Genoa, Mela Verde

Implementation Plan

Ilaria Delponte
Gloria Piaggio
Mirella Marazzo
Roberta Casapietra
Ilaria Pittaluga
Filippo Gasparin
Alex Sorokin
Maria Fassone
Federico Rottura
Antonio Pastorino

December 2014

CONTENTS

Figures

Executive Summary

Context

The neighbourhood of Voltri is located in the innermost point of the Gulf of Liguria and on the far western suburbs (Municipio VII Ponente) of Genoa, about 17 km from the city center.

The Voltri area has strong historical and cultural identity and in the past they have played a significant role in the local economy. In 1926, Voltri's autonomy was removed by incorporating it in the city of Genova the economic structure axis rotated and the networks of relationships have focused mainly on the coastal axis resulting imbalance of the ancient links with the city center.

The area addressed by this framework (called "Green Apple", as a result of a previous project, Cat MED) occupies a surface area equal to approx. 30 hectares**, mostly public: RFI (Italian railway Network) areas and buildings, predominately Port Authority land in concession** to associations and operators, private residential buildings located on the margins.

The two main stakeholders (RFI and Port Authority) are very big and powerful and are connected to the urban system in a vast number of issues so the decision on how to develop Green Apple could be influenced by external factors, including also national economic and financial issues.

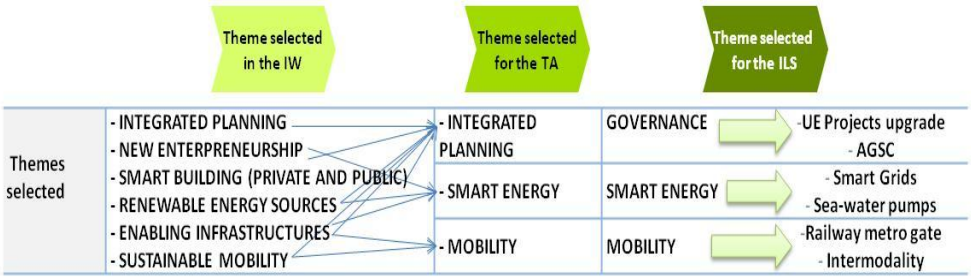
Approach

According to the Transform approach, the Implementation Plan is understood as a strategic document which can be used to support the development of a strategy for an urban area.

In the case of Genoa, due to the early stage of the SUL , the IP aims above all at supporting the promotion of the projects and gathering a sufficient consensus for a

concrete realization. The understanding of the Implementation Plan is closely connected to its embedding in the municipal landscape of programs and strategies, which are variously related to the Smart City conception. In fact, while other cities were thinking about their future and development paradigm concerning smart urban evolution, Genoa chose the way of the building up of a strategic vision by means of an integrated planning, a strong commitment of the City Council around crucial matters of debate and the constitution of an Association (Genoa Smart City association AGSC) in order to set out a process in a coordinated way. AGSC is composed by the Municipality, Enel and University of Genoa as co-founders and about 90 members (enterprises, people associations, territorial and research entities). The challenge for Genoa is trying to decline this concept, referred to the overall city, to one selected small district: Green Apple in Voltri.

Trying to improve the link between strategy (Transformation Agenda) and operations (Implementation Plan), the IP on Green Apple can be defined as a sort of "experimental urban planning tool" which receives the indicatio



ns of the project and tests them in "the middle of the field". How? By means of the **methodological steps built in the city-TransformationAgenda and here purposed again but at the district level.** Following the planning out of the previous paragraphs, the approach towards the T.A. is going to be implemented in Green Apple, at the district scale, with the same tools that we adopted for the whole-city area. Municipality, in the Transform process, try to align the outcomes of the work done on the city with what is under construction for Voltri: within the six themes selected during the Intake Workshop, three main "Green Apple" themes were selected also for the Intensive Lab Session, according to those already decided for the Transformation Agenda. The wished integration among planning visions and tools was considered as the basis-principle of the debate, although it does not contribute directly to the energy efficiency.

Selected key-themes

For assessing the interventions thought for the Green Apple on the selected themes, we can consider CO_2 reducing as a key-target that can contribute to the general achievement of the SEAP city-targets.

★ Energy

The Mela Verde area is served by a gas network and by an electricity network (add features-maps later on). All buildings are heated by either natural gas or diesel. No district heating or energy storages are in place in the area nor significant renewable energy plants. No CHP is present in the area and no waste heat is generated. As far as the SUL is concerned, the only smart grids technology currently in place is the Smart Meter System.

