycle path- 12 spaces + showers	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
A1.13 *Provision and quality of walkways for pedestrian use*	To assess the extent and quality of walkways for occupants and users. Pedestrian walkways shaded by trees, bridges connecting to building, parking spaces leading directly to the building	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
A2.3 *Impact of orientation on the passive solar potential of building(s)*	Deviation, in degrees (º) of main building axis from East-West (to ensure a maximum possible insolation).	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*

B- ENERGY AND RESOURCES CONSUMPTION			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.1 *Primary energy demand*		*Information source*	*Measured data from meters.*
		Assessment method	*Insert text here*
		Standard	*Insert text here*
B1.2 *Delivered thermal energy demand*		*Information source*	*Measured data from VRF meters.*
		Assessment method	
		Standard	
B1.3 *Delivered electric demand*		*Information source*	*Measured data from meters.*
		Assessment method	
		Standard	
B1.4 *Energy from renewable sources in total primary energy consumption*		*Information source*	
		Assessment method	
		Standard	
B1.6 *Energy from renewable sources in total electric energy consumption*		*Information source*	
		Assessment method	
		Standard	
B4.2 *Water consumption for indoor uses*		*Information source*	

		Assessment method	
		Standard	

C- ENVIRONMENTAL LOADINGS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
C1.3 ***Global Warming Potential***	*CO_2 equivalent emissions per internal useful floor area per year*	*Information source*	*Enemalta*
		Assessment method	*Insert text here*
		Standard	*Insert text here*
C3.2 ***Solid waste from building operations***	*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*	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
C5.1 ***Impact on access to daylight or solar energy potential of adjacent property***	*Percentage of nearest face of an existing building, or a future building designed on an adjacent site in accordance with existing regulations that will be shaded by the subject building.*	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
C5.8 ***Degree of atmospheric light pollution caused by project exterior lighting systems***	*Percentage of total exterior light output that lies outside a vertical 120 degree cone, as indicated by drawings and specifications. CO_2 equivalent emissions per internal useful floor area per year*	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*

D- INDOOR ENVIRONMENTAL QUALITY		
CRITERION	**INDICATOR**	**SPECIFICATIONS**

D1.4 *TVOC concentration in indoor air*	*TVOC concentration in indoor air*	*Information source*	*Measured Data*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
D1.5 *CO_2 concentration in indoor air*	*Designs for HVAC systems that conform to ASHRAE, CIBSE or other acceptable protocol during design phase; actual monitoring results during operations phase.*	*Information source*	*Measured Data*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
D2.2 *Thermal Comfort Index*		*Information source*	*Questionnaire*
		Assessment method	*Short Questionnaire was distributed among occupants of the building.*
		Standard	*N.A*

E- SERVICE QUALITY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
E1.2 *Risk to occupants and facilities from fire*	*Risk level for occupants in the most vulnerable part of the building.*	*Information source*	*Fire Assessment Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
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 or other foreseeable flood risk.*	*Information source*	*Water Assessment Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
E1.7 *Personal security for building users during normal*	*Measures that are likely to assure adequate*	*Information source*	*Health and safety plans of building*

operations	*levels of actual and perceived personal security, according to design documentation.*	*Assessment method*	*Desk Analysis*
		Standard	*N.A*
E2.2 *Functionality of layout(s) for required functions*	*Goodness of fit of provided layouts (shape, ease of access) with functional requirements.*	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
E2.4 *Provision of exterior access and unloading facilities for freight or delivery*	*Adequacy of the facility unloading and temporary storage capacity and measures to prevent excessive noise and visual pollution from disturbing occupants.*	*Information source*	*Plans of building*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
E2.5 *Efficiency of vertical or horizontal transportation systems in building*	*Availability of lifts for occupant use, taking into account down-time for service and moving needs, and the time required to travel from the ground floor to the top floor (or vice versa) during peak periods; provision, capacity and speed of horizontal passenger conveying systems.*	*Information source*	*Lift data*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
E2.6 *Spatial efficiency*	*The ratio of directly functional net areas to total net area in each occupancy.*	*Information source*	*Building Plans*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
E2.7 *Volumetric efficiency*	*Total Net Areas exclude only structure and building envelope*	*Information source*	*Building Plans*

	areas; Net Functional Areas (NFA) exclude interior garages, vertical circulation and building mechanical rooms. The ratio of directly functional net areas to total net area in each occupancy.	*Assessment method*	*Desk Analysis*
		Standard	*N.A*
E3.3 ***Degree of local control of lighting systems***	*The area of typical lighting control zones in perimeter areas in m2, as shown in design documentation.*	*Information source*	*Building Plans*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
E3.4 ***Degree of personal control of technical systems by occupants***	*The degree of control over key indoor environment systems that can be exercised by occupants, according to design documentation.*	*Information source*	*Building Plans*
		Assessment method	*Desk Analysis*
		Standard	*N.A*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
F2.2 ***Provision of public open space compatible with local cultural values***	*Expert assessment of the degree to which public open space provided in the project is consistent with local cultural values.*	*Information source*	*Building Plans*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
F2.3 ***Impact of the design on existing streetscapes***	*Expert assessment of the harmony of the Design with adjacent existing buildings, in features such as height, bulk, set-back from the street, window size and height, colour or type of materials.*	*Information source*	*Building Plans*
		Assessment method	*Desk Analysis*
		Standard	*N.A*
F2.4 ***Use of traditional local materials and techniques***	*Architect's estimate of the percent of the non-structural elements of the building will be constructed using traditional local materials and construction techniques.*	*Information source*	*Building Plans*
		Assessment method	*Desk Analysis*
		Standard	*N.A*

G- COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G1.1 *Construction cost*	*Predicted construction cost per unit area, according to design documentation.*	*Information source*	*Design documentation*
		Assessment method	*Desk analysis*
		Standard	*N.A*
G1.4 *Use stage energy cost*	*Energy annual cost per usable floor area*	*Information source*	*Design documentation*
		Assessment method	*Desk analysis*
		Standard	*N.A*
G1.6 *Investment Risk*	*Percent change in market value of properties within 200 m of the project boundaries, 12 months after the start of construction.*	*Information source*	*Property market studies*
		Assessment method	*Desk analysis*
		Standard	*N.A*

REGIONAL TOOL

D.3.4.3 Regional Tool - NOA

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

BUILDING SCALE ASSESSMENT

SBTool structure

A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
A1	**Site Regeneration and Development**
A1.13	*Provision and quality of walkways for pedestrian use.*
A3	**Project Infrastructure and Services**
A3.12	*Public/ Municipal transportation*
A3.13	*Provision of on-site parking facilities for private vehicles.*
A3.16	*Exterior lighting.*

B – ENERGY AND RESOURCES CONSUMPTION	
B1	**Energy**
B1.1	*Primary energy demand **
B1.2	*Delivered thermal energy demand **
B1.3	*Delivered electric energy demand **
B1.5	*Energy from renewable sources in total thermal energy consumption **
B1.6	*Energy from renewable sources in total electrical energy consumption **
B1.8	*Final total energy for all building operations*
B1.11	*Embodied energy (Not for Use phase) **
B2	**Electrical peak demand**
B2.1	*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**
B4.5	*Water consumption for indoor uses **

C- ENVIRONMENTAL LOADINGS	
C1	**Greenhouse Gas Emissions**
C1.3	*Greenhouse Gas Emissions from building's operations **
C3	**Solid and Liquid Wastes**
C3.1	*Construction and demolition waste (Not for Use phase) **
C3.2	*Solid waste from building operations **

D- INDOOR ENVIRONMENTAL QUALITY	
D1	**Indoor Air Quality and Ventilation**
D1.4	*TVOC concentration in indoor air (Not for Use phase) **
D1.10	*Ventilation rate **
D2	**Air Temperature and Relative Humidity**
D2.2	*Thermal comfort index **

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*
E1.4	*Risk to occupants and facilities from earthquake*
E2	**Functionality and efficiency**
E2.5	*Elevators*
E3	**Controllability**
E3.1	*Building Management System (BMS)*
E3.2	*Building Energy Management System (BEMS)*
E3.3	*Control of lighting systems*
E3.4	*Local control of heating/cooling 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.*

G- COST AND ECONOMIC ASPECTS	
G1	**Cost**
F1.4	*Use stage energy cost **
F1.5	*Use stage water cost **

SBTool criteria selection rationale

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE

	CRITERION	REASON/MOTIVATION
A1.13	*Provision and quality of walkways for pedestrian use.*	*Facilitate the occupants*
A3.12	*Public/ Municipal transportation*	*Facilitate the occupants*
A3.13	*Provision of on-site parking facilities for private vehicles*	*Facilitate the occupants*
A3.16	*Exterior lighting.*	*Important for occupants' safety*

B – ENERGY AND RESOURCES CONSUMPTION

	CRITERION	REASON/MOTIVATION
B1.1	*Primary energy demand **	*KPI*
B1.2	*Delivered thermal energy demand **	*KPI*
B1.3	*Delivered electric energy demand **	*KPI*
B1.5	*Energy from renewable sources in total thermal energy consumption **	*KPI*
B1.6	*Energy from renewable sources in total electrical energy*	*KPI*

	*consumption **	
B1.8	*Final total energy for all building operations*	*Interesting and can be calculated*
B1.11	*Embodied energy (Not for Use phase) **	*KPI*
B2.1	*Electrical peak demand for building operations **	*KPI*
B3.5	*Recycled materials (Not for Use phase) **	*KPI*
B4.5	*Water consumption for indoor uses **	*KPI*

C- ENVIRONMENTAL LOADINGS

	CRITERION	REASON/MOTIVATION
C1.3	*Greenhouse Gas Emissions from building's operations **	*KPI*
C3.1	*Construction and demolition waste (Not for Use phase) **	*KPI*
C3.2	*Solid waste from building operations **	*KPI*

D- INDOOR ENVIRONMENTAL QUALITY

	CRITERION	REASON/MOTIVATION
D1.4	*TVOC concentration in indoor air (Not for Use phase) **	*KPI*
D1.10	*Ventilation rate **	*KPI*
D2.2	*Thermal comfort index **	*KPI*

E- SERVICE QUALITY

	CRITERION	REASON/MOTIVATION
E1.2	*Risk to occupants and facilities from fire*	*Important for occupants' safety*
E1.3	*Risk to occupants and facilities from flooding*	*Important for occupants' safety*
E1.4	*Risk to occupants and facilities from earthquake*	*Important for occupants' safety*
E2.5	*Elevators*	*Interesting and can be calculated*
E3.1	*Building Management System (BMS)*	*Important for building's energy consumption*
E3.2	*Building Energy Management System (BEMS)*	*Important for building's energy consumption*
E3.3	*Control of lighting systems*	*Important for building's energy consumption*
E3.4	*Local control of heating/cooling systems*	*Important for building's energy consumption*
E4.5	*Adaptability to future changes in type of energy supply*	*Interesting and can be calculated*
E5.6	*Retention of as-built documentation.*	*Useful*

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS

	CRITERION	REASON/MOTIVATION
F1.1	*Universal access on site and within the building.*	*Important*

G- COST AND ECONOMIC ASPECTS

	CRITERION	REASON/MOTIVATION
G1.4	*Use stage energy cost **	*KPI*
G1.5	*Use stage water cost **	*KPI*

SBTool weights rationale

ISSUE	WEIGHT (1 to 3)	MOTIVATION
A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE		
B – ENERGY AND RESOURCES CONSUMPTION	3	
C- ENVIRONMENTAL LOADINGS	3	
D- INDOOR ENVIRONMENTAL QUALITY	2	
E- SERVICE QUALITY		
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS		
G- COST AND ECONOMIC ASPECTS	1	

* Issue weighting is from the "CESBA KPIs SBTool v1.0" tool

COMMENT: We do not have weighting factors for issues (issues are replaced by primary issue or system, which is factor D). Additionally, reporting of factor A is missing.

