TESTING PROTOCOL

ASSESSMENT REPORT

Version 1.1

Date: 22-2-2018

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

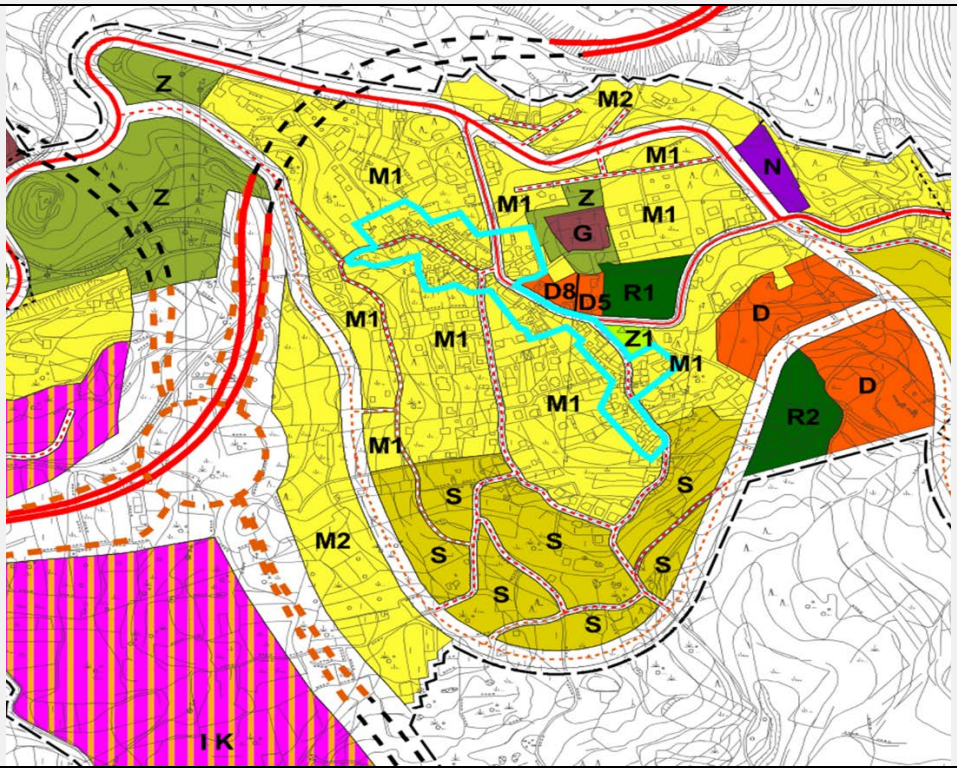
Responsible Partner: Andrea Moro, iiSBE Italia R&D

INDEX

URBAN SCALE ASSESSMENT

1. INITIATION

General information on the selected urban area

City	*City of Solin, heighburhood Mravince*
Brief description	*The Mravince neighborhood is one of the five neighborhoods of the City of Solin and is strongly dependent on Solin and Split. Mravince is located on a hilltop and south oriented slope and is inhabited since beginning of the 20th century. Traditional style construction is still visible in the centre of the neighborhood. More intensive construction activities were in the first part of the 1970-ies and again after the year 2000.* *Local economy and management of spatial resource has a negative effect on the spatial development of the area. Lack of urban values and design standards is cleary noticed, in particular in public spaces i.e. streets, squares, pedestrian lines, public green areas, urban amenities.*
Size (ha)	*95*
Residential population	*1368*
Average building density (total m2/land surface m2)	*42 ha / 95 ha= 0,44*
Plan of the urban area	

Significant pictures	
Desciption of the adjacent areas	*Industry, high density roads, former cement factory and county waste dump site form boundaries of the Mravince neighborhood. To the south the county waste dump site Karepovac is located. To the north and west the highway is located as well as ecologicaly valuable area which has suffered fire hazard in 2017.*
Property ownership	*All households are privately owned. There are 9 public buildings – elementary school, primary health service and ambulance, 2 kindergardens, library, community centre, football centre and neighborhood board office*
Social and economic context	*The inhabitants of the neighborhood are mostly employed in Split. Average monthly income per employee is 351 eur,*
Legal /administrative boundary lines	*Total administrative boundary surface is 280 ha, now 95 ha is constructed*
Energy supply infrastructure	*All households are connected to public electricity grid. No other energy supply grid is available in the neighborhood*
Relevance of the surrounding infrastructures	*Local public roads are not according to relevant standard i.e. the streets are not wide enough and with no pedestrian or bicycle lanes, also not all building plots are accessible from public road. Electricity supply, telecommunication and water supply are sufficiently developed while wastewater drainage infrastructure is not fully developed.*
Reference stakeholders in retrofit process	*City of Solin, Split-Dalmatia County – Department for Economy, Agriculture and EU projects, Public Institution Department for Spatial Planning of the Split-Dalmatia County, VirideST Association, Faculty of Construction, Architecture and Geodesy in Split*
Other significant information	*Ecology area located to north and east has been affected in 2017 by strong forest fire which almost reached housing area. Now the slopes remain without main ecology features*

2. PREPARATION

a. SNTool structure

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

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

b. SNTool criteria selection rationale

A - BUILT URBAN SYSTEMS		
	CRITERION	REASON/MOTIVATION
A1	Urban structure and form	*Comment here*
A1.2	*Urban compactness*	*To improve currrent urban design rules and visual appereance of the neighborhood*
A1.4	*Residential density*	*To determine if residential density – not evaluated so far*
A1.7	*Conservation of land*	*To determine if all undeveloped land is needed for future residential use as defined by urban development plan*
A2	Transportation infrastructure	
A2.2	*Walking distance to public transport for area workers and students*	*To determine sufficient number of bus stops*
A2.9	*On-street and indoor parking spaces relative to local population*	*To determine required number of parking lots and avoid parking on the roads – not quantified so far*
A2.10	*Intermodality facilities*	*To improve mobility for the inhabitants and induce use of alternative mobility principles*

B - ECONOMY		
	CRITERION	REASON/MOTIVATION
B1	Economic Structure and Value	
B1.1	*Affordability of housing property*	*To determine if local population have financial resources for future residential development*
B1.6	*Percent of residential units in the neighbourhood that are vacant*	*To determine if there are housing properties still unused*
B2	Economic activity	
B2.2	*Average annual per-capita income of residents*	*To determine financial capacities of local population*
B3	Cost and Investment	
B3.3	*Use stage energy costs for public buildings*	*To determine if energy costs are entered in the national energy management software and the amount of costs*
B3.4	*Levels of total public and private investment*	*To determine levels of investments and if there is a potential to use them more targeted. No tracking of data for private investment*

C - ENERGY		
	CRITERION	REASON/MOTIVATION
C1	Non-renewable energy	
C1.1	*Total final thermal energy consumption for building operations*	*To determine energy demand of the area – modeled energy used*
C1.4	*Total final electrical energy consumption for building operations*	*To determine energy demand of the area – actual energy consumption used*
C1.7	*Total primary energy demand for building operations*	*To determine energy demand of the area, typical fuels used and assess the potential of on-site RES energy consumption – modeled energy used for thermal energy, actual energy consumption used for electricity*
C2	Renewable and Decarbonised Energy	
C2.1	*Share of renewable energy on-site*	*To assess current and future on-site RES energy production to reduce*

	relative to total final energy consumption for building operations	*fossil fuel use*
C2.4	*Share of renewable energy on-site, relative to total primary energy consumption for building operations*	*To assess current and future on-site RES energy production and reduce dependance on grid supply and reduce fossil fuel use*
C2.7	*Share of renewable energy on-site, on final electric energy consumption*	*To assess current and future on-site RES electricity production and reduce dependance on grid supply*

D - ATMOSPHERIC EMISSIONS		
	CRITERION	REASON/MOTIVATION
D1	Atmospheric emmissions	*Comment here*
D1.2	*GHG emissions from primary energy used in building operations*	*To assess current and future emmissions related to energy consumption if energy refurbishment and RES measures are implemented*
D1.7	*Total GHG Emissions from buildings, private and public mobility*	*To assess current and future emmissions related to energy consumption if energy refurbishment, RES and e-mobiliy measures are implemented*

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

F - ENVIRONMENT		
CRITERION		REASON/MOTIVATION
F1	Environmental impacts	
F1.1	*Impact of construction activities on natural features*	*To determine the impacts of construction on natural features of the area and to define mitigation measures for future development*
F1.3	*Recharge of groundwater through permeable paving or landscaping*	*To determine the impacts of construction on soul permeability and to define mitigation measures for future development*

F1.8	*Impact of private vehicles used by the local population on peak load capacity of the local road system*	*To determine local road traffic intensity*
F2	Outdoor environmental quality	
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	*To determine air quality measurement levels close to the neighborhood and compare measured values to allowed values*
F3	Ecosystems and landscapes	
F3.6	*Tree coverage for shade and management of local ambient temperatures*	*To determine existance of private and public green areas quantity and shading capacity*
F3.10	*Ecological diversity in the area*	*To determine the qualitative features of ecological elements and to assess the impact of forrest fire hazard*

G- SOCIAL ASPECTS

CRITERION		REASON/MOTIVATION
G2	Traffic and Mobility Services	
G2.1	Public transport service	*To compare mobillity demand of residents to avialability of public transport*
G2.4	Quality of pedestrian and bicycle network	*To promote cycling and walking as an alternative to vehicle use by providing a safe and efficient mobility networks*
G3	Communication services	
G3.1	Availability of a broadband communication network	*To determine the percentage of households already connected to internet and future demand for broadband connection*
G4	Public and private facilities and services	
G4.2	Availability and proximity of key services	*To enable better access to key public human services through better mobility or use of communication network*
G5	Local Food	
G5.1	Local production of food	*To introduce concept of local food production as local construction rules in physical planning documents*
G6	Management and community involvement	
G6.3	Community involvement in urban planning activities	*To involve residents in formulation of local construction rules and projects in the neighborhoods*
G7	Society, Culture and Heritage	
G7.1	Compatibility of urban design with local cultural values	*To introduce more traditional construction features in the local construction rules and improve visual appereance of the neighborhood*

c. SNTool weights rationale

ISSUES WEIGHTS

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

CATEGORIES WEIGHTS

Note: the categories weight results automatically from the criteria level

CATEGORIES	WEIGHT (%)
A1- Urban Structure and Form	5,7
A2- Transportation Infrastructure	6,1
TOTAL	**12,2**
B1- Economic Structure and Value	2,0
B2- Economic activity	1,1
B3- Cost and Investment	1,6
TOTAL	**4,6**
C1- Non-Renewable energy	11,2
C2- Renewable and Decarbonised energy	10,4
C3- Energy recycling and storage	0
TOTAL	**21,5**
D1- Atmospheric emissions	13,3
TOTAL	**13,3**
E1- Potable water, stormwater and greywater	4,3
E2- Solid and Liquid Wastes	5,3
E3- Resource consumption, retention and maintenance	4,8
TOTAL	**14,3**
F1- Environmental impacts	4
F2- Outdoor environmental quality	2,4
F3- Ecosystems and landscapes	2,7
TOTAL	**9**
G1- Safety and Accessibility	0

G2- Traffic and Mobility Services	8
G3- Communication services	3,2
G4- Public and private facilities and services	3,2
G5- Local Food	3,2
G6- Management and community involvement	4,3
G7- Society, Culture and Heritage	3,2
G8- Perceptual	0
TOTAL	**25**

CRITERIA WEIGHTS

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

CESBA MED SNTool, sheet WeightsB: LF = Local Factor

A- BUILT URBAN SYSTEMS

A1 - Urban structure and form

	CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A1.2	*Urban compactness*	*2,14*	*3*	*2*	*4*		
A1.4	*Residential density*	*2,14*	*3*	*2*	*4*		
A1.7	*Conservation of land*	*1,42*	*3*	*2*	*4*		
	TOTAL	***5,7***					

A2 Transportation infrastructure

	CRITERION	Weight (%)	B	C	D	L.F.	L.F. REASON/MOTIVATION
A2.2	*Walking distance to public transport for area workers and students*	*1,78*	*2*	*2*	*5*		
A2.9	*On-street and indoor parking spaces relative to local population*	*2,14*	*3*	*4*	*2*		
A2.10	*Intermodality facilities*	*2,14*	*3*	*4*	*2*		
	TOTAL	**6,1**					

B- ECONOMY

B1 - Economic Structure and Value

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

B2 - Economic activity

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

B3 - Cost and Investment

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

	TOTAL	1,6					
C- ENERGY							
C1 - Non-renewable energy							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.1	*Total final thermal energy consumption for building operations*	*4,81*	*3*	*2*	*3*		*Insert your comment here*
C1.4	*Total final electrical energy consumption for building operations*	*3,21*	*3*	*2*	*2*		
C1.7	*Total primary energy demand for building operations*	*3,21*	*3*	*2*	*2*		
	TOTAL	**11,2**					
C2 - Renewable and Decarbonised Energy							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C2.1	*Share of renewable energy on-site, relative to total final thermal energy consumption for building operations*	*4,81*	*3*	*2*	*3*		*Insert your comment here*
C2.4	*Share of renewable energy on-site, relative to total primary energy consumption for building operations*	*3,21*	*2*	*2*	*3*		
C2.7	*Share of renewable energy on-site, on final electric energy consumption*	*2,40*	*1*	*3*	*3*		
	TOTAL	**10,4**					
D- ATHMOSPHERIC EMISSIONS							
D 1 – Atmospheric emissions							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
D1.2	*GHG emissions from primary energy used in building operations*	*6,68*	*3*	*5*	*5*		*Insert your comment here*
D1.7	*Total GHG Emissions from buildings, private and public mobility*	*6,68*	*3*	*5*	*5*		
TOTAL		**13,3**					
E- NON-RENEWABLE RESOURCES							
E1 - Potable water, stormwater and greywater							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
E1.6	*Consumption of potable water for residential population*						
E1.7	*Consumption of potable water for public non-residential building systems*						
E2 - Solid and Liquid Wastes							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
E2.1	*Solid waste and recycling collection points*						
E2.3	*Solid waste from construction and demolition projects retained in the area for re-use or recycling*						
E2.5	*Composting and re-use of organic sludge*						

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

F- Environment							
F1 - Environmental impacts							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
F1.1	*Impact of construction activities on natural features*	*1,07*	*2*	*2*	*3*		
F1.3	*Recharge of groundwater through permeable paving or landscaping*	*0,53*	*1*	*2*	*3*		
F1.8	*Impact of private vehicles used by the local population on peak load capacity of the local road system.*	*2,40*	*3*	*3*	*3*		
TOTAL		**4,0**					
F2 - Outdoor environment quality							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	*2,40*	*3*	*3*	*3*		
TOTAL		**2,4**					
F3 - Ecosystems and landscapes							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
F3.6	*Tree coverage for shade and management of local ambient temperatures*	*1,60*	*3*	*2*	*3*		
F3.10	*Ecological diversity in the area*	*1,07*	*2*	*2*	*3*		
TOTAL		**2,7**					

G- SOCIAL ASPECTS							
G2 – Traffic and Mobility Services							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G2.1	Public transport service	*4,81*	*3*	*2*	*3*		
G2.4	Quality of pedestrian and bicycle network.	*3,21*	*2*	*2*	*3*		
TOTAL		**8,0**					
G3 - Communication Services							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G3.1	Availability of a broadband communication network	*3,21*	*2*	*2*	*3*		
TOTAL		**3,2**					

G4 - Public and private facilities and services							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G4.2	Availability and proximity of key services	*3,2*	*2*	*2*	*3*		
TOTAL		**3,2**					
G5 - Local Food							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G5.1	Local production of food	*3,2*	*2*	*2*	*3*		
TOTAL		**3,2**					
G6 - Management and community involvement							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G6.3	Community involvement in urban planning activities	*4,27*	*2*	*2*	*4*		
TOTAL		**4,3**					
G7 - Society, Culture and Heritage							
CRITERION		**Weight (%)**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
G7.1	Compatibility of urban design with local cultural values	*3,21*	*2*	*2*	*3*		
TOTAL		**3,2**					

d. SNTool benchmarks rationale

A- URBAN STRUCTURE AND FORM				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
A1.2	*Urban compactness*	m3/ha	*0:*	*Insert your comment here*
			5:	
A1.4	*Residential density*	pers/ha	*0: 75*	
			5: 110	
A1.7	*Conservation of land*	%	*0: 2*	
			5: 10	
A2.2	*Walking distance to public transport for area workers and students*	m	*0: 500*	
			5: 150	
A2.9	*On-street and indoor parking spaces relative to local population*	%	*0: 50*	
			5: 100	
A2.10	*Intermodality facilities*		*0: 2*	
			5: 1	