One of the two greatest challenges is **energy saving in buildings**. Given the location of the Mela-Verde area along the coastline, one of the most promising options being proposed and investigated by the Transform project is to improve efficiency and to achieve significant energy (and probably also cost) savings for final consumers by replacing the presently adopted heating systems using fossil fuel boilers (mostly natural gas) by installing and adopting sea-water coupled heat-pump systems. This action will however need to involve citizens and local stakeholders as well as to identify possible financial solutions to promote investments.

The second important challenge is the **retrofitting of public/social buildings** throughout the area (swimming pool, medical practices, library, schools, etc.).

A further challenge derives from the recent flooding events that made the rivers in the area overflow their banks and cover streets with mud. Therefore the implementation of a smart alert system is of primary importance maybe in connection with smart lampposts.

Specifically the basic idea behind this proposal is **to exploit the nearby sea as an enormous heat-source for space heating and any other low-temperature heating purpose (e.g. domestic hot water etc.) as well as for cooling in summer.**

Splitting the intervention into 4 phases of implementation, the expected benefits will be THE REDUCING OF 5586 MWh/year of the energy consumption and 1065 in terms of t CO_2/year.

Another action that was foreseen, related to the energy sector (not precisely calculated yet), is the **replacement of conventional and low-efficient public lightings system with LED technologies,** which will enable energy savings along with the costs reduction related to the maintenance of the system.

★ Mobility

Genoa has about 600,000 inhabitants that lives in 73.53 km^2, representing the 31% of the municipal area. About 302,000 trips are registered during the morning peak hours in the urban territory.

Highway, with its 7 toll gates, is very important in the distribution flows in the urban area: one toll gate “Genova Voltri” is located to the east of the SUL and connects the port (and its trades), too.

The presence of 21 railway stations and the ticket integration between buses and railway carried out the growth of the use of the rail to move within the urban area (along the coastline).

The most relevant infrastructural intervention in Voltri will regard the **railway “metro” station** which will connect the western outskirt of Genoa directly to the centre thanks to a frequent service of small trains, similar to a metro system. **A node with public transport terminal bus** will be realised nearby the new railway station. Moreover the urban mobility plan foresees the realisation of an **interchanging parking**.

The contribution of the Metro Railway system in Voltri and the realization of the related intermodal hub (simulate during the preparation of the SEAP) will be about -772.2 MWh/year and -206.5 t CO_2/year.

★ ICT and smart grids

The main Smart Grids measures that can be planned in Mela Verde are the following: **Electricity Grids preparation and empowerment and Active Demand/Smart Info**. Some **interventions on ICT sector** was foreseen (and calculated) already in 2010 for the preparation of the SEAP and they are now ongoing or completed. The reducing of

energy consumption in consequence of Enabling infrastructures' interventions can estimated in -2222 MWh/year and -555 t CO_2/year.

Conclusions

In the context of Transform Project, **Genoa SUL is an interesting showcase of the preliminary phases in an ambitious urban smart development**, which will help Buddy Cities and others interested in replication better understand the steps to be taken in the process towards a smart district and a smart city.

The present IP offers a matter of debate regarding the crucial question on how downscaling energy planning from the city-wide to the district level, using the Transform approach.

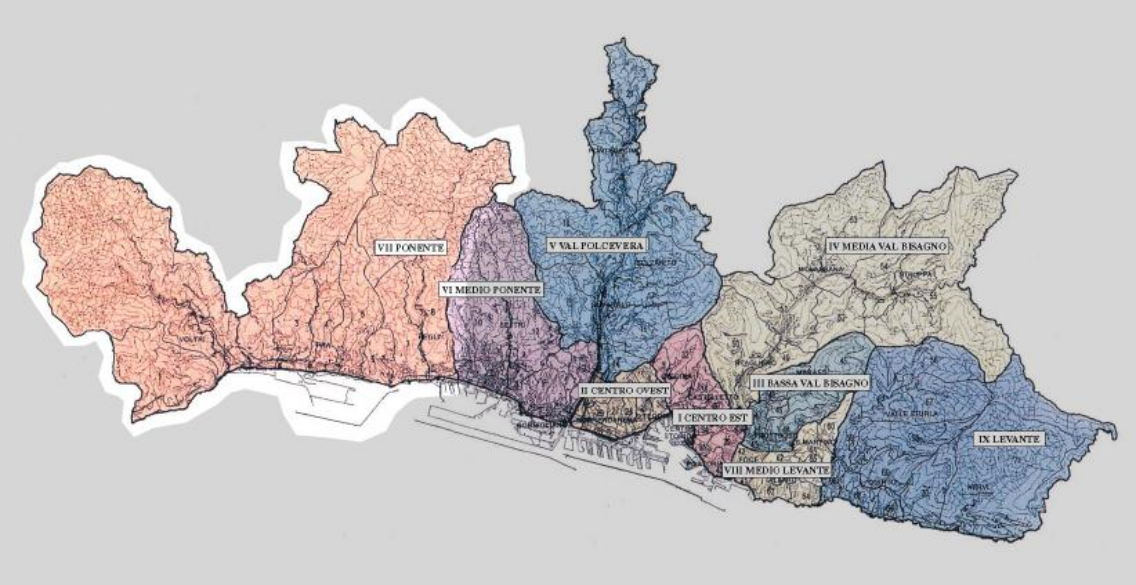
What it came up is a photograph of different colours: from one hand the work already done permit to take into account the complexity of the case, due above all by governance aspects; from the other, such kind of awareness makes the Municipality and the other involved actors conscious of the limits and the gaps of the process so far.