Primary issue or system directly affected	WEIGHT (1 to 5)	MOTIVATION
COST AND ECONOMICS	1	
FUNCTIONALITY AND SERVICABILITY	1	
WELL-BEING AND PRODUCTIVITY OF OCCUPANTS	2	
SOCIAL AND CULTURAL ISSUES	2	
LAND RESOURCES	3	
NON-RENEWABLE MATERIAL RESOURCES	3	
NON-RENEWABLE WATER RESOURCES	3	
HEALTH, SAFETY AND SECURITY OF INDIVIDUALS	3	
RENEWABLE ENERGY RESOURCES	4	
NON-RENEWABLE ENERGY RESOURCES	4	
GLOBAL CLIMATE	5	

CATEGORIES	WEIGHT (%)
A1- Site regeneration and Development	1.3
A3- Project Infrastructure and Services	5.2
TOTAL	6.5
B1- Energy	22.0
B2- Electrical peak demand	5.1
B3- Use of materials	-
B4 – Use of water, stormwater and greywater	1.4
TOTAL	28.5
C1- Greenhouse gas emissions	26.5
C3- Solid and liquid waste	10.1

TOTAL	36.6
D1- Indoor air quality and ventilation	-
D2- Thermal comfort	0.5
TOTAL	0.5
E1- Safety and Security	3.6
E2- Functionality and efficiency	0.2
E3- Controllability	3.8
E4– Flexibility and adaptability	5.1
E5- Optimization and maintenance of operating performance	0.0
TOTAL	12.6
F1- Social aspects	4.3
TOTAL	4.3
G1- Cost	11.0
TOTAL	11.0

CRITERIA WEIGHTS

SBTool file A – WeightA-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
A1.13	*Provision and quality of walkways for pedestrian use.*	*1.26*	*3*	*2*	*1*	*4*	*Pedestrian and bicycle paths are important for future plans*

A3 Project Infrastructure and Services

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A3.12	*Public/ Municipal transportation*	*2.83*	*3*	*3*	*1*	*4*	*Municipal transportation system is important for future plans*
A3.13	*Provision of on-site parking facilities for private vehicles*	*0.47*	*1*	*3*	*1*	*2*	*Parking is less important*
A3.16	*Exterior lighting.*	*1.89*	*1*	*3*	*3*	*4*	*Exterior lighting is important for security reasons*
TOTAL		**6.4**					

B - ENERGY AND RESOURCES CONSUMPTION

B1 Energy

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
B1.1	*Primary energy demand*	*3.77*	*3*	*3*	*4*	*4*	*Energy consumption is an important issue*
B1.2	*Delivered thermal energy demand*	*3.77*	*3*	*3*	*4*	*4*	*Energy consumption is an important issue*
B1.3	*Delivered electric energy demand*	*3.77*	*3*	*3*	*4*	*4*	*Energy consumption is an important issue*
B1.5	*Energy from renewable sources in total thermal*	*0.94*	*3*	*3*	*4*	*1*	*Energy consumption is an important issue*

	energy consumption						
B1.6	*Energy from renewable sources in total electrical energy consumption*	*4.72*	*3*	*3*	*4*	*5*	*Installation of PV are of extremely importance for the Municipality strategic plan*
B1.8	*Final total energy for all building operations*	*3.77*	*3*	*3*	*4*	*4*	*Energy consumption is an important issue*
B1.11	*Embodied energy*	*1.05*	*5*	*1*	*4*	*1*	*Not so important for now*
B2	**Electrical peak demand**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B2.1	*Electrical peak demand for building operations*	*5.03*	*2*	*3*	*4*	*2*	*Not so important for now*
B3	**Use of Materials**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B3.5	*Recycled materials (Not for Use phase)*	-	*4*	*2*	*3*	*2*	Not very common practice
B4	**Use of potable water, stormwater and greywater**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B4.5	*Water consumption for indoor uses*	*1.42*	*3*	*2*	*3*	*3*	
TOTAL		**28.2**					

C- ENVIRONMENTAL LOADINGS							
C1	**Greenhouse Gas Emissions**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.3	*Greenhouse Gas Emissions from building's operations*	*26.21*	*5*	*2*	*5*	*4*	*Reduction of CO2 is an important issue*
C3	**Solid and Liquid Wastes**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C3.1	*Construction and demolition waste (Not for Use phase)*	-	*4*	*2*	*3*	*3*	
C3.2	*Solid waste from building operations*	*10.01*	*4*	*2*	*3*	*4*	*Recycling is an important issue*
TOTAL		**36.3**					

D- INDOOR ENVIRONMENTAL QUALITY							
D1	**Indoor Air Quality and Ventilation**						
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D1.4	*TVOC concentration in indoor air (Not for Use phase)*	-	*1*	*3*	*3*	*3*	
D1.10	*Ventilation rate*	*0.94*	*2*	*3*	*2*	*3*	
D2	**Air Temperature and Relative Humidity**						

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
D2.2	*Thermal comfort index*	*0.47*	*1*	*3*	*2*	*3*	
TOTAL		**1.4**					

E- SERVICE QUALITY

E1 Safety and Security

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E1.2	*Risk to occupants and facilities from fire*	*1.42*	*1*	*3*	*3*	*3*	
E1.3	*Risk to occupants and facilities from flooding*	*1.42*	*1*	*3*	*3*	*3*	
E1.4	*Risk to occupants and facilities from earthquake*	*0.71*	*1*	*3*	*3*	*3*	

E2 Functionality and efficiency

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E2.5	*Elevators*	*0.21*	*1*	*2*	*1*	*4*	

E3 Controllability

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E3.1	*Building Management System (BMS)*	*0.16*	*2*	*1*	*1*	*3*	
E3.2	*Building Energy Management System (BEMS)*	*1.68*	*2*	*2*	*4*	*4*	
E3.3	*Control of lighting systems*	*1.26*	*2*	*2*	*4*	*3*	
E3.4	*Local control of heating/cooling systems*	*0.63*	*2*	*2*	*2*	*3*	

E4 Flexibility and Adaptability

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E4.5	*Adaptability to future changes in type of energy supply*	*5.03*	*3*	*2*	*4*	*4*	*Turning to PV systems is in future plans*

E5 Optimization and Maintenance of Operating Performance

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
E5.6	*Retention of as-built documentation*	*0.03*	*1*	*1*	*1*	*1*	*Of no importance for now*
TOTAL		**12.5**					

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

F1 Social Aspects

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
F1.1	*Universal access on site and within the*	*4.25*	*3*	*3*	*3*	*3*	

	building						
TOTAL		**4.2**					

G- COST AND ECONOMIC ASPECTS

G1 Cost

CRITERION		Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
G1.4	*Use stage energy cost*	*2.36*	*3*	*3*	*1*	*5*	*Reduction of energy cost is very important*
G1.5	*Use stage water cost*	*8.49*	*3*	*3*	*3*	*3*	
TOTAL		**10.8**					

SBTool benchmarks rationale

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE

CRITERION	INDICATOR	UNIT	BENCHMARK	DERIVATIONS
A1.13	*Existence and usability of bicycle and pedestrian paths around the building*	*text*	*0:*	*Short network of pedestrian or bicycle paths or shared areas near the building*
			5:	*Large network of pedestrian or bicycle paths or shared areas near the building leading to public transport stops, schools or public spaces*
A3.12	*Public/ Municipal transportation*	*text*	*0:*	*One stop of public/municipal transportation within 400m from the building, with travel frequency up to 15 minutes.*
			5:	*At least two stops of public/municipal transportation (covering different directions) within 400m from the building, with travel frequency up to 10 minutes.*
A3.13	*Provision of on-site parking facilities for private vehicles*	*Spaces/60m²*	*0: 1*	*ΦΕΚ 76/ΜΑΡΤΙΟΣ 2004* Official journal 76 / March 2004
			5: 1.3	*Based on discussions with National Local Committee Members*
A3.16	*Exterior lighting.*	*text*	*0:*	*Adequate exterior and public lighting around the building with old lighting fixtures, no visual discomfort*
			5:	*Adequate exterior and public lighting around the building with new lighting fixtures, no visual discomfort*

B- ENERGY AND RESOURCES CONSUMPTION

CRITERION	INDICATOR	UNIT	BENCHMARK	DERIVATIONS

B1.1	*Primary energy demand **	*kWh/m²*	*0: 310.6* *5: 87.6*	*Very difficult to get metered data, especially for residential and privately owned non-residential buildings.* *Use of statistical / calculated data.* *Score 0 corresponds to the consumption of the dominant energy class, while Score 5 to energy class A+ (33% of class B).* *Primary energy consumption per building use for the dominant energy class and class B, were defined using data from the Energy Performance Certificates (EPC) electronic repository (buildingcert), for whole buildings adapted for external (TEEKENAK) to internal (CESBAMED) dimensions.* *All end uses (space heating, space cooling, domestic hot water, ventilation, lighting and auxiliaries) were taken into account.*
B1.2	*Delivered thermal energy demand **	*kWh/m²*	*0: 69.1* *5: 11.5*	*Very difficult to get metered data, especially for residential and privately owned non-residential buildings.* *Use of statistical / calculated data.* *Score 0 corresponds to the consumption of the dominant energy class, while Score 5 to energy class A+ (33% of class B).* *Thermal energy consumption per building use for the dominant energy class and class B, were defined using data from the Energy Performance Certificates (EPC) electronic repository (buildingcert), for whole buildings, adapted for external (TEEKENAK) to internal (CESBAMED) dimensions.* *All end uses (space heating, space cooling and domestic hot water) were taken into account.*
B1.3	*Delivered electric energy demand **	*kWh/m²*	*0: 99.4* *5: 29.1*	*Very difficult to get metered data, especially for residential and privately owned non-residential buildings.* *Use of statistical / calculated data.* *Score 0 corresponds to the consumption of the dominant energy class, while Score 5 to energy class A+ (33% of class B).* *Electricity consumption per building use for the dominant energy class and class B, were defined using data from the Energy Performance Certificates (EPC) electronic repository (buildingcert), for whole buildings, adapted for external (TEEKENAK) to internal (CESBAMED) dimensions.* *All end uses (space heating, space cooling, domestic hot water, ventilation, lighting and auxiliaries) were taken into account.*
B1.5	*Energy from renewable sources in total thermal energy consumption **	*%*	*0: 16* *5: 80*	*Building use solar collectors for pre-heating* *Building use solar collectors for pre-heating and partial coverage*

				of heating loads
B1.6	*Energy from renewable sources in total electrical energy consumption **	*%*	*0: 20* *5: 100*	*Very difficult to get metered data.* *Use of statistical/ estimated data*
B1.8	*Final total energy for all building operations*	*kWh/m²*	*0: 168.5* *5: 40.6*	*Based on B1.2 and B1.3*
B1.11	*Embodied energy (Not for Use phase) **	*MJ/m²*	*0: 6230* *5: 3000*	*Based on discussions with National Local Committee Members*
B2.1	*Electrical peak demand for building operations **	*W/m²*	*0: 225.3* *5: 9*	*From typical installed power for heating, cooling, mechanical ventilation, lighting, and equipment for office buildings* *For nzeb buildings*
B3.5	*Weight of recycled materials on total weight of materials (Not for Use phase) **	*%*	*0: 3* *5: 40*	*Based on discussions with National Local Committee Members and common practice in Greece*
B4.5	*Potable water consumption per occupant per year**	*m³/occupant*	*0: 6.0* *5: 1.5*	*From typical values for offices* *Based on discussions with National Local Committee, consumption can be reduced to 75%*

C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	UNIT	BENCHMARK	DERIVATIONS
C1.3	*CO2 equivalent emissions per internal useful floor area per year **	*kg CO2 eq/m²/yr*	*0: 7.5* *5: 2.0*	*Based on thermal and electricity consumption benchmarking as estimated in B1.2 and B1.3. It is assumed that thermal energy is covered by fuel oil.* *Score 0 corresponds to CO2 equivalent emissions for the thermal and electrical energy consumption of the buildings of the dominant energy class* *Score 5 corresponds to the CO2 equivalent emissions for consumptions of energy class A+.*
C3.1	*Weight of waste and materials generated per 1 m2 of useful floor area demolished or constructed (Not for Use phase) **	*kg/m²/life cycle stage*	*0: 120* *5: 36*	*As an assumption of 8 m³/100 m² X 1500 kg/m³* *70% x120kg/m² =1.8 kg/m²* *reuse, recycling and recovery of CDW should be reduced by 70% at 2020*
C3.2	*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 **	*%*	*0: 57* *5: 100*	*Based on discussions with National Local Committee Members and common practice*

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	UNIT	BENCHMARK	DERIVATIONS
D1.4	*TVOC concentration in indoor air (Not for Use phase) **	*μg/ m³*	*0: 1000* *5: 200*	From punished material
D1.10	*Ventilation rate **	*l/s/m²*	*0: 0.29* *5: 0.83*	*Common practice in NR buildings for fresh air* *Based on National guidelines for fresh air for office buildings*
D2.2	*Thermal comfort index **	*%*	*0: 25* *5: 5*	*Based on discussions with National Local Committee Members*

E- SERVICE QUALITY

CRITERION	INDICATOR	UNIT	BENCHMARK	DERIVATIONS
E1.2	*Risk to occupants and facilities from fire*	*text*	*0:*	*The building fulfils the requirements for fire protection. Basic training of the occupants*
			5:	*The building fulfils the requirements for fire protection. Periodical training of the occupants and fire drills. System connected to a BMS.*
E1.3	*Risk to occupants and facilities from flooding*	*text*	*0:*	*Area facing flooding problems (during the last 100years), building partially equipped, OR building in an area with no flooding problems (during the last 100years).*
			5:	*Area facing flooding problems (during the last 100years), building fully equipped, which faced flooding incident successfully*
E1.4	*Risk to occupants and facilities from earthquake*	*text*	*0:*	*Building has passed successfully, a pre-earthquake inspection.*
			5:	*Building has passed successfully, a pre-earthquake inspection and fully complies with National Regulations. Periodical training of the occupants*
E2.5	*Elevators*	*text*	*0:*	*Certified elevators, with regular maintenance but don't comply with regulations for disabled persons. Maximum waiting time about 45 sec.*
			5:	*Certified elevators, with regular maintenance,*

				complied with updated standards EN81.20, and with disabled persons' requirements. Maximum waiting time about 25 sec. System connected to a BMS.
E3.1	*Building Management System (BMS)*	*text*	*0:*	*The building is equipped with a BMS, but it doesn't provide monitoring of system operations, or diagnostic reporting.*
			5:	*The building is equipped with a BMS, capable of ensuring that building technical systems operate at peak efficiency during all operating conditions, and the system provides full monitoring of system operations, as well as diagnostic reporting.*
E3.2	*Building Energy Management System (BEMS)*	*text*	*0:*	*Central control system for heating, cooling and ventilation, on building level*
			5:	*Central control system for heating, cooling, ventilation and lighting on zone level*
E3.3	*Control of lighting systems*	*text*	*0:*	*Automatic control of lighting turning on and off per building part.*
			5:	*Automatic control of lighting turning on and off per zone. Daylight and occupancy sensors in all zones. System connected to a BEMS or BMS.*
E3.4	*Local control of heating/cooling systems*	*text*	*0:*	*Thermostatic control of terminal units or/and central heating system with timer*
			5:	*Automatic local control of terminal units per room. Thermostatic control per room for central heating systems.*
E4.5	*Ease in installing heating or cooling equipment that require a different fuel/ energy carrier, or photovoltaic systems.*	*text*	*0:*	*Adapting the building to a new fuel source will be possible with a moderate level of renovations, but installing photovoltaics will require major renovations.*
			5:	*Adapting the building to a new fuel source or installing photovoltaics will require only minor adjustments to architectural, HVAC or electrical systems.*
E5.6	*Retention of as-built documentation*	*text*	*0:*	*A full set of systems manuals and complete as-built drawings will be been*

				provided. There will be a partial recording, reporting and documentation protocol for maintenance, but somewhat inconsistent with the size and complexity of the building.
			5:	*A full set of operations and maintenance documentation, including a full set of systems manuals, complete as-built drawings and an operations and maintenance guide will be provided in both hard-copy and electronic forms.*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	INDICATOR	UNIT	BENCHMARK	DERIVATIONS
F1.1	*Ease of access and use of facilities for persons with mobility or perceptual disabilities.*	*text*	*0:*	*All key facilities, including outdoor facilities, entry points and hallways, are accessible to wheelchair users and visually impaired persons*
			5:	*All key facilities, including outdoor facilities, entry points and hallways, are accessible to wheelchair users and visually impaired persons.*

G- COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	UNIT	BENCHMARK	DERIVATIONS
G1.4	*Annual energy cost per usable floor area **	*€/m2*	*0: 18.9*	*From benchmarking of B1.2 and B1.3, taking an average fuel and electricity cost. (taking +20% of total for taking into account energy cost for equipment and other installations)*
			5: 4.7	
G1.5	*Annual water cost per usable floor area **	*€/m2*	*0: 0.59*	*From benchmarking of B4.5, taking into account 10 occupants/100m2 and an average of water cost.*
			5: 0.15	

SBTool Criteria Specifications

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE

CRITERION	INDICATOR	SPECIFICATIONS	
A1.13	Existence and usability of bicycle and pedestrian paths around the	*Information source*	*Qualitative indicator - Estimations*

	building	*Assessment method*	*CESBAMED calculation steps* Estimate the existence and usability of bicycle and pedestrian paths around the building *NOA pilot steps/comments:* From area plots and from the on-site audit, three of the building's facades are facing "shared paths", connected to a larger network of "shared areas"
		Standard	
A3.12	Existence and effectiveness of public/municipal transportation near the building	*Information source*	*Qualitative indicator – Estimations – Metered data*
		Assessment method	*CESBAMED calculation steps* Estimate the existence and effectiveness of public/municipal transportation within 400m from the building *NOA pilot steps/comments:* *From metered data. From a study carried out by the Municipality for the public transport, the number and location of public transport stops was defined. (1 stop of a certain transportation line within 400m)*
		Standard	
A3.13	*Ratio of exterior and interior parking spaces to the total usable area of non-residential occupancies (spaces/60 m2)*	*Information source*	*Metered data - Estimations*
		Assessment method	*CESBAMED calculation steps* *1. Calculate the total usable area of non-residential occupancies* *2. Calculate the total parking spaces (exterior and interior)* *3. Calculate the ratio of total parking spaces per 60m^2 total usable area* *NOA pilot steps/comments:* *From metered data.from bluilding plots, the usable area was defined. From the on-site audit the number of total parking spaces was defined. (0.73)*
		Standard	*ΦΕΚ 76/ΜΑΡΤΙΟΣ 2004* *Official Journal 76 / March 2004*
A3.16	*Efficiency and adequacy of the exterior lighting and the public lighting around the building*	*Information source*	*Qualitative indicator – Estimations – Metered data*
		Assessment method	*CESBAMED calculation steps* *Estimation of the efficiency and adequacy of the exterior lighting and the public lighting around the building* *NOA pilot steps/comments:*

			From the on-site audit the number and type of exterior and public lighting was defined. (Adequate exterior and public lighting around the building, with old lighting fixtures, no visual discomfort)
		Standard	

B- ENERGY AND RESOURCES CONSUMPTION

CRITERION	INDICATOR	SPECIFICATIONS	
B1.1	*Primary energy demand **	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps* *National calculation methods used to meet performance requirements or to complete Energy Performance Certificates (EPCs), aligned with the EN standards series, can be used. In-built lighting may not be specifically covered in all national or regional calculation methods. As a result, either the omission from the calculations, or a separate calculation method if used, shall be noted in the reporting. The reference unit is one square meter of useful internal floor area (Level(s) Part 3 – 1.3.1).* *NOA pilot steps/comments:* *From calculated data based on National calculation merthod for the energy performance of building and the issuing of Energy Performance Certificates (semi-steady, monthly method). From an energy study carried out for the Municipal Unit of Ano Liosia, data for primary energy consumption and heated area (external dimensions) for the public buildings within testing area were available, and also adapted for external to internal (CESBAMED) dimensions.(442.4 kWh/m^2)* ***Comment: Lighting is taken into account. Hot water is not taken into account for office buildings***
		Standard	*EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings)* *EN ISO 13790 (Energy performance of buildings)* *EN 15193 (Energy performance of buildings — Energy requirements for lighting)*
B1.2	*Delivered thermal energy demand **	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment	*CESBAMED calculation steps*

		method	*Energy uses taken into account: heating, cooling, ventilation, domestic hot water National calculation methods used to meet performance requirements or to complete Energy Performance Certificates (EPCs), aligned with the EN standards series, can be used. The reference unit is one square meter of useful internal floor area (Level(s) Part 3 – 1.3.1). In case of existing buildings, the delivered thermal energy should be evaluated using data from metering. The metered delivered thermal energy demand (i.e. fuel consumption data) has to be calculated taking the average value over 3 years period. NOA pilot steps/comments: From calculated data based on National calculation merthod for the energy performance of building and the issuing of Energy Performance Certificates (semi-steady, monthly method). From an energy study carried out for the Municipal Unit of Ano Liosia, data for thermal energy consumption and heated area (external dimensions) for the public buildings within testing area were available, and also adapted for external to internal (CESBAMED) dimensions.(100.1 kWh/m^2)* ***Comment: Hot water is not taken into account for office buildings***
		Standard	*EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings) EN ISO 13790 (Energy performance of buildings) EN 15193 (Energy performance of buildings — Energy requirements for lighting)*
B1.3	*Delivered electric energy demand **	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps National calculation methods used to meet performance requirements or to complete Energy Performance Certificates (EPCs), aligned with the EN standards series, can be used. The reference unit is one square meter of useful internal floor area (Level(s) Part 3 – 1.3.1). In case of existing buildings, the delivered electrical energy should be evaluated using data from metering. The metered delivered electric energy demand (i.e. electricity consumption data) has to be calculated taking the average value over 3 years period bills.*

			NOA pilot steps/comments: From calculated data based on National calculation merthod for the energy performance of building and the issuing of Energy Performance Certificates (semi-steady, monthly method). From an energy study carried out for the Municipal Unit of Ano Liosia, data for electric energy consumption and heated area (external dimensions) for the public buildings within testing area were available, and also adapted for external to internal (CESBAMED) dimensions (114.6 kWh/m^2) ***Comment: Lighting is taken into account*. *Hot water is not taken into account for office buildings***
		Standard	*EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings)* *EN ISO 13790 (Energy performance of buildings)* *EN 15193 (Energy performance of buildings — Energy requirements for lighting)*
B1.5	*Energy from renewable sources in total thermal energy consumption **	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps* *Share of renewable energy in final thermal energy consumption of the building. In case of existing buildings, it should be evaluated by energy metering* *NOA pilot steps/comments:* *From an on site audit there were no renewable sources for thermal energy installed on the building (0%)*
		Standard	*Level(s) Part 1-2 – Beta version* *EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings)* *2013/114/EU: Commission Decision of 1 March 2013.* *Directive 2009/28/EC (RES Directive)*
B1.6	*Energy from renewable sources in total electrical energy consumption **	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps* *Share of renewable energy in final electric energy consumption. In case of existing buildings, it should be evaluated by energy metering* *NOA pilot steps/comments:* *From an on site audit there were no renewable sources for electric energy installed on the building (0%)*

		Standard	*Level(s) Part 1-2 – Beta version* *EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings)* *2013/114/EU: Commission Decision of 1 March 2013.* *Directive 2009/28/EC (RES Directive)*
B1.8	*Final total energy for all building operations*	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps* *During early design stages a screening tool may be used, but in later stages an hour-by-hour simulation program should be used* *NOA pilot steps/comments:* *From calculated data based on National calculation merthod for the energy performance of building and the issuing of Energy Performance Certificates (semi-steady, monthly method). From an energy study carried out for the Municipal Unit of Ano Liosia, data for final energy consumption and heated area (external dimensions) for the public buildings within testing area were available, and also adapted for external to internal (CESBAMED) dimensions (214.7 kWh/m^2)* ***Comment: Lighting is taken into account. Hot water is not taken into account for office buildings***
		Standard	*EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings)* *EN ISO 13790 (Energy performance of buildings)* *EN 15193 (Energy performance of buildings — Energy requirements for lighting)*
B1.11	*Embodied energy (Not for Use phase) **	*Information source*	*Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps* *The following steps should be followed in order to compile the BoM:* *- Compile the Bill of Quantities: A BoQ is compiled which comprises the building elements accounting for at least 99% of the mass of the building.* *- Identify the basic composition of each building element. A breakdown of its constituent materials has to be carried out. The mass of each constituent material has to be estimated;* *- Aggregation by material: The mass for each constituent material should thereafter be aggregated to obtain the total mass for each type of material.* *Once the BoM has been compiled, it is*

			possible to calculate the indicator associating to each constituent material the relative embodied primary non-renewable energy by multiplying the specific mass (i.e. kg) with its corresponding embodied energy coefficient (i.e. MJ/kg). The total value of embodied primary non-renewable energy is finally normalized by the gross area of the building *NOA pilot steps/comments:* ***Not for Use phase***
		Standard	*EN 15978 "Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method".* *ISO 14040/44* *EN 15804 (Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products)*
B2.1	*Electrical peak demand for building operations*	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps* *Review of contract documentation and sample equipment specifications by an ouside electrical engineer.* *NOA pilot steps/comments:* *From an on site audit, the installed power of heating, cooling and lighting systmes was defined. For equipment, typical values for office, taken from National Guidelines. An increasement of about 15% to include other systmes (i.e. elevators, circulators, pumps). (434.7 W/m^2)* **COMMENT**: **Usefull area with internal dimensions is used.**
		Standard	
B3.5	*Recycled materials (Not for Use phase) **	*Information source*	*Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps* *- Compile the Bill of Quantities: A BoQ is compiled which comprises the building elements accounting for at least 99% of the mass of the building.* *- Identify the basic composition of each building element. A breakdown of its constituent materials has to elaborated. The mass of each constituent material has to be estimated;* *- Aggregation by material: the mass of all constituent material should thereafter be aggregated to obtain the total mass of*

			materials used in the building (A); - Identify the recycled content of each constituent material (in mass); - Aggregation by material: the recycled mass of all constituent materials should thereafter be aggregated to obtain the total recycled mass of materials (B) used in the building; - The indicator's value is calculated as B/A (total mass of recycled materials on the total mass of materials). *NOA pilot steps/comments:* ***Not for Use phase***
		Standard	*EN ISO 14021 (Environmental labels and declarations - Self-declared environmental claims - Type II environmental labelling)*
B4.5	*Water consumption for indoor uses **	*Information source*	*Metered data – Estimations*
		Assessment method	*CESBAMED calculation steps Includes the use of potable water for: drinking water; water for sanitation; water for cleaning; water for washing machine; water for dishwasher; domestic hot water. The user must include in the calculation the sanitary devices/fittings (i.e. toilets, taps and showers) and water using appliances (i.e dishwashers and washing machines). Consumption rates for different sanitary devices and fittings are determined through specific data from suppliers. The specific usage factors have to be established. The number of days that the building is expected to be occupied per year has to be defined by the user. See KPIs Card document for the principle of the per occupant potable water consumption calculation. In case of existing buildings, the potable area water consumptions should be evaluated using data from metering. The metered consumptions have to be estimated taking the average value over 3 years period bills.* *NOA pilot steps/comments: Metered data not available for the public buildings of the Municipality. From the corresponding department of the Municipality, the annual water consumption was not officially reported, but estimated. From an energy study carried out for the Municipal Unit of Ano Liosia, the number of employyes was defined. The ratio of annual total water consumption to the number of employees was calculated (6 m^3/person)*

		Standard	*Level(s) Part 1-2 – Beta version. EN 15978 (Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method)*

C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	SPECIFICATIONS	
		Information source	*Metered data – Calculated data - Estimations*
C1.3	*Greenhouse Gas Emissions from building's operations **	*Assessment method*	*CESBAMED calculation steps 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) 2. Calculate the aggregated annual total CO2 equivalent emissions from all buildings / total useful internal floor area of all buildings NOA pilot steps/comments: From calculated data based on National calculation merthod for the energy performance of building and the issuing of Energy Performance Certificates (semi-steady, monthly method). From an energy study carried out for the Municipal Unit of Ano Liosia using the national method, data for thermal and electrical energy consumption and heated area (external dimensions) for the public buildings within testing area were available, and also adapted for external to internal (CESBAMED) dimensions. Using the national conversion factors to COeq (20704.1 kg/GWh for fuel oil and 61123.9 kg/GWh for electricity), total CO2 equivalent emissions to total useful internal floor area*

			of the building (9.1 kg/m^2)
		Standard	EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings). Level(s) Part 1-2 – Beta version
C3.1	Construction and demolition waste (Not for Use phase) *	Information source	Metered data –Estimations
		Assessment method	CESBAMED calculation steps <u>Design stage (based on estimations)</u> Estimations of waste based on surveys of existing buildings that will undergo major renovation or where the structure will be reused (life cycle stage B5). Estimations based on scenarios for deconstruction and demolition of the building at a future point in time beyond the end of its service life (life cycle stages C1/3, D). <u>Construction stage (based on data recorded from the site)</u> Data from deconstruction and demolition of (a) building(s) in order to clear a site for a new building construction (as part of a previous life cycle). Data from the part deconstruction of (a) building(s) in order to prepare useful parts for in-situ reuse. Data from construction on site of a new building and/or the prefabrication/construction of parts and elements off site (life cycle stages A3/5). Data from preparation of a building in order to facilitate a major renovation. <u>Completion stage (based on estimations supported by as-built drawings)</u> Estimations based on scenarios for deconstruction and demolition of the building at a future point in time beyond the end of its service life (life cycle stages C1/3, D). NOA pilot steps/comments: **Not for Use phase**
		Standard	Level(s) Part 1-2 – Beta version
C3.2	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 *	Information source	Metered data – Calculated data - Estimations
		Assessment method	CESBAMED calculation steps The seven reference categories of solid waste are: Paper, Metal, Glass, Wet waste, Textiles, Special hazardous waste.