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

C- ENERGY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
C1.1	Total final thermal energy consumption for building operations	kWh/m^2	*0: 100*	*Insert your comment here*
			5: 50	*Insert your comment here*
C1.4	*Total final electric energy consumption for building operations*	kWh/m^2	*0: 75*	
			5: 50	
C1.7	*Total primary energy demand for building operations*	kWh/m^2/y	*0: 100*	
			5: 70	
C2.1	*Share of renewable energy*	%	*0: 5*	

	on-site, relative to total final thermal energy consumption for building operations		*5: 30*
C2.4	*Share of renewable energy on-site, relative to total primary energy consumption for building operations*	%	*0: 5* *5: 10*
C2.7	*Share of renewable energy on-site, on final electric energy consumptions*	%	*0: 20* *5: 35*

D- ATMOSPHERIC EMISSIONS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
D1.2	*GHG emissions from primary energy used in building operations*		*0: 22* *5: 15*	
D1.7	*Total GHG Emissions from buildings, private and public mobility*		*0: 150* *5: 50*	

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

F- ENVIRONMENT				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	RATIONALE
F1.1	*Preservation of land during and pre-construction phase*	desript	*0: Building and infrastructure construction projects have had some negative impacts on pre-existing land forms and vegetation over the previous 3-year period*	
			5: Building and infrastructure construction projects have had no perceptible negative impacts on pre-existing land forms and vegetation over the previous 3-year period	
F1.3	*Recharge of groundwater through permeable paving or landscaping*	%	*0: 20*	
			5: 80	
F1.8	*Impact of private vehicles used by the local population on peak load capacity of the local road system.*	desript	*0: It is estimated that the use of private vehicles by the local population reaches the peak load capacity of the local road system, with some negative impacts on traffic speeds, air quality, pedestrian and bicycling environments, and the function of adjacent buildings.*	
			5: It is estimated that the use of private vehicles by the local population is considerably less than the peak load capacity of the local road system, and there are no significant impacts on traffic speeds, air quality, pedestrian and bicycling environments, and the function of adjacent buildings.	
F2.3	*Ambient air quality with respect to particulates <10 mu (PM10) over a one-year period*	Days/yr	*0: 20*	
			5: 15	
F3.6	*Tree coverage for shade and management of local ambient temperatures*	%	*0: 20*	
			5: 75	
F3.10	*Ecological diversity in the area*	%	*0: The level of ecological diversity in the local area is like the larger urban area*	
			5: The level of ecological diversity in the local area is considerably higher than the larger urban area	

G- SOCIAL ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCH MARK	RATIONALE
G2.1	*Public transport service.*	%	*0: 5*	*Insert your comment here*
			5: 40	*Insert your comment here*
G2.4	*Quality of pedestrian and bicycle network*	*m/100 inhabitants*	0: 0	
			5: 500	

G3.1	*Availability of a broadband communication network*	%	0: 50 5: 65
G4.2	*Availability and proximity of key public human services*	%	0: 20 5: 70
G5.1	*Local production of food.*	m^2/100 residents	0: 100 5: 600
G6.3	*Community involvement in urban planning activities*	descript	0: 0 5: 3
G7.1	*Compatibility of urban design with local cultural values*	descript	0: Street layouts and the character of urban spaces in the local area are not compatible with traditional cultural values in the region 5: Street layouts and the character of urban spaces in the local area are fully compatible with traditional cultural values in the region

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

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

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

			residents of the neighborhood
		Standard	*City budget, Expenses for the acquisition of long-term assets; National Census 2011 for number of residents*

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

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

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

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

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

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

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

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

	services	*Assessment method*	*Percentage of inhabitants in radius of 800 m from key public services*
		Standard	-
G5.1	*Local production of food*	Information source	Measured data
		Assessment method	*Calculation of area of vegetable gardens in the area*
		Standard	-
G6.3	*Community involvement in urban planning activities*	*Information source*	*Questionnaire for residents*
		Assessment method	*Described based on the type of response / total number of responses*
		Standard	*Assessment criteria for the KPI*

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
A – BUILT URBAN SYSTEMS	
A1 – Urban structure and form	
A1.2 – Urban compactness	0,06
A1.4 - Residential density	0,08
A1.7 - Conservation of land	0,00
A2.2 - Walking distance to public transport for area workers and students	0,06
A2.9 - On-street and indoor parking spaces relative to local population	-0,02
A2.10 - Intermodality facilities	-0,02
B – ECONOMY	
B1 - Economic Structure and Value	
B1.1 – Affordability of housing property	0,00
B1.6 - Percent of residential units in the neighborhood that are vacant	-0,3
B2 Economic activity	
B2.2 - Average annual per-capita income of residents	0,03
B3 Cost and Investment	
B3.3 – Use stage energy costs for public buildings	0,01
B3.4 - Levels of total public and private investment	0,00
C – ENERGY	
C1 – Non-renewable energy	
C1.1 - Total final thermal energy consumption for building operations	0,17
C1.4 - Total final electric energy consumption for building operations	-0,03
C1.7 - Total primary energy demand for non-residential building operations	-0,03
C2 – Renewable and Decarbonised energy	
C2.1 - Share of renewable energy on-site, on total final thermal energy consumption for buildings operation	-0,02
C2.4 - Share of renewable energy on-site, relative to total primary energy consumption for buildings operation	-0,03
C2.7 - Share of renewable energy on-site, on final electric energy consumption	-0,02
D – ATMOSPHERIC EMISSIONS	
D1 – Atmospheric Emissions	
D1.2 – GHG emissions from primary energy used for all purposes in building operations	0,00
D1.7 - Total GHG Emissions from buildings, private and public mobility	0,13
E – NON-RENEWABLE SOURCES	
E1 – Potable water, stormwater and greywater	
E1.6 – Consumption of potable water for residential population	0,16
E1.7 - Consumption of potable water for public non-residential building systems	-0,01
E2 – Solid and liquid wastes	
E2.1 - Solid waste and recycling collection points	-0,02
E2.3 - Solid waste from construction and demolition projects retained in the area for re-use or recycling	-0,01
E2.5 - Composting and re-use of organic sludge	0,01
E3 – Resource consumption, retention and maintenance	
E3.2 - Consumption of non-renewable material resources for construction of infrastructure	0,17
F – ENVIRONMENT	

F1 – Environmental impacts	
F1.1 – Impact of construction activities on natural features	0,04
F1.3 - Recharge of groundwater through permeable paving or landscaping	0,03
F1.8 - Impact of private vehicles used by the local population on peak load capacity of the local road system	0,11
F2 – Outdoor environmental quality	
F2.3 - Ambient air quality with respect to particulates <10 mu (PM10) over a one year	0,00
F3– Ecosystems and landscapes	
F3.6 - Tree coverage for shade and management of local ambient temperatures	0,01
F3.10 - Ecological diversity in the area	0,03
G – SOCIAL ASPECTS	
G2 – Traffic and Mobility Services	
G2.1 – Performance of the public transport service	-0,05
G2.4 - Quality of pedestrian and bicycle network	0,08
G3 – Communication Services	
G3.1 - Availability of a broadband communication network	0,05
G4 – Public and private facilities and services	
G4.2 - Availability and proximity of key public human services	-0,03
G5 – Local Food	
G5.1 – Local production of food	0,03
G6 – Management and community involvement	
G6.1 - Involvement of residents in community affairs	0,00
G6.3 - Community involvement in urban planning activities	0
G7 – Society, Culture and Heritage	
G7.1 - Compatibility of urban design with local cultural values	0,10

b. Key Performance Indicators value

KPI	Indicator	Unit of measure	Value
A 1.7 Conservation of land	The total area of undeveloped land considered to be of value for ecological or agricultural purposes by relevant authorities, as a percent of the total local area	%	2
B.3.3 Use stage energy costs for public buildings	Aggregated running cost of energy	Euro/m^2/year	8
C.1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption / gross floor area of all buildings	kWh/m^2/year	64
C.1.4 Total final electric energy consumption for building operations	Aggregated annual total final electric energy consumption / Total gross floor area of all buildings	kWh/m^2/year	194
C.1.7 Total primary energy demand for building operations	total primary energy consumption in buildings / local minimum value	%	147
C.2.1 Share of renewable energy on-site, on total final thermal energy consumption for building operations	Share of renewable thermal energy in final thermal energy consumptions	%	3
C.2.7 Share of renewable energy on-site, on final electric energy consumptions	Share of renewable electric energy in final electric energy consumptions	%	0
D.1.2 Total GHG Emissions from primary energy used in building operations	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	22
E.1.6 Consumption of potable water for residential population	Water consumption per occupant	m^3 per occupant/yr	49
E.1.7 Consumption of potable water for public non-residential building systems	Water consumption per occupant	m^3/m^2/y	3,82
F.1.3 Recharge of groundwater through permeable paving or landscaping	Permeable area / total area	%	79
F.2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one year	Level of exposition of inhabitants to PM10 in the urban area.	Days/year	-
G.2.1 Public transport service	Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop	%	40
G.2.4 Quality of pedestrian and bycicle network	Total walkway meters of dedicated pedestrian paths and meters of bicycle path and “shared space”.	m/100 inhabitants	138,9
G.4.2 Availability and proximity of key services	Proximity to at least 3 key public services	%	0
G.6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	descriptive	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.

STRENGTHS	WEAKNESSES
- Mainly large residential plots without coherent landscaping - Historical neighborhood core is inhabited - Very active social life for all ages – folklore, dancing, music, sport - Kindergarden, elementary school and library available in the neighborhood	- Sustainability not sufficiently addressed in physical planning documents - No local budget allocated to sustainability measures - Citizens not actively involved in physical planning activities
OPPORTUNITIES	**THREATS**
- Still large part of the neighborhood is not developed - EU and national co-financing available for energy and climate related measures - Apartment and tourism rental is growing due to vicinity to historic sites in Split and Solin - High solar potential for electricity and heat production - Large available areas for local production of food, in the existing building plots or on still undeveloped plots, all plots in private properties	- County waste dump located 1 km from the neighborhood - Large distance to Solin (3,6 km) and Split (17 km) i.e to key services - Complex property rights and cadaster layout hinders upgrade of infrastructure upgrade and development

4. STRATEGIC DEFINITION

a. Performance targets

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

Environmental targets	*Develop new green areas, improve ambient features of the neighborhood*
Social targets	*Involve citizens in active participation in physical planning activities, enable better connection to Solin and Split by use of EV-sharing service*
Economy targets	*Energy retrofit of households and implementation of on-site RES systems to reduce energy costs*

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

A – BUILT URBAN SYSTEMS			
Ax – Category name	Unit of measure		
A1.2 – Urban compactness	m^3/ha	Actual value	3,1
Relation between the usable space of the buildings (volume) and the urban space (area).		Target value	3,0
A1.4 - Residential density	pers/ha	Actual value	22
The ratio of total residential population relative to the total land area for all developed residential blocks within the local area.		Target value	110
A1.7 – Conservation of land	%	Actual value	2
Undeveloped land considered to be of value for ecological or agricultural purposes.		Target value	2
A2.2 - Walking distance to public transport for area workers and students	m	Actual value	275
Proximity to bus stops		Target value	300
A2.9 - On-street and indoor parking spaces relative to local population	%	Actual value	42,8
The ratio of on-street and indoor car parking spaces relative to the total resident and working population of the local area		Target value	80
A2.10 - Intermodality facilities	km	Actual value	3,6
Proximity to intermodal platform		Target value	1,0
B – ECONOMY			
Bx – Category name			
B1.1 – Affordability of housing property	%	Actual value	12
The affordability of housing for middle- and low-income segments of the population is a matter of concern for governments and the general population alike. There are many cases of residential properties (houses or condominium apartments) escalating in price because of outside investment, to a point where local middle-income households cannot afford to get into the housing market.		Target value	22
B1.6 - Percent of residential units in the neighborhood that are vacant	%	Actual value	1,6
Percentage of vacant residential units		Target value	0
B2.2 - Average annual per-capita income of residents	%	Actual value	92
Average per-capita income of residents in the local area relative		Target value	90

to that of the urban region.			
B3.3 – Use stage energy costs for public buildings	Euro/m^2	Actual value	8,0
Running cost energy aggregated.		Target value	6,0
B3.4 - Levels of total public and private investment	00 Euro	Actual value	1,0
The average annual aggregate amount of public and private investment, on a per-resident basis, for new construction, renovation and infrastructure projects in the local area		Target value	2,0
C – ENERGY			
C1 – Non-renewable energy			
C1.1 - Total final thermal energy consumption for building operations	kWh/m^2/year	Actual value	64
Urban thermal energy consumption of all buildings (kWh/m2).		Target value	70
C1.4 - Total final electrical energy consumption for building operations	kWh/m^2/year	Actual value	194
Urban electrical energy consumption of all buildings (kWh/m2).		Target value	60
C1.7 - Total primary energy consumption for building operations	kWh/m^2/year	Actual value	104,41
Ratio of average total primary energy consumption of all buildings to the local minimum value		Target value	85
C2 – Renewable and Decarbonised energy			
C2.1 - Share of renewable energy on-site, relative to total final thermal energy consumption for building operations	%	Actual value	3
Ratio of on-site renewable energy consumption to the total final energy consumption of all buildings.		Target value	30
C2.4 - Share of renewable energy on-site, relative to total primary energy consumption for building operations	%	Actual value	2
Ratio of on-site renewable energy consumption to the total primary energy consumption of all buildings		Target value	10
C2.7 - Share of renewable energy on-site, on final electric energy conumption	%	Actual value	0
Share of renewable electric energy in final electric energy consumptions		Target value	35
D – ATMOSPHERIC EMISSIONS			
D1 – Atmospheric Emissions			
D1.2 – GHG emissions from primary energy used for all purposes in building operations		Actual value	22
GHG emissions from primary energy		Target value	20
D1.7 - Total GHG Emissions from buildings, private and public mobility		Actual value	109
Aggregate GHG emissions from buildings, public and private transport fuels		Target value	50
E – NON-RENEWABLE SOURCES			
E1 – Potable water, stormwater and greywater			
E1.6 – Consumption of potable water for residential population	m^3/occupant/year	Actual value	49
Water consumption (m3) per inhabitant and per day		Target value	100
E1.7 - Consumption of potable water for public non-residential building systems	m^3/m^2/yr	Actual value	3,82
Consumption of potable water used in public non-residential buildings		Target value	2,5
E2 – Solid and liquid wastes			
E2.1 - Solid waste and recycling collection points	%	Actual value	75
Proximity of the resident population to the solid waste and recycling collection point.		Target value	85
E2.3 - Solid waste from construction and demolition projects retained in the area for re-use or recycling	%	Actual value	30
Percent of solid waste from construction and demolition projects		Target value	65

retained annually in the area for re-use or recycling.			
E2.5 - Composting and re-use of organic sludge	%	Actual value	35
Percent of organic sludge that is composted and re-used within the local area		Target value	100
E3 – Resource consumption, retention and maintenance			
E3.2 - Consumption of non-renewable material resources for construction of infrastructure		Actual value	100
Aggregate consumption of non-renewable material resources for construction or renovation of infrastructure.		Target value	100
F – ENVIRONMENT			
F1 – Environmental impacts			
F1.1 – Impact of construction activities on natural features		Actual value	3
Preservation of land during and pre construction phase		Target value	4
F1.3 - Recharge of groundwater through permeable paving or landscaping	%	Actual value	79
Percentage of water flowing through the ground		Target value	80
F1.8 - Impact of private vehicles used by the local population on peak load capacity of the local road system		Actual value	4
Impact degree of private vehicles on the population		Target value	4
F2 – Outdoor environmental quality			
F.2.3 Ambient air quality with respect to particulates <10 mu (PM10) over a one year	No of days	Actual value	-
Number of days exceeding the daily limits in a year.		Target value	-
F3– Ecosystems and landscapes			
F3.6 - Tree coverage for shade and management of local ambient temperatures	%	Actual value	30
Reduction of ambient temperatures through evapotranspiration		Target value	50
F3.10 - Ecological diversity in the area	descriptive	Actual value	3
Diversity of surface and aquatic biota in the local area.		Target value	4
G – SOCIAL ASPECTS			
G2 – Traffic and Mobility Services			
G2.1 – Public transport service	%	Actual value	40
Percentage of inhabitants that are within 400 meters walking distance of at least one public transportation service stop		Target value	70
G2.4 - Quality of pedestrian and bicycle network	m/100 inhabitants	Actual value	138,9
Total walkway meters of dedicated pedestrian paths and meters of bicycle path and “shared space” per 100 inhabitants.		Target value	300
G3 – Communication Services			
G3.1 - Availability of a broadband communication network	%	Actual value	55
Local area with available broadband communication network		Target value	85
G4 – Public and private facilities and services			
G4.2 - Availability and proximity of key services	%	Actual value	0
Proximity to at least 3 key public services		Target value	70
G5 – Local Food			
G5.1 – Local production of food	m^2/100 residents	Actual value	200
Surface of garden areas per capita.		Target value	600
G6 – Management and community involvement			
G6.3 - Community involvement in urban planning activities	descriptive	Actual value	0
Level of involvement of users in urban planning		Target value	3
G7 – Society, Culture and Heritage			
G7.1 - Compatibility of urban design with local cultural values	descriptive	Actual value	2
Compatibility with local area traditional values of street layouts and the character of urban spaces		Target value	4

