TESTING PROTOCOL

ASSESSMENT REPORT

Version 2.0

Date: 18-10-2018

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

Responsible Partner: Andrea Moro, iiSBE Italia R&D

AUTHOR of the present document: Andrea Camarlinghi & Luca Degiorgis

INDEX

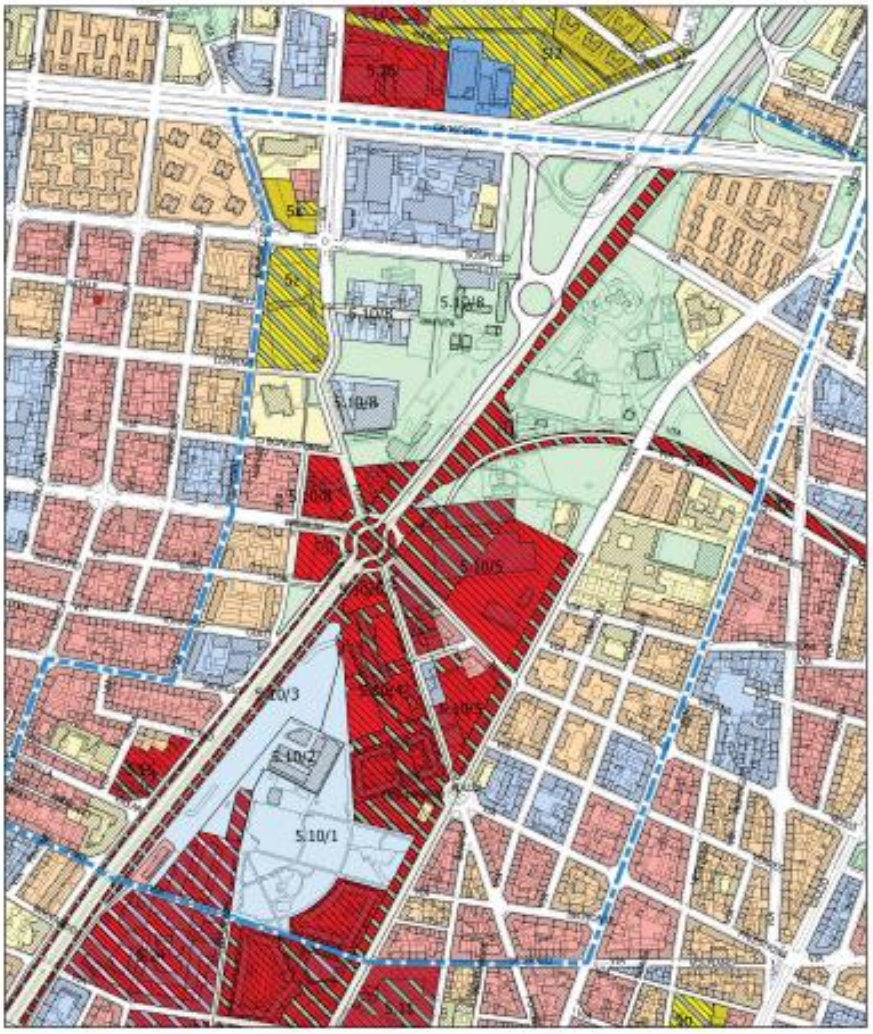
URBAN SCALE ASSESSMENT

1. INITIATION

General information on the selected urban area

City	*TORINO*
Brief description	***Important Area for urban transformation:*** • New underground railway (8km) • New link between 2 parts of the city that have been separated by the railway from end of 1800 • New main road with "low" circulation Presence of: • Public buildings • Social housing • Industrial areas (ex- Gondrand; Italian Railway company area; social housing areas; superintendency protected area (docks Dora). ***General numbers:*** • *1.069 968 m^2 surface* • *194.208 m^2 built up area* • *2.749.773 m^3 buildings volume* • *12.607 inhabitants* *The selected area is located in the N-E part of the city*
Size (km^2)	*CITY AREA: 2.300 km2* *PROJECT AREA: 1.069 968 m^2 surface*
Residential population	*CITY: 872.367* *PROJECT AREA: 12.607*
Average building density (total m2/land surface m2)	*(Number) 0,1815*
Plan of the urban area	*source: via michelin.fr* *CITY*


A55
SS23
SS11
SR11
SP590
SP10
San Mauro Torinese
Rivodora
Superga
Pino Torinese
Pecetto Torinese
Revigliasco
Beinasco
rugliasco
Légende

	CITTÀ DI TORINO DIVISIONE URBANISTICA E TERRITORIO AREA URBANISTICA E QUALITÀ DEGLI SPAZI URBANI Area PRGC Spina 4 European Project ""CESBA MED Area di test Estratto PRG Tavola n.1 azzon. scala 1:5.000 11/09/2018 
Significant pictures	

	 *from: avis.co.eu*  *Foto: the authors*
Desciption of the adjacent areas	*Urbanized area*
Property ownership	*mix public and private*
Social and economic context	*Residential and small commercial*
Legal /administrative boundary lines	*The AREA represents a district of the CITY*
Energy supply infrastructure	*gas pipe, electric lines, (future DH)*
Relevance of the surrounding infrastructures	*Highway not far from AREA* *Railway underground*
Reference stakeholders in retrofit process	*The Municipality* *Public utilities Companies*
Other significant information	*CORINTEA: calculation and data analysis* *iiSBE Italia: Responsible Partner*

2. PREPARATION

a. SNTool structure

In this section it is described the structure of your SNTool.
Please, enter here the list of the criteria selected from the CESBA MED Generic Framework ay Urban scale.
Please remember that KPIs are mandatory.

A- BUILT URBAN SYSTEMS	
A1	**Urban structure an 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 building 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*

b. SNTool criteria selection rationale

In this section PPs must motivate the selection of the criteria that have been included in the SNTool. Why the criterion has been included? The reason could depend on regional policies, targets, specific characteristics of the territory (i.e. touristic area, agricultural area, etc.…).

In this section PPs must motivate the selection of the criteria that have been included in the SNTool. Why the criterion has been included? The reason could depend on regional policies, targets, specific characteristics of the territory (i.e. touristic area, agricultural area, etc.…).

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 energie**	
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 building operations*	*Achievement of the objectives set by the 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*
C2.7	*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*
	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*
G4.3	*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*
G.4.4	*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*
G4.5	*Community involvement in urban planning activities"*	

c. SNTool weights rationale

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

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	low capacity for influence by the municipality of Turin
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

Note: the categories weight results automatically from the criteria level

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

Ax-……

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

Bx-……

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

Cx-……						
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						
Dx-……						
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						
Ex-……						
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

Fx-……

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

Gx-……

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**					

d. SNTool benchmarks rationale

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

A- URBAN STRUCTURE AND FORM				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
A1.2	*Urban compactness*	m^3/m^2	*0: 14*	*Technical evaluation of municipal offices*
			5: 18	*Technical evaluation of municipal offices*
A1.7	*Conservation of land*	%	*0: 0,5%*	*Technical evaluation of municipal offices*
			5: 2%	*Technical evaluation of municipal offices*
A2.1	*Walking distance to public transport for area residents*	%	*0: 85%*	*represents a minimum standard on average in the whole city (city center, peripherical areas, …)*
			5: 100%	*Represents the optimal standard*
A2.4	*extent and connectivity of bicycle paths*	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	*Average annual per capita income*	%	*0: 80%*	*Based on technical report (Rapporto Rota)*
			5: 90%	*Based on technical report (Rapporto Rota)*
B3.3	*operating energy costs for public buildings*	€/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	*Total final thermal*	kWh/m2	*0: 70*	*Values from TABULA project*

	energy consumption for building operations	year	*5: 30*	*Values from Casa ClimaBolzano and ENEA*
C1.2	*Total final thermal energy consumption for residential building operations*	kWh/m2 year	*0: 70*	*Values from TABULA project*
			5: 30	*Values from Casa ClimaBolzano and ENEA*
C1.3	*Total final thermal energy consumption for non residential building operations*	kWh/m2 year	*0: 70*	*Values from TABULA project (excluded process)*
			5: 30	*Values from Casa ClimaBolzano and ENEA*
C1.4	*Total final electrical energy consumption for building operations*	kWh/m2 year	*0: 50*	*EURAC Study*
			5: 20	*EURAC study*
C1.5	*Total final electrical energy consumption for residential building operations*	kWh/m2 year	*0: 20*	*EURAC study*
			5: 5	*EURAC study*
C1.6	*Total final electrical energy consumption for non residential building operations*	kWh/m2 year	*0: 60*	*EURAC study*
			5: 39	*Insert EURAC study*
C1.7	*Total primary energy demand for building operations*	kWh/m2 year	*0: 322*	*20% reduction compared to actual value*
			5: 242	*40% reduction compared to actual value*
C1.20	*Energy consumption for public ligthing*	kWh/m2 year	*0: 1*	*20% reduction compared to actual value*

			5: 0,5	*Best practice (EU, DE)*
C2.1	*Share of renewable energy on-site, on total final energy consumptions for building operations*	%	*0: 20*	*20% objectives from 2020 EU Strategy*
			5: 100	*Excellent and ideal target*
C2.4	*Share of renewable energy on-site, on total primary energy consumptions for building operations*	%	*0: 20*	*20% objectives from 2020 EU Strategy*
			5: 100	*Excellent and ideal target*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy*	%	*0: 20*	*20% objectives from 2020 EU Strategy*
			5: 100	*Excellent and ideal target*
C2.8	*Aggreagated electrical energy generation from renewable sources located on public properties*	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	*GHG Emissions from energy used for all purposes in building operations*	kgCO2/1000m2	*0: 22,5*	*Technical evaluation*
			5: 0	*Excellent and ideal target*