			1. Identify the availability and position of bins and containers for each of the seven solid waste categories. *2. Calculate the walking distance (m) from the building's main entrance to each identified bin or container.* *3. Evaluate how many of the 7 categories of solid waste is possible to collect within a 100 m walking distance from the building's entrance (A).* *4. Calculate the value of the indicator as : A/7* *NOA pilot steps/comments:* *From calculated data. From an on-site audit in the testing area, the number and the type of collectable solid waste categories within a 100 m distance was defined. In this case there were single bins used to collect different types of waste that will be later separated at the waste facility. (57%)*
		Standard	

D- INDOOR ENVIRONMENTAL QUALITY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
		Information source	*Metered data*
D1.4	*TVOC concentration in indoor air (Not for Use phase) **	*Assessment method*	*CESBAMED calculation steps* *Post completion phase* *Testing shall be carried out for a minimum of 10% of the apartments and be representative of any significant variations in the house or apartment typologies, configurations and materials. Samples shall be taken in the living room and the smallest bedroom of each property* *NOA pilot steps/comments:* ***Not for Use phase*** ***COMMENT: TVOC concentrations have been in the past used as an indicator of the ability of combined VOC exposures to produce adverse health effects. This approach is no longer supported (e.g. ASHRAE), because the irritant potential and toxicity of individual VOCs vary widely, and measured concentrations are highly dependent on the sampling and analytical methods used. The available data do not allow establishing of thresholds for TVOC (ECA-IAQ***

			European Collaborative Action, JRC)
		Standard	*CEN/TS 16516 (Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air).* *EN 15251 (Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics).* *Level(s) Part 1-2 – Beta version*
D1.10	*Ventilation rate **	*Information source*	*Metered data – Calculated data*
		Assessment method	*CESBAMED calculation steps* *<u>ONLY for ventilated buildings</u>* *The ventilation rate (l/s/m2) must be calculated in all the main rooms, excluding circulation spaces and service rooms (i.e. toilets).* *The indicator must be calculated as weighted sum all the calculated ventilation rates.* *NOA pilot steps/comments:* *Building not mechanically ventilated.*
		Standard	*EN 16798-7 (Energy performance of buildings - Ventilation for buildings - Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration)*
D2.2	*Predicted Percentage Dissatisfied (PPD) **	*Information source*	*Metered data – Calculated data - Estimations*
		Assessment method	*CESBAMED calculation steps* *<u>Design stage (mechanically conditioned)</u>* *For all main occupied room:* *1. Estimate PMV* *2. Calculate PPD* *NOA pilot steps/comments:* *From short ohn site occupant survey.* *From on site audit there were some spaces with no heating system and there was difficulty in controlling internal conditions and natural ventilation. (18%)*
		Standard	*EN ISO 7730 – Ergonomics of the thermal environment – Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria.* *EN 16798-1:2017 - Energy performance of buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal*

		environment, lighting and acoustics - Module M1-6 (revision of EN 15251). Brussels: European Committee for Standardization. *Level(s) Part 1-2 – Beta version. Brussels: European Commission*

E- SERVICE QUALITY

CRITERION	INDICATOR	SPECIFICATIONS	
		Information source	*Metered data*
E1.2	*Risk to occupants and facilities from fire*	*Assessment method*	*CESBAMED calculation steps* *Estimate the level of compliance with the requirements for fire protection as well as of the occupnats training* *NOA pilot steps/comments:* *From and on site audit and information from the corresponding department. (The building fulfils the requirements for fire protection. Basic training of the occupants)*
		Standard	*Insert text here*
		Information source	*Metered data*
E1.3	*Risk to occupants and facilities from flooding*	*Assessment method*	*CESBAMED calculation steps* *Estimate the area's flooding risk as well as the building equipment.* *NOA pilot steps/comments:* *From an on site audit and information from the corresponding department. (*Area often facing floodings, building properly equipped)
		Standard	
		Information source	*Metered data*
E1.4	*Risk to occupants and facilities from earthquake*	*Assessment method*	*CESBAMED calculation steps* *Evaluate the building's anti-earthquaqe protection.* *NOA pilot steps/comments:* *From an on site audit and information from the corresponding department. (Building has passed successfully, a pre-erthquaqe inspection. Basic training of the occupants)*
		Standard	

E2.5	*Elevators*	*Information source*	*Metered data*
		Assessment method	*CESBAMED calculation steps* *Assess the service quality and functional efficiency of elevators within a building, as well as their compliance with the existing regulations.* *NOA pilot steps/comments:* *From an on site audit and information from the corresponding department. (The elevator is certified, but it is too small)*
		Standard	
E3.1	*Building Management System (BMS)*	*Information source*	*Metered data*
		Assessment method	*CESBAMED calculation steps* *Visual inspection and review of specifications.* *NOA pilot steps/comments:* *From an on site audit and information from the corresponding department. (The building has no BMS)*
		Standard	
E3.2	*Building Energy Management System (BEMS)*	*Information source*	*Metered data*
		Assessment method	*CESBAMED calculation steps* *Visual inspection and review of specifications.* *NOA pilot steps/comments:* *From an on site audit and information from the corresponding department. (Building is equipped with a compensation system)*
		Standard	
E3.3	*Control of lighting systems*	*Information source*	*Metered data*
		Assessment method	*CESBAMED calculation steps* *Visual inspection and review of specifications for lighting control zones, control types and locations* *NOA pilot steps/comments:* *From an on site audit and information from the corresponding department. (The building has no lighting control system)*
		Standard	

E3.4	*Local control of heating/cooling systems*	*Information source*	*Metered data*
		Assessment method	*CESBAMED calculation steps* *Type of mechanical and electrical equipment accessible by occupants, and the extent to which local systems can be operated and modulated by occupants.* *NOA pilot steps/comments:* *From an on site audit and information from the corresponding department. (Thermostatic control of terminal units)*
		Standard	
E4.5	*Adaptability to future changes in type of energy supply*	*Information source*	*Estimations*
		Assessment method	*CESBAMED calculation steps* *Evaluate the ease or difficulty in installing heating or cooling equipment that require a different fuel, or to install photovoltaic systems.* *NOA pilot steps/comments:* *From an on site audit and information from the corresponding department. (Adapting the building to a new fuel source or installing photovoltaics will require only a minor level of renovations).*
		Standard	
E5.6	*Retention of as-built documentation*	*Information source*	*Metered data*
		Assessment method	*CESBAMED calculation steps* *Evaluate the availability of architectural, mechanical and electrical drawings, and equipment manuals.* *NOA pilot steps/comments:* *From an on site audit and information from the corresponding department.* (*Building drawing, operation and maintenance manuals exist but are deficient)*
		Standard	

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
F1.1	*Universal access on site and within the building*	*Information source*	*Metered data*

		Assessment method	*CESBAMED calculation steps* *Assess the ease of access and use of facilities for persons with mobility or perceptual disabilities.* *NOA pilot steps/comments:* *From an on site audit. (Outdoor facilities, entry points and ground-floor hallways, are accessible to wheelchair users and visually impaired persons)*
		Standard	

G- COST AND ECONOMIC ASPECTS

CRITERION	INDICATOR	SPECIFICATIONS	
G1.4	*Energy annual cost per usable floor area **	*Information source*	*Metered data – Estimations*
		Assessment method	*CESBAMED calculation steps* *In case of existing buildings, the total annual cost of actual thermal and electrical energy use from energy bills should be calculated taking the average energy cost over 3 years period.* *NOA pilot steps/comments:* *Metered data not available for the public buildings of the Municipality. From the corresponding department of the Municipality, the annual water consumption was not officially reported, but estimated. From the architectural plans, the total internal surface of the building was defined. (23.8 €/m^2)* **COMMENT: All uses are taken into account, including equipment and installations (unlike energy related indicators). Usefull area with internal dimensions is used.**
		Standard	*Level(s) Part 1-2 – Beta version*
G1.5	*Water annual cost per usable floor area **	*Information source*	*Metered data – Estimations*
		Assessment method	*CESBAMED calculation steps* *In case of existing buildings, the total annual cost of water use from water bills should be calculated taking the average water cost over 3 years period.* *NOA pilot steps/comments:*

	(0.37 €/m^2) **COMMENT: Gross area with internal dimensions is used.**
Standard	*Level(s) Part 1-2 – Beta version*

REGIONAL TOOL

D.3.4.3 Regional Tool - EIHP

Version 1.1

Date: March 2019

2.1: To raise capacity for better management of energy in public buildings at transnational level
Work package: WP3 TESTING
Activity: 3.4 Evaluation of test results
Deliverable: 3.4.3 – Regional CESBA MED SNTs

Responsible Partner: Andrea Moro, iiSBE Italia R&D

BUILDING SCALE ASSESSMENT

SBTool structure

A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
A1	**Site regeneration and development**
A1.7	Use of vegetation to provide ambient outdoor cooling
A1.10	*Provision and quality of children's play area(s)*
A3	*Project Infrastructure and Services*
A3.13	*Provision of on-site parking facilities for private vehicles*

B – ENERGY AND RESOURCES CONSUMPTION	
B1	**Total life cycle non-renewable energy**
B1.1	*Primary energy demand*
B1.2	*Delivered thermal energy demand*
B1.3	*Delivered electric energy demand*
B1.4	*Energy from renewable sources in total primary energy consumption*
B1.5	*Energy from renewable in total thermal energy consumption*
B1.6	*Energy from renewable sources in total electric energy consumption*
B1.11	*Embodied non-renewable primary energy*
B2	***Electrical peak demand***
B2.1	*Electrical peak demand for building operations.*
B3	***Use of material***
B3.5	*Recycled materials – only in construction phase*
B4	***Use of potable water, stormwater and greywater***
B4.5	Potable water consumption for indoor uses.

C- ENVIRONMENTAL LOADINGS	
C1	**Greenhouse gas emissions**
C1.3	*Global Warming Potential*
C3	***Solid and liquid waste***
C3.1	*Construction and demolition waste – not active for this phase*
C3.2	*Solid waste from building operations*

D- INDOOR ENVIRONMENTAL QUALITY	
D1	**Indoor air quality and ventilation**
D1.4	*TVOC concentration in indoor air – unable to measure*
D1.5	*CO_2 concentration in indoor air*
D1.10	*Ventilation rate – only for mechanical ventilation*
D2	***Air Temperature and Relative humidity***
D2.1	*Time outside of the thermal comfort range*
D2.2	*Thermal comfort index*

E- SERVICE QUALITY	
E3	**Controllability**
E.3.4	*Degree of personal control of technical systems by occupants.*
E4	***Flexibility and Adaptability***
E.4.5.	*Adaptability to future changes in type of energy supply*

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
F1	**Social Aspects**
F1.2	Access to direct sunlight from living areas of dwelling units.
F2	**Culture and Heritage**
F2.4	Use of traditional local materials and techniques

G- COST AND ECONOMIC ASPECTS	
G1	**Cost and economics**
G1.4	*Use stage energy cost*
G1.5	*Use stage water cost*

SBTool criteria selection rationale

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE

CRITERION	REASON/MOTIVATION
A1. - Site regeneration and development	
A1.7. - Use of vegetation to provide ambient outdoor cooling	To increase use of green zones (parks) for children playgrounds and green roofs.
A1.10. - *Provision and quality of children's play area(s)*	Have all places on one location to motivate children to play
A3. - *Project Infrastructure and Services*	
A3.13. - *Provision of on-site parking facilities for private vehicles*	Availability of parking spaces to avoid morning and afterwork crowds when parents come to their children

B – ENERGY AND RESOURCES CONSUMPTION

CRITERION	REASON/MOTIVATION
B.1.1 Primary energy demand	Use of ecological fuel
B.1.2 Delivered thermal energy demand	To improve well-being of occupants and reduce consumption and emission
B.1.3 Delivered electric energy demand	To reduce consumption and emission
B.1.4 Energy from renewable sources in total primary energy consumption	To encourage use of renewable energy sources
B.1.5 Energy from renewable in total thermal energy consumption	To encourage use of renewable energy sources
B.1.6 Energy from renewable sources in total	To encourage use of renewable energy

electric energy consumption	sources
B1.11 *Embodied non-renewable primary energy*	To lower consumption of energy in planning / construction phase with different material use.
B2.1. *Electrical peak demand for building operations.*	To ensure availability and safety of power grid on location, and ensure batter planning of power grid
B3.5 *Recycled materials – only in construction phase*	To ensure lower resources consumption during construction and decommissioning phase, and to increase use of recyclable resources
B.4.5 Potable water consumption for indoor uses.	

