



S3UNICA
Interreg Europe



European Union
European Regional
Development Fund

Self Assessment Tool (SAT) and the calculation of Smart Readiness Indicator (SRI)

S3UNICA developed a Self Assessment Tool to enable regional stakeholders to identify strengths and weaknesses across the innovation cycle, policy framework, technical and financial performance.

- The self-assessment was be developed in two steps.
 1. Creation of a basic profile for each Campus and information for the development of the second phase (in which indices and equation models are developed)
 2. Development of a multi-criteria decision support system in order to integrate SRI and financial and policy performance,

SAT - Structure

POLICY FRAMEWORK: to understand the situation of the regulations supporting energy efficiency on university campuses, the following information is required from the partners, therefore the following question needs an answer from the single partners (1,000 characters per each answer).

- Are there policy measures at any level (Local, National) for encouraging the development of university buildings in NZEB buildings?(A policy is a principle or protocol to guide decisions and achieve rational outcomes, defined by political agreement at Local/National/EU levels and adopted by law).
- Are there policy measures at any level (Local, National) for encouraging the adoption of smart monitoring and control systems?
- Are there policy measures at any level (Local, National) for encouraging an integrated energy management systems for university/public buildings
- Are there self implemented energy or environmental policies in place,not part of mandatory policies? (Specify if the university campus has implemented additional policy regulations not mandatory requested by the Regional-National-EU levels)
- Does your university campus adhere to mandatory energy policies at any level (Local, National, EU)? (Specify. Addressed parties indicated in the policy document must be in line with the specific measures/ standards reported)
- Are there measureable objectives or targets to be achieved by your university campus? (Specify if the campus has set up targets and objectives, both at quantitative (e.g. numbers to be achieved) or qualitative (e.g. general final objectives expressed in a to-do-list levels)

SAT - Structure

FINANCIAL PERFORMANCE: to understand the availability of financial instruments for the implementation of energy efficiency interventions on university campuses, each single partner should answer provide the information in the following (1,000 characters per each answer).

Are available the following financial instruments?

- Energy Performance Contract
- Mortgages for energy efficiency/Bank loans
- State Incentives dedicated to Universities
- National programmes dedicated to energy efficiency works for public buildings
- Dedicated credit institutions/bodies (EE funds) for energy efficiency works/investments
- Other financial systems or initiatives: specify

SAT - Structure

TECHNICAL PERFORMANCE: to understand the technological state of the buildings within university campuses, the first level following information is required

Section a): Identification informations, status and size of campuses collection

Question Text	Question Description
University Name	Fill in the full University name
Country	Fill in the country where the University is located
City	Fill in the city where the University is located
ZIP code	Fill in the related ZIP code
Street name Number	Fill in streetname and number

SAT - Structure

Section a): Identification informations, status and size of campuses collection

Question Text	Question Description
Description of the campus	Insert a short and clear description of the campus: buildings (single or group of buildings), e activities carried out (teaching rooms, labs, auditorium, offices, hospitals, sports facilities,...) (max. 1000 characters).
Campus ownership	Property is the state of full possession of the assets used by the University. Rent is the state of contractual duty of these assets with an external owner..
Location	Specify if the University is located in a fully independent building or if it is shared. Specify if the buildings are isolated or integrated into a district with other activities, or if they are included like the other civil residences in the city
Number of employees	Indicate the number of students, lecturers, researchers, technicians, other staff present daily in buildings (reference: year 2019)
Area [m ²]	Specify the net floor area occupied by the buildings, taking into account all features allocated (offices, teaching rooms, etc).
Volume [m ³]	Specify the net volume of the campus, taking into account all features allocated (offices, teaching rooms, etc).