E- NON-RENEWABLE RESOURCES				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
E1.6	*Consumption of potable water for residential population*	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	*Consumption of potable water for public non residential building*	m3/m2 y	*0: 1*	*Local current values*

	systems			
			5: 0,5	*50% reduction based on local current value*
E2.1	*Solid waste and recycling collection points*	%	*0: 75*	*represents a minimum standard on average in the whole city (city center, peripherical areas, …)*
			5: 98	*Represents the optimal standard*
E2.2	*Separate collection and disposal of solid waste and recycling*	%	*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	*Recharge of ground water trough permeable paving or landscaping*	%	*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	*Ambient air quality with respect to particulates < 2,5 mu (PM 2,5) over a one year period*	µg/m3	*0: 20*	*Based on EU Directive limits*
			5: 10	*OMS recommendation*
F2.3	*Ambient air quality with respect to particulates < 10 mu (PM10) over a one year period*	n	*0: 35*	*Based on EU Directive limits*
			5: 25	*Based on values in similar cities without significant pollution problems (suggested by ARPA)*
F3.1	*Green zones and recreation areas availability*	m2 /inhab	*0: 12,5*	*Based on national urban standard*
			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	*Availability and proximity of key services*	%	*0: 80*	*Technical evaluation*
			5: 100	*Actual value*
G4.3	*Availability and proximity of a primary school*	%	*0: 50*	*Based on National standard (DM 75/75, evaluated with municipal offices)*
			5: 75	*Increase compared to National standard (DM 75/75, evaluated with municipal offices)*
G4.4	*Availability and proximity of a primary school*	%	*0: 30*	*Based on National standard (DM 75/75, evaluated with municipal offices)*
			5: 60	*Increase compared to National standard (DM 75/75, evaluated with municipal offices)*
G4.5	*Availability and proximity of children's play facility*	%	*0: 30*	*Technical evaluation*
			5: 60	*Technical evaluation*
G6.3	*Community involvement in urban planning activities*	n	*0: -1(0)*	-
			5: 5	-

e. SNTool Criteria Specifications

In this section PPs must indicate for each selected criterion:

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

A- 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 to public transport for area residents*	*Information source*	*Shape file from Comune di Torino (ing. Gallo). The data are geometrical measurements*
		Assessment method	*Centroids for distance evaluation*
		Standard	*no*
A2.4	*Extent and connectivity of bicycle paths separated from vehicular traffic*	*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	*Average annual per capita income of residents*	*Information source*	*Rapporto Rota*
		Assessment method	*Content of the study*
		Standard	*no*
B3.3	*Operating energy costs 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 operations*	*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 final thermal energy consumption for residential building operations*	*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 final thermal energy consumption for non residential building operations*	*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 electrical energy consumption for building operations*	*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 electrical energy consumption for residential building operations*	*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 electrical energy consumption for non residential building operations*	*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 energy demand for building operations*	*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 of public lighting*	*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 relative to total final energy consumption for building operations*	*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 of renewable energy on site relative to total primary energy consumption for building operations*	*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*

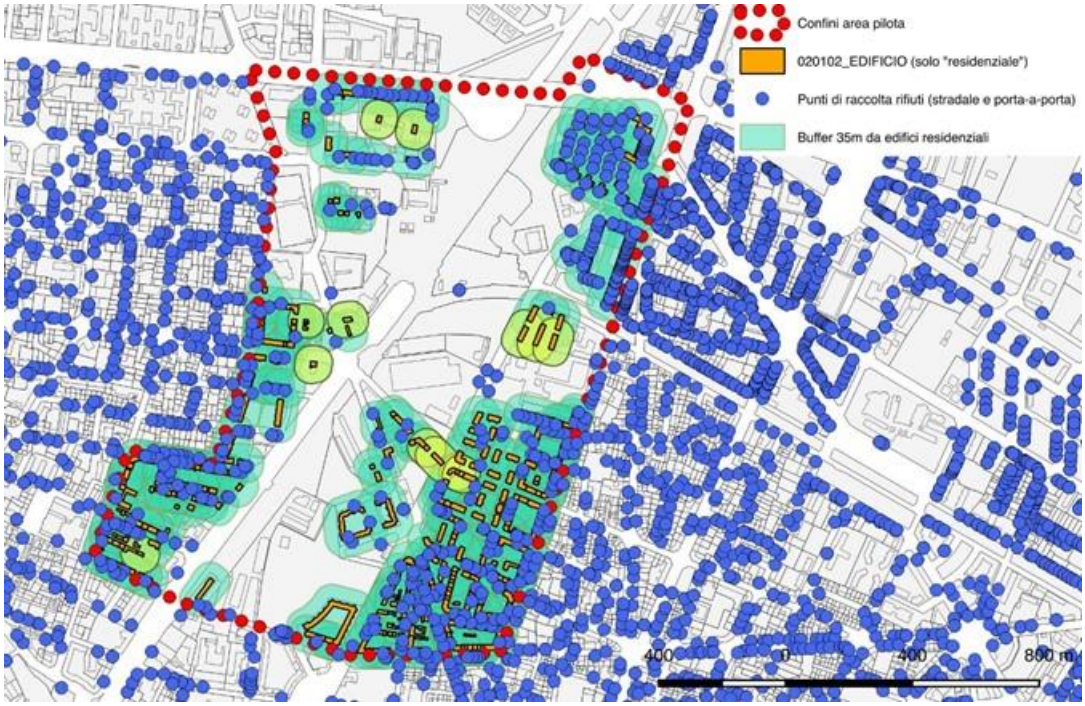
			consumption, from DB from Convenant of Majors. Transformation into primary energy. Ration between them
		Standard	*No*
C2.7	*Share of electric energy generation from on-site renewable sources on final electric energy*	*Information source*	*Altlaimpianti_GSE; DB from Convenant of Majors*
		Assessment 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	*Aggreagated electrical energy generation from renewable sources located on public properties*	*Information source*	*Size of PV plant on scuola Frassati (estimation)*
		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. Referred to the heated surface in the AREA of the project*
		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 public non residential building*	*Information Source*	
		Assessment method	
		Standard	*no.*
E 2.1	*Solid Waste and recycling collection points*	*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.*

Map of Indicator "E 2.1 - Solid Waste and recycling point"



F- ENVIRONMENT			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
		Information source	*Shape file from Comune di Torino* *The data are geometrical measurements*
F 1.3	*Recharge of groundwater through permeable paving or landscaping*	*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 <2,5 mu (PM 2,5) over a one*	*Information source*	*Annual report on air quality, drawn up by Arpa Piemonte and the Metropolitan City of Turin - Data from the monitoring unit located in*

	year period		*Piazza Rebaudengo*
		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 <10mu (PM 10) 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 located in Piazza Rebaudengo*
		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

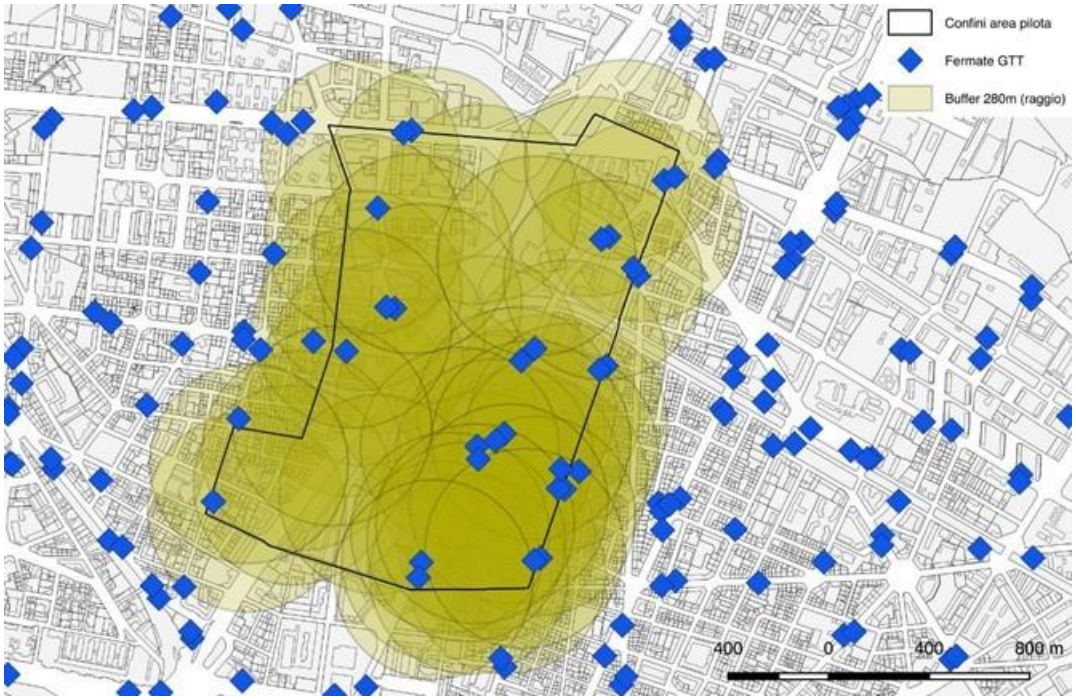
G- SOCIAL ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
G 2.1	*Performance of the public transport service*	*Information source*	*Shapefile from Comune di Torino* *Divisione Infrastrutture e Mobilità*
		Assessment	*Definition of centroids drawn on the different census sections (centre of*

		method	*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*

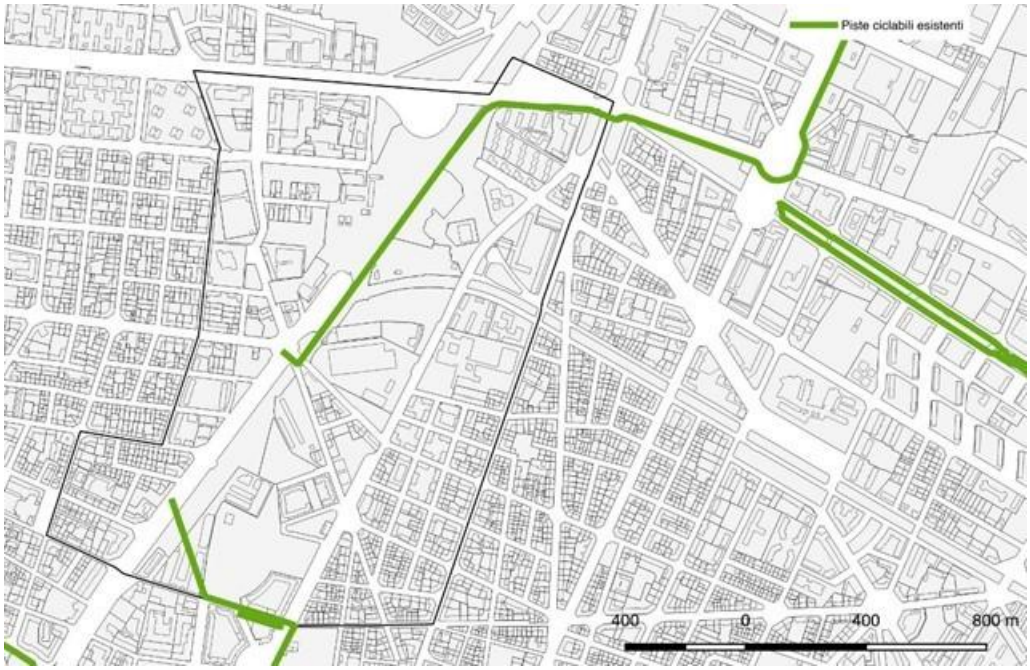
		Standards	*no*
G 4.3	*Availability and proximity of a primary school*	*Information source*	*Shape file from Comune di Torino*
		Assessment method	*Definition of centroids drawn on the different census sections (centre of gravity of the polygon).* *The radius of the centroid (hypotenuse) is established 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's play facilitiesl*	*Information source*	*Shape file from Comune di Torino*
		Assessment	*Definition of centroids drawn on the different census sections (centre of*