C- ENVIRONMENTAL LOADINGS

CRITERION	REASON/MOTIVATION
C1.3 Global Warming Potential	*Lower GWP to reduce local and global pollution*
C3.1 Construction and demolition waste – not active for this phase	
C3.2 *Solid waste from building operations*	*Increase awareness of necessity of waste separation*

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	REASON/MOTIVATION
D1.4 TVOC concentration in indoor air – unable to measure	*To ensue healthy space before space is used for primary purpose*
D1.5 *CO_2 concentration in indoor air*	*To ensure normal level of carbon dioxide during use phase*
D1.10 *Ventilation rate – only for mechanical ventilation*	*To ensure enough fresh air from mechanical ventilation during occupancy*
D2.1 Time outside of the thermal comfort range	*Increase high level of comfort in building during both winter and summer period*
D2.2 *Thermal comfort index*	*Measure comfort inside space*

E- SERVICE QUALITY

CRITERION	REASON/MOTIVATION
E3.4 *Degree of personal control of technical systems by occupants*	*To motivate installation of controllable systems that can be adjusted by occupant need*
E4.5 *Adaptability to future changes in type of energy supply*	Motivate planers to plan building that can easily run on multiple energy sources

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
CRITERION	**REASON/MOTIVATION**
F1.2 Access to direct sunlight from living areas of dwelling units	*Lowering consumption for lighting, increase daily lighting in building. Motivate planers to optimize orientation of building and shades.*
F2.4 Use of traditional local materials and techniques	Motivate to use local materials and manufacturers in renovation/construction phase

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
CRITERION	**REASON/MOTIVATION**
F1.2 Access to direct sunlight from living areas of dwelling units	*Lowering consumption for lighting, increase daily lighting in building. Motivate planers to optimize orientation of building and shades.*
F2.4 Use of traditional local materials and techniques	Motivate to use local materials and manufacturers in renovation/construction phase

G- COST AND ECONOMIC ASPECTS	
CRITERION	**REASON/MOTIVATION**
G.1.4 Use stage energy cost	Lowering energy cost during operation phase is best way to motivate owner
G.1.5 Use stage water cost	Lowering water cost during operation phase is best way to motivate owner

SBTool weights rationale

ISSUE	WEIGHT (1 to 5)	MOTIVATION
Cost and economics	3	Although this should be main driver in most scenarios, this weight is set because of more important issue on global scale
Functionality and serviceability	2	Since main motivation of building is it functionality weight to this issue should be lower
Well-being and productivity of occupants	4	Ensure healthy space for all occupant and prevent health issue
Social and cultural issues	2	Preserve cultural heritage and improve social component
Land resources	3	Improve land use, better planning
Non-renewable material resources	3	Reduce local production of cement
Non-renewable water resources	3	Increase reusing water
Health, safety and security of individuals	3	-
Renewable energy resources	4	Increase use of renewable energy sources mainly
Non-renewable energy resources	2	Decrease use of non-renewable resources
Ecosystem(s)	3	Preserve local ecosystem
Local and regional atmosphere	2	Preserve local atmosphere and reduce air pollution from local pollutants
Global climate	5	Improving global climate should be main goal

CATEGORIES	WEIGHT (%)
A1- Site regeneration and Development	6,17
A2- Urban design	-
A3- Project Infrastructure and Services	1,45
TOTAL	7,62
B1- In use energy consumptions	40,34
B2- Embodied energy	-
B3- Use of materials	4,36
B4 – Use of water, stormwater and greywater	6,53
TOTAL	51,23
C1- Greenhouse gas emissions	15,13
C2- Other atmospheric emissions	-
C3- Solid and liquid waste	4,36
C4- Impact on project site	-
C5- Other local and regional impacts	-
TOTAL	19,48
D1- Indoor air quality and ventilation	3,63
D2- Thermal comfort	4,36
D3– Visual comfort	-
D4– Acoustic comfort	-
TOTAL	7,99
E1- Safety and Security	-
E2- Functionality and efficiency	-

E3- Controllability	2,42
E4– Flexibility and adaptability	-
E5- Optimization and maintenance of operating performance	0,73
TOTAL	3,15
F1- Social aspects	2,18
F2- Culture and heritage	2,90
F3- Perceptual	-
TOTAL	5,08
G1- Cost and economics	5,45
TOTAL	5,45

CRITERIA WEIGHTS

SBTool file A – WeightA-G

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE							
A1- Site regeneration and Development							
CRITERION	**Weight (%)**	**A**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
A1.7	*3,46*	*2*	*3*	*2*	*4*	*3*	
A1.10	*3,90*	*3*	*3*	*2*	*3*	*3*	
A3 - Project Infrastructure and Services							
A.3.13	*1,73*	*3*	*2*	*2*	*2*	*3*	
TOTAL	6,17						

B- ENERGY AND RESOURCES CONSUMPTION							
B1- In use energy consumptions							
CRITERION	**Weight (%)**	**A**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B1.1	*4,03*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.2	*4,03*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.3	*4,03*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.4	*8,07*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.5	*8,07*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.6	*8,07*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.11	*4,03*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B3 - Use of materials							
B3.5	*4,36*	*4*	*3*	*2*	*3*	*3*	
B4 - Use of water, stormwater and greywater							
B4.5	*6,53*	*4*	*3*	*3*	*3*	*3*	
TOTAL	51,23						

C- ENVIRONMENTAL LOADINGS							
C1- Greenhouse gas emissions							
CRITERION	**Weight (%)**	**A**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.3	*15,13*	5	5	*3*	*5*	*2*	Too much impacts on final decision
C3 - Solid and liquid waste							
C.3.2.	*4,36*	*4*	*3*	*2*	*3*	*3*	
TOTAL	19,48						

D- INDOOR ENVIRONMENTAL QUALITY

D1- Indoor air quality and ventilation

CRITERION	Weight (%)	A	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.4	*0,73*	*1*	1	*3*	*4*	*3*	
D1.5	*2,18*	*1*	*3*	*3*	*4*	*3*	
D1.10.	*0,73*	*1*	*3*	*3*	*2*	*3*	
D1- Indoor air quality and ventilation							
D2.1	*2,18*	*1*	*3*	*3*	*4*	*3*	
D2.2	*2,18*	*1*	*3*	*3*	*4*	*3*	
TOTAL							

E- SERVICE QUALITY

E3- Controllability

CRITERION	Weight (%)	A	B	C	D	L.F.	L.F. REASON/MOTIVATION
E3.4	*2,42*	1	*2*	*3*	*4*	*5*	Motivation to increase controllability of systems and comfort of occupant.
E4- Flexibility and adaptability							
E4.5	*0,73*	*1*	*2*	*3*	*2*	*3*	
TOTAL	3,15						

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

F1- Social aspects

CRITERION	Weight (%)	A	B	C	D	L.F.	L.F. REASON/MOTIVATION
F1.2	*2,18*	*1*	3	*3*	*4*	*3*	
F2 - Culture and Heritage							
F2.4	*2,90*	*3*	*2*	*2*	*3*	*4*	*Support local and circular economy*
TOTAL	**5,08**						

G- COST AND ECONOMIC ASPECTS

G1 - Cost and Economic Aspects

CRITERION	Weight (%)	A	B	C	D	L.F.	L.F. REASON/MOTIVATION
G1.4	*3,27*	2	3	*3*	*3*	*3*	
G1.5	*2,18*	2	*3*	*2*	*3*	*3*	
TOTAL	5,45						

SBTool benchmarks rationale

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
A1 - Site Regeneration and Development				
A1.7.	*Use of vegetation to provide ambient outdoor cooling.*	%	*0: 40%*	*Value taken from urban plan decreased by access roads and parking spaces*
			5: 95%	*Max value if all surfaces are under vegetation*
A1.10	Provision and quality of children's play area(s).	-	*0: description*	*Personal assessment*
			5: description	*Personal assessment*
A3 - Project Infrastructure and Services				
A3.13	*Provision of on-site parking facilities for private vehicles.*	Spaces/classrooms	*0: 1*	*Value taken from urban plan*
			5: 0,50	*Double then minimal requirements*

B- ENERGY AND RESOURCES CONSUMPTION				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
B1 - Total Life Cycle Non-Renewable Energy				
B1.1	*Primary energy demand*	kWh/m²a	*0: 90*	*Standard value for this region*
			5: 55	Value to achieve NZEB standard in Croatia
B1.2	Delivered thermal energy demand	kWh/m²a	*0: 50*	*Standard value for this region*
			5: 10	Value to achieve NZEB standard in Croatia
B1.3	*Delivered electrical energy demand*	kWh/m²a	*0: 30*	*Standard value for this region*
			5: 0	*Entire production of electrical energy comes from RES (photovoltaics)*
B1.4	Energy from renewable sources in total primary energy consumption.	%	*0: 20*	Minimal value to for new buildings
			5: 90	Nearly zero energy house, passive house
B1.5	*Energy from renewable sources in total thermal energy consumption.*	%	*0: 20*	Minimal value to for new buildings – not in standards
			5: 90	Nearly zero energy house, passive house
B1.6	Energy from renewable sources in total electrical energy consumption.	%	*0: 5*	Minimal value to for new buildings – not in standards
			5: 90	Nearly zero energy house, passive house
B1.11	*Embodied non-renewable primary energy*	GJ/m²	*0: 14*	Standard value for existing building typology
			5: 3	Value for new passive buildings
B3 - Use of Materials				
B3.5	Recycled materials	%	*0: 5*	*Same as in tool. Unable to find relevant percentage for Croatia*
			5: 40	*Same as in tool. Unable to find relevant percentage for Croatia*
B4 - Use of potable water, stormwater and greywater				
B4.5	*Potable water consumption for indoor uses.*	m³/occupant/a	*0: 5,5*	*Average consumption of water in schools*
			5: 2	

C- ENVIRONMENTAL LOADINGS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
C1 - Greenhouse Gas Emissions				
C1.3	*Global Warming Potential*	kg CO_2 eq/m²/a	*0: 40*	*Average CO_2 emission for this region.*
			5: 5	*Average for passive houses*
C3 - Solid and Liquid Wastes				
C3.2	Solid waste from building operations.	%	*0: 28*	*Don't know what is final KPI, the one from "Testing protocol" or the one from last excel file. As result took the one from "Testing protocol" since it was already calculated.*
			5: 100	

D- INDOOR ENVIRONMENTAL QUALITY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
D1 - Indoor Air Quality and Ventilation				
D1.4	*TVOC concentration in indoor air.*	µg / m³	*0: 300*	*Guidelines*
			5: 0	*Best practice without TVOC*
D1.5	CO_2 concentrations in indoor air.	ppm	*0: 700*	*Allowed concentration of CO_2 in space*
			5: 350	*Outdoor concentration of CO_2*
D1.10	*Ventilation rate.*	l/s/m²	*0: 2,77*	*Required by algorithm for mechanical ventilation*
			5: 6,00	*High level of air quality*
D2 - Air Temperature and Relative Humidity				
D2.1	Time outside of the thermal comfort range	%	*0: 30*	*Keep the same value as in tool*
			5: 10	*Keep the same value as in tool*
D2.2	*Thermal comfort index*	%	*0: 25*	*Keep the same value as in tool*
			5: 5	*Keep the same value as in tool*

E- SERVICE QUALITY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
E3 - Controllability				
E3.4	*Degree of personal control of technical systems by occupants.*		*0: description*	*Assessment based on location status*
			5: description	*Assessment based on location status*
E4 - Flexibility and Adaptability				
E4.5	Adaptability to future changes in type of energy supply		*0: description*	*Assessment based on location status*
			5: description	*Assessment based on location status*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
F1 - Social Aspects				
F1.2	*Access to direct sunlight from living areas of dwelling units.*	%	*0: 60*	*Guidelines for school designed*
			5: 90	*Optimal design of classroom*
F2 - Culture and Heritage				
F2.4	Use of traditional local materials and techniques	%	*0: 10*	*Keep the same value as in tool*
			5: 25	*Keep the same value as in tool*

G- COST AND ECONOMIC ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
G1 - Cost and Economics				
G1.4	*Use stage energy cost.*	€ / m²	*0: 7,50*	*Average cost on location*
			5: 1,50	*Average cost for NZEB buildings*
G1.5	Use stage water cost.	€ / m²	*0: 0,50*	*Average cost of elementary schools*
			5: 0,20	*Lowest cost of elementary schools*

SBTool Criteria Specifications

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.7.	*Use of vegetation to provide ambient outdoor cooling.*	*Information source*	*Satellite images of country (http://preglednik.arkod.hr/ARKOD-Web/)* solin.hr/detaljni_plan/UPU%20NASELJE%20MRAVINCE%202-NOVI.zip
		Assessment method	*Measure on image green area of land plot and divide it with total area of land plot*
		Standard	
A1.10.	Provision and quality of children's play area(s).	*Information source*	*Satellite images of country (http://preglednik.arkod.hr/ARKOD-Web/)*
		Assessment method	*Asses by description*
		Standard	*Assessments with description*
A3.13	*Provision of on-site parking facilities for private vehicles.*	*Information source*	*Urban plan of settlement solin.hr/detaljni_plan/UPU%20NASELJE%20MRAVINCE%202-NOVI.zip*
		Assessment method	*Total number of classrooms divided by total amount of parking spaces*
		Standard	