1. Background and context information on the SUL and the city

1.1 Description of the area and its overall development

The neighborhood of Voltri is located in the innermost point of the Gulf of Liguria and on the far western suburbs (Municipio VII Ponente) of Genoa, about 17 km from the city center.

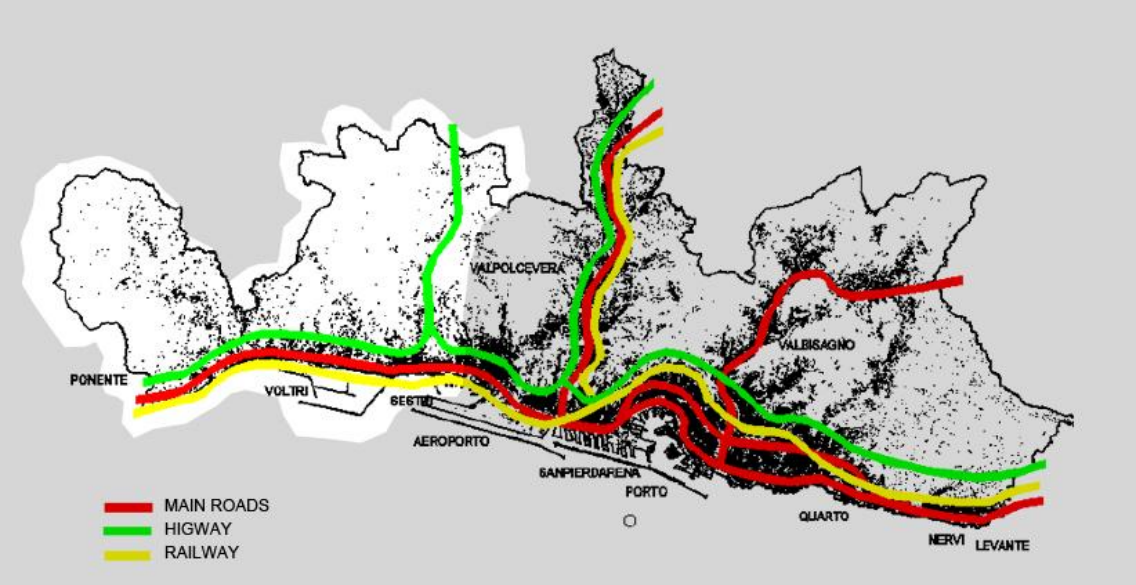
Figure 1: Genova's Municipi: Municipio VII Ponente



The territory is surrounded by the mountains of the Ligurian: Reixa (m. 1183), Faiallo (m. 1138), Tooth (m. 1107), Costa Cerusa (m. 1032), Martin (d. 1001).

The Voltri area has strong historical and cultural identity and in the past they have played a significant role in the local economy. In 1926, Voltri's autonomy was removed by incorporating it in the city of Genova the economic structure axis rotated and the networks of relationships have focused mainly on the coastal axis resulting imbalance of the ancient links with the city center.

Figure 2: Mobility: main road, highway and railway networks



As for the mobility and transport infrastructure, Voltri's territory is crossed by:

- ★ SS1 Road (Aurelia), historical road connecting Rome to France
- ★ SP456 Road, connecting to Piedmont and Northern Italy
- ★ A10 (Genova – Ventimiglia) motorway
- ★ A26 (Voltri – Gravellona Toce – Sempione) motorways that connects Genoa and Liguria with the Po Valley and Piedmont, going up to the north, with the Simplon Pass
- ★ railway line Genova – Ventimiglia
- ★ municipality and local bus lines

The coastal stretch of the coast of the Mela Verde area in Voltri, between the mouths of the Leiro and the San Giuliano rivers, is characterized by a strong heterogeneity of urban functions and by a lacking local road system.