	method	*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*

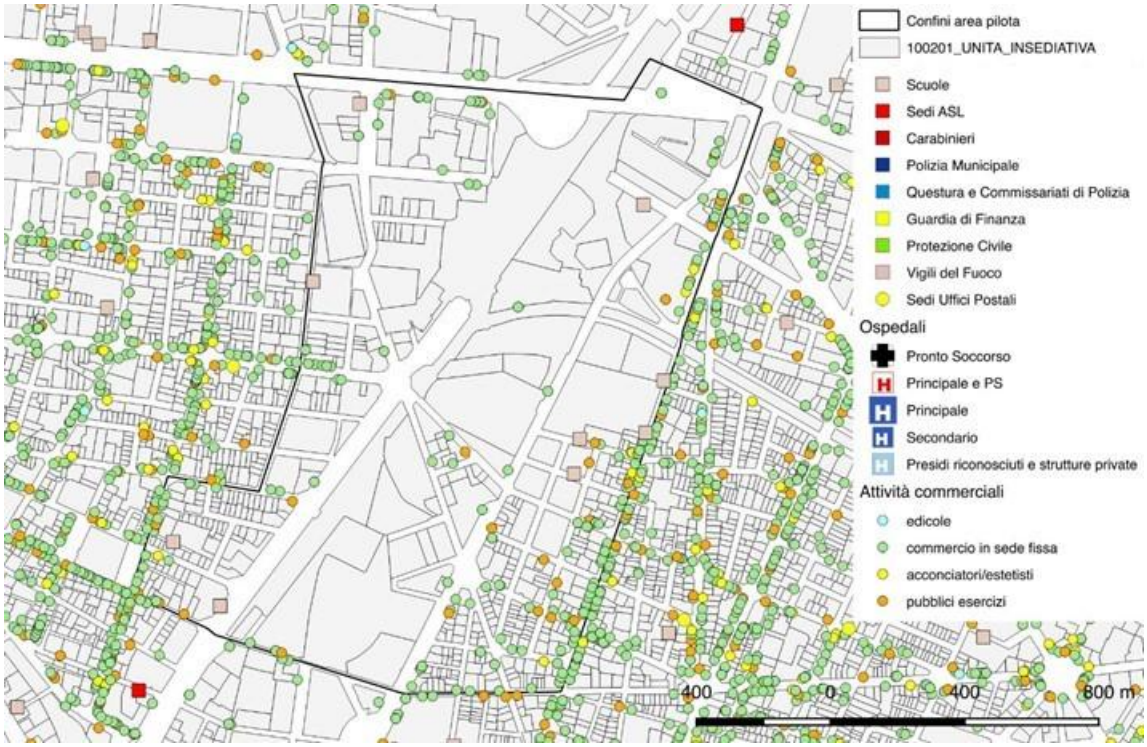
Map of Indicator "G 2.1 - Performance of Public transport service"

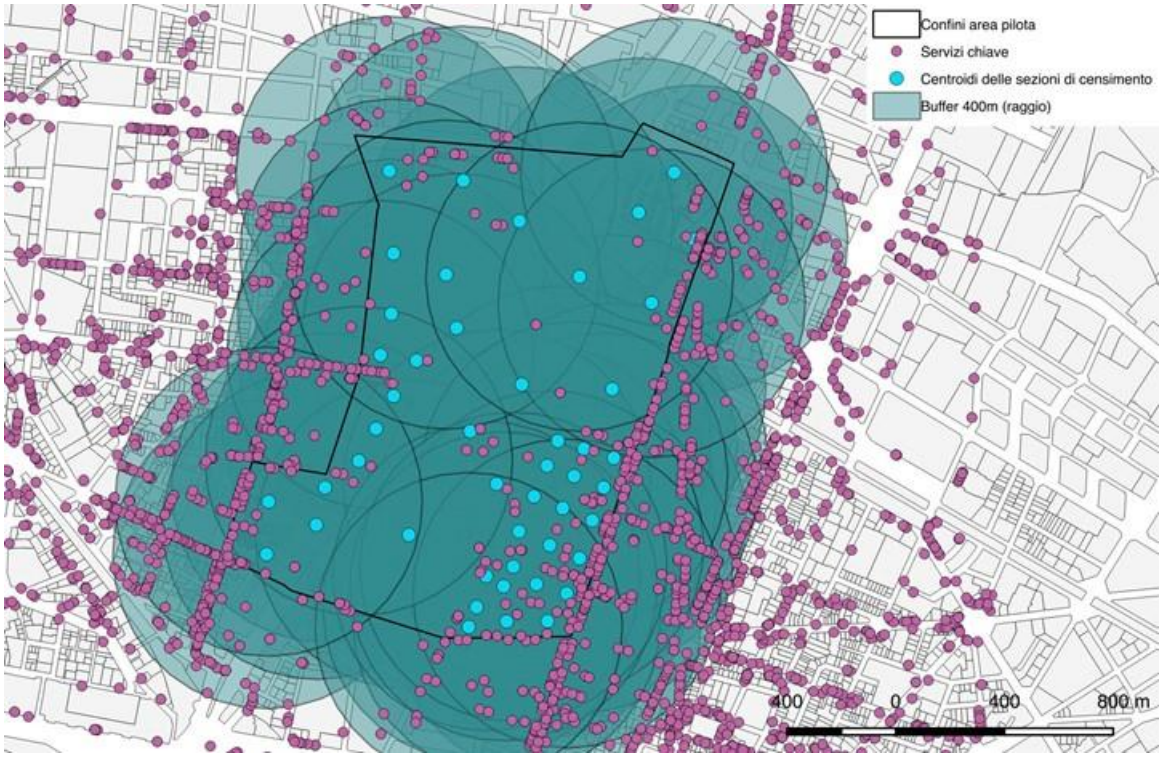


Map of Indicator "G 2.4 - Quality of pedestrian and bicycle network"

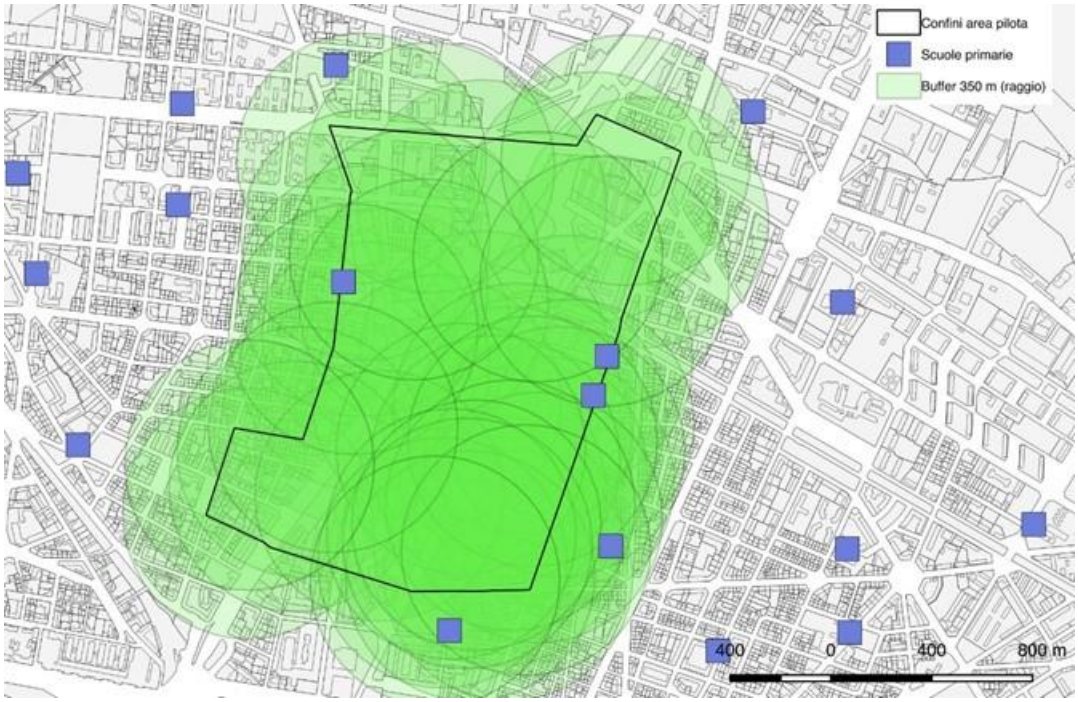


Maps of indicator "G 4.2- Availability and proximity of key public human services"

