D1.1

Domain requirements specification (M3)

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Executive Summary

Smart Urban Isle is a project involving several technical and economic aspects that impact directly with governmental rules in the project participating countries. As expected, there are some European Directives that guide most of national regulations regarding SUI topics. From all of them, there are three main directives that should be highlighted:

- Directive 2010/31/EU on Energy performance of buildings which promotes the improvement of the energy performance of buildings within the Union, considering outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness.
- Directive 2012/27/EU on Energy Efficiency which establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020 20 % headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date.
- Directive 2009/28/EC on the promotion of the use of energy from renewable sources which stablishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport.

Moreover, additional topics such emission trading system, Energy-related Products (ErP) or rules for the internal market in electricity are also considered.

On the other hand, in countries like Switzerland or The Netherlands, it is set a clear structure of how to implement successfully energy efficient buildings, Minergie and 2000-Watt-Society in the first case and the BENG in The Netherlands. In both cases, it is given standard rates of energy consumption depending on building function and, only in the Dutch case the use of renewable energy as well.

Thus, we define a Smart Urban Isle as "*scalable, flexible and inter connected urban space*" that employ the last trends in bioclimatic architecture and renewable energy technology to provide a sustainable and self-sufficient environment. Thanks to the information and communications technology, SUI develops a strategy that integrates power control and the optimization of the internal resources and the environment and creates synergies between buildings and energy systems making use of the scale advantages for renewable energy utilization and storage solutions. SUIs are composed by three domains: "bioclimatic building design", "management platform" and "urban isle mini-networks".

To achieve this, several challenges need to be faced and resolved. Throughout the project, all the PPs will deal with common issues that attach the global SUI concept, these are named as general challenges and are divided into two types: technical and non-technical. Integration of individual solutions and implementation of them are issues to be solved in between the technical challenges and how to get all the information and how innovative the concept is between the non-technical ones. Also, each expert field (bioclimatic architecture, management platform and mini-networks) will deal with its own innovative issues:

Bioclimatic architecture

Bioclimatic designed buildings (houses) are buildings with very low energy and resource demand, which lead to a sustainable way of living (or working). The scope of bioclimatic architecture is to minimise the energy needs of the buildings and the urban environment while at the same time achieve indoor and outdoor comfort conditions, by utilizing the beneficial aspects of the local climate and the environmental conditions. This is accomplished by employing appropriate geometry, structure, orientation and envelope design of the buildings.

A high-energy efficient envelope design results from the properties of the materials and the detailing of its construction, the application of thermal insulation and the provision of proper shading. In a further step, bioclimatic architecture is integrated in urban wide-open areas, the relation and interactive processes between the structures of the buildings, their usage and the common open/free spaces need to be exploited towards further reduction the energy needs.

Management platform

The management platform will act as a multi-dimension system, i.e. energy forms including electricity, heat and cold; spatial entities including buildings, community, and network; as well as time horizon; that monitor and control energy flow throughout the SUI and allows buildings interacting with each other and with the network to achieve a SUI with locally balanced energy system. The platform treats each building as an active user, considering the intra-inter buildings measures and the multi-commodity nature of the energy network.

SUI also develops a strategy of data collection in which static and dynamic probes are introduced. The static probes are sensors scattered around the SUI that capture data like wind speed, temperature or humidity that cannot be grasped by a smartphone. The smartphones become the dynamic probes and get data from users like flow of people, volume of people and anomaly detection. With those data, we can generate patterns to forecast energy loads and energy flows and to detect anomalies in order to maintain the optimal comfort levels in the SUI.

Mini-network

The mini-networks deal with the generation, storage and supply of energy in a building or buildings. In the production/generation of the energy, renewable energy sources may contribute greatly, leading to a reduction of CO2 and other Green House Emissions (GHE). Depending on the amount of onsite energy production, an autonomous mini-network, using entirely green energy, can be sustained.

The SUI mini-networks must be adapted to the specific needs of an urban isle, and can also include for example heat networks or DC networks between some buildings.

As a result of the analysis done of the identified challenges, a list of initial requirements is generated. To this mean, every requirement should be compared to a reference scenario in order to make them comparable. Thus, each expert field has its own indicators allowing an easy comparison between them.

Also, general indicators are identified. These indicators can be applied to all fields as they deal with economic and common indicators applicable to all.