b. Constraints and restrictions

CONSTRAINTS / RESTRICTIONS	
Legal constraints	*Complex property rights and cadaster layout hiders development of quality urban plans and public infrastructure for existing and for new development areas. The process of land purchase to form roads and rearrange building plots of favorable profile and size is long lasting and expensive.* *Although the neighborhood has a traditional style center during the time its value has been degraded by individual construction activities and there is no heritage value to be preserved.*
Technical constraints	*It would be difficult to develop centralized energy systems since the neighborhood is mostly composed of single-family households. Best solution is to implement local PV and/or solar heating systems for individual use. There might be difficulties to allow all households to install own PV system due to grid capacity therefore it is recommended to use power chargers for storing.* *All residential houses are privately owned so decision to implement retrofit measures is an individual decision.*
Financial constraints	*High amount of both private (1,3 M Eur) and public financing (150,000 Eur for retrofit and at least 1,5 M Eur for resolving property rights) is needed to improve sustainability and living standard.* *Co-financing of up to 40% is available for energy retrofit for households (PV systems can be included when integrated with other energy saving measures) which reduces PBP to 15 years.* *Co-financing of up to 40% is available for electric vehicles and charging stations, may up to 27,000 eur.* *Public financing from local budget is needed to purchase land and for favorable road profile and building plots size and to implement the activity of clearing property rights and cadaster layout.*
Environmental condition constraints	*Climate conditions are pleasant in the neighborhood but there is a fire hazard risk due to low growing bushes on neglected agricultural surfaces surrounding the neighborhood. Cultivation and management of these surfaces is needed to reduce risk of fires in the future. Since the neighborhood is positioned on a slope planting trees is necessary to reduce the erosion of soil.* *Vicinity of the county waste dump is leading to occasional higher H_2S concentration and negative the visual ambient quality.*
Stakeholder based restrictions	*In the neighborhood some social activities are very developed (traditional culture, sport) but there is lack of involvement of inhabitants in participation in defining major physical planning or local budget decisions. There is a need to build capacities in both administration and citizens to be able working together and define projects suited for specific demands of the territory.* *More effort should be given by public administration to track energy consumption in EMIS (national energy management system for public buildings) to*
Other relevant constraints	*There is little economic activity in the neighborhood, the are some workshops, wholesale stores and touristic apartment rental, therefore further development of these and introducing other activities is necessary to reduce daily migration for work. Also, local needs-based agriculture and exchange of crops-based approach need to be promoted and developed. Much more promotion on benefits and improvements and available funding of sustainability issues needs to be available in local community and help-desks for support in preparing applications is needed.*

5. DECISION MAKING

a. Description of scenarios

SCENARIO NAME	DESCRIPTION
1. Energy refurbishment of family houses and PV on family houses 1,36	Installation of photovoltaic system up to 5 kW including a battery storage on family houses. Also, the building envelope (thermal insulation + windows) or the heating system (high SEER for heat pumps or pellets for boilers) will be improved. It total, 40 PV systems and 40 energy efficiency improvement will be implemented which represents 17% of the households in the neighborhood.
2. Permaculture and participative principles 1,75	Permaculture principles to be considered as implementation requirements in local physical plan: • Use of passive measures to reduce energy demand in residential buildings and reduce urban heat island effect in streets by planting trees to create shade • Promoting use of green roofs, green/shaded facades, green pergolas to increase total surface of green spaces and shade, • Promoting use of stone or recycled materials for pavement of pedestrian paths to improve overall ambient and traditional values of the area • Reducing risk of high floods by increasing green areas and planting trees and bushes • Promoting use of rainwater tanks and use of rainwater for irrigation of gardens, use of glasshouses for gardens, composting and re-use for nourishing gardens • Local production and exchange of ecological food up to 50%of total demand, improving household economy and creating local solidarity exchange group • Collecting biomass on abandoned sites around the neighborhood to contribute in reducing fire risk. Reuse of biomass for composting and/or for heating/cooking • Overall increase of green areas on residential plots and public area. • Cooperation with inhabitants to select the recommended implementation requirements for local physical plan
2. Electromobility, energy refurbishment of family houses, PV on family houses, permaculture design principles and participative involvement of residents 2,58	Fast charging station with 3 entries to be installed. Electric bicycles (10) and scooters (10) in sharing service to be available. Photovoltaic system up to 5 kW including a battery storage to be installed in 40 households. Also, the building envelope (thermal insulation + windows) or the heating system (high SEER for heat pumps or pellets for boilers) will be improved in 40 households. It total, by 40 PV systems and 40 refurbished family houses to be implemented which represents 17% of the households in the neighborhood. Permaculture principles to be considered as implementation requirements in local physical plan, as described above.

a. Scenarios raking

i. Performance Scores

Issues	Current state	Scenario 1	Scenario 2	Scenario 3
TOTAL SCORE	**1,03**	**1,36**	**1,75**	**2,58**
A – Built Urban Systems	1,51	1,51	2,09	1,51
B – Economy	3,21	4,31	4,36	4,36
C – Energy	0,17	1,03	0,26	1,88
D – Atmospheric	1,02	1,71	1,02	2,50
E – Non-renewable sources	2,06	2,06	3,22	3,87
F - Environment	0,98	0,98	0,98	0,98
G – Social aspects	0,55	0,55	2,21	3,23

ii. Key Performance Indicators

SCENARIO 1 **1,36**			
KPI	**Indicator**	**Unit of measure**	**Value**
A1.2 – Urban compactness	Relation between the usable space of the buildings (volume) and the urban space (area).	M3/ha	3,1
A1.4 Residential density	The ratio of total residential population relative to the total land area for all developed residential blocks within the local area.	Residents/ha	22
A 1.7 Conservation of Land	The total area of undeveloped land considered to be of value for ecological or agricultural purposes by relevant authorities, as a percent of the total local area	%	2
A2.2 - Walking distance to public transport for area workers and students	Proximity to bus stops	M	275
A2.9 - On-street and indoor parking spaces relative to local population	The ratio of on-street and indoor car parking spaces relative to the total resident and working population of the local area	%	42,8
A2.10 - Intermodality facilities	Proximity to intermodal platform	km	4
B1.1 – Affordability of housing property	Housing properties in the local area that are financially accessible for purchase by the lowest 50% of the area population.	%	12
B1.6 - Percent of residential units in the neighbourhood that are vacant	Percentage of vacant residential units	%	3
B2.2 - Average annual per-capita income of residents	Average per-capita income of residents in the local area relative to that of the urban region	%	92
B.3.3 Running costs energy for public buildings	Running cost of energy aggregated	Euro/m^2/year	8

C.1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption / gross floor area of all buildings	kWh/m^2/year	53
C.1.4 Total final electric energy consumption for building operations	Aggregated annual total final electric energy consumption / Total gross floor area of all buildings	kWh/m^2/year	60,1
C.1.7 Total primary energy demand for building operations	Buildings total primary energy consumption / local minimum value	%	147
C.2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Share of renewable thermal energy in final thermal energy consumptions	%	4
C.2.4 Share of renewable energy on-site, relative to total primary energy consumptions for buildings operation	Share of renewable energy in primary energy consumptions	%	1
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy.	Share of renewable electric energy in final electric energy consumptions.	%	1
D.1.2 Total GHG Emissions from primary energy used in building operations	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	21,5
D1.7 Total GHG Emissions from buildings, private and public mobility	Aggregate GHG emissions from buildings, pubblic and private transport fuels	Tonees GHG/1000 residents	88
E.1.6 Consumption of potable water for residential population	Water consumption per occupant	m^3 per occupant*yr	100
E.1.7 Consumption of potable water for non-residential building systems	Water consumption per m^2	m^3/m^2/yr	3,82
E2.1 Solid waste and recycling collection points	Proximity of the resident population to the solid waste and recycling collection point	%	75
E.2.3 Solid waste from construction and demolition projects retained in the area for re-use or recycling	Volume of materials that may be re-used or recycled from the local area on the total solid waste from construction and demolition projects	%	
E2.5 Composting and re-use of organic sludge.	Percent of of organic sludge that is composted and re-used within the local area.	%	30
E.3.2 Consumption of non-renewable material resources for construction of infrastructure	Quantity of materials from non-renewable material resources for construction or renovation of infrastructures in the local area over a 5-year period	Tonnes/ 1000 m2	100
F1.1 Impact of construction activities on natural features.	Preservation of land during and pre-construction phase	Qualitative mark	3,5
F.1.3 Recharge of groundwater through permeable paving or landscaping	Permeable area / total area	%	79
F1.8 Impact of private vehicles used by the local population on peak load capacity of the local road system.	Impact degree of private vehicles on the population.	Qualitative mark	4,5
F2.3 - Ambient air quality with respect to H2S over a one-year period	Number of days exceeding the daily limits in a year.	n	20,8
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.	%	40
G.2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated pedestrian paths and meters of bicycle path and “shared space” per 100	M/100 inhabitants	138,9

	inhabitants.		
G3.1 Availability of a broadband communication network	Local area with available broadband communication network	%	55
G.4.2 Availability and proximity of key services	Percent of residential buildings located within 500 m. of emergency and basic municipal services.	%	0
G5.1 Local production of food.	Surface of garden areas per capita.	M2/100 residents	200
G.6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Qualitative mark	0
G7.1 Compatibility of urban design with local cultural values.	Compatibility with local area traditional values of street layouts and the character of urban spaces.	Qualitative mark	3

SCENARIO 2 1,75			
KPI	**Indicator**	**Unit of measure**	**Value**
A1.2 – Urban compactness	Relation between the usable space of the buildings (volume) and the urban space (area).	M3/ha	3,1
A1.4 Residential density	The ratio of total residential population relative to the total land area for all developed residential blocks within the local area.	Residents/ha	22
A 1.7 Conservation of Land	The total area of undeveloped land considered to be of value for ecological or agricultural purposes by relevant authorities, as a percent of the total local area	%	30
A2.2 - Walking distance to public transport for area workers and students	Proximity to bus stops	M	275
A2.9 - On-street and indoor parking spaces relative to local population	The ratio of on-street and indoor car parking spaces relative to the total resident and working population of the local area	%	42,8
A2.10 - Intermodality facilities	Proximity to intermodal platform	km	4
B1.1 – Affordability of housing property	Housing properties in the local area that are financially accessible for purchase by the lowest 50% of the area population.	%	12
B1.6 - Percent of residential units in the neighbourhood that are vacant	Percentage of vacant residential units	%	1,6
B2.2 - Average annual per-capita income of residents	Average per-capita income of residents in the local area relative to that of the urban region	%	92
B.3.3 Running costs energy for public buildings	Running cost of energy aggregated	Euro/m^2/year	8
B3.4 Levels of total public and private investment.	The average annual aggregate amount of public and private investment, on a per-resident	00 eur/resident/year	2

	basis, for new construction, renovation and infrastructure projects in the local area.		
C.1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption / gross floor area of all buildings	kWh/m^2/year	60
C.1.4 Total final electric energy consumption for building operations	Aggregated annual total final electric energy consumption / Total gross floor area of all buildings	kWh/m^2/year	120
C.1.7 Total primary energy demand for building operations	Buildings total primary energy consumption / local minimum value	%	147%
C.2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Share of renewable thermal energy in final thermal energy consumptions	%	3
C.2.4 Share of renewable energy on-site, relative to total primary energy consumptions for buildings operation	Share of renewable energy in primary energy consumptions	%	2
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy.	Share of renewable electric energy in final electric energy consumptions.	%	0
D.1.2 Total GHG Emissions from primary energy used in building operations	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	22
D1.7 Total GHG Emissions from buildings, private and public mobility	Aggregate GHG emissions from buildings, pubblic and private transport fuels	Tonees GHG/1000 residents	109
E.1.6 Consumption of potable water for residential population	Water consumption per occupant	m^3 per occupant*yr	100
E.1.7 Consumption of potable water for non-residential building systems	Water consumption per m2	m3 /m2/yr	3,82
E2.1 Solid waste and recycling collection points	Proximity of the resident population to the solid waste and recycling collection point	%	75
E.2.3 Solid waste from construction and demolition projects retained in the area for re-use or recycling	Volume of materials that may be re-used or recycled from the local area on the total solid waste from construction and demolition projects	%	30
E2.5 Composting and re-use of organic sludge.	Percent of of organic sludge that is composted and re-used within the local area.	%	100
E.3.2 Consumption of non-renewable material resources for construction of infrastructure	Quantity of materials from non-renewable material resources for construction or renovation of infrastructures in the local area over a 5-year period	Tonnes/ 1000 m2	80
F1.1 Impact of construction activities on natural features.	Preservation of land during and pre-construction phase	Qualitative mark	3,5
F.1.3 Recharge of groundwater through permeable paving or landscaping	Permeable area / total area	%	90
F1.8 Impact of private vehicles used by the local population on peak load capacity of the local road system.	Impact degree of private vehicles on the population.	Qualitative mark	4,5
F2.3 - Ambient air quality with respect to H2S over a one-year period	Number of days exceeding the daily limits in a year.	n	20,8
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.	%	40
G.2.4 Quality of pedestrian and bicycle	Total walkway meters of	M/100 inhabitants	138,9

network	dedicated pedestrian paths and meters of bicycle path and "shared space" per 100 inhabitants.		
G3.1 Availability of a broadband communication network	Local area with available broadband communication network	%	55
G.4.2 Availability and proximity of key services	Percent of residential buildings located within 500 m. of emergency and basic municipal services.	%	0
G5.1 Local production of food.	Surface of garden areas per capita.	M2/100 residents	600
G.6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Qualitative mark	3
G7.1 Compatibility of urban design with local cultural values.	Compatibility with local area traditional values of street layouts and the character of urban spaces.	Qualitative mark	4