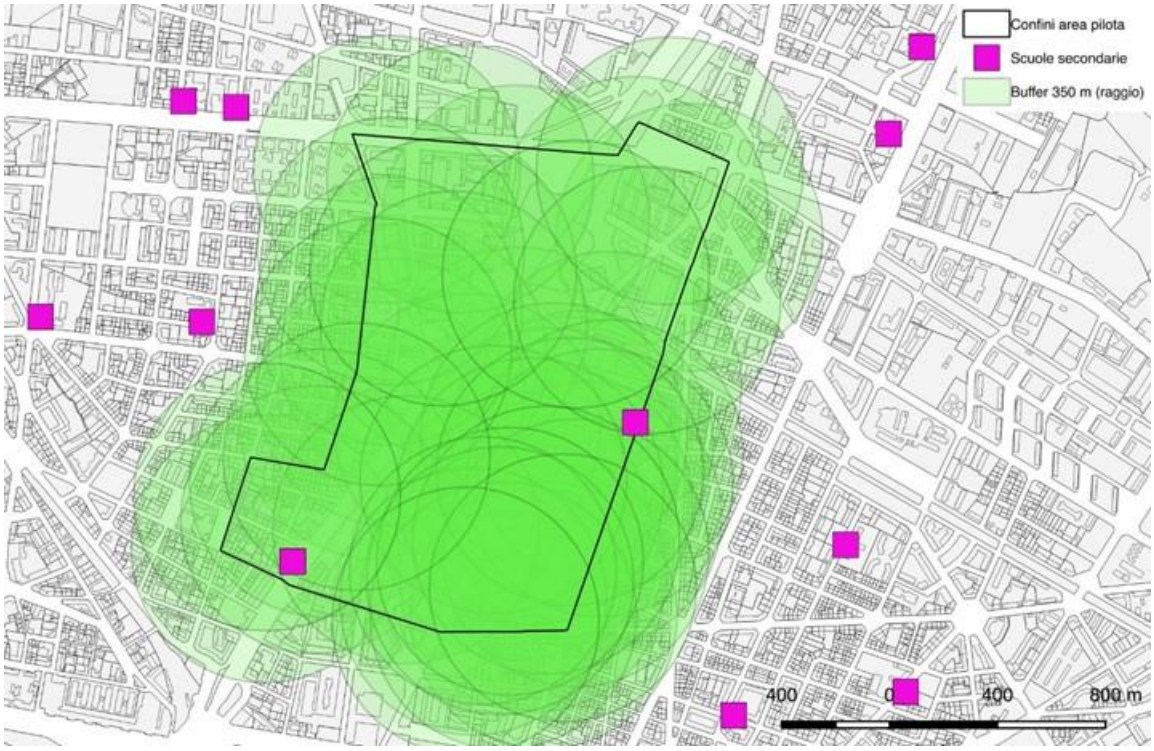




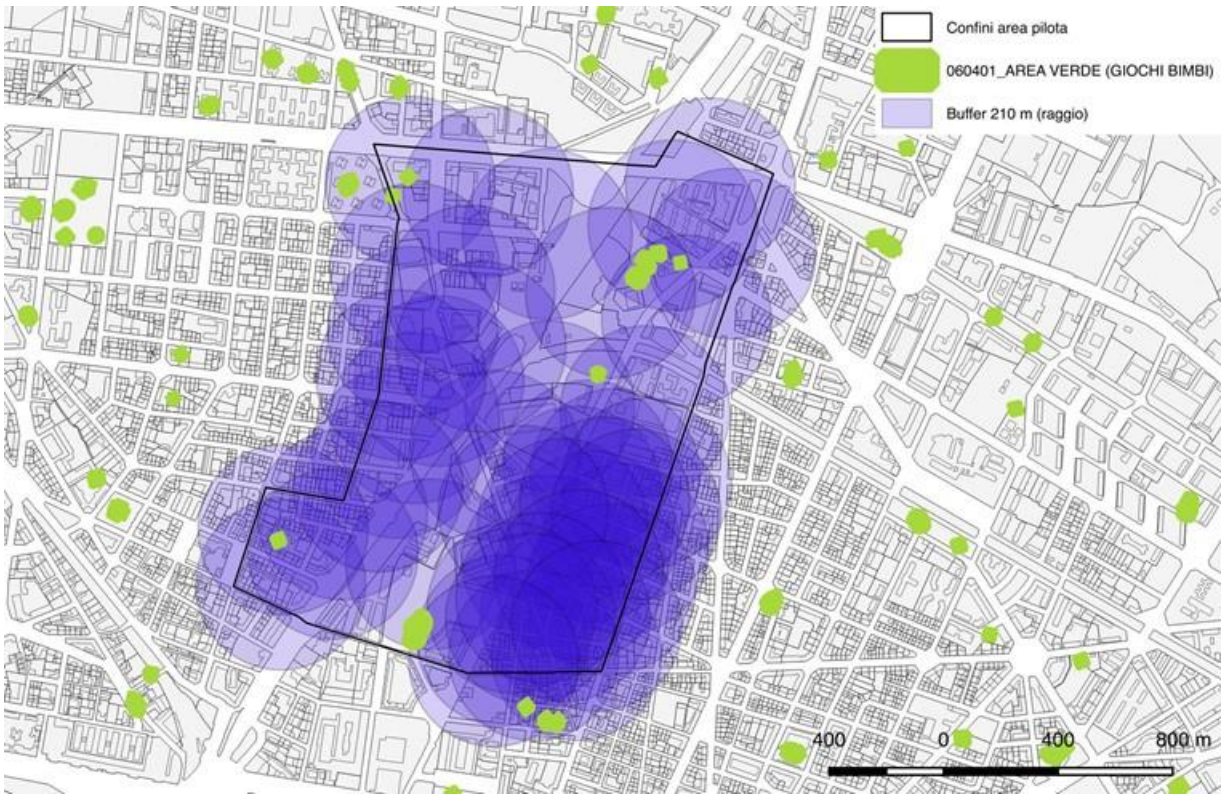
Maps of indicator "G 4.3- Availability and proximity of a primary school"



Maps of indicator "G 4.4- Availability and proximity of a secondary school"



Maps of indicator "G 4.5- Availability and proximity of children's play facilities"



3. DIAGNOSIS

a. Performance scores

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

	SCORE	WEIGHTED SCORE
A – BUILT URBAN SYSTEMS		
A1– Urban structure an form		
A1.2-Urban Compactness	0,2	0,01
A1.7 – Conservation of land	0	0
A2 Transportation infrastructures		
A2.1 – Walking distance	5	0,06
A2.4 – Extent and connectivity bike path	-1	-0,02
B – ECONOMY		
B2 Economic acitivity		
B 2.2. Average annual per capita income	0,5	0,00
B3 – Cost and investements		
B3.3 – Operating energy cost public buildings	-1	-0,01
….		
C – ENERGY		
C1 – Non renewable energy		
C1.1 - Total final thermal energy consumption for building operations	-1	-0,04
C1.2 - Total final thermal energy consumption for residential building operations	-1	-0,04
C1. 3 - Total final thermal energy consumption for non residential building operations	3,6	0,13
C1.4 - Total final electric energy consumption for building operations	-1	-0,04
C1.5 - Total final electric energy consumption for residential building operations	-1	-0,04
C1.6 - Total final electric energy consumption for non residential building operations	-1	-0,04
C1.7 - Total primary energy demand for building operations	-1	-0,05
C1.20 - Energy consumption of public lightning	-1	-0,02
C2 Renewable and Decarbonised energy		
C2.1 - Share of thermal energy generation from on-site renewable sources on final thermal energy	-1	-0,04
C2.7 - Share of electric energy generation from on-site renewable sources on final electric energy	-1	-0,01
C2.8 - Aggregated electric energy generation from renewable sources located on public properties	-1	-0,03
D – ATMOSPHERIC EMISSIONS		
D1 – Atmospheric emissions		
D1.2 - Total GHG Emissions from energy used in building operations	-1	-0,07
E – NON RENEWABLE SOURCES		

E1 – Potable water, stormwater and greywater		
E1.6 - Consumption of potable water for residential population	1,9	0,03
E1.7 - Consumption of potable water for non-residential building systems	2	0,02
….		
F – ENVIRONMENT		
F1 – Environment impact		
F1.3– Recharge of groundwater through permeable paving or landscaping	0,4	0,02
F2 Outdoor environmental quality		
F 2.3 - Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	-1	-0,06
G – SOCIAL ASPECTS		
G2 – traffic and mobility services		
G2.1 – Performance of the public transport	5	0,07
G2.4 - Quality of pedestrian and bicycles network	-1	-0,02
G4 Public and private facilities and services		
G4.2 - Availability and proximity of key services	5	0,06
G4.3 – Availability and proximity of a primary school	1,4	0,05
G4.4 – Availability and proximity of a secondary school	3,4	0,08
G4.5 – Availability and proximity of children's' play facilities	4,6	0,11
G6 Management and community involvement Management and community involvement		
G6.3 – Community involvement in urban planning activities	0	0

b. Key Performance Indicators value

KPI	Indicator	Unit of measure	Value
A 1.7 Conservation of Land	Area of undeveloped land with ecological or agricultural value / area of the neighborhood	%	0,5
B.3.3 Running costs energy for public buildings	Aggregated annual operating energy cost per aggregated indoor useful floor area	Euro/m2/year	8,2
C.1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption per aggregated indoor useful floor area	kWh/m^2/year	235
C.1.4 Total final electric energy consumption for building operations	Aggregated annual total final electric energy consumption per aggregated indoor useful floor area	kWh/m^2/year	78,2
C.1.7 Total primary energy demand for building operations	Aggregated annual total primary energy consumption per aggregated indoor useful floor area	kWh/m2/year	403
C.2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Annual total thermal energy consumption from on-site renewable energy sources / annual total final thermal energy consumption	%	0,00003
C.2.7 Share of electric energy generation from on-site renewable sources on final electric energy	Share of renewable electric energy in final electric energy consumptions	%	1,23
D.1.2 Total GHG Emissions from primary energy used in building operations	CO2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	86
E.1.6 Consumption of potable water for residential population	Annual potable water consumption per occupant	m^3 per occupant*yr	63,5
E.1.7 Consumption of potable water for non-residential building systems	Annual water consumption per occupant	m^3 /m^2	0,8
F.1.3 Recharge of groundwater through permeable paving or landscaping	Area of permeable surfaces on total neighborhood area	%	17,19
F.2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	Number of days exceeding the daily limits in a year	days/year	118
G.2.1 Performance of the public transport	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop	%	100
G.2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated pedestrian paths and meters of bicycle path or “shared space” per 100 inhabitants.	m/100 inhabitants	12,07
G.4.2 Availability and proximity of key services	Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services.	%	100
G.6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Level (score)	0

c. SWOT analysis

Where are we now ?

A SWOT analysis is a study undertaken to identify its strengths, weaknesses, available opportunities, and possible threats. The analysis is based on a quadrant matrix, in which strengths and weaknesses (internal factors) are presented above the x-axis, and opportunities and threats (external factors) are presented below. Typically, strengths and opportunities (positive factors) are listed on the left of the y-axis, while weaknesses and threats (negative factors) are listed on the right.

The SWOT analysis is referred to the indicators related to different categories.