SAT - Structure

Section b): Identification informations, status and size of campuses collection

		A	B	C	D	E
		ABILITY TO MAINTAIN ENERGY PERFORMANCE AND OPERATION	ABILITY TO REPORT ON ENERGY USE	ADAPT ITS OPERATION MODE IN RESPONSE TO THE NEEDS OF THE OCCUPANT	MAINTAINING HEALTHY INDOOR CLIMATE CONDITIONS	FLEXIBILITY OF A BUILDING'S OVERALL ENERGY DEMAND
1	MONITORING AND MEASUREMENT	<ul style="list-style-type: none"> Quality of the measure (entire building, single thermal zone, single service for example: lighting, air conditioning, driving force); 	<ul style="list-style-type: none"> Frequency of measurements (annual, monthly, weekly); Quality of energy consumption measurement (system of buildings single building, single service for example: lighting, air conditioning, driving force); 	<ul style="list-style-type: none"> Quality of the measure (system of buildings , building, single service for example: lighting, air conditioning, driving force) of temperature, relative humidity, CO₂ rate; lighting, noise level 	<ul style="list-style-type: none"> Quality of the measure (entire building, single service for example: lighting, air conditioning, driving force) of temperature, relative humidity, CO₂ rate; 	<ul style="list-style-type: none"> Availability of system to monitor energy demand and local energy availability (in direct or accumulated production);
2	TECHNICAL SOLUTIONS	<ul style="list-style-type: none"> Supply capacity of thermal and cooling energy for system of buildings, single building or single thermal zone; 		<ul style="list-style-type: none"> Supply capacity of thermal and cooling energy and adjustment of air changes depending on the needs of the occupants in the single areas; 	<ul style="list-style-type: none"> Supply capacity of thermal and cooling energy and adjustment of air changes depending on the needs in the single areas; 	<ul style="list-style-type: none"> Presence of energy production from renewable sources (Photovoltaic, geothermal, solar thermal); Availability of electrical energy storage; Availability of thermal energy storage; Ability to guarantee the necessary energy through the purchase of energy or local production from renewable sources or, also, through the integration with other availability in the territory (e.g. waste heat)

SAT - Structure

1. Monitoring and measurement: question text	Question Description.
Is there a dedicated office or person for energy management?	Specify.
Is there a Building Management System (BMS) implemented?	A Building Management System (BMS) is a computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment such as ventilation, lighting, power systems, fire systems, and security systems
Data Collection	Specify. Which quantities are measured (e.g. energy consumption, temperature, relative humidity, CO ₂ rate); indicate if the measurement is aggregated (for whole campus, single building, building zone) or single service (example:; lighting, air conditioning; thermal energy, driving force); for each of them give the measurement frequency (e.g. annual, monthly) weekly).
Energy flow measurements	Specify if this specific action is performed on campus and if it is implemented in the BMS
Energy cost analysis	Specify if this specific action is performed on campus and if it is implemented in the BMS
Emission measurement	Specify if this specific action is performed on campus and if it is implemented in the BMS
Other measurements	Specify
Was an indoor air quality test ever conducted in the building?	
Did customers or employees ever report thermal comfort dissatisfaction?	

SAT - Structure

2.Technical solutions: question text	Question Description
Main Source for Electrical Power	Specify which is the main source for electrical power used within the campus
Additional Relevant Source for Electrical Power	Specify if you are using an additional relevant source for electrical power in your university
Type of Supply Electrical Energy Contract	Answer "metered" if you receive a bill from the utility company. Alternatively specify other methods
Yearly Electrical Energy Consumption [kWh] (reference year 2019)	Fill in the value of the electric energy consumption of one year
Yearly Electrical Energy Cost	Fill in the value for the total energy cost of one year of activities

SAT - Structure

2. Technical solutions: question text	Question Description
Main Source for Space Heating	Specify the main source for space heating in the buildingsi
Main Fuel Type	Specify the main fuel type utilized by your company
Yearly main fuel Consumption (referred year: 2019)	Fill in the value for your total energy consumption of one year of operation and specify the reference unit for the specific fuel
Yearly main fuel Cost	Fill in the value for the total energy cost of one year of activities.
Main heating Conversion Technology	Specify which is the main conversion technology for space heating
Main Heating Distribution Technology	Specify the main distribution technology for space heat

SAT - Structure

2. Technical solutions: question text	Question Description
Main Source for Space Cooling	Specify which is the main source for buildings cooling
Main Cooling Conversion Technology	Specify which is the main conversion technology for space cooling
Main Cooling Distribution Technology	Specify the main distribution technology for space cooling
Additional relevant Fuels Type	Specify if the University utilizes an additional relevant fuel type beside the main fuel type stated before
Type of additional fuels Supply Contract	Answer "metered" if you receive a bill from the utility company. Alternatively specify other methods
Yearly additional fuel Consumption (referred year: 2019)	Fill in the value for your total energy consumption of one year of operation and specify the reference unit for the specific fuel

SAT - Structure

2. Technical solutions: question text	Question Description
Additional relevant Fuels Type	Specify if the University utilizes an additional relevant fuel type beside the main fuel type stated before
Type of additional fuels Supply Contract	Answer "metered" if you receive a bill from the utility company. Alternatively specify other methods
Yearly additional fuel Consumption (referred year: 2019)	Fill in the value for your total energy consumption of one year of operation and specify the reference unit for the specific fuel