B- ENERGY AND RESOURCES CONSUMPTION			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.1	*Primary energy demand*	*Information source*	*Measured data of energy consumption on site or calculations*
		Assessment method	*Energy consumption for energy sources multiplied by primary energy factor*
		Standard	*Algorithm for calculation of energy demand or measured data*
B1.2	Delivered thermal energy demand	*Information source*	*Measured data of energy consumption on site or calculations*
		Assessment method	*Calculation of thermal energy demand or data measured on site*
		Standard	*Algorithm for calculation of energy demand or measured data*
B1.3	*Delivered electrical energy demand*	*Information source*	*Measured data on site, or in design phase by calculation*
		Assessment method	*Measured data on site, or by algorithm for lightning*
		Standard	*Measured data on site, or by algorithm for lightning*
B1.4	Energy from renewable sources in total primary energy consumption.	*Information source*	*Measured data of energy consumption on site or calculations* *https://www.rehva.eu/ , https://mgipu.gov.hr/UserDocsImages//dokumenti/EnergetskaUcinkovitost/meteoroloski_podaci//Metodologija-2017.pdf*
		Assessment method	*Energy consumption of each energy sources multiplied by renewable primary energy factor for each energy sources divided by energy consumption of each energy sources multiplied by total primary energy factor for each energy*
		Standard	
B1.5	*Energy from renewable sources in total thermal energy consumption.*	*Information source*	*Measured data of energy consumption on site or calculations* *https://www.rehva.eu/, ,*

			https://mgipu.gov.hr/UserDocsImages//dokumenti/EnergetskaUcinkovitost/meteoroloski_podaci//Metodologija-2017.pdf
		Assessment method	*Energy consumption of each energy sources for heating multiplied by renewable primary energy factor for each energy sources divided by energy consumption for heating of each energy sources multiplied by total primary energy factor for each energy source for heating*
		Standard	
B1.6	Energy from renewable sources in total electrical energy consumption.	*Information source*	*Measured data on location, or calculation*
		Assessment method	*Electrical energy produced on location divided by total electrical energy demand*
		Standard	*Energy performance of building*
B1.11	*Embodied non-renewable primary energy*	*Information source*	*BoQ, BoM*
		Assessment method	*Amount of material embedded in building multiplied by embodied factor for each material divided by floor area of building*
		Standard	*EN 15978 "Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method"*
B3.5	Recycled materials	*Information source*	*BoQ, BoM*
		Assessment method	*Total weight of reused materials divided by total weight materials*
		Standard	*EN ISO 14021*
B4.5	*Potable water consumption for indoor uses.*	*Information source*	*Measured data on location*

		Assessment method	*Total annually water used divided by occupants*
		Standard	-

C- ENVIRONMENTAL LOADINGS

CRITERION	INDICATOR	SPECIFICATIONS	
C1.3	*Global Warming Potential*	*Information source*	*Measured data on location, or calculation https://mgipu.gov.hr/UserDocsImages/dokumenti/EnergetskaUcinkovitost/meteoroloski_podaci/FAKTORI_primarne_energije.pdf*
		Assessment method	*Consumption of each energy source on location multiplied by CO_2 factor for each energy source*
		Standard	
C3.2	Solid waste from building operations.	*Information source*	*Tour around building*
		Assessment method	*Number of different can trash can / 7*
		Standard	-

D- INDOOR ENVIRONMENTAL QUALITY

CRITERION	INDICATOR	SPECIFICATIONS	
D1.4	*TVOC concentration in indoor air.*	*Information source*	*Measurement on location after completion of building*
		Assessment method	*Measure with instrument on location after building completion*
		Standard	*EN 15251, https://www.epa.gov/indoor-air-quality-iaq/technical-overview-volatile-organic-compounds#measurement*
D1.5	CO_2 concentrations in indoor air.	*Information source*	*Measurement on location or calculated*

		Assessment method	*Measure with instrument on location periodically or calculate in design phase*
		Standard	*Measuring, ASHRE https://www.researchgate.net/publication/289566619_Examining_CO2_levels_in_school_classrooms*
D1.10	*Ventilation rate.*	*Information source*	*Measured with blower door test, algorithm, design https://mgipu.gov.hr/UserDocsImages/dokumenti/EnergetskaUcinkovitost/meteoroloski_podaci/Algoritam_HVAC_2017.pdf*
		Assessment method	*Assessment from Algorithm or from design of HVAC system. Air exchange (m^3/h) of HVAC system divided by total heated volume of building*
		Standard	
D2.1	Time outside of the thermal comfort range	*Information source*	*Calculation based on simplified hourly method.*
		Assessment method	*If demand for heating or cooling on each hour is higher than nominal power of heating or cooling system, then that hour is temperature outside thermal comfort range*
		Standard	*Simplified hourly method EN 13790*
D2.2	*Thermal comfort index*	*Information source*	*Models and simulations https://www.researchgate.net/publication/255971260_SPREADSHEETS_FOR_THE_CALCULATION_OF_THERMAL_COMFORT_INDICES_PMV_AND_PPD*
		Assessment method	*Measure temperature inside each space and calculate PPD, in winter and summer period*
		Standard	*ISO 7730 – Fanger"s method -*

E- SERVICE QUALITY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
E3.4	*Degree of personal control of technical systems by occupants.*	*Information source*	*From main design or walkthrough audit*
		Assessment method	*Asses from description*
		Standard	*Assessment*
E4.5	Adaptability to future changes in type of energy supply	*Information source*	*From main design or walkthrough audit*
		Assessment method	*Asses from description*
		Standard	*Assessment*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
F1.2	*Access to direct sunlight from living areas of dwelling units.*	*Information source*	*Calculation*
		Assessment method	*Simple calculation of direct sunlight in each classroom. Also, should be applicable on schools.*
		Standard	*Review assessment of design team or do own calculation*
F2.4	Use of traditional local materials and techniques	*Information source*	*BoQ, BoM*
		Assessment method	*Architect estimation of percent building elements (non-structural) that has been constructed using traditional local materials. (we think structural should be also include in design phase)*
		Standard	*Estimation*

G- COST AND ECONOMIC ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
G1.4	*Use stage energy cost.*	*Information source*	*Measured data (operational phase) calculated data (design phase)*
		Assessment method	*Collect bills for energy in operational phase and divide it with total floor area. Calculate amount of energy that should be spent, multiply it with unit price and divide it with total floor area.*
		Standard	*Levels*
G1.5	Use stage water cost.	*Information source*	*Measured data (operational phase) calculated data (design phase)*
		Assessment method	*Collect bills for water in operational phase and divide it with total floor area. Calculate amount of water that should be spent, multiply it with unit price and divide it with total floor area, or compare it with similar buildings.*
		Standard	*Estimation or measurement*

COMPARATIVE ANALYSIS – BUILDING SCALE

Total number of criteria calculated

N° Criteria TOT	City of Turin	City of Udine	EVBDM	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP	*Average*
Building	16	31	16	19	38	40	36	33	27	**28,44**

Table1: Number of criteria that compose the 9 Regional Tools.

Exactly as has been done for the urban scale analysis, a first information collected from the analysis of the 9 Regional reports concerns the number of criteria selected by the partners to compose their Regional Tools at building scale. Obviously each of them has had to calculate the 16 mandatory KPIs and, to these criteria, others have been added to be calculated, depending on their regional needs.

Compared to the urban analysis, a smaller number of criteria has been selected for the building scale with an average value of about 29 criteria. Also in this case some partners have limited the calculation to those which are mandatory or a little more, while others have composed regional instruments with about 40 criteria. The bar chart below shows the numerical distribution of the criteria one by one, for all the nine partners involved in the task; the range of fluctuation of values has as minimum value the 16 criteria selected by the City of Turin and EnvirobatBDM and reaches the maximum value of 40 criteria selected and calculated by Sant Cugat del Vallès.

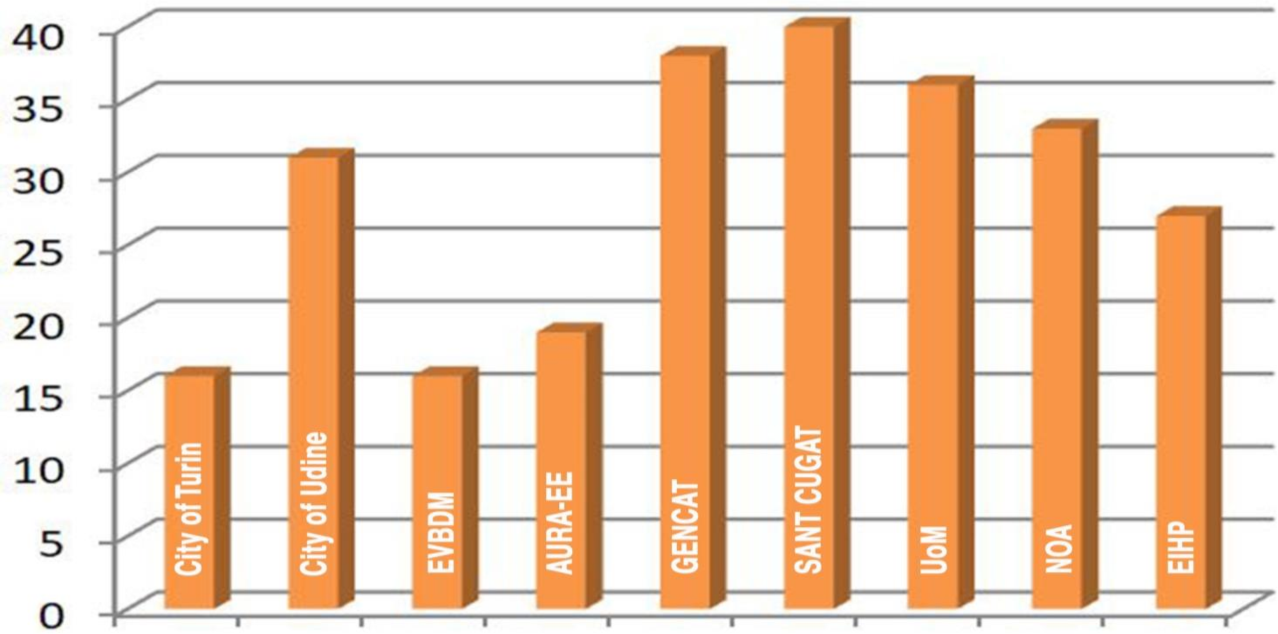

Chart1: Bar chart showing the numerical distribution of criteria selected by each partner.

Number of criteria per area

The table below describes the number of criteria selected by each partners for each areas of the building tool, it helps to understand the areas that are most densely populated and the criteria distribution.

N° of Criteria per Area	City of Turin	City of Udine	EVBDM	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP	*Average*
A	0	5	0	0	4	10	7	4	3	**3,7**
B	7	11	8	9	12	9	6	10	10	**9,1**
C	2	5	3	3	4	3	4	3	3	**3,3**
D	5	5	3	5	5	3	3	3	5	**4,1**
E	0	1	0	0	10	8	10	10	2	**4,6**
F	0	2	0	0	1	3	3	1	2	**1,3**
G	2	2	2	2	2	4	3	2	2	**2,3**

Table2: Numerical distribution of criteria making up the 9 Regional Tools, distributed in the seven areas. In the last column there are the weighted average values of this distribution.

Lots of partners have not selected criteria in areas A - site regeneration and development, urban, design and infrastructure, E – service quality and F – social, cultural and perceptual aspects and thanks to the distributive analysis of the criteria within the different seven areas, it can be stated that the area most densely populated of criteria is Area B, related to energy and resource consumption. The 32% of the all pie chart it's covered by criteria belonging from Area B, as it is possible to note from the chart below, to follow with almost the same percentage and relevance there are Area E with the 16%, Area D with the 14%, Area A with the 13% and Area C with the 12% of the all pie chart.

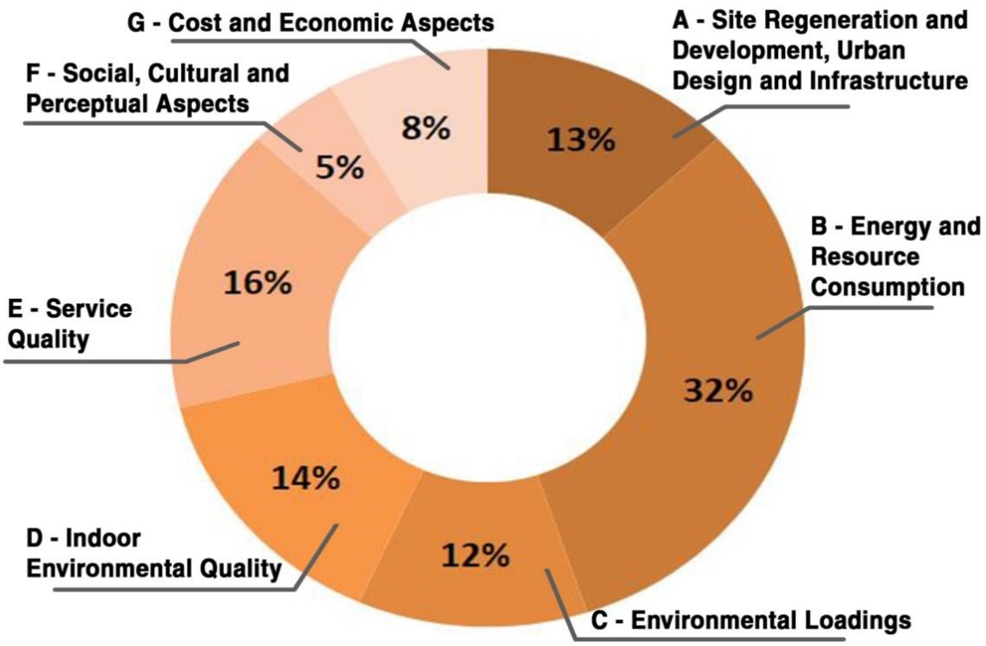

Chart2: Pie chart showing the percentage distribution of the criteria within the 7 areas making up the tool, resulting from the weighted average of the individual values of the 9 Regional Tools.

The areas with the lowest number of criteria are Area F - social, cultural and perceptual aspects with the 5% and Area G - cost and economic aspects with the 8%. Exactly as happened in the urban analysis, also in this case the economic aspects have less importance and relevance than the others. While, for what concerns Area F, probably, the reason why few criteria have been selected is related to the fact that lots of criteria in this area are qualitative and not – quantifiable and may be less relevant for the evaluation.

A comparative analysis between the total number of criteria that there are in the Generic Framework Building scale and the average value of the total number of criteria selected by partners for each of the seven areas has been produced.

The image below describes graphically the ratio of the two values in a specific area; as can be seen by looking at the bar chart, this ratio is often not proportional, like for example in Area A in which lots of criteria are contained into the Generic Framework but few have been selected by partners, the same happened for Area F, while in Area B, as stated in the previous analysis, a large number of criteria have been calculated by the partners involved in the task.