Figure 3: Mobility: bus network

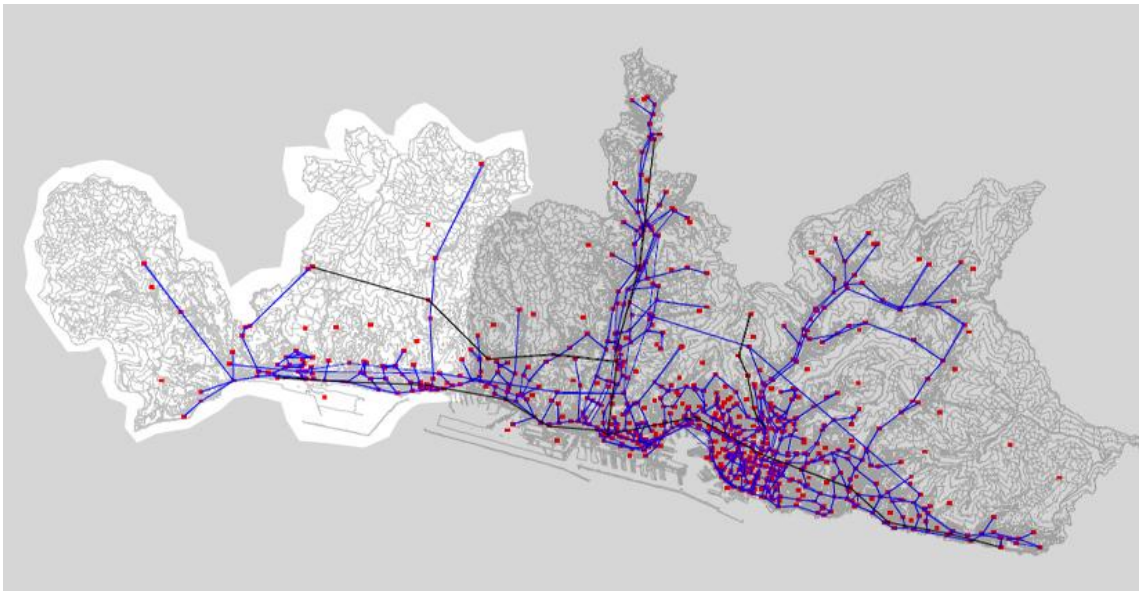


Figure 4: Mela verde area

In addition to a small portion of a residential building located between the banks of the Leiro river and Via Don Giovanni Verità and a commercial assistance activities and to vehicle mobility buildings, within the area can be identify:

- the railway facilities,
- the local Carabinieri barracks,
- a mid-sized commercial activity,
- a hotel with a parking area,
- some sporting facilities,
- a ship yard,

- various buildings for sports clubs and associations, b
- each clubs and other businesses,
- activities connected to the port.

The area addressed by this framework occupies a surface area equal to approx. 30 hectares, mostly public: RFI (Italian railway Network) areas and buildings, predominately Port Authority land in concession to associations and operators, private residential buildings located on the margins.

Within the Regulatory Masterplan (PUC in Italian) many development action are focused on Voltri and on the Mela Verde area on different topics.

In particular:

- concerning the **socio-economic and infrastructure development:**
  - the enhancement of connecting infrastructure north-south and east-west from the Municipality of Genova foresees the realization of the metropolitan rail service Voltri-Nervi
  - the enhancement of intermodality and use of public transport push Voltri neighbourhood towards the realization of interchange parks and the strengthening of public transport to hill areas and of the “Navebus” (boat service) extention from Pegli to Voltri
  - the re-launch of house policies see in the future years the conversion of the former “Coproma” building in health and social services
- concerning the **spatial organization of the city** and **qualification of the urban image**:
  - promotion of the city compact and enhancement of public space trough the creation of more pedestrian areas of quality
  - architectural, landscape and environmental promotion of the city crossing axis and redevelopment of the image of the city with the requalification of Voltri historical center
  - strengthening of the link with the sea and promotion of interventions increasing the visibility of water, the accessibility and usability of the waterfront through reduction of built-up areas and visual barriers creating new public beaches, accessible through pedestrian and cycle paths and completing the east side promenade

Overview on programmatic documents and vision: introducing AGSC

While other cities were thinking about their future and development paradigm concerning smart urban evolution, Genoa chose the way of the building up of a strategic vision by means of an integrated planning, a strong commitment of the City Council around crucial matters of debate and the constitution of an Association (Genoa Smart City association AGSC) in order to set out a process in a coordinated way. AGSC is composed by the Municipality, Enel and University of Genoa as co-founders and about 90 members (enterprises, people associations, territorial and research entities). AGSC is the reference organism for all the activities related to the overall strategy carried out by the Municipality but also by the most relevant local stakeholders.