SAT - Structure

2. Technical solutions: question text	Question Description
Is there an on-site or off-site renewable energy system installed?	Specify if the Campus has installed an energy system based on renewable sources (e.g. solar, biomass, wind, geothermal, hydro)
Which kinds of renewable energy systems are installed?	Select the proper system(s)
Percentage of Electrical Energy Consumption from Renewable Sources	Specify the range of electrical energy consumption from renewable resources according to the overall electrical energy consumption in your campus
Percentage of Thermal Energy Consumption from Renewable Sources	Specify the range of thermal energy consumption from renewable resources according to the overall thermal energy consumption in your campus
Renewable Electric Energy Self-Consumption [%]	Specify percentage of self-consumed renewable electrical energy according to the total self-produced renewable electrical energy
Renewable Energy Systems Added Value [€]	Specify the approximative added value in euros per year obtained from renewable energy systems installed by your campus, as a sum of both energy discounts and feed-in tariff
Is there any additional potential for improvement in terms of energy efficiency?	Specify if you consider that the University has a relevant potential for improving the energy efficiency at any level of building, indoor, lab,..
Can you quantify approximately the overall savings achieved [%]?	Indicate the approximate percentage for improvements yet achieved by the company after above selected measures have been taken
Is there any additional potential for improvement in terms of energy efficiency?	

SAT - Structure

Section c): both a self-assessment of campus performance (in accordance with the barriers, obstacles and relevance of energy efficiency) and targets at various levels of policy actions is required

Relevance of energy efficiency, future outlook and Vision: question text	Question Description.
Impact of energy efficiency measures during last three years?	Specify if the university is considering to receive back a positive impact from energy efficient measures adopted in last three years (1 means not receiving any positive impact, 5 means very high positive impact).
Did you find obstacles on energy efficiency measures and their implementation?	Specify, whenever the university has had some obstacles, in implementing EE measures
Have you been able to overcome obstacles on energy efficiency measures and their implementation?	Specify, whenever the university has had some obstacles, if it has been able to overcome them and correctly implement target actions
Among the listed obstacles, rate their relevance either on the basis of your direct experience or according to your knowledge of the field (give a score between 1 and 5, 1 means small obstacle or low relevance, 5 means big obstacle or high relevance):	

SAT - Structure

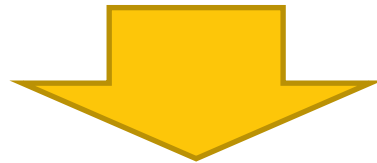
Relevance of energy efficiency, future outlook and Vision: question text	Question Description.
Impact of energy efficiency measures during last three years?	Specify if the university is considering to receive back a positive impact from energy efficient measures adopted in last three years (1 means not receiving any positive impact, 5 means very high positiv impact).
Did you find obstacles on energy efficiency measures and their implementation?	Specify, whenever the university has had some obstacles, in implementing EE measures
Have you been able to overcome obstacles on energy efficiency measures and their implementation?	Specify, whenever the university has had some obstacles, if it has been able to overcome them and correctly implement target actions
A mong the listed obstacles, rate their relevance either on the basis of your direct experience or according to your knowledge of the field (give a score between 1 and 5, 1 means small obstacle or low relevance, 5 means big obstacle or high relevance):	
No idea of energy efficient measures	Rate the relevance of this obstacle or barrier for the university energy efficiency either on the basis of your direct experience or according to your knowledge of the field (give a score between 1 and 5, 1 means small obstacle or low relevance, 5 means big obstacle or high relevance)
Time and staff resources in the company	See above
External support (thecnical or economic)	See above
Financial issues: Absence of dedicated budget for improvement of energy efficiency	See above
Long pay-back period for possible projects	See above

SAT - Structure

Relevance of energy efficiency, future outlook and Vision: question text	Question Description.
No idea of energy efficient measures	Rate the relevance of this obstacle or barrier for the university energy efficiency either on the basis of your direct experience or according to your knowledge of the field (give a score between 1 and 5, 1 means small obstacle or low relevance, 5 means big obstacle or high relevance)
Time and staff resources in the company	See above
External support (technical or economic)	See above
Financial issues: Absence of dedicated budget for improvement of energy efficiency	See above
Long pay-back period for possible projects	See above
Have you planned to implement (additional) energy efficiency policies in your university?	Specify an already planned intention to implement energy efficiency measures in the company, considering all levels of building, manufacturing, products, etc.
In which time framework	Indicate the time horizon of eventually planned actions to be implemented by the university in the next future
Which reduction in overall energy consumption is expected?	Indicate the percentage of expected reduction in energy consumption expected from the planned actions to be implemented by the university in the next future
Which reduction of fossil fuels is expected?	Indicate the percentage of expected reduction in energy from fossil fuels expected from the planned actions to be implemented by the university in the next future

SAT objective

Allowing regional stakeholder to identify strengths and weaknesses of the whole innovation cycle, policy framework, technical and financial performance.