STRENGTHS	WEAKNESSES
A. BUILT URBAN SYSTEMS - easy accessibility to public transport **B. ECONOMY** **C. ENERGY** - …… - …… - …… - …… **D. ATMOSPHERIC EMISSIONS** - **…..** **E. NON RENEWABLE SOURCES** - per capita water consumption decreasing in recent years…… - …… - …… - …… **F. ENVIRONMENT** - Good per capita availability of green and recreational areas - …… - …… - …… **G. SOCIAL ASPECTS** - moderate provision of cycling infrastructure - -Good presence of key services - …… - …… - …… - ……	**A. BUILT URBAN SYSTEMS** - low rate of incidence of high ecological value areas - reduced infrastructure of the cycling network - **B. ECONOMY** - the income situation of the inhabitants is lower than that of the regional and metropolitan context - Significant energy costs for the operation of public buildings **C. ENERGY** - Reduced availability of income for energy investments - Parceled out property - almost no renewable energy plants installed … - …… **D. ATMOSPHERIC EMISSIONS** …… - prevalent use of non-renewable energy sources - **E. NON RENEWABLE SOURCES** - low percentage of separate collection of urban waste - …… - …… - …… - …… **F. ENVIRONMENT** - Limited presence of water-permeable surfaces…… - extremely critical situation related to fine dust pollution (PM10 and PM 2.5) - …… - …… - …… **G. SOCIAL ASPECTS** - …… - ……

	- …… - ……
OPPORTUNITIES **A. BUILT URBAN SYSTEMS** - possible renaturation of abandoned industrial areas - strengthening of the cycling network **B. ECONOMY** - Financial resources from the European Structural Funds and from national (i.e. conto termico, economic public contributions to the security of public buildings) for the energy regeneration of public heritage - …… **C. ENERGY** - Low performance of actual buidings means high rate of energy savings with little esxpenditures incurred by citizens - Development of Energy Communities - investments supported by ESCO - Possible extension of existing district heating - Increased use of high-efficiency technologies (LEDs) for public lighting - possible integration of renewable energy plants with the district heating network - availability of surfaces and solar radiation for the installation of photovoltaic systems - to stimulate the collective purchase of certified electricity from renewable sources (RECS) **D. ATMOSPHERIC EMISSIONS** - Low performance of actual buidings means high rate of GHG emissions savings with little esxpenditures incurred by citizens - **E. NON RENEWABLE SOURCES** - Extension of the door-to-door collection service for urban waste and installation of eco-islands with controlled access on the Via Cigna axis - Awareness and information campaigns aimed at citizens and schools - …… - …… **F. ENVIRONMENT** - availability of areas potentially convertible into green and recreational zones… - …… **G. SOCIAL ASPECTS** - significant increase in the provision of cycling infrastructure due to the possible construction of new cycle paths……	THREATS **A. BUILT URBAN SYSTEMS** - Reduced redevelopment of abandoned areas - possible need for decontamination of abandoned areas **B. ECONOMY** - worsening of the socio-economic situation of resident citizens due to the continuation of the negative economic situation **C. ENERGY** - energy infrastructure requires significant investment - …… - …… - …… - …… - …… **D. ATMOSPHERIC EMISSIONS** …… - …… - …… - …… - …… - …… - …… **E. NON RENEWABLE SOURCES** - reduced sensitivity of citizens to correctly carry out the correct door-to-door separate collection…… **F. ENVIRONMENT** - High number of private vehicles per capita…… - High number of private boilers per building…… - …… - …… **G. SOCIAL ASPECTS** *

- …… - …… - ……	

PUNTI DI FORZA	PUNTI DI DEBOLEZZA
A. SISTEMI URBANI COSTRUITI - Agevole accessibilità al trasporto pubblico **B. ECONOMIA** Nessuno **C. ENERGIA** nessuno **D. EMISSIONI IN ATMOSFERA** nessuno **E. RISORSE NON RINNOVABILI** - consumo pro-capite di acqua in diminuzione nel corso degli ultimi anni **F. AMBIENTE** - Discreta disponibilità di dotazione pro-capite di superfici ad aree verdi e ricreative **G. ASPETTI SOCIALI** - Discreta dotazione di infrastrutture ciclabili - Buona presenza capillare dei servizi chiave alla persona	**A. SISTEMI URBANI COSTRUITI** - Bassa incidenza delle aree ad alta valenza ecologica **B. ECONOMIA** - Condizione reddituale degli abitanti inferiore al contesto regionale e metropolitano - Significativi costi energetici per l'esercizio degli edifici pubblici **C. ENERGIA** - Ridotta disponibilità da parte dei cittadini a sostenere spese per investimenti - Parcellizzazione della proprietà - quasi inesistenza di impianti a fonti rinnovabili…… **D. EMISSIONI IN ATMOSFERA** - Utilizzo prevalente di fonti energetiche non rinnovabili - **E. RISORSE NON RINNOVABILI** - bassa percentuale di raccolta differenziata dei rifiuti urbani **F. AMBIENTE** - Estensione limitata di superfici permeabili all'acqua - situazione estremamente critica correlata all'inquinamento da polveri sottili (PM10 e PM 2.5) **G. ASPETTI SOCIALI**

OPPORTUNITA’	MINACCE
A. STRUTTURA E FORMA URBANA possibile rinaturalizzazione di aree industriali abbandonate - Potenziamento della rete ciclabile - **B. ECONOMIA** - Risorse finanziarie derivanti dai fondi strutturali europei e da fondi nazionali (es. Conto termico, contributi per la messa in sicurezza del patrimonio pubblico) per la riqualificazione energetica del patrimonio pubblico **C. ENERGIA** - Basse prestazioni energetiche degli edifici esistente possono permettere significativi risparmi con investimenti non rilevanti - Sviluppo delle Comunità Energetiche - Interventi sostenuti dale ESCO - Possibile estensione del teleriscaldamento urbano - Incremento dell’impiego delle tecnologie ad alta efficienza (Led) per l’illuminazione pubblica - possibile integrazione di impianti a fonti rinnovabili con la rete di teleriscaldamento - disponibilità di superfici e di radiazione solare per l'installazione di impianti fotovoltaici - stimolare l'acquisto, in forma collettiva, di energia elettrica certificata da fonti rinnovabili (RECS) **D. EMISSIONI IN ATMOSFERA** - …… **E. RISORSE NON RINNOVABILI** - Estensione del Servizio di raccolta porta a porta dei rifiuti urbani e installazione di ecoisole con accesso controllato sull’asse di Via Cigna - Campagne di sensibilizzazione e informazione rivolte ai cittadini e alle scuole	**A. STRUTTURA E FORMA URBANA** **B. ECONOMIA** - Mancata riqualificazione delle aree abbandonate industriali - aggravarsi della condizione socio-economica dei cittadini residenti dovuti al perdurare della congiuntura economica negativa **C. ENERGIA** - infrastrutture energetiche richiedono significativi investimenti **D. EMISSIONI IN ATMOSFERA** **E. RISORSE NON RINNOVABILI** - scarsa sensibilità dei cittadini ad effettuare correttamente la corretta raccolta differenziata porta a porta **F. AMBIENTE** - Alto numero di veicoli private pro-capite - Alto numero di caldaie per edificio **G. ASPETTI SOCIALI** -

F. AMBIENTE - disponibilità di aree potenzialmente convertibili in zone verdi e ricreative - Sostegno da parte degli enti pubblici alla diffusione di sistemi di mobilità condivisa e all'incremento del trasporto pubblico locale **G. ASPETTI SOCIALI** - significativo incremento della dotazione infrastrutturale ciclabile dovuto alla possibile realizzazione di nuove piste ciclabili previste dalla Città	

4. STRATEGIC DEFINITION

a. Performance targets

The overall Environmental, Social and Economic targets have to be described

Environmental targets	*- Reduction of land consumption with the aim of achieving "zero consumption" and full and rational management of environmental resources aimed at qualitative and quantitative improvement of their overall level, with particular reference to agricultural areas and the existing settlement and infrastructure heritage;* *- Increasing the permeability of urban soil and adaptation to climate change;* *- - Prediction of urban morphology in relation to the improvement of environmental conditions;* *- Improvement of air quality, reduction of CO2 emissions, with reference to the Covenant of Mayors.* *- Energy efficiency of buildings, adequate management of the transition phase towards the objective of "near-- zero" consumption buildings, introduction of environmental policies for energy certification on a building and urban scale;* *- Sustainable mobility, increased use of soft mobility (pedestrian and cycle), car sharing and local public transport and measures to combat private transport.*
Social targets	*Improvement of the quality of public spaces and of the quality of life in general, with the aim of guaranteeing citizens an adequate supply of services in terms of quality, quantity and distribution. The new urban forecasts must, therefore, also identify new methods of use and provision of services, suitable to meet the needs of all citizens with a widespread and balanced distribution on the urban territory. It will be necessary to enhance the identity of the neighborhoods through the provision and redevelopment of meeting spaces (green areas, cultural centers, libraries, etc.) and other functions whose provision can be decentralized with multifunctional services, using the latest technologies;*
Economy targets	*create the conditions for easy access to basic services, in particular for the most vulnerable people*

Each partner must establish a target value for each criterion in the SNTool reflecting the overall targets..

A –			
A1 – Built urban system			
A 1.2 – Urban compactness		Actual value	14,2
indicator	m3/m2	Target value	18
A 1.7 Conservation of land		Actual value	0,5
indicator	%	Target value	1
A.2.1 Walking distance to public transport for residents		Actual value	100
indicator	%	Target value	100
A 2.4 Connectivity Of bicycle path		Actual value	0,0012
indicator	Km/1000 inhab	Target value	0.0023
B - ECONOMY			
B2– Economic activity			
B2.2 – Average annual income		Actual value	81
(Indicator)	%	Target value	90
B3– Cost and investments			
B3.3 – Operating energy cost		Actual value	8,2
(Indicator)	€/mq year	Target value	4
C – ENERGY			
C1 – NON RENEWABLE ENERGY			
C1.1– Total final thermal energy consumption for building operations.		Actual value	235
(Indicator)	kWh/mq year	Target value	30
C1.2 – Total final thermal energy consumption for residential building operations.		Actual value	198,8
(Indicator)	kWh/mq year	Target value	30
C1.3– Total final thermal energy consumption for non residential building operations.		Actual value	41
(Indicator)	kWh/mq year	Target value	40
C1.4 – Total final electrical energy consumption for building operations.		Actual value	78,2
(Indicator)	kWh/mq year	Target value	20
C1.5 – Total final electrical energy consumption for residential building operations		Actual value	31,1
(Indicator)	kWh/mq year	Target value	5
C1.6 – Total final electrical energy consumption for NON residential building operations.		Actual value	90
(Indicator)	kWh/mq year	Target value	22
C1.7 – Total primary energy demand for building operations.		Actual value	403,4
(Indicator)	kWh/mq year	Target value	56
C1.20– Energy consumption of public lighting		Actual value	1,2
(Indicator)	kWh/mq year	Target value	0,5
C2.1 – Share of renewable energy on-site, relative to total final thermal energy consumption for building operations.		Actual value	0
(Indicator)	%	Target value	100
C2.4 – Share of renewable energy on-site, relative to total primary energy consumption for building operations.		Actual value	1
(Indicator)	%	Target value	100
C2.7 – Share of renewable energy on-site, relative to final electric energy consumption.		Actual value	1,23
(Indicator)	%	Target value	100
C2.8– Aggregated electrical energy generation from renewable sources located on public properties.		Actual value	22
(Indicator)	MWh/y	Target value	1000
D – ATMOSPHERIC EMISSIONS			