Green Apple project aims at planning a sustainable Mediterranean district in Voltri, the westernmost city quarter, adopting solutions using innovative technologies while respecting lifestyle, environment, local identity and promoting economic development. The area is highly complex as it includes residences, commerce, industrial activities, train station, port activities, sports centres, beaches, agricultural activities, ancient villas and a historic centre in a district with a strong identification with fishing and agricultural traditions; it is also Genoa's main gateway to the West which includes touristic, industrial and commercial connection with France and Spain.

Green Apple was the result of a Cat Med project aiming at finding KPIs and characteristics for a Mediterranean smart district, respecting and using local techniques, expertise, traditions, materials. It was started and carried out by the Urban Plan Department working with the International Relations Department. Results can be seen at Cat Med web site.

The framework for the Implementation Plan in terms of energy is given by Genoa's SEAP, whose translation into concrete actions is expected to be decided during the implementation process.

1.2 Structure of population and businesses

The city of Genoa is one of the so-called “Slow transition cities” and consists of a few major urban Italian areas that have experienced significant restructuring of the economic base, but in which the manufacturing industry still maintains characters.

This group of cities is also characterized by the evident dynamics of population decline: the population is stagnant in the decade (while other urban areas of the north-central Italian grow), the process of aging is very marked as demonstrated by the high number of elderly (41.2 compared to an average of 34.0) and the high mortality rate (13.2 compared to an average of 10.5).

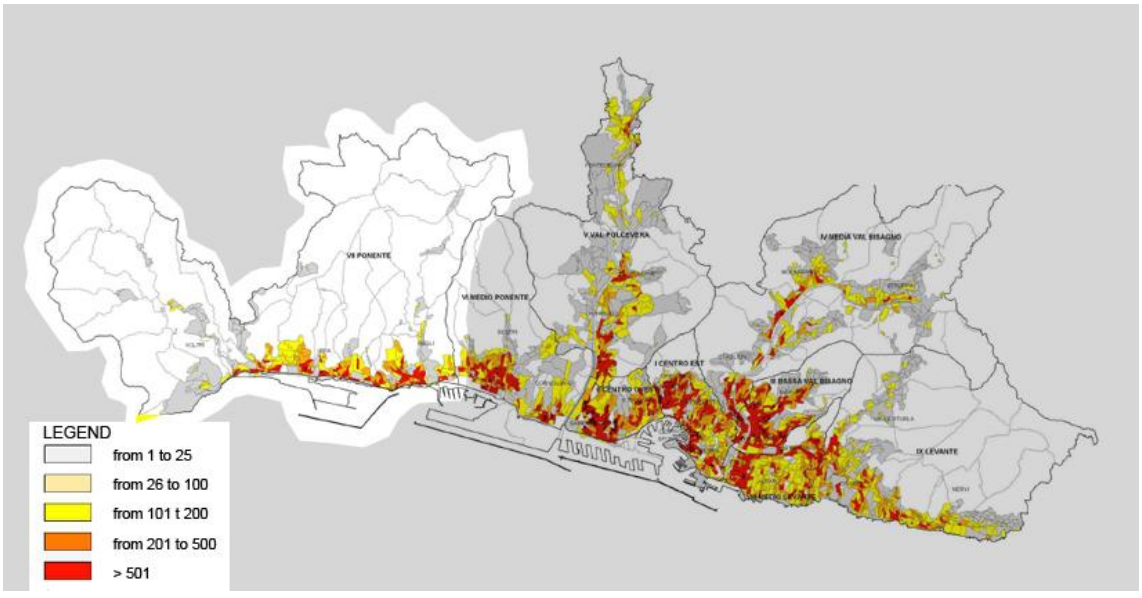
In the Voltri area, in particular, the population variation index shows negative values: in the last 15 years the Municipio VII Ponente recorded a -3% decrease of the resident population, showing the worst results among all the Genova's Municipi.

Plus, the elderly index shows values higher the Municipal average: the percentage of over 65 is particularly high, with values around 30%. Vice versa the presence of foreign born is lower than average, it being contained between 4% and 6%

Voltri and the Municipio VII Ponente has one of the lowest values of the presence of resident foreigners 3.6% (vs. 7.5% as Municipality average).