GOOD PRACTICE

Undertaken initiative that showed to be effective in a Region and of potential interest for other Regions.

«Showed to be effective» means that good practice has already provided tangible and **measurable** results in achieving a specific objective.

SRI calculation(EU): methodology

10 DOMAINS



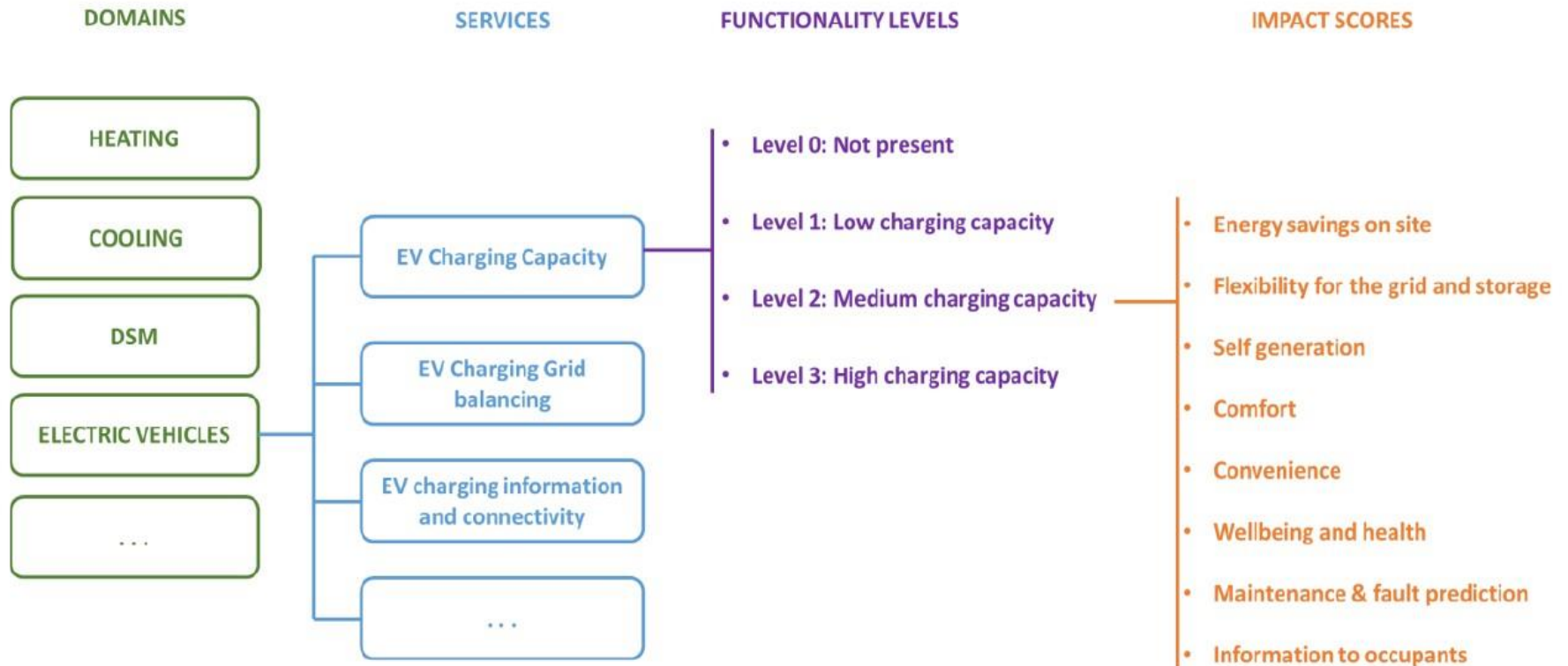
8 IMPACT CRITERIA

The total SRI score is based on average of total scores on 8 impact criteria.



Each domain has an impact assessed on 8 criteria: not only energy, but also health and well-being and information to the occupant.