D1 – Atmospheric emission			
D1.2 – Total GHG Emissions from primary energy used in building operations-		Actual value	86
(Indicator)	kgCO2/1000mq	Target value	22,5
E – NON RENEWABLE RESOURCES			
E1 – Potable water, stormwater and greywater			
E1.6 – *Consumption of potable water for residential population and non residential building systems*		Actual value	63,5
(Indicator)	mc/inhab year	Target value	60
E1.7 *Consumption of potable water for public non residential building systems*		Actual value	0,8
indicator	mc/mq	Target value	0,5
E2 Solid and liquid wastes			
E2.1 Solid waste and recycling collection points.		Actual value	97
indicator	%	Target value	98
E2.2 Separate collection and disposal of solid waste and recycling.		Actual value	36,2
indicator	%	Target value	0,575
F – ENVIRONMENT			
F1 – environmental impacts			
F1.3 – Recharge of groundwater through permeable paving or landscaping		Actual value	17
(Indicator)	%	Target value	40
F2.1– Ambient air quality with respect to particulates <2.5 mu (PM2.5) over a one-year period.		Actual value	33
(Indicator)	µg/mc	Target value	15
F2.3 – Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period.		Actual value	17
(Indicator)	days/year	Target value	40
F3.1– Green zones & recreation areas availability		Actual value	14,3
(Indicator)	m2/inhab	Target value	25
G – SOCIAL ASPECTS			
G2 – Traffic and mobility services			
G2.1 – Performance of the public transport system.		Actual value	100
(Indicator)	%	Target value	100
G2.4 – Quality of pedestrian and bicycle network.		Actual value	12,07
(Indicator)	m/100 inhab	Target value	23
G4 Public and private facilities and services			
G4.2 – Availability and proximity of key services		Actual value	100
(Indicator)	%	Target value	100
G4.3 – Availability and proximity o a primary school		Actual value	57
(Indicator)	%	Target value	75
G4.4 – Availability and proximity of secondary school		Actual value	50
(Indicator)	%	Target value	60
G4.5 – Availability and proximity of childrens' play facilities		Actual value	58
(Indicator)	%	Target value	60
G6 Management and community involvement			
G6.3– Community involvement in urban planning activities		Actual value	0

(Indicator)	n	Target value	5

5. DECISION MAKING

a. Description of scenarios

NAME OF SCENARIO	DESCRIPTION
1.RENEWABLE ENERGY AND RESOURCES EFFICIENCY	the scenario foresees: 1. expansion of the district heating network and 100% of connections 2. solar system for 2% of the need 3. reduction of consumption for thermal insulation of buildings 4. Centralized photovoltaic system 5. widespread diffusion of the door-to-door collection system for urban waste 6. extension of bicycle network and pedestrian areas 7. recovery of disused areas with renaturalisation 8. increase in electric mobility

b. Scenarios ranking

i. Performance Scores

	Current state	Scenario 1
TOTAL SCORE	**0,15**	**0,98**
A – Built Urban Systems	0,36	0,48
B – Economy	7,28	9,97
C – Energy	-0,58	0,44
D – Atmospheric	-1	-1
E – Non-renewable sources	0,96	3,24
F - Environment	-0,61	-0,3
G – Social aspects	2,56	3,55

ii. Key Performance Indicators

SCENARIO A

KPI	Indicator	Unit of measure	Value
A 1.7 Conservation of Land	Area of undeveloped land with ecological or agricultural value / area of the neighborhood	%	1
B.3.3 Running costs energy for public buildings	Aggregated annual operating energy cost per aggregated indoor useful floor area	Euro/m^2/year	5,5
C.1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption per aggregated indoor useful floor area	kWh/m^2/year	180
C.1.4 Total final electric energy consumption for building operations	Aggregated annual total final electric energy consumption per aggregated indoor useful floor area	kWh/m^2/year	50
C.1.7 Total primary energy demand for building operations	Aggregated annual total primary energy consumption per aggregated indoor useful floor area	kWh/m2/year	363
C.2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Annual total thermal energy consumption from on-site renewable energy sources / annual total final thermal energy consumption	%	8
C.2.7 Share of electric energy generation from on-site renewable sources on final electric energy	Share of renewable electric energy in final electric energy consumptions	%	26
D.1.2 Total GHG Emissions from primary energy used in building operations	CO2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	50
E.1.6 Consumption of potable water for residential population	Annual potable water consumption per occupant	m^3 per occupant*yr	62
E.1.7 Consumption of potable water for non-residential building systems	Annual water consumption per occupant	m^3 /m^2	1
F.1.3 Recharge of groundwater through permeable paving or landscaping	Area of permeable surfaces on total neighborhood area	%	20
F.2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one year period	Number of days exceeding the daily limits in a year	days/year	94
G.2.1 Performance of the public transport	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop	%	100
G.2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated pedestrian paths and meters of bicycle path or “shared space” per 100 inhabitants.	m/100 inhabitants	40
G.4.2 Availability and proximity of key services	Percentage of inhabitants that are within 800 meters walking distance of at least 3 key services.	%	100
G.6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Level (score)	3

iii. Financing mechanisms evaluation

Scenario A	Different scenarios are evaluated. For each one a financing evaluation is provided: 1. expansion of the district heating network and 100% of connections: the expansion is already planned by the Local Energy Operator 2. solar system for a % of the need: • solar PV can be financed by EU structural Investment funds • solar Thermal can be financed by EU structural Investment funds, eventually coupled to the “Conto Termico” investment subsidy. 3. reduction of consumption for thermal insulation of buildings: ○ a physiological rate of building renovation has been foreseen; it can be partially funded by the Italian mechanism for tax reduction 4. widespread diffusion of the door-to-door collection system for urban waste collection: ○ the Local Operator has planned the increase of door to door collection. This value has been taken into account. 5. extension of bicycle network and pedestrian areas ○ the scenario is based on the planned increase of cycle path and pedestrian areas, by the City. Funding will came from the city itself. 6. recovery of disused areas with renaturalisation ○ significant surfaces (ex- Gondrand, …) will be renaturalized in the Area 7. increase in electric mobility ○ this ia a market trend that will develop with own fundings; also the public transportation will increase the electric mobility ratio Other funding sources: • Decreto Sviluppo • ELENA (joint initaiative by the European Investment Bank and the European Commission, under the Horizon program, focused on the implementation of the energy efficiencies, distributed renewable energy and urban transport programs) • CONTO TERMICO

6. RETROFIT CONCEPT

SELECTED SCENARIO	DESCRIPTION
A. RENEWABLE ENERGY AND RESOURCES EFFICIENCY	the scenario foresees: 1. expansion of the district heating network and 100% of connections 2. solar system for % of the need 3. reduction of consumption for thermal insulation of buildings 4. Centralized photovoltaic system 5. widespread diffusion of the door-to-door collection system for urban waste 6. extension of bicycle network and pedestrian areas 7. recovery of disused areas with renaturalisation 8. increase in electric mobility

KEY ELEMENTS OF THE CONCEPT

Retrofits Strategies	ENERGY Increase of District heating Building performance increase Solar thermal and PV large scale systems Increase in efficiency for internal electric appliances and public lightning
	WASTE Extension of door to door waste collection service
	MOBILITY Extension of cycle path and pedestrian areas Increase of electric mobility and charge facilities
Performance improvement	Environment Reduction of CO2 and GHG emission (Small) reduction of energy consumption Renaturalization of dismissed areas
	Society Increase of life quality trough the availability of urban spaces for a sustainable fruition of the area
	Economy Increase in the average income of residents due to a greater attractiveness of the are
Financial mechanism	Funding sources: • EU structural Investment funds • Decreto Sviluppo • ELENA (joint initaiative by the European Investment Bank and the European Commission, under the Horizon program, focused on the implementation of the energy efficiencies, distributed renewable energy and urban transport programs) • CONTO TERMICO

BUILDING SCALE ASSESSMENT – BUILDING 1

1. INITIATION

General information on the selected building	
Building (Name) SCUOLA FRANCHETTI	
Address	*Via Randaccio 60*
Building use	*school*
Owner	*municipality*
Year of construction	*1980*
Building method	*concrete structure*
Number of levels above earth	*4*
Number of levels underground	*1*
Heating system	*centralized boiler*
Cooling system	*NO*
DHW system	*Electric boiler*
Ventilation system	*NO*
Lighting system	*Normal*
Average U value	*1 W/mqK*
Number of occupants	*330*
Hours of occupation per year	*Approx 1900 h*

2. PREPARATION

a. SBTool structure

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

B – ENERGY AND RESOURCES CONSUMPTION		
	Name of the Category	
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 **	
B1.11	*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

b. SBTool criteria selection rationale

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

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*

c. SBTool weights rationale

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

ISSUE	WEIGHT (1 to 3)	MOTIVATION
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**					

d. SBTool benchmarks rationale

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

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*

e. SBTool Criteria Specifications

In this section PPs must indicate for each selected criterion:

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

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* *CESBAMED calculation steps*
		Assessment method	*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*

		Information source	*Metered data – Calculated data - Estimations*
D2.2	*Predicted Percentage Dissatisfied (PPD) **	*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	---