	Status quo (2013)
Total area	4,092.72 ha
... of which built up area	279.86 ha
Nr. of population	12,758
Nr. of households	6,494
Density	3.23

Figure 5: Urban density



Resident population age										
0-5	3-5	6-10	11-13	14-18	19-24	25-44	45-64	65-74	> 75	TOTAL
259	293	439	301	479	549	2,947	3,748	1,751	1,992	12,758

The west area of Genoa has been affected in recent years, on one hand, from the disposal of industrial activities. and on the other by the transformation of the infrastructure system with the construction of new commercial port of Voltri, the rail connection with the lines of the pass, the connection to the motorway network.

The new Porto has given a different connotation of the entire area by strengthening the economic structure and a consequent rebalancing of the relationship employee/active.

The territory of Voltri presents also different small and medium enterprises realities, sometimes limited by weak transport infrastructures. There are numerous cases of unused buildings and whose state of abandonment has determined, in some cases, situations of deterioration and decay of the associated buildings.

It appears quite clear that the economic recovery is related to infrastructure interventions to be started under a careful use of public resources.

The areas intended for production activity from PUC in the urban coastal strip are limited to those provided in the port area: deposits and self-transportation activities and Costaguta shipyards close to the river San Giuliano.

2. Development process (so far)

2.1 Insight in the ongoing development process

The two main stakeholders (RFI and Port Authority) are very big and powerful and are connected to the urban system in a vast number of issues so the decision on how to develop Green Apple could be influenced by external factors, including also national economic and financial issues.

Major stakeholders relate to the Mayor and Alderpeople; local stakeholders are partly contacted by the Municipio, partly by the Municipality. People's involvement is mainly managed by the Municipio. Genoa Smart City Association will help in the process.

Italian port systems foresee that each of its 27 ports has an Entity, answering directly to the State, called Port Authority. It is responsible for regulation, applying rules and laws, promoting traffic and port development following law 84/1994 which regulated in detail its activity. Among other things it must coordinate its own structural and physical development contained in the so called Piano di Sviluppo Portuale (Port Development Plan) with the city in which it is located, but the coordination and agreement depend also on political issues; the President of the Port Authority is named by the Minster of Transport choosing among three names proposed by Municipality, Chamber of Commerce and Province and need the Region's President's approval. Also the Port is subject to special laws and maritime law which in some cases influences also land decisions.

RFI is the national railway infrastructure owner, in charge of developing, maintaining all railway infrastructures and consenting, according to European law, all proposed users to use them. It is a major player owning a big portion of the Mela Verde Area and its commitment to the project will influence decisions as well as a very complex negotiation which need to be carried out in order to decide exactly what to do in the concerned area.

2.2 Basis for decisions – available data and detailed knowledge

Heating data

So far the data collection activities carried out by the project team (by using municipality's databases) on the Mela-Verde area has been centred around heating consumption for 58 buildings and facilities which have been identified to be of interest for the Transform project, and all these buildings (100%) have been quantified in terms of

- address and localisation/geographical coordinates,
- external above-ground dimensions,
- Number of above-ground storeys .

Since heavily misleading and therefore deemed unacceptable to put missing data = ZERO, the project team decided to estimate crucial missing data on the basis of the best available evidence. Specifically, as long as exact reliable data from the field remain unavailable, for the time being missing crucial data are being estimated on the basis of typical indicator values (such as type of building use, surface per inhabitant, energy consumption per surface area etc.) collected from the average of similar buildings located in the neighbourhood.

Data collection activities shall anyway continue for the whole duration of the Transform project, and sizing calculations, figures and data will be continuously updated as soon as new data from the field become available, allowing thereby to continuously improve and increase reliability and robustness of sizing results and project outcomes.

2.3 Legal framework, tax incentives, aid schemes

The regulatory framework for energy issues derives from the national, the regional and the local government levels.

At national levels we have the binding targets for 2020 generated by the EU **"Climate action and renewable energy package"** launched in 2008.

	Italy	**Norm**
RES objective on final gross consumption, 2020 (S_{2020})	17%	*Dir 2009/28/CE*
Greenhouse gases reduction in 2020 in relation to 2005	-13%	*COD 406/2009/CE*
RES in final gross energy consumption in transport	10%	*Dir 2009/28/CE*

The RES objective has been broken down to the regional level through the so- called "Burden Sharing" decree, which assigns to Liguria a binding target of 14.1% for 2020.