Areas	Generic Framework	Average in Regional Tools
A	34	3,7
B	25	9,1
C	21	3,3
D	19	4,1
E	29	4,6
F	17	1,3
G	7	2,3

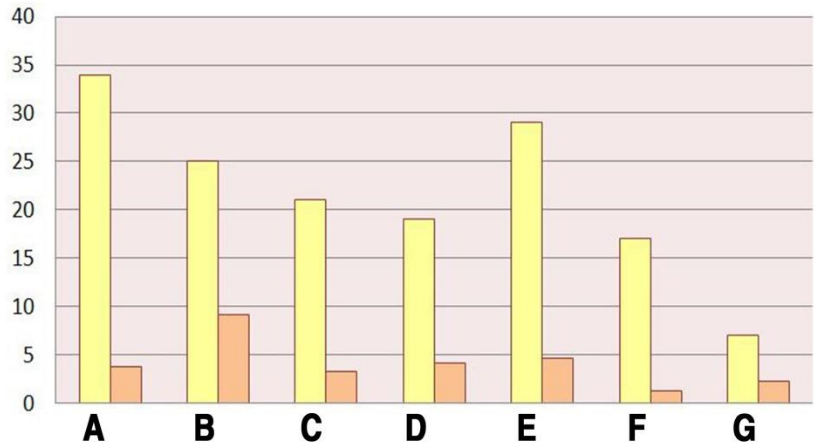

Chart3: On the left, the table shows the number of criteria existing in the Generic Framework broken down by area, subsequently compared with the average value obtained from the analysis of the 9 Regional Tools. On the right, the bar chart that graphically translates the results.

Average value of Priority factors per KPIs

For each criterion included within the Regional Tool it was necessary to assign a priority factor concerning the Impact, the Extent and the Duration of the effect of that specific criterion , with the purpose of defining an order of importance and relevance between the criteria, being able to more easily complete the weighing operation.

The table below summarizes the average values obtained from the analysis of the 9 Regional Tools for each of the 16 KPIs, in relation to:

- B= Impact of the Potential effect (1-3)
- C= Extent of potential effect (1-5)
- D= Duration of potential effect (1-5)

Code	Criterion	*Value*	*Average*
B1.1	Primary energy demand	*B= Impact*	**4**
		C=Extent	**4**
		D=Duration	**3**
B1.2	Delivered thermal energy demand	*B= Impact*	**4**
		C=Extent	**4**
		D=Duration	**3**
B1.3	Delivered electric energy demand	*B= Impact*	**4**
		C=Extent	**4**
		D=Duration	**3**
B1.5	Energy from renewable sources in total thermal energy consumption	*B= Impact*	**4**
		C=Extent	**5**
		D=Duration	**3**
B1.6	Energy from renewable sources in total electric energy consumption	*B= Impact*	**4**
		C=Extent	**4**
		D=Duration	**3**
B1.11	Embodied non-renewable primary energy	*B= Impact*	**4**
		C=Extent	**4**
		D=Duration	**3**
B3.5	Recycled materials	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**3**
B4.5	Potable water consumption for indoor uses	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**3**
C1.3	Global Warming potential	*B= Impact*	**5**
		C=Extent	**4**
		D=Duration	**4**

C3.1	Construction and demolition waste	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**3**
C3.2	Solid waste from building operation	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**3**
D1.4	TVOC concentration in indoor air	*B= Impact*	**2**
		C=Extent	**2**
		D=Duration	**3**
D1.10	Ventilation rate	*B= Impact*	**2**
		C=Extent	**3**
		D=Duration	**3**
D2.2	Thermal comfort index	*B= Impact*	**2**
		C=Extent	**3**
		D=Duration	**3**
G1.4	Use stage energy cost	*B= Impact*	**3**
		C=Extent	**3**
		D=Duration	**2**
G1.5	Use stage water cost	*B= Impact*	**2**
		C=Extent	**3**
		D=Duration	**2**

Weight per area

The weighting is one of the crucial aspect in the all process, it consists in the assignment of a weight to each criterion, category and issue. The weight is expressed as a percentage. This process allows to align the assessment tool to local environmental, social and economic priorities.

The table below shows the percentage distribution of the weights assigned by the partners to the seven areas of the Generic Framework at building scale. The average value is reported in the last column and it is calculated for every areas; it is meaningful of the importance given to the different aspects of the tool given by the partners involved in the activity. As stated in the previous paragraph, lots of partners haven't selected criteria in Area A, E and F, for that reason, many of them gave no importance to those areas by assigning the 0% of weight (easily identified by looking the yellow boxes in the table).

For an easy reading of the results of the table below, colors have been used to identify in green the higher percentage given by each partners to the area with the greatest importance in the tool and marked in yellow the area with the least relevance among the others six. In this way it is possible to see at a glance what areas are the ones with the higher weight and, in the same way, the ones with the lower importance for the partners involved in this task.

Weight of Areas	**City of Turin**	**City of Udine**	**EVBDM**	**AURA-EE**	**GEN CAT**	**Sant Cugat**	**UoM**	**NOA**	**EIHP**	***Average***
A	0,0%	0,0%	0,0%	0,0%	4,9%	11,6%	7,0%	6,5%	7,6%	4,2%
B	58,0%	69,8%	72,0%	72,0%	62,9%	54,9%	31,6%	28,5%	51,2%	55,7%
C	23,0%	24,3%	25,0%	25,0%	19,5%	20,4%	23,6%	36,6%	19,5%	24,1%
D	11,0%	4,2%	2,0%	2,0%	2,1%	1,5%	2,0%	0,5%	8,0%	3,7%
E	0,0%	0,0%	0,0%	0,0%	7,9%	8,1%	20,7%	12,6%	3,2%	5,8%
F	0,0%	0,0%	0,0%	0,0%	1,9%	2,7%	12,0%	4,3%	5,1%	2,9%
G	8,0%	1,8%	2,0%	2,0%	0,8%	0,8%	3,1%	11,0%	5,5%	3,9%

Table3: Percentage distribution of the weights assigned by the partners to the seven Areas of the Tool. Cells in yellow represent the lower weight given while the green ones represent the higher weight.

Analyzing the results achieved by the comparison study, basically almost all the project partners involved in the activity have given the higher weight, and so the higher relevance, to Area B, the one related to the energy and resource consumption. More than the 55% of the total weight is devoted to this aspect that is, of course, very important in the evaluation of the sustainability of a building. Considering the areas with the higher percentage in term of weight, immediately after Area B there is Area C the one related to the environmental loading, with the 24% of importance. It is another really important aspect to take into account for almost all the partners.

While, all the other five areas of the Tool seem not to have a great importance; by looking at the percentages achieved, Area A has receive the 4,2%, Area D the 3,7%, Area E the 5,8% area G the 3,9% and the area with the lowest weight is Area F, devoted to the social, cultural and perceptual aspects, with only the 2,9% of weight compared to the total.

By looking at the horizontal bar chart, the importance of the Area B within the Tool is immediately visible, almost all the partners attributed the greater weight to this area and to follow Area C, than all the others, justifying this choice because of the importance that energy aspects and environmental loading have in terms of environmental sustainability.

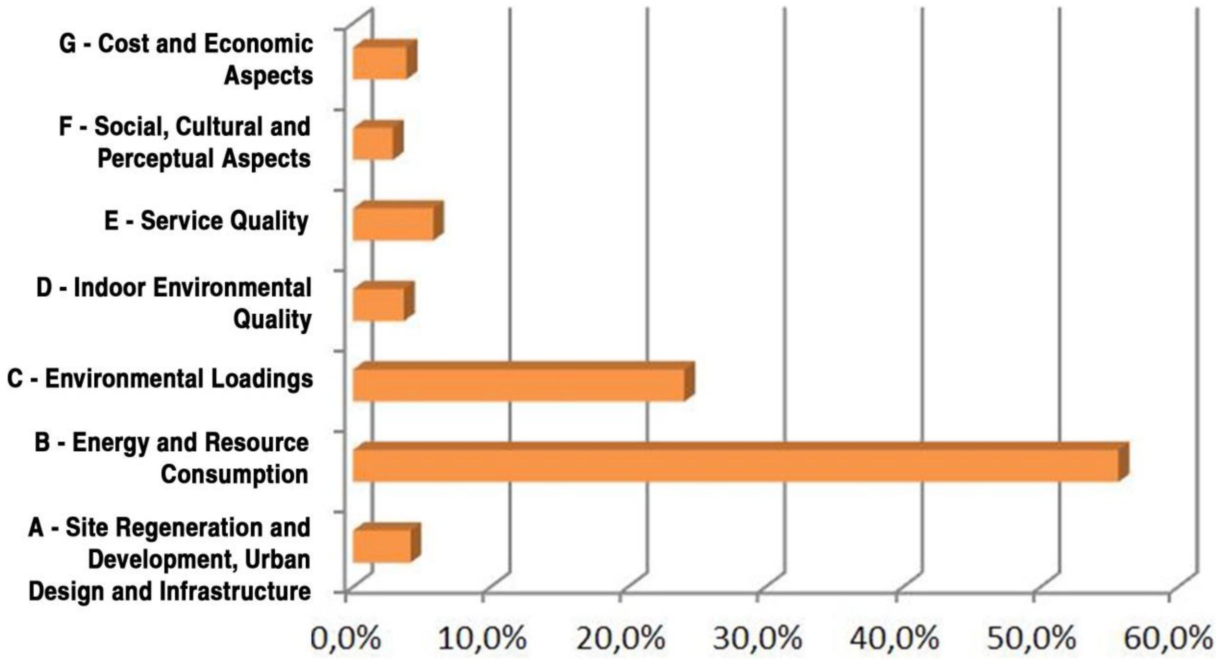

Chart4: Bar chart showing the average percentage weight obtained for each Area.

There is a very evident disparity among the results, only two areas (Area b and C) have been able to get even the 80% of the total percentage achievable, the others five have very low weighting percentage.

It is also interesting to note that the results achieved in these two areas are fairly homogeneous, in fact there were no significant numerical fluctuations between scores given by partners.

Average value of Minimum/Best value

Code	Criterion	Unit of Measure	*Value*	City of Turin	City of Udine	EnvirobatBDM	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP	*Average*
B1.1	Primary energy demand	$kWh/m^2/yr$	*Minimum*	80	140	48	140	225	292		310,6	90	**165,7**
			Best Value	30	23	0	0	70	58		87,6	55	**40,5**
B1.2	Delivered thermal energy demand	$kWh/m^2/yr$	*Minimum*	70	80	40	130	22	75		69,1	50	**67,0**
			Best Value	20	10	0	30	12	20		11,5	10	**14,2**
B1.3	Delivered electric energy demand	$kWh/m^2/yr$	*Minimum*	30	23	40	140	75	70		99,4	30	**63,4**
			Best Value	20	5	0	0	20	30		29,1	0	**13,0**
B1.5	Energy from renewable sources in total thermal energy consumption	%	*Minimum*	30	25	25	10	30	30		16	20	**23,3**
			Best Value	100	50	100	100	100	100		80	90	**90,0**
B1.6	Energy from renewable sources in total electric energy consumption	%	*Minimum*	40	35	10	10	40	40		20	5	**25,0**
			Best Value	100	75	200	100	100	100		100	90	**108,1**
B1.11	Embodied non-renewable primary energy	MJ/m^2	*Minimum*	2500		180	900				6230	14	**1964,8**
			Best Value	1000		90	504				3000	3	**919,4**
B3.5	Recycled materials	%	*Minimum*	15	15	5	5		15		3	5	**9,0**
			Best Value	50	50	75	75		50		40	40	**54,3**
B4.5	Potable water consumption for indoor uses	m^3/occupant/year	*Minimum*	40	47	40	90	100	11		6	5,5	**34,2**
			Best Value	25	23	20	20	20	5		1,5	2	**13,8**
C1.3	Global Warming potential	kg CO_2 eq./m^2/yr	*Minimum*	30	28	20	80	30	96,31		7,5	40	**43,1**
			Best Value	0	5	5	5	10	19,26		2	5	**5,9**
C3.1	Construction and demolition waste	kg/m^2/life cycle stage	*Minimum*	100		1400	1700		1700		120		**1004,0**
			Best Value	20		600	1200		600		36		**491,2**
C3.2	Solid waste from building operation	%	*Minimum*	50	14	0,4	0,4	15			57	28	**23,5**
			Best Value	80	100	1	1	100			100	100	**68,9**
D1.4	TVOC concentration in indoor air	$\mu g/ m^3$	*Minimum*	5000	2000	300	300		1000		1000	300	**1414,3**
			Best Value	1000	1000	200	100		200		200	0	**385,7**
D1.10	Ventilation rate	$l/s/m^2$	*Minimum*	10	0,35	0,5		6			0,29	2,77	**3,3**
			Best Value	20	0,49	0,9		12			0,83	6	**6,7**
D2.2	Thermal comfort index	%	*Minimum*	10	10	10	10	25	10		25	25	**15,6**
			Best Value	0	6	5	0	5	0		5	5	**3,3**
G1.4	Use stage energy cost	€/m^2/yr	*Minimum*	20	10,7	15	15	60	35		18,9	7,5	**22,8**
			Best Value	10	1,75	5	5	40	10		4,7	1,5	**9,7**
G1.5	Use stage water cost	€/m^2/yr	*Minimum*	5	1,55	10	13		5		0,59	0,5	**5,1**
			Best Value	1	0,7	3	2,3		1		0,15	0,2	**1,2**

Table4: Benchmark e Best values set out by each partners for all the 16 KPIs at building scale.

As stated for the urban analysis, benchmarking consists in the definition of the scoring scale for each selected criterion. The benchmark is a quantification of the indicator's value corresponding to the minimum acceptable performance and the one that is considered the best at regional level and the assignment of a reference value is not at all a simple matter. Like for the urban scale investigation, for some criteria, there are legal limits to refer to, or national or regional regulations but finding these values is not always easy. A minimum and a best value have been defined by each partners for all the 16 KPIs of the Tool, as it is possible to note from the previous table summarizes them. This table also contains an average value of these two parameters and exactly how happened for the urban scale, these mean values in most cases are not particularly meaningful because the reference values are definitely different one country from another.