SCENARIO 3 2,58			
KPI	**Indicator**	**Unit of measure**	**Value**
A1.2 – Urban compactness	Relation between the usable space of the buildings (volume) and the urban space (area).	M3/ha	3,1
A1.4 Residential density	The ratio of total residential population relative to the total land area for all developed residential blocks within the local area.	Residents/ha	22
A 1.7 Conservation of Land	The total area of undeveloped land considered to be of value for ecological or agricultural purposes by relevant authorities, as a percent of the total local area	%	2
A2.2 - Walking distance to public transport for area workers and students	Proximity to bus stops	M	275
A2.9 - On-street and indoor parking spaces relative to local population	The ratio of on-street and indoor car parking spaces relative to the total resident and working population of the local area	%	42,8
A2.10 - Intermodality facilities	Proximity to intermodal platform	km	1
B1.1 – Affordability of housing property	Housing properties in the local area that are financially accessible for purchase by the lowest 50% of the area population.	%	12
B1.6 - Percent of residential units in the neighbourhood that are vacant	Percentage of vacant residential units	%	1,6
B2.2 - Average annual per-capita income of residents	Average per-capita income of residents in the local area relative to that of the urban region	%	92
B.3.3 Running costs energy for public buildings	Running cost of energy aggregated	Euro/m^2/year	8
B3.4 Levels of total public and private investment.	The average annual aggregate amount of public and private investment, on a per-resident basis, for new construction,	00 eur/resident/year	3

	renovation and infrastructure projects in the local area.		
C.1.1 Total final thermal energy consumption for building operations	Aggregated annual total final thermal energy consumption / gross floor area of all buildings	kWh/m^2/year	53
C.1.4 Total final electric energy consumption for building operations	Aggregated annual total final electric energy consumption / Total gross floor area of all buildings	kWh/m^2/year	60
C.1.7 Total primary energy demand for building operations	Buildings total primary energy consumption / local minimum value	%	139
C.2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	Share of renewable thermal energy in final thermal energy consumptions	%	11
C.2.4 Share of renewable energy on-site, relative to total primary energy consumptions for buildings operation	Share of renewable energy in primary energy consumptions	%	7
C2.7 Share of electric energy generation from on-site renewable sources on final electric energy.	Share of renewable electric energy in final electric energy consumptions.	%	20
D.1.2 Total GHG Emissions from primary energy used in building operations	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m2/yr	22
D1.7 Total GHG Emissions from buildings, private and public mobility	Aggregate GHG emissions from buildings, pubblic and private transport fuels	Tonees GHG/1000 residents	50
E.1.6 Consumption of potable water for residential population	Water consumption per occupant	m^3 per occupant*yr	100
E.1.7 Consumption of potable water for non-residential building systems	Water consumption per m2	m3 /m2/yr	3,82
E2.1 Solid waste and recycling collection points	Proximity of the resident population to the solid waste and recycling collection point	%	100
E.2.3 Solid waste from construction and demolition projects retained in the area for re-use or recycling	Volume of materials that may be re-used or recycled from the local area on the total solid waste from construction and demolition projects	%	30
E2.5 Composting and re-use of organic sludge.	Percent of of organic sludge that is composted and re-used within the local area.	%	100
E.3.2 Consumption of non-renewable material resources for construction of infrastructure	Quantity of materials from non-renewable material resources for construction or renovation of infrastructures in the local area over a 5-year period	Tonnes/ 1000 m2	90
F1.1 Impact of construction activities on natural features.	Preservation of land during and pre-construction phase	Qualitative mark	3,5
F.1.3 Recharge of groundwater through permeable paving or landscaping	Permeable area / total area	%	79
F1.8 Impact of private vehicles used by the local population on peak load capacity of the local road system.	Impact degree of private vehicles on the population.	Qualitative mark	4,5
F2.3 - Ambient air quality with respect to H2S over a one-year period	Number of days exceeding the daily limits in a year.	n	20,8
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.	%	70
G.2.4 Quality of pedestrian and bicycle network	Total walkway meters of dedicated pedestrian paths and	M/100 inhabitants	138,9

	meters of bicycle path and "shared space" per 100 inhabitants.		
G3.1 Availability of a broadband communication network	Local area with available broadband communication network	%	55
G.4.2 Availability and proximity of key services	Percent of residential buildings located within 500 m. of emergency and basic municipal services.	%	0
G5.1 Local production of food.	Surface of garden areas per capita.	M2/100 residents	600
G.6.3 Community involvement in urban planning activities	Level of involvement of users in urban planning	Qualitative mark	3
G7.1 Compatibility of urban design with local cultural values.	Compatibility with local area traditional values of street layouts and the character of urban spaces.	Qualitative mark	4

iii. Financing mechanisms evaluation

Scenario 1	Private financing in the amount from 7,000 to 8,000 eur for PV systems with/without battery storage. **Total amount 600,000 eur**. This measure is part of 2019 national initiative to reduce legal constraints for micro RES, without co-financing. Public co financing (up to 40%) in the amount from 7,000 to 8,000 eur for energy retrofit of family houses. This measure is a part of national program and financial resources will be available in 2019. **Total public co-financing 240,000 eur, total private financing 960,000 eur.** Public co-financing: https://mgipu.gov.hr/o-ministarstvu-15/djelokrug/energetska-ucinkovitost-u-zgradarstvu/energetska-obnova-zgrada-8321/energetska-obnova-obiteljskih-kuca-8324/8324 Private financing - targeted credit lines: Mini ECO loans available for citizens at fixed rates of 5,9%, ECO loans for citizens at fixed rates of 5,9% to 6,5%, (EBRD funded, offered by local bank). http://www.zivotuplusu.info/prvi-eko-krediti-za-ulaganje-u-energetsku-ucinkovitost-gradana/ https://ebrdgeff.com/projects/erste-bank-finances-first-residential-energy-efficiency-project-croatia/
Scenario 2	Private financing in the amount from 500 to 7,000 eur per household for permaculture design principles on residential houses and within residential plots. Total 20 households to participate, total 70,000 eur of private finanicnig. Public financing from local budget in the amount from 7,000 to 50,000 eur for informative and training workshops on permaculture design principles with residents, donating seed and plants to residents, retrofitting or adding new green areas, upgrading implementation requirements of local physical plan. **Total public – local budget financing up to 50,000 eur, total private financing up to 70,000 eur.** Possible use of crowdfunding or other alternative principles to collect necessary financing resources for community actions.
Scenario 3	Public co-financing from EU funding (40%) for electrical vehicle (EV) charging station in the amount of 9,000 eur, for electrical bicycles/scooters 2000 eur per vehicle - total 20 vehicles, **total EV facility 60,000 eur**. Public-private partnership model or public financing from local budget for management and maintenance of the EV service is in the amount of 60,000

	eur/year. Total public co-financing 27,600 eur, total public financing from local budget or public private partnership for EV service in the amount of 101,400 eur. The NEEAP T5 measure - *Development of infrastructure for alternative fuels*, enables 40% co-financing or up to 27,000 eur per user for charging station up to 50 kW DC or 22 kW AC and/or form 600 up to 10,000 eur for electrical vehicle purchase, available in 2018 and 2019 https://autostart.24sata.hr/novosti/planirate-kupiti-auto-na-struju-jos-vise-poticaja-bit-ce-u-2019-6404 Private financing in the amount from 7,000 to 8,000 eur for PV systems with battery storage. Total amount 600,000 eur. This measure is part of 2019 national initiative to reduce legal constraints for micro RES, without co-financing. Public co-financing (up to 40%) in the amount from 7,000 to 8,000 eur for energy refurbishment of family houses. This measure is a part of national program and financial resources will be available in 2019. Total public co-financing 240,000 eur, total private financing 960,000 eur. Public co-financing: https://mgipu.gov.hr/o-ministarstvu-15/djelokrug/energetska-ucinkovitost-u-zgradarstvu/energetska-obnova-zgrada-8321/energetska-obnova-obiteljskih-kuca-8324/8324 Private financing - targeted credit lines: Mini ECO loans available for citizens at fixed rates of 5,9%, ECO loans for citizens at fixed rates of 5,9% to 6,5%, (EBRD funded, offered by local bank). http://www.zivotuplusu.info/prvi-eko-krediti-za-ulaganje-u-energetsku-ucinkovitost-gradana/ https://ebrdgeff.com/projects/erste-bank-finances-first-residential-energy-efficiency-project-croatia/ Households' own financing in the amount from 500 to 7,000 eur for permaculture design principles on residential houses and within residential plots. Public financing from local budget in the amount from 7,000 to 15,000 eur for informative and training workshops on permaculture design principles with residents, donating seed and plants to residents, retrofitting or adding new green areas. Possible use of crowdfunding or other alternative principles to collect necessary financing resources for community actions. **Total public co-financing 267,600 eur, total public financing from local budget 151,400 eur, total private financing 1,03 M eur.**

6. RETROFIT CONCEPT

SELECTED SCENARIO	DESCRIPTION
A. (i.e. Renewable Energy Synergy grid with central storage)	**Electromobility** • Fast charging station with 3 entries to be installed. • Electric bicycles (10) and scooters (10) in sharing service to be available. **On-site RES** • Photovoltaic system up to 5 kW including/without battery storage to be installed in 40 households. **Energy retrofit of buildings** • Building envelope retrofit (thermal insulation + windows) or the heating system (high SEER for heat pumps or pellets for boilers) will be improved in 40 households. **Participation** • Cooperation with inhabitants to select the recommended implementation permaculture requirements for local physical plan **Permaculture design** • Use of passive measures to reduce energy demand in residential buildings and reduce urban heat island effect in streets by planting trees to create shade • Promoting use of green roofs, green/shaded facades, green pergolas to increase total surface of green spaces and shade, • Promoting use of stone or recycled materials for pavement of pedestrian paths to improve overall ambient and traditional values of the area • Reducing risk of high floods by increasing green areas and planting trees and bushes • Promoting use of rainwater tanks and use of rainwater for irrigation of gardens, use of glasshouses for gardens, composting and re-use for nourishing gardens • Local production and exchange of ecological food up to 50%of total demand, improving household economy and creating local solidarity exchange group • Collecting biomass on abandoned sites around the neighborhood to contribute in reducing fire risk. Reuse of biomass for composting and/or for heating/cooking • Overall increase of green areas on residential plots and public area.

KEY ELEMENTS OF THE CONCEPT

Retrofits Strategies	1. Electromobility
	2. On-site RES
	3. Energy retrofit of buildings
	4. Participation
	5. Permaculture design
Performance improvement	Environment Improved ambient features of the neighborhood by increase of green areas on public and private surfaces, re-use of rainwater, better soil permeability, reduced risks of fire hazard by collecting biomass on abandoned sites around the neighborhood, improved outdoor and indoor

	comfort by shade of trees/pergolas/greenroofs. 40 PV systems and 40 refurbished family houses reduces energy demand by 17% and increases RES electricity produced on-site by 19,75% Electric vehicle sharing service improves connectivity to Solin and Split.
	Society Increased participation of residents in in defining major physical planning and local budget decisions. Improved capacities in both administration and citizens to work together and define projects suited for specific demands of the territory like initiation of process of land purchase to form roads and rearrange building plots of favorable size in the still undeveloped part of neighborhood.
	Economy High investing of private and public money in the territory by participating in national programs. Increased economy activity in tourism due to improvement of ambient features of the neighborhood. Production of food on local needs-based and exchange of crops-based approach in private gardens and by applying permaculture design. Higher income achieved in local territory and reduced daily migration for work.
Financial mechanism	1. Electromobility – national co-financing
	2. On-site RES – private financing
	3. Energy retrofit of buildings – national co-financing
	4. Participation – public local budget
	5. Permaculture design – private, public local budget and crowdfunding

KPIs EVALUATION

1. URBAN SCALE KPIs

KPI	Indicator			Unit of measure
A.1.7 Conservation of Land	The total area of undeveloped land considered to be of value for ecological or agricultural purposes by relevant authorities, as a percent of the total local area			%
Level of data availability	0	1	**2**	3
	Not available	Scarce	**Sufficient**	Easy
Data quality	0	**1**	2	3
	Poor	**Sufficient**	Good	Very Good
Professional skill	0	1	2	**3**
	Formal training and significant experience	Formal training and applied experience	Formal training	**Limited experience**
Time for evaluation	0	1	2	**3**
	More than one week	Less than one week	Less than one day	**Less than 4 hours**
Estimated cost	**0**	1	2	3
	Low	Acceptable	High	Very Expensive
Reliability of results	0	1	**2**	3
	Poor	Sufficient	**Good**	Very Good
AFFORDABILITY AND OPERATIVITY SCORE				**21 100%**
DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI	Indicator			Unit of measure
B.3.3 Running costs energy for public buildings	Running cost of energy aggregated			Euro/m2/year
Level of data availability	0	1	2	**3**
	Not available	Scarce	Sufficient	**Easy**
Data quality	0	1	2	**3**
	Poor	Sufficient	Good	**Very Good**
Professional skill	0	1	**2**	3

		Formal training and significant experience	Formal training and applied experience	**Formal training**	Limited experience
	Time for evaluation	0	1	2	**3**
		More than one week	Less than one week	Less than one day	**Less than 4 hours**
	Estimated cost	**0**	1	2	3
		Low	Acceptable	High	Very Expensive
	Reliability of results	0	1	2	**3**
		Poor	Sufficient	Good	**Very Good**
	AFFORDABILITY AND OPERATIVITY SCORE				**14 67%**
	DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI	**Indicator**			**Unit of measure**
C.1.1 Total final thermal energy consumption for building operations	**Aggregated annual total final thermal energy consumption / gross floor area of all buildings**			**kWh/m2/year**
Level of data availability	0	1	**2**	3
	Not available	Scarce	**Sufficient**	Easy
Data quality	**0**	1	2	3
	Poor	Sufficient	Good	Very Good
Professional skill	**0**	1	2	3
	Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
Time for evaluation	0	**1**	2	3
	More than one week	**Less than one week**	Less than one day	Less than 4 hours
Estimated cost	0	**1**	2	3
	Low	**Acceptable**	High	Very Expensive
Reliability of results	0	1	**2**	3
	Poor	Sufficient	**Good**	Very Good
AFFORDABILITY AND OPERATIVITY SCORE				**5 24%**

	DO YOU WANT TO KEEP THIS INDICATOR?	**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)	

KPI	**Indicator**			**Unit of measure**
C.1.4 Total final electric energy consumption for building operations	**Aggregated annual total final electric energy consumption / Total gross floor area of all buildings**			**kWh/m2/year**
Level of data availability	0	1	2	**3**
	Not available	Scarce	Sufficient	**Easy**
Data quality	0	1	2	**3**
	Poor	Sufficient	Good	**Very Good**
Professional skill	0	1	2	**3**
	Formal training and significant experience	Formal training and applied experience	Formal training	**Limited experience**
Time for evaluation	0	1	2	**3**
	More than one week	Less than one week	Less than one day	**Less than 4 hours**
Estimated cost	**0**	1	2	3
	Low	Acceptable	High	Very Expensive
Reliability of results	0	1	2	**3**
	Poor	Sufficient	Good	**Very Good**
AFFORDABILITY AND OPERATIVITY SCORE				**21** **100%**
DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI	**Indicator**			**Unit of measure**
C.1.7 Total primary energy demand for building operations	**Buildings total primary energy consumption / local minimum value**			**%**
Level of data availability	**0**	1	2	3
	Not available	Scarce	Sufficient	Easy

	Data quality	**0**	1	2	3
		Poor	Sufficient	Good	Very Good
	Professional skill	**0**	1	2	3
		Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
	Time for evaluation	0	**1**	2	3
		More than one week	**Less than one week**	Less than one day	Less than 4 hours
	Estimated cost	0	**1**	2	3
		Low	**Acceptable**	High	Very Expensive
	Reliability of results	0	1	**2**	3
		Poor	Sufficient	**Good**	Very Good
	AFFORDABILITY AND OPERATIVITY SCORE				**2 10%**
	DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI	**Indicator**			**Unit of measure**
C.2.1 Share of thermal energy generation from on-site renewable sources on final thermal energy	**Share of renewable thermal energy in final thermal energy consumptions**			**%**
Level of data availability	**0**	1	2	3
	Not available	Scarce	Sufficient	Easy
Data quality	0	1	2	3
	Poor	Sufficient	Good	Very Good
Professional skill	**0**	1	2	3
	Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
Time for evaluation	0	**1**	2	3
	More than one week	**Less than one week**	Less than one day	Less than 4 hours
Estimated cost	0	1	**2**	3
	Low	Acceptable	**High**	Very Expensive
Reliability of results	0	1	**2**	3
	Poor	Sufficient	**Good**	Very Good

	AFFORDABILITY AND OPERATIVITY SCORE	**2** **10%**
	DO YOU WANT TO KEEP THIS INDICATOR?	**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)	

KPI	**Indicator**			**Unit of measure**
C.2.4 Share of renewable energy on-site, on total primary energy consumptions for buildings operation	**Share of renewable energy in primary energy consumptions**			**%**
Level of data availability	**0**	1	2	3
	Not available	Scarce	Sufficient	Easy
Data quality	**0**	1	2	3
	Poor	Sufficient	Good	Very Good
Professional skill	**0**	1	2	3
	Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
Time for evaluation	0	**1**	2	3
	More than one week	**Less than one week**	Less than one day	Less than 4 hours
Estimated cost	0	1	**2**	3
	Low	Acceptable	**High**	Very Expensive
Reliability of results	0	1	**2**	3
	Poor	Sufficient	**Good**	Very Good
AFFORDABILITY AND OPERATIVITY SCORE				2 10%
DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI	**Indicator**	**Unit of**

					measure
	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**			**%**
	Level of data availability	0	1	**2**	3
		Not available	Scarce	**Sufficient**	Easy
	Data quality	**0**	1	2	3
		Poor	Sufficient	Good	Very Good
	Professional skill	**0**	1	2	3
		Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
	Time for evaluation	0	**1**	2	3
		More than one week	**Less than one week**	Less than one day	Less than 4 hours
	Estimated cost	0	1	**2**	3
		Low	Acceptable	**High**	Very Expensive
	Reliability of results	0	1	2	3
		Poor	Sufficient	Good	Very Good
	AFFORDABILITY AND OPERATIVITY SCORE				4 19%
	DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