At **national level**, Italy has taken steps in recent years to transpose other European Directives relating to the energy performance of buildings and the energy certification of buildings and has set up incentive schemes in terms of tax deductions that each citizen can get.

On the other hand, The **regional** government is in charge of regional energy planning which means that it has to define the actions to take in order to reach the Burden Sharing Objectives mentioned before. The three main macro-objectives of the under re-scoping Regional Energy Plan (Burden Sharing, economic development and communication) are targeting RES promotion (electrical and thermal), "smart" distribution networks (smart grid), and the promotion of energy efficiency in the residential, commercial, public lighting, business and production cycles sectors.

It is important to highlight how the on-going regional plan foresees the continued and active involvement of local authorities both in the planning of the actions and in their monitoring, especially in light of the Covenant of Mayors and Smart Cities initiatives. Over the years, the regional government has launched specific norms for energy performance of buildings which each municipality has to conform to during authorization process.

As per the City of Genoa (**municipality level**), its SEAP was internationally regarded as a reference document for completeness and correctness with the goal of achieving a 23.7% reduction of CO_2 by 2020 compared to 2005, through interventions in all key sectors and a cross-cutting approach that combines all City planning tools.

The SEAP defined Genoa's ten-year energy policies, focusing on:

- spatial planning, through the City's Urban Plan and Urban Mobility Plan
- the construction sector through adoption of standards for energy efficiency in the new more stringent Building Regulation
- renewables, with installation of photovoltaic systems on schools and sports facilities
- transport, with a strategy to strengthen local public transport through reorganization of the urban mobility system.

The SEAP was also the starting step in becoming a “Smart City”, a process which now includes research, industry, institutions, finance and civil society, reunited in the “Genoa Smart City Association”, counting over eighty members and chaired by the Mayor.

The energy transition as well as the application of smart appliances/infrastructures, building retrofitting and new infrastructures can be financed through a number of facilities. While there is no possibility to find a single source able to finance the whole transformation picture, it will be possible to combine different sources in one business plan, so that it might be necessary to divide the identified investment programme into lots.

The available funds are:

EU related funds

- ERDF: the Operational Programme for Liguria, period 2014-2020, assigns a budget to innovation, energy saving and smart transformation and it will be made available mainly through capital funding for hard measures.
- ERDF PON Metro: the national operational programme for Metropolitan cities devotes capital funding to the biggest Italian cities (such as Genoa) for infrastructures development, digital agenda, buildings renovation, environment interventions.
- Horizon 2020: the EU programme can finance a series of smart applications/infrastructures/methodologies according to the various calls that are periodically launched. The “Lighthouse” call is particularly interesting and Genoa is targeting it for the transformation of a district.
- ELENA: it is the BEI facility which finances the elaboration of feasibility studies and business plans to be then launched for a tendering contract. While the investment needs other sources of financing. Therefore ELENA is a complimentary fund.

National funds

The Italian government offers a series of incentives for energy, targeting both private and public beneficiaries:

- Private: Small biomass heaters can be financed by Conto Termico while small energy saving measures can benefit of the 65% tax deductions
- Public: small energy efficiency interventions can be financed by Conto Termico

- Renewables are financed through Feed in tariff and Green Certificates depending on size
- Bigger energy efficiency interventions are incentivised through White Certificates (beneficiaries can be ESCos, DSO, public bodies and residential multi dwelling buildings)
- PPP (Public-private partnership): it involves a contract between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project
- Third Party Financing: with this approach ESCos make the investment that is paid back through the payment, by public authority, of a fee for a certain number of years that is covered by the energy savings.

3. Status of the energy system and related themes and enabling themes

3.1 Energy systems and networks

Genoa has 611,000 habitants, of whom 401,824 are energy customers, and aims to cut the CO_2 emissions baseline of 2.3 million tons by 24 per cent. In Genoa there are 396,734 smart meters installed in the end-user's households.

Beside Enel has laid out a plan which will offer support to both local municipal authorities in their Sustainable Energy Action Plans (SEAP) targets, where the most import elements to address are smart grids, electric mobility and the active involvement of consumers in the energy system. This will contribute to reach the total emissions targets fixed by the Municipality of Genoa, in view of their commitments by 2020. Moreover Genoa is frontrunner city in the electric mobility development at urban area. Notably there are already 17 installed public and private recharge infrastructures.

The most significant actions that Enel has realized on the distribution grid of Genoa are:

- Technological upgrade according to the smart evolution of the grid of 45 MV-LV electrical substations on the basis of the state-of-the-art solution (other 22 substations scheduled for the next years);
- Voltage level adaptation according to the EU standard (more than 5,000 customers involved).