The rationale adopted by partners and the data sources investigated to define the reference values for the analyzed KPIs at building scale are summarized below.

Code	Criterion	Benchmark Rationale/Data source
B1.1	Primary energy demand	- Level(s) Part 1-2 – Beta version. - EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings). - CEN standards that support the implementation of the Directive on the Energy Performance of Buildings (EPBD) in the European Union. - EN ISO 52000 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). - New collective dwellings RT2012. - Building regulation (2020). - Energy Performance Certificates (EPC). - Consumption bills. - National Agency for new technologies, energy and sustainable economic development (ENEA). -TABULA EU Project: http://episcope.eu/building-typology/ - CasaClima.
B1.2	Delivered thermal energy demand	- New collective dwellings RT2012. - Level(s) Part 1-2 – Beta version. - EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings). - CEN standards that support the implementation of the Directive on the Energy Performance of Buildings (EPBD) in the European Union. - EN ISO 52000 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). - Building regulation (2020). - Energy Performance Certificates (EPC). - Consumption bills.

		- National Agency for new technologies, energy and sustainable economic development (ENEA). - CasaClima.
B1.3	Delivered electric energy demand	- CEN standards that support the implementation of the Directive on the Energy Performance of Buildings (EPBD) in the European Union. - EN 52000 (Energy performance of buildings. Overall energy consumption and definition of energy assessments). - EN ISO 56001 (Energy performance of buildings - Calculation of energy requirements for space heating and cooling). - New collective dwellings RT2012. - Energy Performance Certificates (EPC). - (Level(s) Part 3 – 1.3.1). - EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings). - EN ISO 13790 (Energy performance of buildings). - EN 15193 (Energy performance of buildings — Energy requirements for lighting). - Energy bills.
B1.5	Energy from renewable sources in total thermal energy consumption	- Level(s) Part 1-2 – Beta version. - EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings). - 2013/114/EU: Commission Decision of 1 March 2013. - Directive 2009/28/EC (RES Directive). - EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments). - National regulation of thermal installations in building.
B1.6	Energy from renewable sources in total electric energy consumption	- CEN standards that support the implementation of the Directive on the Energy Performance of Buildings (EPBD) in the European Union. - EN 52000 Energy performance of buildings: overall energy consumption and definition of energy assessments. - Level(s) Part 1-2 – Beta version. - EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings). - 2013/114/EU: Commission Decision of 1 March 2013. - Directive 2009/28/EC (RES Directive). - Reference Autonomous building nZEB.
B1.11	Embodied non-renewable primary energy	- CSTB report "Capitalization of the results of the HQE Performance experimentation, Statistical analysis, Action 22" of October 2013.

		- ISO 14040/44, EN 15804 (Contribution of construction works to sustainable development - Environmental product declarations - Rules governing categories of construction products). - EN 15978 (Contribution of construction works to sustainable development - Evaluation of the environmental performance of buildings - Calculation method). - EN 15804 (Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products).
B3.5	Recycled materials	- EN ISO 14021 (Environmental labels and declarations - Self-declared environmental claims - Type II environmental labelling). - Autonomous and state regulations on quality control concerning recycled materials. - UNI PdR 13 ITACA. - CAM edilizia, DM 11/10/2017.
B4.5	Potable water consumption for indoor uses	- Level(s) Part 1-2 – Beta version. - EN 15978 (Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method). - UNI PdR 13 ITACA. - Consumption bills.
C1.3	Global Warming potential	- EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments). - National calculation method for the energy performance of building. - Energy Performance Certificates (EPC). - EN 15603 (Energy performance of buildings - Overall energy use and definition of energy ratings). - Level(s) Part 1-2 – Beta version. - National Office for Climate Change. - Energy bills.
C3.1	Construction and demolition waste	- Level(s) Part 1-2 – Beta version. - National Office for Climate Change. - EN 52000 (Energy performance of buildings: overall energy consumption and definition of energy assessments). - UNI PdR 13 ITACA.
C3.2	Solid waste from building operation	- Plan of the availability and position of bins and containers for each of the seven solid waste categories. - Google maps. - National Decree regulating the Production and management of construction and demolition waste.

D1.4	TVOC concentration in indoor air	- Recommendation of National Federal Agency. - ISO 16000-6 (Indoor Air - Part 6: Determination of Volatile Organic Compounds in Indoor Air and Active Sampling Chambers on Tenax TA (R) Sorbent, Desorption thermal and gas chromatographic using MS or MS / FID) or equivalent. - EN 16516 (Construction products - evaluation of the emission of dangerous substances - Determination of indoor air emissions). - EN 15251 (Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics). - CEN/TS 16516 (Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air). - Level(s) Part 1-2 – Beta version. - Content in VOC according to UNE-EN ISO 11890-1 / 2 and ASTM D2369 standards. - Determination of the formaldehyde emission on wood derived boards according to UNE-EN 717. - UNI PdR 13 ITACA.
D1.10	Ventilation rate	- EN 16798-7 (Energy performance of buildings - Ventilation for buildings - Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration). - UNI EN 15251 Table B.5 Cat III. - Standard UNI 10339.
D2.2	Thermal comfort index	- EN 7730 (Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort by calculation of the PMV and PPD indices and by local thermal comfort criteria. - ISO 7730 Ergonomics of the thermal environment - - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria. - EN 16798-1:2017 - Energy performance of buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics - Module M1-6 (revision of EN 15251). Brussels: European Committee for Standardization. - Level(s) Part 1-2 – Beta version.
G1.4	Use stage energy cost	- Energy bills. - Level(s) Part 1-2 – Beta version.
G1.5	Use stage water cost	- Water bills. - Level(s) Part 1-2 – Beta version.

Standard for calculation

Exactly how it was important to define, in the previous paragraph, the reference data sources of the criteria in order to extrapolate benchmark and best practice data, in the same way, it is fundamental to identify the support tools useful to perform the calculations for the quantification of the value of the indicators.

The table below summarizes the main support tools used by the partners to perform the calculations.

Code	Criterion	Information source
B1.1	Primary energy demand	- Models and simulation. - Measured data of energy consumption on site or calculations. - Metered data. - Calculated data.
B1.2	Delivered thermal energy demand	- Models and simulation. - Measured data of energy consumption on site or calculations. - Metered data. - Calculated data.
B1.3	Delivered electric energy demand	- Models and simulation. - Measured data on site.
B1.5	Energy from renewable sources in total thermal energy consumption	- Metered data. - Calculated data. - Monitoring of produced energy. - Models and simulation.
B1.6	Energy from renewable sources in total electric energy consumption	- Models and simulation. - Statistical/ estimated data - Metered data. - Calculated data. - Monitoring of produced energy.
B1.11	Embodied non-renewable primary energy	- Models and simulation. - Calculated data – Estimations.
B3.5	Recycled materials	- Models and simulation or material documents. - Calculated data – Estimations.
B4.5	Potable water consumption for indoor uses	- Models and simulation. - French Tool “Water calculator”. - Metered data – Estimations.
C1.3	Global Warming potential	- Models and simulation. - Calculated data.
C3.1	Construction and demolition waste	- Models and simulation. - Metered data –Estimations.
C3.2	Solid waste from building operation	- Calculated data. - Metered data –Estimations.

D1.4	TVOC concentration in indoor air	- Measured data.
D1.10	Ventilation rate	- Measured with blower door test, algorithm. - Metered data. - Calculated data.
D2.2	Thermal comfort index	- Models and simulation. - Measured method. - Estimations.
G1.4	Use stage energy cost	- Models and simulation. - Calculated data.
G1.5	Use stage water cost	- Models and simulation. - Calculated data.

KPIs value

Code	Criterion	City of Turin	City of Udine	EnvirobatBDM	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP
B1.1	Primary energy demand	253	160,66	48,9	47,5	279,39	161,02	133,91	442,4	50,93
B1.2	Delivered thermal energy demand	170	108,48	27,6	36,5	18,47	54,05	14,68	100,1	42,19
B1.3	Delivered electric energy demand	21	19,26	15,1	23,3	128,26	63,42	63,54	114,6	28,34
B1.5	Energy from renewable sources in total thermal energy consumption	0	0	44	43	0	0	N.A.	0	100
B1.6	Energy from renewable sources in total electric energy consumption	0	0	0	0	1,68	0	25,2	0	0
B1.11	Embodied non-renewable primary energy	0	N.A.	no data	No Data	N.A.	N.A.	N.A.	Not for use phase	9274
B3.5	Recycled materials	0	N.A.	no data	No Data	N.A.	N.A.	N.A.	Not for use phase	3,27
B4.5	Potable water consumption for indoor uses	77	52,23	no data	30	6,74	18,91	N.A.	6	6,02
C1.3	Global Warming potential	42,5	31,65	4	4,58	11,22	24,35	41,2	9,1	8,16
C3.1	Construction and demolition waste	0	N.A.	no data	No Data	N.A.	N.A.	N.A.	Not for use phase	Not for use phase
C3.2	Solid waste from building operation	60	0	70	0,42	100	100	N.A.	57	43
D1.4	TVOC concentration in indoor air	200	N.A.	no data	No Data	N.A.	N.A.	1474,4	Not for use phase	No Data
D1.10	Ventilation rate	0,225	N.A.	no data	not calculated	12	N.A.	N.A.	-	No Data
D2.2	Thermal comfort index	5	Not detected	no data	No Data	7	N.A.	N.A.	18	48
G1.4	Use stage energy cost	17,7	12,07	no data	10	16,9	12,97	N.A.	23,8	6,38
G1.5	Use stage water cost	6,16	2,17	no data	3,5	1,01	0,74	N.A.	0,37	3,26

KPIs score

Code	Criterion	City of Turin	City of Udine	EnvirobatBDM	AURA-EE	GEN CAT	Sant Cugat	UoM	NOA	EIHP
B1.1	Primary energy demand	0,4	-1	1	3	-1	3	4	-1	0,2
B1.2	Delivered thermal energy demand	2	-1	2	3	1,8	3	5	-1	0,04
B1.3	Delivered electric energy demand	2,5	-1	0,5	3	-1	3	5	-1	0,01
B1.5	Energy from renewable sources in total thermal energy consumption	0,1	-1	1	0	0	4		-1	0,41
B1.6	Energy from renewable sources in total electric energy consumption	2,5	-1	-1	-1	-1	4	-1	-1	-0,08
B1.11	Embodied non-renewable primary energy	-1	No Data	No Data	No Data	No Data	No Data	not calculated	Not for use phase	0,09
B3.5	Recycled materials	0,6	No Data	No Data	No Data	No Data	Not for use phase	not calculated	Not for use phase	-0,04
B4.5	Potable water consumption for indoor uses	1,7	-1	No Data	3	4,13	3	5	0	0,22
C1.3	Global Warming potential	2,8	-1	5	5	4,7	3,5	-0,3	-1	0,7
C3.1	Construction and demolition waste	2,5	No Data	No Data	No Data	No Data	No Data	not calculated	Not for use phase	Not for use phase
C3.2	Solid waste from building operation	0,3	-1	3	0	5	3	not calculated	0	0,05
D1.4	TVOC concentration in indoor air	-1	No Data	No Data	No Data	No Data	No Data	3	Not for use phase	not calculated
D1.10	Ventilation rate	0	No Data	0,5	not calculated	5	not calculated	not calculated	Not for use phase	not calculated
D2.2	Thermal comfort index	1,5	-1	no cooling	No Data	4,5	No Data	not calculated	1,8	-0,02
G1.4	Use stage energy cost	2	-1	No Data	0	0	4	no value	-1	0,03
G1.5	Use stage water cost	2,5	-1	No Data	3	No Data	4	no value	2,5	-0,02

Thanks to the testing activity at building scale carried out by the nine partners involved in this task, some assumptions related to the selection of the Key Performance Indicators have been questioned. As it is possible to see from the results contained in the table concerning the minimum and best value, lots of partners have had many problems in finding data about the following criteria:

- B1.11 Embodied non-renewable primary energy
- B3.5 Recycled materials
- C3.1 Construction and demolition waste
- D1.4 TVOC concentration in indoor air
- D1.10 Ventilation rate

In accordance with all the partners of the project, it has been decided to remove from the KPIs list criteria B3.5, C3.1 and D1.4, because of the general inability in calculating them due to the difficulty in finding data. Anyway, they are still in the Generic Framework at Building scale and so they are selectable and calculable in any future regional tool.

For what concerns criterion B1.11 Embodied non-renewable primary energy and criterion D1.10 Ventilation rate, they are both complex issues but, at the same time, a priority in the action program of Agenda 2030 and for that reason, despite the difficulties encountered in data acquisition and calculation, it has been decided to maintain them in the Building scale KPIs list.

With regard to the minimum and the best values proposed by partners for all the KPIs at Building scale, in most cases they are very different from each other. This happens because the data sources used are not the same and consequently the benchmarks fixed are different one country from another. Sometimes, also when the data sources taken into account are the same, values set out are not so similar. For that reason, the average value calculated for each minimum and best value of every KPIs is not always so significant.

There are, however, few cases in which the results are very close to each other, for example, the energy criteria B1.5 - Energy from renewable sources in total thermal energy consumption and B1.6 - Energy from renewable sources in total electric energy consumption, both for the minimum and best value they received similar and comparable values. Similarly, also criterion D2.2 - Thermal comfort index has achieved from partners minimum and best values absolutely similar, using in most case as data source Level(s) Part 1-2 – Beta version.

On the contrary, criterion B4.5 - Potable water consumption for indoor uses has obtained minimum and best values completely different and non-comparable and the same inconsistency is visible also for criterion B1.1 - Primary energy demand.