	KPI	**Indicator**			**Unit of measure**
	D.1.2 Total GHG Emissions from energy used in building operations	**CO2 equivalent emissions per useful internal floor area per year**			**kg CO2 eq./m2/yr**
	Level of data availability	**0**	1	2	3
		Not available	Scarce	Sufficient	Easy
	Data quality	**0**	1	2	3
		Poor	Sufficient	Good	Very Good
	Professional skill	**0**	1	2	3
		Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
	Time for evaluation	0	1	**2**	3
		More than one week	Less than one week	**Less than one day**	Less than 4 hours

	Estimated cost	0	1	**2**	3
		Low	Acceptable	**High**	Very Expensive
	Reliability of results	0	1	**2**	3
		Poor	Sufficient	**Good**	Very Good
	AFFORDABILITY AND OPERATIVITY SCORE				4 19%
	DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI	**Indicator**			**Unit of measure**
E.1.6 Consumption of potable water for residential population	**Water consumption per occupant**			**m3 per occupant*yr**
Level of data availability	0	1	2	**3**
	Not available	Scarce	Sufficient	**Easy**
Data quality	0	1	2	**3**
	Poor	Sufficient	Good	**Very Good**
Professional skill	0	1	2	**3**
	Formal training and significant experience	Formal training and applied experience	Formal training	**Limited experience**
Time for evaluation	0	1	2	**3**
	More than one week	Less than one week	Less than one day	**Less than 4 hours**
Estimated cost	**0**	1	2	3
	Low	Acceptable	High	Very Expensive
Reliability of results	0	1	2	**3**
	Poor	Sufficient	Good	**Very Good**
AFFORDABILITY AND OPERATIVITY SCORE				21 100%
DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI	Indicator			Unit of measure
E.1.7 Consumption of potable water for non-residential building systems	**Water consumption per occupant**			**m3 per occupant*yr**
Level of data availability	0	1	2	**3**
	Not available	Scarce	Sufficient	**Easy**
Data quality	0	**1**	2	3
	Poor	**Sufficient**	Good	Very Good
Professional skill	0	1	**2**	3
	Formal training and significant experience	Formal training and applied experience	**Formal training**	Limited experience
Time for evaluation	0	1	2	**3**
	More than one week	Less than one week	Less than one day	**Less than 4 hours**
Estimated cost	**0**	1	2	3
	Low	Acceptable	High	Very Expensive
Reliability of results	0	1	2	**3**
	Poor	Sufficient	Good	**Very Good**
AFFORDABILITY AND OPERATIVITY SCORE				**14 67%**
DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI	Indicator			Unit of measure
E.2.3 Solid waste from construction and demolition projects retained in the area for re-use or recycling	**Percent of solid waste from construction and demolition projects retained annually in the area for re-use or recycling.**			**%**
Level of data availability	0	1	2	3
	Not available	Scarce	Sufficient	Easy
Data quality	0	1	2	3
	Poor	Sufficient	Good	Very Good
Professional skill	0	1	2	3
	Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
Time for evaluation	0	1	2	3
	More than one week	Less than one week	Less than one day	Less than 4 hours
Estimated cost	0	1	2	3

		Low	Acceptable	High	Very Expensive
	Reliability of results	0	1	2	3
		Poor	Sufficient	Good	Very Good
	AFFORDABILITY AND OPERATIVITY SCORE				1 5%
	DO YOU WANT TO KEEP THIS INDICATOR?				N
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...) **Unreliable information is only available - no designated data source, not implemented on national level**				

	KPI	**Indicator**			**Unit of measure**
	E.3.2 Consumption of non-renewable material resources for construction of infrastructure	**Aggregate consumption of non-renewable material resources for construction or renovation of infrastructure**			**Tonnes/ 1000 m2**
	Level of data availability	**0**	1	2	3
		Not available	Scarce	Sufficient	Easy
	Data quality	**0**	1	2	3
		Poor	Sufficient	Good	Very Good
	Professional skill	**0**	1	2	3
		Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
	Time for evaluation	**0**	1	2	3
		More than one week	Less than one week	Less than one day	Less than 4 hours
	Estimated cost	0	1	**2**	3
		Low	Acceptable	**High**	Very Expensive
	Reliability of results	**0**	1	2	3
		Poor	Sufficient	Good	Very Good
	AFFORDABILITY AND OPERATIVITY SCORE				1 5%
	DO YOU WANT TO KEEP THIS INDICATOR?				N

	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...) **Unreliable information is only available - no designated data source, not implemented on national level**

KPI	Indicator			Unit of measure
F.1.3 Recharge of groundwater through permeable paving or landscaping	**Permeable area**			**%**
Level of data availability	0 Not available	1 Scarce	**2** **Sufficient**	3 Easy
Data quality	0 Poor	**1** **Sufficient**	2 Good	3 Very Good
Professional skill	0 Formal training and significant experience	**1** **Formal training and applied experience**	2 Formal training	3 Limited experience
Time for evaluation	0 More than one week	1 Less than one week	2 Less than one day	**3** **Less than 4 hours**
Estimated cost	**0** **Low**	1 Acceptable	2 High	3 Very Expensive
Reliability of results	0 Poor	1 Sufficient	**2** **Good**	3 Very Good
AFFORDABILITY AND OPERATIVITY SCORE				12 57%
DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI	Indicator			Unit of measure
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**			**n**
Level of data availability	0 Not available	1 Scarce	2 Sufficient	3 Easy

	Data quality	0	1	2	3
		Poor	Sufficient	Good	Very Good
	Professional skill	0	1	2	3
		Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
	Time for evaluation	0	1	2	3
		More than one week	Less than one week	Less than one day	Less than 4 hours
	Estimated cost	0	1	2	3
		Low	Acceptable	High	Very Expensive
	Reliability of results	0	1	2	3
		Poor	Sufficient	Good	Very Good
	AFFORDABILITY AND OPERATIVITY SCORE				**12 57%**
	DO YOU WANT TO KEEP THIS INDICATOR?				**N**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...) **Measurements are obligatory only for high pollutant sources (factories, wastelands, high traffic roads,etc). measurements available can only be used as information not indicator for neighbourhood.**				

	KPI	**Indicator**			**Unit of measure**
	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**			**%**
	Level of data availability	0	1	2	**3**
		Not available	Scarce	Sufficient	**Easy**
	Data quality	0	1	2	**3**
		Poor	Sufficient	Good	**Very Good**
	Professional skill	0	1	2	**3**
		Formal training and significant experience	Formal training and applied experience	Formal training	**Limited experience**
	Time for evaluation	0	1	2	**3**
		More than one week	Less than one week	Less than one day	**Less than 4 hours**
	Estimated cost	**0**	1	2	3
		Low	Acceptable	High	Very Expensive
	Reliability of results	0	1	2	**3**
		Poor	Sufficient	Good	**Very Good**

	AFFORDABILITY AND OPERATIVITY SCORE	**21 100%**
	DO YOU WANT TO KEEP THIS INDICATOR?	**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)	

KPI		**Indicator**			**Unit of measure**
	G.2.4 Quality of pedestrian and bicycle network	**Total walkway meters of dedicated pedestrian paths and meters of bicycle path per 100 inhabitants**			**m/100 inhabitants**
	Level of data availability	0	1	**2**	3
		Not available	Scarce	**Sufficient**	Easy
	Data quality	0	1	**2**	3
		Poor	Sufficient	**Good**	Very Good
	Professional skill	0	1	2	**3**
		Formal training and significant experience	Formal training and applied experience	Formal training	**Limited experience**
	Time for evaluation	0	1	2	**3**
		More than one week	Less than one week	Less than one day	**Less than 4 hours**
	Estimated cost	**0**	1	2	3
		Low	Acceptable	High	Very Expensive
	Reliability of results	0	1	2	**3**
		Poor	Sufficient	Good	**Very Good**
	AFFORDABILITY AND OPERATIVITY SCORE				15 71%
	DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI		**Indicator**	**Unit of measure**
	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			
	Level of data availability	0	1	2	3
		Not available	Scarce	Sufficient	Easy
	Data quality	0	**1**	2	3
		Poor	**Sufficient**	Good	Very Good
	Professional skill	0	1	2	**3**
		Formal training and significant experience	Formal training and applied experience	Formal training	**Limited experience**
	Time for evaluation	0	1	2	**3**
		More than one week	Less than one week	Less than one day	**Less than 4 hours**
	Estimated cost	**0**	1	2	3
		Low	Acceptable	High	Very Expensive
	Reliability of results	0	1	2	**3**
		Poor	Sufficient	Good	**Very Good**
	AFFORDABILITY AND OPERATIVITY SCORE				**13 62%**
	DO YOU WANT TO KEEP THIS INDICATOR?				**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)				

KPI		**Indicator**			**Unit of measure**
	G.6.3 Community involvement in urban planning activities	**Level of involvement of users in urban planning**			**Level**
	Level of data availability	**0**	1	2	3
		Not available	Scarce	Sufficient	Easy
	Data quality	0	1	2	3
		Poor	Sufficient	Good	Very Good
	Professional skill	0	1	2	3
		Formal training and significant experience	Formal training and applied experience	Formal training	Limited experience
	Time for evaluation	0	1	2	3
		More than one week	Less than one week	Less than one day	Less than 4 hours
	Estimated cost	0	1	2	3
		Low	Acceptable	High	Very Expensive
	Reliability of results	0	1	2	3
		Poor	Sufficient	Good	Very Good

	AFFORDABILITY AND OPERATIVITY SCORE	**7** **33%**
	DO YOU WANT TO KEEP THIS INDICATOR?	**Y**
	PROPOSED MODIFICATIONS or REASON TO ELIMINATE THE KPI (calculation method, indicator, unit of measure, etc...)	

TESTING PROTOCOL

ASSESSMENT REPORT

Version 1.1

Date: 20-12-2018

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

INDEX

BUILDING SCALE ASSESSMENT – BUILDING 1

1. INITIATION

General information on the selected building	
Building (Name) QUEEN JELENA ELEMENTARY SCHOOL IN MRAVINCE	
Address	*Gajeva 2, 21209 Mravince, Croatia*
Building use	  
Owner	*Republic of Croatia*
Year of construction	*Mid 1950*
Building method	*Vertical walls are made from stone and brick (masonry). Roof is made from wooden structure and covered with roofing tiles.*
Number of levels above earth	*2*
Number of levels underground	*0*
Heating system	*Decentralized heating system:* *– two pellet stoves of total nominal heat output 2x9,05 =* ***18,1 kW*** *– three electrical heaters of total electrical power 2x2,4+1,9 =* ***6,7 kW***
Cooling system	*No cooling systems installed*
DHW system	*1 electrically heated domestic hot water storage heater (nominal capacity 5 liters, electrical power 2 kW)*

Ventilation system	*Natural ventilation only*
Lighting system	*Lighting system is manually turned with no sensors. It consists mainly of fluorescent lightening.*
Average U value	*0,95*
Number of occupants	*Pupils: **70*** *Employees: **4***
Hours of occupation per year	***2.244 hours/year** (187 days/year, 12 hours/day)*

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.

A – SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
A1	**Site regeneration and development**
A1.7	Use of vegetation to provide ambient outdoor cooling
A1.10	*Provision and quality of children's play area(s)*
A3	*Project Infrastructure and Services*
A3.13	*Provision of on-site parking facilities for private vehicles*

B – ENERGY AND RESOURCES CONSUMPTION	
B1	**Total life cycle non-renewable energy**
B1.1	*Primary energy demand*
B1.2	*Delivered thermal energy demand*
B1.3	*Delivered electric energy demand*
B1.4	*Energy from renewable sources in total primary energy consumption*
B1.5	*Energy from renewable in total thermal energy consumption*
B1.6	*Energy from renewable sources in total electric energy consumption*
B1.11	*Embodied non-renewable primary energy*
B2	***Electrical peak demand***
B2.1	*Electrical peak demand for building operations.*
B3	***Use of material***
B3.5	*Recycled materials – only in construction phase*
B4	***Use of potable water, stormwater and greywater***
B4.5	Potable water consumption for indoor uses.

C- ENVIRONMENTAL LOADINGS	
C1	**Greenhouse gas emissions**
C1.3	*Global Warming Potential*
C3	***Solid and liquid waste***
C3.1	*Construction and demolition waste – not active for this phase*
C3.2	*Solid waste from building operations*

D- INDOOR ENVIRONMENTAL QUALITY	
D1	**Indoor air quality and ventilation**
D1.4	*TVOC concentration in indoor air – unable to measure*
D1.5	*CO_2 concentration in indoor air*
D1.10	*Ventilation rate – only for mechanical ventilation*
D2	***Air Temperature and Relative humidity***
D2.1	*Time outside of the thermal comfort range*
D2.2	*Thermal comfort index*

E- SERVICE QUALITY	
E3	**Controllability**
E.3.4	*Degree of personal control of technical systems by occupants.*
E4	***Flexibility and Adaptability***
E.4.5.	*Adaptability to future changes in type of energy supply*

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
F1	**Social Aspects**
F1.2	Access to direct sunlight from living areas of dwelling units.
F2	**Culture and Heritage**
F2.4	Use of traditional local materials and techniques

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

b. SBTool criteria selection rationale

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

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	
CRITERION	**REASON/MOTIVATION**
A1. - Site regeneration and development	
A1.7. - Use of vegetation to provide ambient outdoor cooling	To increase use of green zones (parks) for children playgrounds and green roofs.
A1.10. - *Provision and quality of children's play area(s)*	Have all places on one location to motivate children to play
A3. - *Project Infrastructure and Services*	
A3.13. - *Provision of on-site parking facilities for private vehicles*	Availability of parking spaces to avoid morning and afterwork crowds when parents come to their children

B – ENERGY AND RESOURCES CONSUMPTION	
CRITERION	**REASON/MOTIVATION**
B.1.1 Primary energy demand	Use of ecological fuel
B.1.2 Delivered thermal energy demand	To improve well-being of occupants and reduce consumption and emission
B.1.3 Delivered electric energy demand	To reduce consumption and emission

B.1.4 Energy from renewable sources in total primary energy consumption	To encourage use of renewable energy sources
B.1.5 Energy from renewable in total thermal energy consumption	To encourage use of renewable energy sources
B.1.6 Energy from renewable sources in total electric energy consumption	To encourage use of renewable energy sources
B1.11 *Embodied non-renewable primary energy*	To lower consumption of energy in planning / construction phase with different material use.
B2.1. *Electrical peak demand for building operations.*	To ensure availability and safety of power grid on location, and ensure batter planning of power grid
B3.5 *Recycled materials – only in construction phase*	To ensure lower resources consumption during construction and decommissioning phase, and to increase use of recyclable resources
B.4.5 Potable water consumption for indoor uses.	