SRI calculation(EU): methodology

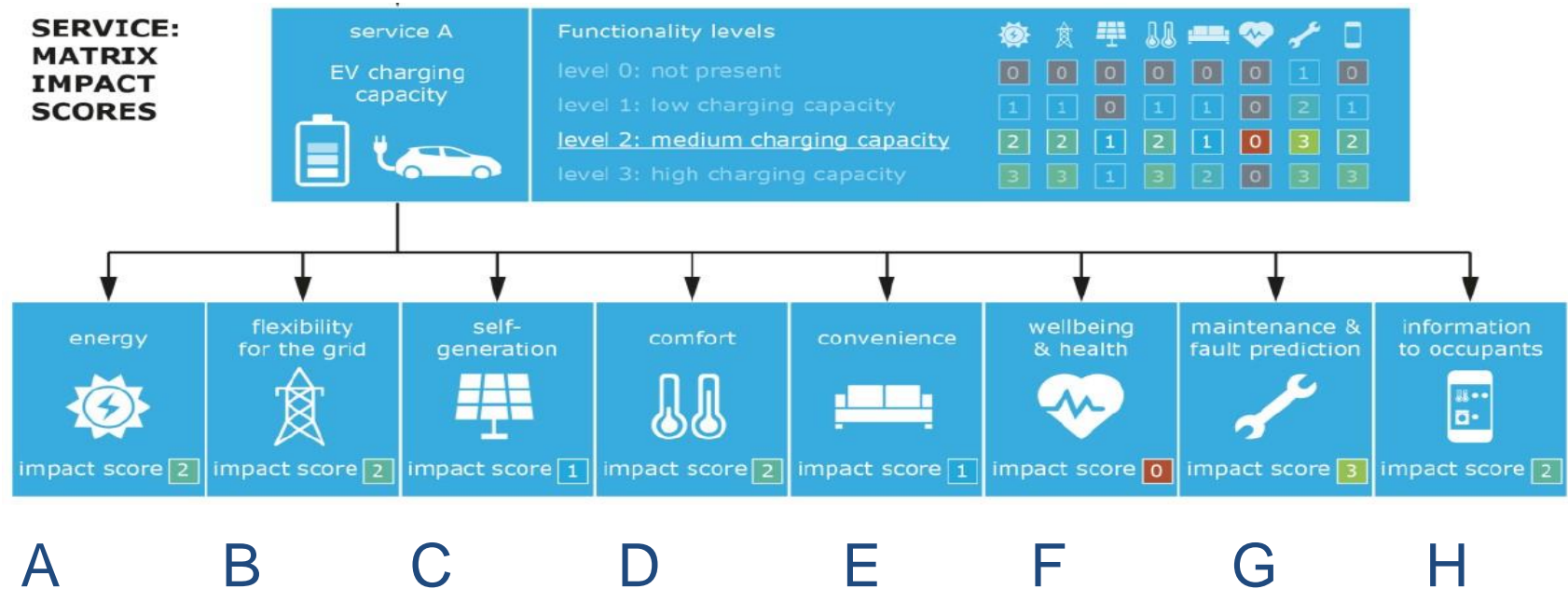


- 122 SMART services,
- Different levels of implementation, each level weighs on each impact.

SRI calculation(EU): methodology

domain mechanical ventilation									
code	service	Service group: Air flow control							
Ventilation-1a	Supply air flow control at the room level	Service group: Air flow control							
Functionality levels		IMPACTS							
		Energy savings on site	Flexibility for the grid and storage	Comfort	Convenience	Wellbeing and health	maintenance & fault prediction	information to occupants	
level 0	No ventilation system or no automatic control	0	0	0	0	0	0	0	
level 1	Time control	+	0	+	+	+	0	0	
level 2	Occupancy detection control	+	0	++	++	++	0	0	
level 3	Demand control based on air quality sensors (CO2, VOC,RH,...)	++	0	+++	+++	+++	0	0	
level 4	0								
Information sources									
Standard?		EN 15232							
code	service	Service group: Air flow control							
Ventilation-1b	Adjust the outdoor air flow or exhaust air rate	Service group: Air flow control							
Functionality levels		IMPACTS							
		Energy savings on site	Flexibility for the grid and storage	Comfort	Convenience	Wellbeing and health	maintenance & fault prediction	information to occupants	
level 0	Fixed OA ratio / OA flow	0	0	0	0	0	0	0	
level 1	Staged (low/high) OA ratio / OA flow (time schedule)	+	0	+	+	+	0	0	

SRI calculation(EU): methodology



The evaluation of the SRI is multi-criteria, based on the impacts of the services present in a building.

$$N = a \times A + b \times B + c \times C + d \times D + e \times E + f \times F + g \times G + h \times H$$

$$SRI = \sum N$$

SAT and SRI for Action Planning

For an order of priority of the plan actions, it will be based on an evaluation of the good practices obtainable with multi-criteria analysis:

$$GP_t = \alpha \cdot SRI + \beta \cdot PF + \gamma \cdot FP$$

α, β, γ weights assigned with quantitative criteria and/or panel of experts (proposal: egalitarian system)

SRI smart readiness indicator

PF policy framework indicator

FP Financial performances

Insertion of 2 domains, identification of «services» and impact assessment