3. DIAGNOSIS

a. Performance scores

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

B – ENERGY AND RESOURCES CONSUMPTION		1,1
B1– total life cycle non renewable energy		1,2
B1.1	*Primary energy demand **	*0,4*
B1.2	*Delivered thermal energy demand **	*2,0*
B1.3	*Delivered electric energy demand **	*2,5*
B1.5	*Energy from renewable sources in total thermal energy consumption **	*0,1*
B1.6	*Energy from renewable sources in total electrical energy consumption **	*2,5*
B1.11	*Embodied energy **	*0,0*
B3.5	*Recycled materials**	*0,0*
B4	*Use of potable water, stormwater and greywater*	*1,7*
B4.5	*Water consumption for indoor uses **	*1,7*
C- ENVIRONMENTAL LOADINGS		2,9
C1 – Green house gas emissions		2,8
C1.3	*Greenhouse Gas Emissions from building's operations **	*2,8*
C3.1	*Construction and demolition waste **	*2,5*
C3.2	*Solid waste from building operations **	*3,3*
D- INDOOR ENVIRONMENTAL QU		4,3
D1 – indoor air quality and ventilation		2,1
D1.4	***TVOC concentration in indoor air ****	*0,1*
D1.10	*Ventilation rate **	*0,2*
D2 – air temperature and relative humidity		10,3
D2.2	***Thermal comfort index ****	***5,0***
G- COST AND ECONOMIC ASPECTS		2,3
G1 – Cost and economics		2,3
G1.4	*Use stage energy cost **	*2,0*
G1.5	*Use stage water cost **	2.5

b. Key Performance Indicators value

c. KPI	Indicator	Unit of measure	Value
B.1.1 Primary energy demand	Primary energy demand per internal useful floor area per year	kWh/m2/yr	76
B.1.2 Delivered thermal energy demand	Delivered thermal energy demand per internal useful floor area per year	kWh/m2/yr	50
B.1.3 Delivered electric energy demand	Delivered electric energy demand per internal useful floor area per year	kWh/m2/yr	25
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	32
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumption	%	70
B.1.11 Embodied non-renewable primary energy	Embodied primary non-renewable energy	MJ/m^2	2500
B.3.5 Recycled materials	Weight of recycled materials on total weight of materials	%	15
B.4.5 Potable water consumption for indoor uses	Potable water consumption per occupant per year	m^3/occupant/year	35
C.1.3 Global Warming potential	CO_2 equivalent emissions per internal useful floor area per year	kg CO_2 eq./m^2/yr	13
C.3.1 Construction and demolition waste	Weight of waste and materials generated per 1 m^2 of useful floor area demolished or constructed	kg/m^2/life cycle stage	60
C.3.2 Solid waste from building operation	Ratio of the number of collectable solid waste categories within a 100 m distance from the building's entrance to the reference solid waste categories	%	70
D.1.4 TVOC concentration in indoor air	TVOC concentration in indoor air	µg/ m^3	4900
D.1.10 Ventilation rate	Ventilation rate normalized per useful floor area	l/s/m2	18
D.2.2 Thermal comfort index	Predicted Percentage Dissatisfied (PPD)	%	0

G.1.4 Use stage energy cost	Energy annual cost per usable floor area	€/m2/yr	16
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m2/yr	3

d. Actual performance analysis

WEAKNESSES ASPECTS	*The building is critical under the energy aspects, a general refurbishment is needed.* *The Urban Scenario designs the arrival of the DH system, this must be considered in the new heating system planning*
STRENGHT ASPECTS	*Solar PV plant already existing (check the real production)*
POTENTIAL FOR PERFORMANCE IMPROVEMENT	*Future availability of DH* *Significant increase in insulation performances*

4. STRATEGIC DEFINITION

a. Performance targets

B – ENERGY AND RESOURCES CONSUMPTION			
B1 – Energy			
B1.1 – Primary energy demand		Actual value	76
Primary energy demand	kWh/m^2	Target value	50
B1.2 – Delivered thermal energy demand		Actual value	50
Delivered thermal energy demand	kWh/m^2	Target value	40
B1.3 – Delivered electric energy demand		Actual value	25
Delivered electric energy demand	kWh/m^2	Target value	24
B1.5 – Energy from renewable sources in total thermal energy consumption		Actual value	32
Energy from renewable sources in total thermal energy consumption	%	Target value	55
B1.6 – Energy from renewable sources in total electrical energy consumption		Actual value	70
Energy from renewable sources in total electrical energy consumption	%	Target value	76
B1.11 – Embidied NRPE		Actual value	2500
Final total energy for all building operations	kWh/m^2	Target value	2500
B3. – Use of materials			
B3.5 – *Recicled material*		Actual value	15
	%	Target value	15
B4 – Use of potable water, stormwater and greywater			
B4.5 – Water consumption for indoor uses		Actual value	35
Water consumption for indoor uses	m^3/person	Target value	31
C- ENVIRONMENTAL LOADINGS			
C1 – Greenhouse Gas Emissions			
C1.3 – Greenhouse Gas Emissions from building's operations		Actual value	13
Greenhouse Gas Emissions from building's operations	kg CO2eq/m^2	Target value	12
C3 – Solid and Liquid Wastes			
C3.1 – *Construction and demolition waste*		Actual value	60
	%	Target value	60
C3.2 – *Solid waste from building operation*		Actual value	70
	%	Target value	70
D- INDOOR ENVIRONMENTAL QUALITY			
D1 – Air quality and ventilation			
D1.4 –		Actual value	4900
	µg/mc	Target value	2600
D1.10 – Ventilation rate			
		Actual value	18
	l/s/mq	Target value	18
D2 – Air Temperature and Relative Humidity			
D2.2 – Thermal comfort index		Actual value	0
Predicted Percentage Dissatisfied (PPD)	%	Target value	0
G- COST AND ECONOMICS ASPECTS			
G1 – Cost and economics			
G1.4 – Use stage energy costs		Actual value	16
Risk to occupants and facilities from fire	€/mq y	Target value	14
G1.5 – Use stage water costs		Actual value	3
	€/mq y	Target value	2,6

b. Constraints and restrictions

CONSTRAINTS / RESTRICTIONS	
Legal constraints	*Buildings under major renovation should comply with National, regional and local regulation on the energy performance in the building sector*
Technical constraints	*Schools must verify anti seismic rules*
Financial constraints	*Municipal fundings*
Environmental condition constraints	*no*
Stakeholder based restrictions	
Other relevant constraints	*no*

c. Potential strategies at building scale

Synergy zones	
Energetic synergies	*It is possible to sell excess electric energy from PV plant to other municipal buildings*
Water synergies	*It will be possible to reuse rain water in to toilets*
Waste synergies	*The school will be linked to the new urban waste collection system*
Mobility synergies	*The school will host bike parkings*
Other synergies	

5. DECISION MAKING

a. Description of scenarios

SCENARIO A	DESCRIPTION
1.	Building insulation
2.	Connection to planned DH
3.	Mechanical ventilation with heat recovery
4.	Use LED light
5.	Increase of PV power +20%
6.	Rain water storage and use

b. Scenarios ranking

i. Performance Scores

Issues	Current state	Scenario 1
TOTAL SCORE		
B – Energy and Resources C.	1,1	2,2
C – Environmental Loadings	2,9	3
D – Indoor Env. Quality	4,3	4,6
G – Cost and Economic Asp.	2,3	3

ii. Key Performance Indicators

SCENARIO A			
KPI	Indicator	Unit of measure	Value
B.1.1 Primary energy demand	Primary energy demand per internal useful floor area per year	kWh/m2/yr	50
B.1.2 Delivered thermal energy demand	Delivered thermal energy demand per internal useful floor	kWh/m2/yr	40

	area per year		
B.1.3 Delivered electric energy demand	Delivered electric energy demand per internal useful floor area per year	kWh/m2/yr	24
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	55
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumption	%	76
B.1.11 Embodied non-renewable primary energy	Embodied primary non-renewable energy	MJ/m^2	2500
B.3.5 Recycled materials	Weight of recycled materials on total weight of materials	%	15
B.4.5 Potable water consumption for indoor uses	Potable water consumption per occupant per year	m^3/occupant/year	31
C.1.3 Global Warming potential	CO_2 equivalent emissions per internal useful floor area per year	kg CO_2 eq./m^2/yr	12
C.3.1 Construction and demolition waste	Weight of waste and materials generated per 1 m^2 of useful floor area demolished or constructed	kg/m^2/life cycle stage	60
C.3.2 Solid waste from building operation	Ratio of the number of collectable solid waste categories within a 100 m distance from the building's entrance to the reference solid waste categories	%	70
D.1.4 TVOC concentration in indoor air	TVOC concentration in indoor air	µg/ m^3	2600
D.1.10 Ventilation rate	Ventilation rate normalized per useful floor area	l/s/m2	16
D.2.2 Thermal comfort index	Predicted Percentage Dissatisfied (PPD)	%	0
G.1.4 Use stage energy cost	Energy annual cost per usable floor area	€/m2/yr	14
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m2/yr	2,6

iii. Financing mechanisms evaluation

Scenario A	Municipality funds + Conto termico Energia + DL Crescita EU fundings programs (European Structural and Investments Funds) Bank Foundations

iv. Synergies at building level

Scenario A	PV excess production can be used in other municipal buildings/uses

6. RETROFIT CONCEPT

SELECTED SCENARIO	DESCRIPTION
A	The increase insulation of the building will reduce the energy needs; the new DH will provide the thermal power. The new ventilation system will improve the internal air quality and comfort, in the same time it will help in reduce energy consumption. LED lamps will reduce electric energy needs and the new PV power will cover an increased percentage. Rain water collection will be used in toilet flush for reduce tap water use.

KEY ELEMENTS OF THE CONCEPT

Retrofits Strategies	Building insulation
	PV surface increase
	LED lamps
Performance improvement	Environment: reduced CO2 emission
	Society: better quality of life for school users, educational revenues
	Economy: reduction of expenditure for the municipality
Financial mechanism	Aspect 1: Municipality funds + Conto termico Energia + DL Crescita
	Aspect 2 EU fundings programs (European Structural and Investments Funds)
	Aspect 3 Bank Foundations

BUILDING SCALE ASSESSMENT – BUILDING 2

1. INITIATION

General information on the selected building	
Building (Name) EDIFICIO ATC	
Address	
Building use	*residential*
Owner	*ATC*
Year of construction	*1930*
Building method	*Brocks wall*
Number of levels above earth	*4*
Number of levels underground	*1*
Heating system	*Decentralized boilers*
Cooling system	*NO*
DHW system	*Electric boiler*
Ventilation system	*NO*
Lighting system	*Normal*
Average U value	*1 W/mqK*
Number of occupants	*….*
Hours of occupation per year	*Approx 8600h*

2. PREPARATION

a. SBTool structure

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 **
B1.11	*Embodied energy **
B3	**Use of Materials**
B3.5	*Recycled materials*
B4	**Use of potable water, stormwater and greywater**
B4.5	*Water consumption for indoor use*

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*
C3.2	*Solid waste from building operations **

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 **

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

b. SBTool criteria selection rationale

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

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 city*	
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*		
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**
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**
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*

c. SBTool weights rationale

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

ISSUE	WEIGHT (1 to 3)	MOTIVATION
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 criterion 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 (Not for Use phase)*	*5*	*4*	*3*	*2*	*3*	*Important criterion 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**					

d. SBTool benchmarks rationale

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

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: 20*	*Values from CasaClima ed ENEA*
			5: 70	*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 electric energy consumption*	*%*	*0: 40*	*20% objectives 2020 from EU strategies + increase for public building*
			5: 100	*Excellent and ideal target*
B.1.11	*Embodied non renewable primary 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	*Potable 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	*Global warming*	*kgCO2eq/*	*0: 30*	*technical evaluation*

	potential	*m2 y*	*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 operation*	*%*	*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*

e. SBTool Criteria Specifications

In this section PPs must indicate for each selected criterion:

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

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*	*Information source*	*Calculated data - Estimations*