C- ENVIRONMENTAL LOADINGS	
CRITERION	**REASON/MOTIVATION**
C1.3 Global Warming Potential	*Lower GWP to reduce local and global pollution*
C3.1 Construction and demolition waste – not active for this phase	
C3.2 *Solid waste from building operations*	*Increase awareness of necessity of waste separation*

D- INDOOR ENVIRONMENTAL QUALITY	
CRITERION	**REASON/MOTIVATION**
D1.4 TVOC concentration in indoor air – unable to measure	*To ensue healthy space before space is used for primary purpose*
D1.5 *CO_2 concentration in indoor air*	*To ensure normal level of carbon dioxide during use phase*
D1.10 *Ventilation rate – only for mechanical ventilation*	*To ensure enough fresh air from mechanical ventilation during occupancy*
D2.1 Time outside of the thermal comfort range	*Increase high level of comfort in building during both winter and summer period*
D2.2 *Thermal comfort index*	*Measure comfort inside space*

E- SERVICE QUALITY	
CRITERION	**REASON/MOTIVATION**
E3.4 *Degree of personal control of technical systems by occupants*	*To motivate installation of controllable systems that can be adjusted by occupant need*
E4.5 *Adaptability to future changes in type of energy supply*	Motivate planers to plan building that can easily run on multiple energy sources

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
CRITERION	**REASON/MOTIVATION**
F1.2 Access to direct sunlight from living areas of dwelling units	*Lowering consumption for lighting, increase daily lighting in building. Motivate planers to optimize orientation of building and shades.*
F2.4 Use of traditional local materials and techniques	Motivate to use local materials and manufacturers in renovation/construction phase

F- SOCIAL, CULTURAL AND PERCEPTUAL ASPECTS	
CRITERION	**REASON/MOTIVATION**
F1.2 Access to direct sunlight from living areas of dwelling units	*Lowering consumption for lighting, increase daily lighting in building. Motivate planers to optimize orientation of building and shades.*
F2.4 Use of traditional local materials and techniques	Motivate to use local materials and manufacturers in renovation/construction phase

G- COST AND ECONOMIC ASPECTS	
CRITERION	**REASON/MOTIVATION**
G.1.4 Use stage energy cost	Lowering energy cost during operation phase is best way to motivate owner
G.1.5 Use stage water cost	Lowering water cost during operation phase is best way to motivate owner

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 5)	MOTIVATION
Cost and economics	3	Although this should be main driver in most scenarios, this weight is set because of more important issue on global scale
Functionality and serviceability	2	Since main motivation of building is it functionality weight to this issue should be lower
Well-being and productivity of occupants	4	Ensure healthy space for all occupant and prevent health issue
Social and cultural issues	2	Preserve cultural heritage and improve social component
Land resources	3	Improve land use, better planning
Non-renewable material resources	3	Reduce local production of cement
Non-renewable water resources	3	Increase reusing water
Health, safety and security of individuals	3	-
Renewable energy resources	4	Increase use of renewable energy sources mainly
Non-renewable energy resources	2	Decrease use of non-renewable resources
Ecosystem(s)	3	Preserve local ecosystem
Local and regional atmosphere	2	Preserve local atmosphere and reduce air pollution from local pollutants
Global climate	5	Improving global climate should be main goal

CATEGORIES	WEIGHT (%)
A1- Site regeneration and Development	6,17
A2- Urban design	-
A3- Project Infrastructure and Services	1,45
TOTAL	7,62
B1- In use energy consumptions	40,34
B2- Embodied energy	-
B3- Use of materials	4,36
B4 – Use of water, stormwater and greywater	6,53
TOTAL	51,23
C1- Greenhouse gas emissions	15,13
C2- Other atmospheric emissions	-
C3- Solid and liquid waste	4,36
C4- Impact on project site	-
C5- Other local and regional impacts	-
TOTAL	19,48
D1- Indoor air quality and ventilation	3,63
D2- Thermal comfort	4,36
D3– Visual comfort	-
D4– Acoustic comfort	-
TOTAL	7,99

E1- Safety and Security	-
E2- Functionality and efficiency	-
E3- Controllability	2,42
E4– Flexibility and adaptability	-
E5- Optimization and maintenance of operating performance	0,73
TOTAL	3,15
F1- Social aspects	2,18
F2- Culture and heritage	2,90
F3- Perceptual	-
TOTAL	5,08
G1- Cost and economics	5,45
TOTAL	5,45

CRITERIA WEIGHTS

SBTool file A – WeightA-G

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE							
A1- Site regeneration and Development							
CRITERION	**Weight (%)**	**A**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
A1.7	*3,46*	*2*	3	*2*	*4*	*3*	
A1.10	*3,90*	*3*	3	*2*	*3*	*3*	
A3 - Project Infrastructure and Services							
A.3.13	*1,73*	*3*	2	*2*	*2*	*3*	
TOTAL	6,17						

B- ENERGY AND RESOURCES CONSUMPTION							
B1- In use energy consumptions							
CRITERION	**Weight (%)**	**A**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
B1.1	*4,03*	2	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.2	*4,03*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.3	*4,03*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.4	*8,07*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.5	*8,07*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.6	*8,07*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B1.11	*4,03*	*2*	*5*	*5*	*2*	*2*	Too much impacts on final decision
B3 - Use of materials							
B3.5	*4,36*	*4*	*3*	*2*	*3*	*3*	
B4 - Use of water, stormwater and greywater							
B4.5	*6,53*	*4*	*3*	*3*	*3*	*3*	
TOTAL	51,23						

C- ENVIRONMENTAL LOADINGS							
C1- Greenhouse gas emissions							
CRITERION	**Weight (%)**	**A**	**B**	**C**	**D**	**L.F.**	**L.F. REASON/MOTIVATION**
C1.3	*15,13*	5	5	*3*	*5*	*2*	Too much impacts on final decision
C3 - Solid and liquid waste							
C.3.2.	*4,36*	*4*	*3*	*2*	*3*	*3*	
TOTAL	19,48						

D- INDOOR ENVIRONMENTAL QUALITY

D1- Indoor air quality and ventilation

CRITERION	Weight (%)	A	B	C	D	L.F.	L.F. REASON/MOTIVATION
D1.4	*0,73*	*1*	1	*3*	*4*	*3*	
D1.5	*2,18*	*1*	*3*	*3*	*4*	*3*	
D1.10.	*0,73*	*1*	*3*	*3*	*2*	*3*	
D1- Indoor air quality and ventilation							
D2.1	*2,18*	*1*	*3*	*3*	*4*	*3*	
D2.2	*2,18*	*1*	*3*	*3*	*4*	*3*	
TOTAL							

E- SERVICE QUALITY

E3- Controllability

CRITERION	Weight (%)	A	B	C	D	L.F.	L.F. REASON/MOTIVATION
E3.4	*2,42*	1	*2*	*3*	*4*	*5*	Motivation to increase controllability of systems and comfort of occupant.
E4- Flexibility and adaptability							
E4.5	*0,73*	*1*	*2*	*3*	*2*	*3*	
TOTAL	3,15						

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS

F1- Social aspects

CRITERION	Weight (%)	A	B	C	D	L.F.	L.F. REASON/MOTIVATION
F1.2	*2,18*	*1*	3	*3*	*4*	*3*	
F2 - Culture and Heritage							
F2.4	*2,90*	*3*	*2*	*2*	*3*	*4*	*Support local and circular economy*
TOTAL	**5,08**						

G- COST AND ECONOMIC ASPECTS

G1 - Cost and Economic Aspects

CRITERION	Weight (%)	A	B	C	D	L.F.	L.F. REASON/MOTIVATION
G1.4	*3,27*	2	*3*	*3*	*3*	*3*	
G1.5	*2,18*	*2*	*3*	*2*	*3*	*3*	
TOTAL	5,45						

d. SBTool benchmarks rationale

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

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
A1 - Site Regeneration and Development				
A1.7.	*Use of vegetation to provide ambient outdoor cooling.*	%	*0: 40%*	*Value taken from urban plan of Mravince county decreased by access roads and parking spaces*
			5: 95%	*Max value if all surfaces are under vegetation*
A1.10	Provision and quality of children's play area(s).	-	*0: description*	*Personal assessment*
			5: description	*Personal assessment*
A3 - Project Infrastructure and Services				
A3.13	*Provision of on-site parking facilities for private vehicles.*	Spaces/classrooms	*0: 1*	*Value taken from urban plan of Mravince county*
			5: 0,50	*Double then minimal requirements*

B- ENERGY AND RESOURCES CONSUMPTION				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
B1 - Total Life Cycle Non-Renewable Energy				
B1.1	*Primary energy demand*	kWh/m²a	*0: 90*	*Standard value for this region*
			5: 55	Value to achieve NZEB standard in Croatia
B1.2	Delivered thermal energy demand	kWh/m²a	*0: 50*	*Standard value for this region*
			5: 10	Value to achieve NZEB standard in Croatia
B1.3	*Delivered electrical energy demand*	kWh/m²a	*0: 30*	*Standard value for this region*
			5: 0	*Entire production of electrical energy comes from RES (photovoltaics)*
B1.4	Energy from renewable sources in total primary energy consumption.	%	*0: 20*	Minimal value to for new buildings
			5: 90	Nearly zero energy house, passive house
B1.5	*Energy from renewable sources in total thermal energy consumption.*	%	*0: 20*	Minimal value to for new buildings – not in standards
			5: 90	Nearly zero energy house, passive house
B1.6	Energy from renewable sources in total electrical energy consumption.	%	*0: 5*	Minimal value to for new buildings – not in standards
			5: 90	Nearly zero energy house, passive house
B1.11	*Embodied non-renewable primary energy*	GJ/m²	*0: 14*	Standard value for existing building typology
			5: 3	Value for new passive buildings
B3 - Use of Materials				
B3.5	Recycled materials	%	*0: 5*	*Same as in tool. Unable to find relevant percentage for Croatia*
			5: 40	*Same as in tool. Unable to find relevant percentage for Croatia*
B4 - Use of potable water, stormwater and greywater				
B4.5	*Potable water consumption for indoor uses.*	m³/occupant/a	*0: 5,5*	*Average consumption of water in schools*
			5: 2	

C- ENVIRONMENTAL LOADINGS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
C1 - Greenhouse Gas Emissions				
C1.3	*Global Warming Potential*	kg CO_2 eq/m²/a	*0: 40*	*Average CO_2 emission for this region.*
			5: 5	*Average for passive houses*
C3 - Solid and Liquid Wastes				
C3.2	Solid waste from building operations.	%	*0: 28*	*Don't know what is final KPI, the one from "Testing protocol" or the one from last excel file. As result took the one from "Testing protocol" since it was already calculated.*
			5: 100	

D- INDOOR ENVIRONMENTAL QUALITY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
D1 - Indoor Air Quality and Ventilation				
D1.4	*TVOC concentration in indoor air.*	µg / m³	*0: 300*	*Guidelines*
			5: 0	*Best practice without TVOC*
D1.5	CO_2 concentrations in indoor air.	ppm	*0: 700*	*Allowed concentration of CO_2 in space*
			5: 350	*Outdoor concentration of CO_2*
D1.10	*Ventilation rate.*	l/s/m²	*0: 2,77*	*Required by algorithm for mechanical ventilation*
			5: 6,00	*High level of air quality*
D2 - Air Temperature and Relative Humidity				
D2.1	Time outside of the thermal comfort range	%	*0: 30*	*Keep the same value as in tool*
			5: 10	*Keep the same value as in tool*
D2.2	*Thermal comfort index*	%	*0: 25*	*Keep the same value as in tool*
			5: 5	*Keep the same value as in tool*

E- SERVICE QUALITY				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
E3 - Controllability				
E3.4	*Degree of personal control of technical systems by occupants.*		*0: description*	*Assessment based on location status*
			5: description	*Assessment based on location status*
E4 - Flexibility and Adaptability				
E4.5	Adaptability to future changes in type of energy supply		*0: description*	*Assessment based on location status*
			5: description	*Assessment based on location status*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
F1 - Social Aspects				
F1.2	*Access to direct sunlight from living areas of dwelling units.*	%	*0: 60*	*Guidelines for school designed*
			5: 90	*Optimal design of classroom*
F2 - Culture and Heritage				
F2.4	Use of traditional local materials and techniques	%	*0: 10*	*Keep the same value as in tool*
			5: 25	*Keep the same value as in tool*

G- COST AND ECONOMIC ASPECTS				
CRITERION	INDICATOR	UNIT OF MEASURE	BENCHMARK	DERIVATIONS
G1 - Cost and Economics				
G1.4	*Use stage energy cost.*	€ / m²	*0: 7,50*	*Average cost on location*
			5: 1,50	*Average cost for NZEB buildings*
G1.5	Use stage water cost.	€ / m²	*0: 0,50*	*Average cost of elementary schools*
			5: 0,20	*Lowest cost of elementary schools*

e. SBTool Criteria Specifications

In this section PPs must indicate for each selected criterion:

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

A- SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
A1.7.	*Use of vegetation to provide ambient outdoor cooling.*	*Information source*	*Satellite images of country (http://preglednik.arkod.hr/ARKOD-Web/)*
		Assessment method	*Measure on image green area of land plot and divide it with total area of land plot*
		Standard	solin.hr/detaljni_plan/UPU%20NASELJE%20MRAVINCE%202-NOVI.zip
A1.10.	Provision and quality of children's play area(s).	*Information source*	*Satellite images of country (http://preglednik.arkod.hr/ARKOD-Web/)*
		Assessment method	*Asses by description*
		Standard	*Assessments with description*
A3.13	*Provision of on-site parking facilities for private vehicles.*	*Information source*	*Urban plan of settlement*
		Assessment method	*Total number of classrooms divided by total amount of parking spaces*
		Standard	*solin.hr/detaljni_plan/UPU%20NASELJE%20MRAVINCE%202-NOVI.zip*

B- ENERGY AND RESOURCES CONSUMPTION			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
B1.1	*Primary energy demand*	*Information source*	*Measured data of energy consumption on site or calculations*
		Assessment method	*Energy consumption for energy sources multiplied by primary energy factor*
		Standard	*Algorithm for calculation of energy demand or measured data*
B1.2	Delivered thermal energy demand	*Information source*	*Measured data of energy consumption on site or calculations*
		Assessment method	*Calculation of thermal energy demand or data measured on site*
		Standard	*Algorithm for calculation of energy demand or measured data*
B1.3	*Delivered electrical energy demand*	*Information source*	*Measured data on site, or in design phase by calculation*
		Assessment method	*Measured data on site, or by algorithm for lightning*
		Standard	*Measured data on site, or by algorithm for lightning*
B1.4	Energy from renewable sources in total primary energy consumption.	*Information source*	*Measured data of energy consumption on site or calculations*
		Assessment method	*Energy consumption of each energy sources multiplied by renewable primary energy factor for each energy sources divided by energy consumption of each energy sources multiplied by total primary energy factor for each energy*
		Standard	*https://www.rehva.eu/ , https://mgipu.gov.hr/UserDocsImages//dokumenti/EnergetskaUcinkovitost/meteoroloski_podaci//Metodologija-2017.pdf*
B1.5	*Energy from renewable sources in total thermal energy consumption.*	*Information source*	*Measured data of energy consumption on site or calculations*
		Assessment method	*Energy consumption of each energy sources for heating multiplied by renewable primary energy factor for each energy sources divided by energy*

		Standard	*consumption for heating of each energy sources multiplied by total primary energy factor for each energy source for heating* https://www.rehva.eu/, , https://mgipu.gov.hr/UserDocsImages//dokumenti/EnergetskaUcinkovitost/meteoroloski_podaci//Metodologija-2017.pdf
B1.6	Energy from renewable sources in total electrical energy consumption.	*Information source*	*Measured data on location, or calculation*
		Assessment method	*Electrical energy produced on location divided by total electrcal energy demand*
		Standard	*Energy performance of building*
B1.11	*Embodied non-renewable primary energy*	*Information source*	*BoQ, BoM*
		Assessment method	*Amount of material embedded in building multiplied by embodied factor for each material divided by floor area of building*
		Standard	*EN 15978 "Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method"*
B3.5	Recycled materials	*Information source*	*BoQ, BoM*
		Assessment method	*Total weight of reused materials divided by total weight materials*
		Standard	*EN ISO 14021*
B4.5	*Potable water consumption for indoor uses.*	*Information source*	*Measured data on location*
		Assessment method	*Total annually water used divided by occupants*
		Standard	-

C- ENVIRONMENTAL LOADINGS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
C1.3	*Global Warming Potential*	*Information source*	*Measured data on location, or calculation*
		Assessment method	*Consumption of each energy source on location multiplied by CO_2 factor for each energy source*
		Standard	*https://mgipu.gov.hr/UserDocsImages/dokumenti/EnergetskaUcinkovitost/meteoroloski_podaci/FAKTORI_primarne_energije.pdf*
C3.2	Solid waste from building operations.	*Information source*	*Tour around buidling*
		Assessment method	*Number of different can trash can / 7*
		Standard	*-*

D- INDOOR ENVIRONMENTAL QUALITY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
D1.4	*TVOC concentration in indoor air.*	*Information source*	*Measurement on location after completion of building*
		Assessment method	*Measure with instrument on location after building completion*
		Standard	*EN 15251, https://www.epa.gov/indoor-air-quality-iaq/technical-overview-volatile-organic-compounds#measurement*
D1.5	CO_2 concentrations in indoor air.	*Information source*	*Measurement on location or calculated*
		Assessment method	*Measure with instrument on location periodically or calculate in design phase*
		Standard	*Measuring, ASHRE https://www.researchgate.net/publication/289566619_Examining_CO2_levels_in_school_classrooms*
D1.10	*Ventilation rate.*	*Information source*	*Measured with blower door test, algorithm, design*

		Assessment method	*Assessment from Algorithm or from design of HVAC system. Air exchange (m^3/h) of HVAC system divided by total heated volume of building*
		Standard	*https://mgipu.gov.hr/UserDocsImages/dokumenti/EnergetskaUcinkovitost/meteoroloski_podaci/Algoritam_HVAC_2017.pdf*
D2.1	Time outside of the thermal comfort range	*Information source*	*Calculation based on simplified hourly method.*
		Assessment method	*If demand for heating or cooling on each hour is higher than nominal power of heating or cooling system, then that hour is temperature outside thermal comfort range*
		Standard	*Simplified hourly method EN 13790*
D2.2	*Thermal comfort index*	*Information source*	*Models and simulations*
		Assessment method	*Measure temperature inside each space and calculate PPD, in winter and summer period*
		Standard	*ISO 7730 – Fanger"s method - https://www.researchgate.net/publication/255971260_SPREADSHEETS_FOR_THE_CALCULATION_OF_THERMAL_COMFORT_INDICES_PMV_AND_PPD*

E- SERVICE QUALITY			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
E3.4	*Degree of personal control of technical systems by occupants.*	*Information source*	*From main design or walkthrough audit*
		Assessment method	*Asses from description*
		Standard	*Assessment*
E4.5	Adaptability to future changes in type of energy supply	*Information source*	*From main design or walkthrough audit*
		Assessment method	*Asses from description*
		Standard	*Assessment*

F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
F1.2	*Access to direct sunlight from living areas of dwelling units.*	*Information source*	*Calculation*
		Assessment method	*Simple calculation of direct sunlight in each classroom. Also, should be applicable on schools.*
		Standard	*Review assessment of design team or do own calculation*
F2.4	Use of traditional local materials and techniques	*Information source*	*BoQ, BoM*
		Assessment method	*Architect estimation of percent building elements (non-structural) that has been constructed using traditional local materials. (we think structural should be also include in design phase)*
		Standard	*Estimation*

G- COST AND ECONOMIC ASPECTS			
CRITERION	**INDICATOR**	**SPECIFICATIONS**	
G1.4	*Use stage energy cost.*	*Information source*	*Measured data (operational phase) calculated data (design phase)*
		Assessment method	*Collect bills for energy in operational phase and divide it with total floor area. Calculate amount of energy that should be spent, multiply it with unit price and divide it with total floor area.*
		Standard	*Levels*
G1.5	Use stage water cost.	*Information source*	*Measured data (operational phase) calculated data (design phase)*
		Assessment method	*Collect bills for water in operational phase and divide it with total floor area. Calculate amount of water that should be spent, multiply it with unit price and divide it with total floor area, or compare it with similar buildings.*
		Standard	*Estimation or measurement*

3. DIAGNOSIS

a. Performance scores

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

	SCORE
A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE	0,24
A1 - Site Regeneration and Development	0,17
A1.7. - Use of vegetation to provide ambient outdoor cooling.	0,07
A1.10. Provision and quality of children's play area(s).	0,10
A3 - Project Infrastructure and Services	0,07
A3.13. - Provision of on-site parking facilities for private vehicles.	0,07
B – ENERGY AND RESOURCES CONSUMPTION	0,99
B1 - Total Life Cycle Non-Renewable Energy	0,81
B1.1. - Primary energy demand	0,20
B1.2. - Delivered thermal energy demand	0,04
B1.3. - Delivered electrical energy demand	0,01
B1.4. - Energy from renewable sources in total primary energy consumption.	0,16
B1.5. - Energy from renewable sources in total thermal energy consumption.	0,41
B1.6. - Energy from renewable sources in total electrical energy consumption.	-0,08
B1.11. - Embodied non-renewable primary energy	0,09
B3 - Use of Materials	-0,04
B3.5. - Recycled materials	-0,04
B4 - Use of potable water, stormwater and greywater	0,22
B4.5. - Potable water consumption for indoor uses.	0,22
C- ENVIRONMENTAL LOADINGS	0,74
C1 - Greenhouse Gas Emissions	0,70
C1.3 - Global Warming Potential	0,70
C3 - Solid and Liquid Wastes	0,05
C3.2 - Solid waste from building operations.	0,05
D- INDOOR ENVIRONMENTAL QUALITY	0,06
D1 - Indoor Air Quality and Ventilation	-0,02
D1.4 - TVOC concentration in indoor air.	--
D1.5 - CO_2 concentrations in indoor air.	-0,02
D1.10 - Ventilation rate	--
D2 - Air Temperature and Relative Humidity	-0,04
D2.1 - Time outside of the thermal comfort range	-0,02
D2.2 - Thermal comfort index	-0,02
E- SERVICE QUALITY	0,08
E3 - Controllability	0,07
E3.4 - Degree of personal control of technical systems by occupants.	0,07
E4 - Flexibility and Adaptability	0,01
E4.5 - Adaptability to future changes in type of energy supply	0,01
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS	0,00
F1 - Social Aspects	-0,02
F1.2 - Access to direct sunlight from living areas of dwelling/classroom units.	-0,02
F2 - Culture and Heritage	0,02
F2.4 - Use of traditional local materials and techniques	0,02
G- COST AND ECONOMIC ASPECTS	0,01
G1 - Cost and Economics	0,01
G1.4 - Use stage energy cost.	0,03
G1.5 - Use stage water cost.	-0,02

b. Key Performance Indicators value

KPI	Indicator	Unit of measure	Value
A1.7. - Use of vegetation to provide ambient outdoor cooling.	Ratio of total vegetated surface area (on ground and on roofs, and including trees), divided by total site area.	-	0,65
A1.10. Provision and quality of children's play area(s).	Type of facilities for children's play and the quality of service provided.	description	3
A3.13. - Provision of on-site parking facilities for private vehicles.	The ratio of parking spaces for private vehicles per dwelling unit, plus the ratio of parking spaces for private vehicles per classroom	%	1,25
B.1.1 Primary energy demand (in use stage)	Annual primary energy demand per useful internal floor area	kWh/m^2/yr	50,93
B.1.2 Delivered thermal energy demand (in use stage)	Annual delivered thermal energy demand per useful internal floor area	kWh/m^2/yr	42,19
B.1.3 Delivered electric energy demand (in use stage)	Annual delivered electric demand per useful internal floor area	kWh/m^2/yr	28,34
B.1.4 Energy from renewable sources in total primary energy consumption	Primary energy demand of the building that is met by renewable sources on total primary energy demand	%	47,98
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	100
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumptions	%	0
B.1.11. Embodied non-renewable primary energy	Embodied primary non-renewable energy per area	MJ/m^2	9.274
B.3.5 Recycled materials	Weight of recycled materials on total weight of materials.	%	3,27
B4.5. - Potable water consumption for indoor uses.	Water consumption per occupant per year	m^3 of water per occupant per year	6,02
C.1.3 Greenhouse Gas Emissions (in use stage)	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m^2/yr	8,16
C.3.2 Solid waste from building operation	Ratio between the number of collectable solid waste types in a 50 meters distance from the building's entrance and the	%	43%

	reference solid waste categories.		
D.1.4 TVOC concentration in indoor air	VOC concentration in indoor air	µg per cube meter	n/a
D.1.5 CO_2 concentration in indoor air	CO_2 concentration in indoor air	Ppm	1000
D1.10 - Ventilation rate	Percent of ventilation air reaching work surfaces, as indicated by an analysis of proposed HVAC system and room characteristics.	%	n/a
D.2.1 Time outside of the thermal comfort range	Percentage of the time out of range of defined maximum and minimum temperatures during the heating and cooling seasons	%	42%
D.2.2 Thermal comfort index	Predicted Mean Vote	%	48%
E3.4 - Degree of personal control of technical systems by occupants.	The degree of control over key indoor environment systems that can be exercised by occupants, according to design documentation.	Description	0 (unable to go minus)
E4.5 - Adaptability to future changes in type of energy supply	The ease or difficulty in installing heating or cooling equipment that require a different fuel, or to install photovoltaic systems.	Description	1
F1.2 - Access to direct sunlight from living areas of dwelling/classroom units.	The percentage of school's units whose principal daytime classrooms have direct sunlight. for at least 2 hours per day at 12 noon on Winter Soltice, according to design documentation.	%	50%
F2.4 - Use of traditional local materials and techniques	Architect's estimate of the percent of the non-structural elements of the building that has been constructed using traditional local materials and construction techniques.	%	12%
G.1.4 Use stage energy cost	Energy annual cost per usable floor a	€/m²/yr	6,38
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m²/yr	3,26

c. Actual performance analysis

WEAKNESSES ASPECTS	*Relatively old building, without centralized system for heating, cooling or domestic hot water, and therefor unable to quality control of inner temperature. Envelope is almost without any insulations. Also, high consumption of water indicated that there is possibility of reducing consumption or losses. Also, orientation of building is not an optimal for school. Low cost indicates more that indoor temperature is not on optimal level then hat energy is spent in optimal way.*
STRENGHT ASPECTS	*Since it is school building it is very good positioned near playgrounds, park football fields, etc. Current heating system in schools runs on pellets (RES), what is visible on indicators of primary energy and energy consumption. Low energy consumption of energy in building.*
POTENTIAL FOR PERFORMANCE IMPROVEMENT	*Entire building envelope should be retrofitted as well as centralized heating/cooling system should be installed. On the roof there should be installed PV modules to reduce energy consumption from grid. Also, water consumption should reduce to normal levels for this kind of occupancy. With all of these measures there would be also more comfortable attendance of classes.*

4. STRATEGIC DEFINITION

a. Performance targets

Each partner must establish a target value for each criterion in the SBTool.

The target values have to reflect the global Environmental, Social and Economic targets established at urban level.

A - SITE REGENERATION AND DEVELOPMENT, URBAN DESIGN AND INFRASTRUCTURE			
A1 - Site Regeneration and Development			
A1.7. - Use of vegetation to provide ambient outdoor cooling.		Actual value	0,65
Ratio of total vegetated surface area	%	Target value	50%
A1.10. Provision and quality of children's play area(s).		Actual value	3
Type of facilities for children's play and the quality of service provided.	description	Target value	3
A3 - Project Infrastructure and Services			
A3.13. - Provision of on-site parking facilities for private vehicles.		Actual value	125
The ratio of parking spaces for private vehicles per dwelling unit, plus the ratio of parking spaces for private vehicles per classroom	%	Target value	100
B – ENERGY AND RESOURCES CONSUMPTION			
B1 - Total Life Cycle Non-Renewable Energy			
B1.1. - Primary energy demand		Actual value	50,93
Annual primary energy demand per useful internal floor area	kWh/m^2/yr	Target value	55,00
B1.2. - Delivered thermal energy demand		Actual value	42,19
Annual delivered thermal energy demand per useful internal floor area	kWh/m^2/yr	Target value	30,00
B1.3. - Delivered electrical energy demand		Actual value	28,34
Annual delivered electric demand per useful internal floor area	kWh/m^2/yr	Target value	15,00
B1.4. - Energy from renewable sources in total primary energy consumption.		Actual value	47,98
Primary energy demand of the building that is met by renewable sources on total primary energy demand	%	Target value	50
B1.5. - Energy from renewable sources in total thermal energy consumption.		Actual value	100
Share of renewable energy in final thermal energy consumptions	%	Target value	60
B1.6. - Energy from renewable sources in total electrical energy consumption.		Actual value	0
Share of renewable energy in final electric energy consumptions	%	Target value	60
B1.11. - Embodied non-renewable primary energy		Actual value	9,27
Embodied primary non-renewable energy per area	GJ/m^2	Target value	6,00
B3 - Use of Materials			
B3.5. - Recycled materials		Actual value	3,27
Weight of recycled materials on total weight of materials.	%	Target value	13

B4 - Use of potable water, stormwater and greywater			
B4.5. - Potable water consumption for indoor uses.		Actual value	6,02
Water consumption per occupant per year	m^3 of water per occupant per year	Target value	3,00
C- ENVIRONMENTAL LOADINGS			
C1 - Greenhouse Gas Emissions			
C1.3 - Global Warming Potential		Actual value	8,16
CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m^2/yr	Target value	15,00
C3 - Solid and Liquid Wastes			
C3.2 - Solid waste from building operations.		Actual value	43
Ratio between the number of collectable solid waste types in a 50 meters distance from the building's entrance and the reference solid waste categories.	%	Target value	70
D- INDOOR ENVIRONMENTAL QUALITY			
D1 - Indoor Air Quality and Ventilation			
D1.4 - TVOC concentration in indoor air.		Actual value	-
VOC concentration in indoor air	µg per cube meter	Target value	
D1.5 - CO_2 concentrations in indoor air.		Actual value	1000
CO_2 concentration in indoor air	Ppm	Target value	550
D1.10 - Ventilation rate		Actual value	-
Percent of ventilation air reaching work surfaces, as indicated by an analysis of proposed HVAC system and room characteristics.	l/s/m^2	Target value	6
D2 - Air Temperature and Relative Humidity			
D2.1 - Time outside of the thermal comfort range		Actual value	42
Percentage of the time out of range of defined maximum and minimum temperatures during the heating and cooling seasons	%	Target value	48
D2.2 - Thermal comfort index		Actual value	48
Predicted Mean Vote	%	Target value	10
E- SERVICE QUALITY			
E3 - Controllability			
E3.4 - Degree of personal control of technical systems by occupants.		Actual value	0
The degree of control over key indoor environment systems that can be exercised by occupants, according to design documentation.	Description	Target value	3
E4 - Flexibility and Adaptability			
E4.5 - Adaptability to future changes in type of energy supply		Actual value	1
The ease or difficulty in installing heating or cooling equipment that require a different fuel, or to install photovoltaic systems.	description	Target value	3
F- SOCIAL CULTURAL AND PERCEPTUAL ASPECTS			
F1 - Social Aspects			
F1.2 - Access to direct sunlight from living areas of dwelling/classroom units.		Actual value	50%
The percentage of school's units whose principal daytime classrooms have direct sunlight. for at least 2 hours per day at 12 noon on Winter	%	Target value	80%

Soltice, according to design documentation.			
F2 - Culture and Heritage			
F2.4 - Use of traditional local materials and techniques		Actual value	7%
Architect's estimate of the percent of the non-structural elements of the building that has been constructed using traditional local materials and construction techniques.	%	Target value	20%
G- COST AND ECONOMIC ASPECTS			
G1 - Cost and Economics			
G1.4 - Use stage energy cost.		Actual value	6,38
Energy annual cost per usable floor area	€/m²/yr	Target value	2,80
G1.5 - Use stage water cost.		Actual value	3,26
Water annual cost per usable floor area	€/m²/yr	Target value	0,40

b. Constraints and restrictions

CONSTRAINTS / RESTRICTIONS	
Legal constraints	*One additional room for heating/cooling source if centralized system is going to be installed.*
Technical constraints	*Unable to move classrooms to other side to catch more daylight. Installation of centralized system only possible while schools is not working.*
Financial constraints	*Low energy and water cost represent very large financial constrain since payback period of any measure is very long.*
Environmental condition constraints	*-*
Stakeholder based restrictions	*Stakeholders should have optimal temperature while staying inside building, and with this system that is not possible.*
Other relevant constraints	*-*

c. Potential strategies at urban scale

Synergy zones	
Energetic synergies	*Possibility to connect building on centralized system that should be installed for new stadium nearby.*
Water synergies	*-*
Waste synergies	*More recycling containers to increase amount of recycled materials*
Mobility synergies	*Organizing mutual transportation of children to school or any activities around school*

Other synergies	

5. DECISION MAKING

a. Description of scenarios

NAME OF SCENARIO	DESCRIPTION
1. Envelope retrofit	Retrofit of entire envelope. In retrofit should be included walls, windows and roof. It is not feasible to retrofit floor unless entire building is going to be reconstructed (new floor and new doors in whole building ground floor).
2. Heat pump instalation	Installation of centralized system as heat pump to improve wellbeing of occupants with mechanical ventilation integrated heat recovery for classrooms. Also new lightning system should be installed to secure lower consumption and increase comfort of occupants. New water measurement system and upgrade of water system with more efficient system.
3. PV modules	Installation of PV modules on roof to produce electrical energy on site and low energy bills.
4. Integral retrofit	Integral retrofit of entire building envelope, new centralized system for heating and cooling (heat pump) and PV modules to lower down electrical energy consumption. Also new lightning system should be installed to secure lower consumption and increase comfort of occupants. New water measurement system and upgrade of water system with more efficient system.