	*consumption **	*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* *CESBAMED calculation steps*
		Assessment method	*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	*CESBAMED calculation steps; D.M.*

		method	*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	---

3. DIAGNOSIS

a. Performance scores

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

B – ENERGY AND RESOURCES CONSUMPTION		-0,3
B1– total life cycle non renewable energy		-0,2
B1.1	*Primary energy demand **	*-1,0*
B1.2	*Delivered thermal energy demand **	*-1*
B1.3	*Delivered electric energy demand **	*4,5*
B1.5	*Energy from renewable sources in total thermal energy consumption **	*-1*
B1.6	*Energy from renewable sources in total electrical energy consumption **	*0*
B1.11	*Embodied energy **	*0*
B3.5	*Recycled materials**	*0,0*
B4	*Use of potable water, stormwater and greywater*	*-1*
B4.5	*Water consumption for indoor uses **	*-1*
C- ENVIRONMENTAL LOADINGS		0,1

C1 – Green house gas emissions		-1
C1.3	***Greenhouse Gas Emissions** from building's operations **	*-1*
C3		*2,1*
C3.1	*Construction and demolition waste **	*2,5*
C3.2	*Solid waste from building operations **	*1,7*
D- INDOOR ENVIRONMENTAL QU		2
D1 – indoor air quality and ventilation		1,9
D1.4	***TVOC concentration in indoor air **	*3,8*
D1.10	*Ventilation rate **	*0,0*
D2 – air temperature and relative humidity		2,5
D2.2	***Thermal comfort index **	***2,5***
G- COST AND ECONOMIC ASPECTS		-1
G1 – Cost and economics		-1
G1.4	*Use stage energy cost **	*-1*
G1.5	*Use stage water cost **	-1

b. Key Performance Indicators value

c. KPI	Indicator	Unit of measure	Value
B.1.1 Primary energy demand	Primary energy demand per internal useful floor area per year	kWh/m2/yr	253
B.1.2 Delivered thermal energy demand	Delivered thermal energy demand per internal useful floor area per year	kWh/m2/yr	170
B.1.3 Delivered electric energy demand	Delivered electric energy demand per internal useful floor area per year	kWh/m2/yr	21
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	0
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumption	%	0
B.1.11 Embodied non-renewable primary energy	Embodied primary non-renewable energy	MJ/m^2	2500
B.3.5 Recycled materials	Weight of recycled materials on total weight of materials	%	15
B.4.5 Potable water consumption for indoor uses	Potable water consumption per occupant per year	m^3/occupant/year	77
C.1.3 Global Warming potential	CO_2 equivalent emissions per internal useful floor area per year	kg CO_2 eq./m^2/yr	42,5
C.3.1 Construction and demolition waste	Weight of waste and materials generated per 1 m^2 of useful floor area demolished or constructed	kg/m^2/life cycle stage	60
C.3.2 Solid waste from building operation	Ratio of the number of collectable solid waste categories within a 100 m distance from the building's entrance to the reference solid waste categories	%	60
D.1.4 TVOC concentration in indoor air	TVOC concentration in indoor air	µg/ m^3	2000
D.1.10 Ventilation rate	Ventilation rate normalized per useful floor area	l/s/m2	0,8
D.2.2 Thermal comfort index	Predicted Percentage Dissatisfied (PPD)	%	5

G.1.4 Use stage energy cost	Energy annual cost per usable floor area	€/m2/yr	17,7
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m2/yr	6,16

c. Actual performance analysis

WEAKNESSES ASPECTS	*The building is critical under the energy aspects, a general refurbishment is needed.* *The Urban Scenario designs the arrival of the DH system, this must be considered in the new heating system planning*
STRENGHT ASPECTS	*No*
POTENTIAL FOR PERFORMANCE IMPROVEMENT	*Future availability of DH* *Significant increase in insulation performances* *Find a place insight the lot or make alocal grid (net metering) for PV plant*

4. STRATEGIC DEFINITION

f. Performance targets

B – ENERGY AND RESOURCES CONSUMPTION			
B1 – Energy			
B1.1 – Primary energy demand		Actual value	76
Primary energy demand	kWh/m^2	Target value	50
B1.2 – Delivered thermal energy demand		Actual value	50
Delivered thermal energy demand	kWh/m^2	Target value	40
B1.3 – Delivered electric energy demand		Actual value	25
Delivered electric energy demand	kWh/m^2	Target value	24
B1.5 – Energy from renewable sources in total thermal energy consumption		Actual value	32
Energy from renewable sources in total thermal energy consumption	%	Target value	55
B1.6 – Energy from renewable sources in total electrical energy consumption		Actual value	70
Energy from renewable sources in total electrical energy consumption	%	Target value	76
B1.11 – Embodied NRPE		Actual value	2500
Final total energy for all building operations	kWh/m^2	Target value	2500
B3. – Use of materials			
B3.5 – *Recycled material*		Actual value	15
	%	Target value	15
B4 – Use of potable water, stormwater and greywater			
B4.5 – Water consumption for indoor uses		Actual value	35
Water consumption for indoor uses	m^3/person	Target value	31
C- ENVIRONMENTAL LOADINGS			
C1 – Greenhouse Gas Emissions			
C1.3 – Greenhouse Gas Emissions from building's operations		Actual value	13
Greenhouse Gas Emissions from building's operations	kg CO2eq/m^2	Target value	12
C3 – Solid and Liquid Wastes			
C3.1 – *Construction and demolition waste*		Actual value	60
	%	Target value	60
C3.2 – *Solid waste from building operation*		Actual value	70
	%	Target value	70
D- INDOOR ENVIRONMENTAL QUALITY			
D1 – Air quality and ventilation			
D1.4 –		Actual value	4900
	µg/mc	Target value	2600
D1.10 – Ventilation rate			
		Actual value	18
	l/s/mq	Target value	18
D2 – Air Temperature and Relative Humidity			
D2.2 – Thermal comfort index		Actual value	0
Predicted Percentage Dissatisfied (PPD)	%	Target value	0
G- COST AND ECONOMICS ASPECTS			
G1 – Cost and economics			
G1.4 – Use stage energy costs		Actual value	16
Risk to occupants and facilities from fire	€/mq y	Target value	14
G1.5 – Use stage water costs		Actual value	3
	€/mq y	Target value	2,6

g. Constraints and restrictions

CONSTRAINTS / RESTRICTIONS	
Legal constraints	*Buildings under major renovation should comply with National, regional and local regulation on the energy performance in the building sector*
Technical constraints	*Relevant renovation must verify anti seismic rules*
Financial constraints	*Municipal fundings/ELENA/EU project*
Environmental condition constraints	*no*
Stakeholder based restrictions	
Other relevant constraints	*The building lot is owned by a large number of single people. It will be necessary to converge to a common decision about refurbishment and expenditure*

h. Potential strategies at building scale

Synergy zones	
Energetic synergies	*It will be possible to sell excess electric energy from PV plant and share thermal energyto other buildings in a possible future (Energy community and DH)*
Water synergies	*It will be possible to reuse rain water in to toilets*
Waste synergies	*The lot will be linked to the new urban waste collection system*
Mobility synergies	*The building will host bike parkings*
Other synergies	

5. DECISION MAKING

i. Description of scenarios

SCENARIO A	DESCRIPTION
1.	Building insulation (roof, windows; walls)
2.	Connection to planned DH
3.	Mechanical ventilation with heat recovery (eventually)
4.	Use LED light
5.	Install PV system
6.	Rain water storage and use

j. Scenarios ranking

i. Performance Scores

Issues	Current state	Scenario 1
TOTAL SCORE		
B – Energy and Resources C.	-0,3	1,2
C – Environmental Loadings	0,1	2,2
D – Indoor Env. Quality	2	2,5
G – Cost and Economic Asp.	-1	2,6

ii. Key Performance Indicators

SCENARIO A			
KPI	**Indicator**	**Unit of measure**	**Value**
B.1.1 Primary energy demand	Primary energy demand per internal useful floor area per year	kWh/m2/yr	90
B.1.2 Delivered thermal energy demand	Delivered thermal energy demand per internal useful floor	kWh/m2/yr	110

	area per year		
B.1.3 Delivered electric energy demand	Delivered electric energy demand per internal useful floor area per year	kWh/m2/yr	20
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	55
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumption	%	76
B.1.11 Embodied non-renewable primary energy	Embodied primary non-renewable energy	MJ/m^2	2500
B.3.5 Recycled materials	Weight of recycled materials on total weight of materials	%	15
B.4.5 Potable water consumption for indoor uses	Potable water consumption per occupant per year	m^3/occupant/year	31
C.1.3 Global Warming potential	CO_2 equivalent emissions per internal useful floor area per year	kg CO_2 eq./m^2/yr	16,2
C.3.1 Construction and demolition waste	Weight of waste and materials generated per 1 m^2 of useful floor area demolished or constructed	kg/m^2/life cycle stage	60
C.3.2 Solid waste from building operation	Ratio of the number of collectable solid waste categories within a 100 m distance from the building's entrance to the reference solid waste categories	%	60
D.1.4 TVOC concentration in indoor air	TVOC concentration in indoor air	µg/ m^3	2600
D.1.10 Ventilation rate	Ventilation rate normalized per useful floor area	l/s/m2	10
D.2.2 Thermal comfort index	Predicted Percentage Dissatisfied (PPD)	%	0
G.1.4 Use stage energy cost	Energy annual cost per usable floor area	€/m2/yr	12
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m2/yr	4

iii. Financing mechanisms evaluation

Scenario A	Municipality funds + Conto termico Energia + DL Crescita EU fundings programs (European Structural and Investments Funds) Bank Foundations

iv. Synergies at building level

Scenario A	Use DH heat from grid, participate in installing large scale Solar thermal plant in another area and share the production across the net; Install PV and share excess production in the grid

6. RETROFIT CONCEPT

SELECTED SCENARIO	DESCRIPTION
A	The increased insulation of the building will reduce the energy needs; the new DH will provide the thermal power. The new ventilation system will improve the internal air quality and comfort, in the same time it will help in reduce energy consumption. LED lamps will reduce electric energy needs and the new PV power will cover an increased percentage. Rain water collection will be used in toilet flush for reduce tap water use.

KEY ELEMENTS OF THE CONCEPT

Retrofits Strategies	Building insulation
	PV plant, Solar Thermal Plant (remote and/or local)
	LED lamps
Performance improvement	Environment: reduced CO2 emission
	Society: better quality of life for school users, educational revenues
	Economy: reduction of expenditure for the municipality
Financial mechanism	Aspect 1: Municipality funds + Conto termico Energia + DL Crescita
	Aspect 2 EU fundings programs (European Structural and Investments Funds)
	Aspect 3 Bank Foundations