b. Scenarios raking

i. Performance Scores

Issues	Current state	Scenario 1	Scenario 2	Scenario 3	Scenario 4
TOTAL SCORE	**1,99**	**2,39**	**1,87**	**2,36**	**2,92**
A – Site regeneration	3,1	3,1	3,1	3,1	3,1
B – Energy and Resources C.	1,9	2,1	1,4	2,4	2,6
C – Environmental Loadings	3,8	3,8	3,1	4,1	4,1
D – Indoor Env. Quality	-1,0	2,6	3,6	0,6	3,6
E – Service Quality	2,5	2,5	2,8	2,7	3,2
F – Social Aspects	0,0	0,5	0,0	0,0	0,5
G – Cost and Economic Asp.	0,2	0,2	-1,0	-1,0	2,2

ii. Key Performance Indicators

Scenario 1			
KPI	**Indicator**	**Unit of measure**	**Value**
A1.7. - Use of vegetation to provide ambient outdoor cooling.	Ratio of total vegetated surface area (on ground and on roofs, and including trees), divided by total site area.	-	0,65
A1.10. Provision and quality of children's play area(s).	Type of facilities for children's play and the quality of service provided.	description	3
A3.13. - Provision of on-site parking facilities for private vehicles.	The ratio of parking spaces for private vehicles per dwelling unit, plus the ratio of parking spaces for private vehicles per classroom	%	125
B.1.1 Primary energy demand (in use stage)	Annual primary energy demand per useful internal floor area	kWh/m^2/yr	48,82
B.1.2 Delivered thermal energy demand (in use stage)	Annual delivered thermal energy demand per useful internal floor area	kWh/m^2/yr	25,00
B.1.3 Delivered electric energy demand (in use stage)	Annual delivered electric demand per useful internal floor area	kWh/m^2/yr	28,34
B.1.4 Energy from renewable sources in total primary energy consumption	Primary energy demand of the building that is met by renewable sources on total primary energy demand	%	52,00
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	100
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumptions	%	0
B.1.11. Embodied non-renewable primary energy	Embodied primary non-renewable energy per area	MJ/m^2	9.274
B.3.5 Recycled materials	Weight of recycled materials on total weight of materials.	%	3,27
B4.5. - Potable water consumption for indoor uses.	Water consumption per occupant per year	m^3 of water per occupant per year	6,02
C.1.3 Greenhouse Gas Emissions (in use stage)	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m^2/yr	7,62
C.3.2 Solid waste from building operation	Ratio between the number of collectable solid waste types in	%	43%

	a 50 meters distance from the building's entrance and the reference solid waste categories.		
D.1.4 TVOC concentration in indoor air	VOC concentration in indoor air	µg per cube meter	n/a
D.1.5 CO_2 concentration in indoor air	CO_2 concentration in indoor air	Ppm	1000
D1.10 - Ventilation rate	Percent of ventilation air reaching work surfaces, as indicated by an analysis of proposed HVAC system and room characteristics.	%	n/a
D.2.1 Time outside of the thermal comfort range	Percentage of the time out of range of defined maximum and minimum temperatures during the heating and cooling seasons	%	10
D.2.2 Thermal comfort index	Predicted Mean Vote	%	10
E3.4 - Degree of personal control of technical systems by occupants.	The degree of control over key indoor environment systems that can be exercised by occupants, according to design documentation.	Description	0 (unable to go minus)
E4.5 - Adaptability to future changes in type of energy supply	The ease or difficulty in installing heating or cooling equipment that require a different fuel, or to install photovoltaic systems.	Description	1
F1.2 - Access to direct sunlight from living areas of dwelling/classroom units.	The percentage of school's units whose principal daytime classrooms have direct sunlight. for at least 2 hours per day at 12 noon on Winter Soltice, according to design documentation.	%	50%
F2.4 - Use of traditional local materials and techniques	Architect's estimate of the percent of the non-structural elements of the building that has been constructed using traditional local materials and construction techniques.	%	10%
G.1.4 Use stage energy cost	Energy annual cost per usable floor a	€/m²/yr	10,36
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m²/yr	3,26

Scenario 2			
KPI	**Indicator**	**Unit of measure**	**Value**
A1.7. - Use of vegetation to provide ambient outdoor cooling.	Ratio of total vegetated surface area (on ground and on roofs, and including trees), divided by total site area.	-	0,65
A1.10. Provision and quality of children's play area(s).	Type of facilities for children's play and the quality of service provided.	description	3
A3.13. - Provision of on-site parking facilities for private vehicles.	The ratio of parking spaces for private vehicles per dwelling unit, plus the ratio of parking spaces for private vehicles per classroom	%	1,25
B.1.1 Primary energy demand (in use stage)	Annual primary energy demand per useful internal floor area	kWh/m^2/yr	97,66
B.1.2 Delivered thermal energy demand (in use stage)	Annual delivered thermal energy demand per useful internal floor area	kWh/m^2/yr	80,00
B.1.3 Delivered electric energy demand (in use stage)	Annual delivered electric demand per useful internal floor area	kWh/m^2/yr	60,51
B.1.4 Energy from renewable sources in total primary energy consumption	Primary energy demand of the building that is met by renewable sources on total primary energy demand	%	69,00
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	67,00
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumptions	%	0
B.1.11. Embodied non-renewable primary energy	Embodied primary non-renewable energy per area	MJ/m^2	9.274
B.3.5 Recycled materials	Weight of recycled materials on total weight of materials.	%	3,27
B4.5. - Potable water consumption for indoor uses.	Water consumption per occupant per year	m^3 of water per occupant per year	1,00
C.1.3 Greenhouse Gas Emissions (in use stage)	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m^2/yr	14,43
C.3.2 Solid waste from building operation	Ratio between the number of collectable solid waste types in	%	43%

	a 50 meters distance from the building's entrance and the reference solid waste categories.		
D.1.4 TVOC concentration in indoor air	VOC concentration in indoor air	µg per cube meter	n/a
D.1.5 CO_2 concentration in indoor air	CO_2 concentration in indoor air	Ppm	600
D1.10 - Ventilation rate	Percent of ventilation air reaching work surfaces, as indicated by an analysis of proposed HVAC system and room characteristics.	%	200%
D.2.1 Time outside of the thermal comfort range	Percentage of the time out of range of defined maximum and minimum temperatures during the heating and cooling seasons	%	1
D.2.2 Thermal comfort index	Predicted Mean Vote	%	5
E3.4 - Degree of personal control of technical systems by occupants.	The degree of control over key indoor environment systems that can be exercised by occupants, according to design documentation.	Description	3
E4.5 - Adaptability to future changes in type of energy supply	The ease or difficulty in installing heating or cooling equipment that require a different fuel, or to install photovoltaic systems.	Description	2
F1.2 - Access to direct sunlight from living areas of dwelling/classroom units.	The percentage of school's units whose principal daytime classrooms have direct sunlight. for at least 2 hours per day at 12 noon on Winter Soltice, according to design documentation.	%	50%
F2.4 - Use of traditional local materials and techniques	Architect's estimate of the percent of the non-structural elements of the building that has been constructed using traditional local materials and construction techniques.	%	7%
G.1.4 Use stage energy cost	Energy annual cost per usable floor a	€/m²/yr	9,31
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m²/yr	0,58

Scenario 3			
KPI	**Indicator**	**Unit of measure**	**Value**
A1.7. - Use of vegetation to provide ambient outdoor cooling.	Ratio of total vegetated surface area (on ground and on roofs, and including trees), divided by total site area.	-	0,65
A1.10. Provision and quality of children's play area(s).	Type of facilities for children's play and the quality of service provided.	description	3
A3.13. - Provision of on-site parking facilities for private vehicles.	The ratio of parking spaces for private vehicles per dwelling unit, plus the ratio of parking spaces for private vehicles per classroom	%	1,25
B.1.1 Primary energy demand (in use stage)	Annual primary energy demand per useful internal floor area	kWh/m^2/yr	14,56
B.1.2 Delivered thermal energy demand (in use stage)	Annual delivered thermal energy demand per useful internal floor area	kWh/m^2/yr	42,19
B.1.3 Delivered electric energy demand (in use stage)	Annual delivered electric demand per useful internal floor area	kWh/m^2/yr	5,81
B.1.4 Energy from renewable sources in total primary energy consumption	Primary energy demand of the building that is met by renewable sources on total primary energy demand	%	47,98
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	100
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumptions	%	80
B.1.11. Embodied non-renewable primary energy	Embodied primary non-renewable energy per area	MJ/m^2	9.274
B.3.5 Recycled materials	Weight of recycled materials on total weight of materials.	%	3,27
B4.5. - Potable water consumption for indoor uses.	Water consumption per occupant per year	m^3 of water per occupant per year	6,02
C.1.3 Greenhouse Gas Emissions (in use stage)	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m^2/yr	2,84
C.3.2 Solid waste from building operation	Ratio between the number of collectable solid waste types in a 50 meters distance from the	%	43%

	building's entrance and the reference solid waste categories.		
D.1.4 TVOC concentration in indoor air	VOC concentration in indoor air	µg per cube meter	n/a
D.1.5 CO_2 concentration in indoor air	CO_2 concentration in indoor air	Ppm	1000
D1.10 - Ventilation rate	Percent of ventilation air reaching work surfaces, as indicated by an analysis of proposed HVAC system and room characteristics.	%	n/a
D.2.1 Time outside of the thermal comfort range	Percentage of the time out of range of defined maximum and minimum temperatures during the heating and cooling seasons	%	42%
D.2.2 Thermal comfort index	Predicted Mean Vote	%	48%
E3.4 - Degree of personal control of technical systems by occupants.	The degree of control over key indoor environment systems that can be exercised by occupants, according to design documentation.	Description	0 (unable to go minus)
E4.5 - Adaptability to future changes in type of energy supply	The ease or difficulty in installing heating or cooling equipment that require a different fuel, or to install photovoltaic systems.	Description	1,5
F1.2 - Access to direct sunlight from living areas of dwelling/classroom units.	The percentage of school's units whose principal daytime classrooms have direct sunlight. for at least 2 hours per day at 12 noon on Winter Soltice, according to design documentation.	%	50%
F2.4 - Use of traditional local materials and techniques	Architect's estimate of the percent of the non-structural elements of the building that has been constructed using traditional local materials and construction techniques.	%	7%
G.1.4 Use stage energy cost	Energy annual cost per usable floor a	€/m²/yr	11,02
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m²/yr	3,26

Scenario 4			
KPI	**Indicator**	**Unit of measure**	**Value**
A1.7. - Use of vegetation to provide ambient outdoor cooling.	Ratio of total vegetated surface area (on ground and on roofs, and including trees), divided by total site area.	-	0,65
A1.10. Provision and quality of children's play area(s).	Type of facilities for children's play and the quality of service provided.	description	3
A3.13. - Provision of on-site parking facilities for private vehicles.	The ratio of parking spaces for private vehicles per dwelling unit, plus the ratio of parking spaces for private vehicles per classroom	%	1,25
B.1.1 Primary energy demand (in use stage)	Annual primary energy demand per useful internal floor area	kWh/m^2/yr	26,32
B.1.2 Delivered thermal energy demand (in use stage)	Annual delivered thermal energy demand per useful internal floor area	kWh/m^2/yr	25,00
B.1.3 Delivered electric energy demand (in use stage)	Annual delivered electric demand per useful internal floor area	kWh/m^2/yr	16,31
B.1.4 Energy from renewable sources in total primary energy consumption	Primary energy demand of the building that is met by renewable sources on total primary energy demand	%	83
B.1.5 Energy from renewable sources in total final thermal energy consumption	Share of renewable energy in final thermal energy consumptions	%	100
B.1.6 Energy from renewable sources in total final electric energy consumption	Share of renewable energy in final electric energy consumptions	%	58
B.1.11. Embodied non-renewable primary energy	Embodied primary non-renewable energy per area	MJ/m^2	9.274
B.3.5 Recycled materials	Weight of recycled materials on total weight of materials.	%	3,27
B4.5. - Potable water consumption for indoor uses.	Water consumption per occupant per year	m^3 of water per occupant per year	1,00
C.1.3 Greenhouse Gas Emissions (in use stage)	CO_2 equivalent emissions per useful internal floor area per year	kg CO_2 eq./m^2/yr	3,89
C.3.2 Solid waste from building operation	Ratio between the number of collectable solid waste types in a 50 meters distance from the building's entrance and the	%	43%

	reference solid waste categories.		
D.1.4 TVOC concentration in indoor air	VOC concentration in indoor air	µg per cube meter	n/a
D.1.5 CO_2 concentration in indoor air	CO_2 concentration in indoor air	Ppm	600
D1.10 - Ventilation rate	Percent of ventilation air reaching work surfaces, as indicated by an analysis of proposed HVAC system and room characteristics.	%	200
D.2.1 Time outside of the thermal comfort range	Percentage of the time out of range of defined maximum and minimum temperatures during the heating and cooling seasons	%	1
D.2.2 Thermal comfort index	Predicted Mean Vote	%	5
E3.4 - Degree of personal control of technical systems by occupants.	The degree of control over key indoor environment systems that can be exercised by occupants, according to design documentation.	Description	3
E4.5 - Adaptability to future changes in type of energy supply	The ease or difficulty in installing heating or cooling equipment that require a different fuel, or to install photovoltaic systems.	Description	4
F1.2 - Access to direct sunlight from living areas of dwelling/classroom units.	The percentage of school's units whose principal daytime classrooms have direct sunlight. for at least 2 hours per day at 12 noon on Winter Soltice, according to design documentation.	%	50%
F2.4 - Use of traditional local materials and techniques	Architect's estimate of the percent of the non-structural elements of the building that has been constructed using traditional local materials and construction techniques.	%	10%
G.1.4 Use stage energy cost	Energy annual cost per usable floor a	€/m²/yr	2,51
G.1.5 Use stage water cost	Water annual cost per usable floor area	€/m²/yr	0,58

iii. Financing mechanisms evaluation

Scenario 1	Since school has no extra profit municipality should retrofit building. Also, any financial evaluation of retrofit gives negative values but main reason is low comfort in building and low consumption. Each year Ministry of physical planning and construction putt call where is possible to provide co-financing in the amount of 40% of the eligible funds for energy efficiency and RES.
Scenario 2	Since school has no extra profit municipality should retrofit building. Also, any financial evaluation of retrofit gives negative values but main reason is low comfort in building and low consumption. Each year Ministry of physical planning and construction putt call where is possible to provide co-financing in the amount of 40% of the eligible funds for energy efficiency and RES.
Scenario 3	Since school has no extra profit municipality should retrofit building. Also, any financial evaluation of retrofit gives negative values but main reason is low comfort in building and low consumption. Each year Ministry of physical planning and construction putt call where is possible to provide co-financing in the amount of 40% of the eligible funds for energy efficiency and RES.
Scenario 4	Since school has no extra profit municipality should retrofit building. Also, any financial evaluation of retrofit gives negative values but main reason is low comfort in building and low consumption. Each year Ministry of physical planning and construction putt call where is possible to provide co-financing in the amount of 40% of the eligible funds for energy efficiency and RES.

iv. Synergies at urban level

Scenario 1	Increase wellbeing of occupants in building. Lower energy demand and reduce pollution nearby
Scenario 2	Increase wellbeing of occupants in building, and secure better environment for local community especially children.
Scenario 3	Increase production of RES and lower energy cost.
Scenario 4	With integral measure of energy efficiency, installation of new system for heating/cooling and PV final consumption of energy would be lower as well as wellbeing of occupants. Main reason for retrofit is not just in economical reason but mainly with health issue and comfort rate of staying in school.

6. RETROFIT CONCEPT

SELECTED SCENARIO	Integral retrofit
A. (i.e. Heat pump and solar panels)	Integral retrofit of entire building envelope, new centralized system for heating and cooling (heat pump) and PV modules to lower down electrical energy consumption. Also new lightning system should be installed to secure lower consumption and increase comfort of occupants. New water measurement system and upgrade of water system with more efficient system.

KEY ELEMENTS OF THE CONCEPT

Retrofits Strategies	First lower down energy demand (retrofit of envelope) and slightly increase comfort in building
	After lowering energy demand with envelope retrofit, next step is installation of heat pump and entirely new system (Heat pump air-water with COP=3) for heating and reconstruction of lightning system (new LED lightening system). With those two measures comfort of building would be very high, and there will be no worry for wellbeing of occupants, especially when the temperature in winter and summer time can be adjusted by occupant needs. Also, it will be possible to install new systems if necessary.
	As final measure would be installation of PV modules on roof since all energy consumed in building comes from electrical energy, it will be wise to lower down consumption and energy cost.
Performance improvement	Environment - Increase energy efficiency in building, increase production energy from RES (heat pump and PV) and lowering down CO2 emission
	Society - Increase wellbeing of occupant (especially children) in school, and secure environment for study.
	Much lower energy and maintenance cost, but very high capital investment (loan). Loan rate would be higher then saving even with co-financing of 40%.
Financial mechanism	School has no income and municipality should finance retrofit of building.
	Call from Ministry of physical planning and construction with co-financing of 40% of eligible costs.
	Other 60% of investment should be from municipality or other financing source (crowd-founding)