As far as the Smart Urban Lab of Mela Verde is concerned, the only smart grids technology currently in place is the Smart Meter System. Therefore there will be the opportunity to implement further Smart Grids measures, such as: electric vehicle recharging infrastructures or active demand devices linked to Smart Meter System and innovative functionalities for RES integration/storage facilities.

The Mela Verde area is served by a gas network and by an electricity network (add features-maps later on). All buildings are heated by either natural gas or diesel. No district heating or energy storages are in place in the area nor significant renewable energy plants. No CHP is present in the area and no waste heat is generated.

There is in place an electricity distribution grid of medium and low voltage.

One of the two greatest challenges is energy saving in buildings. Given the location of the Mela-Verde area along the coastline, one of the most promising options being proposed and investigated by the Transform project is to improve efficiency and to achieve significant energy (and probably also cost) savings for final consumers by replacing the presently adopted heating systems using fossil fuel boilers (mostly natural gas) by installing and adopting sea-water coupled heat-pump systems. This action will however need to involve citizens and local stakeholders as well as to identify possible financial solutions to promote investments.

The second important challenge is the retrofitting of public/social buildings throughout the area (swimming pool, medical practices, library, schools, etc.).

A further challenge derives from the recent flooding events that made the rivers in the area overflow their banks and cover streets with mud. Therefore the implementation of a smart alert system is of primary importance maybe in connection with smart lampposts.

3.2 Buildings, industry and services – energy demand and energy efficiency

The energy demand in the Mela Verde area is mainly driven by the residential sector.

Buildings belong to 3 main construction periods: medieval ages (historical centre), 60ies (on the hills), and 1800 (along the main roads).

The greatest challenge is the reduction of buildings energy consumption by retrofitting (windows, insulation) and the replacement of conventional (fossil fuel) boilers for heating purposes by highly efficient sea-water coupled heat pumps.

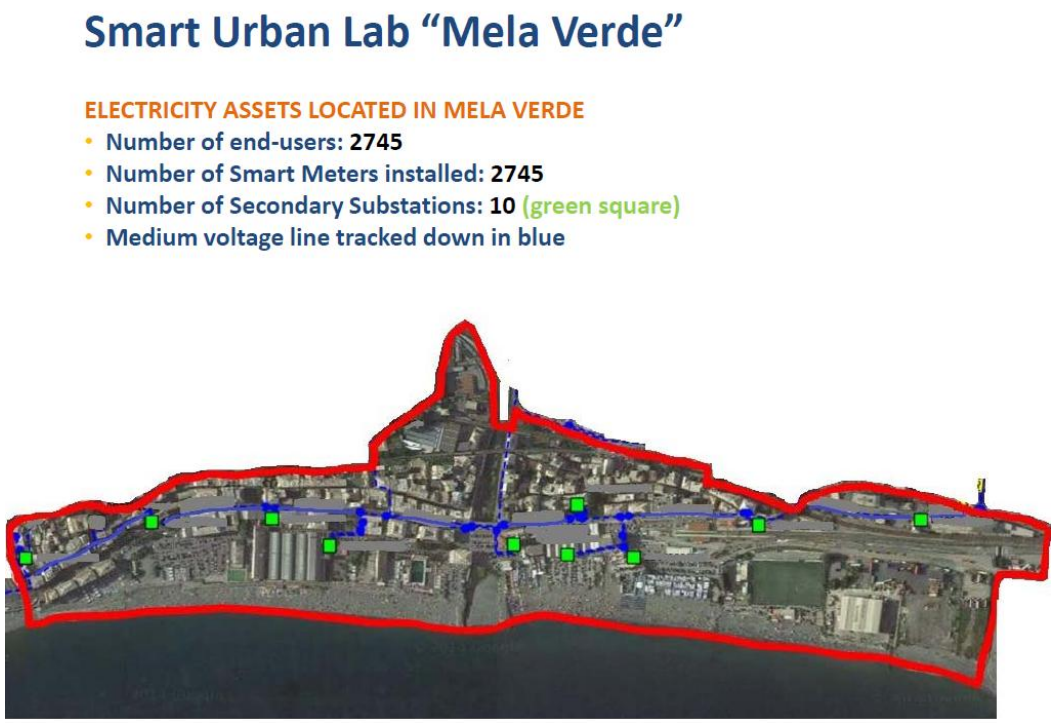
Private buildings retrofitting can be financed by tenants by using the tax incentives currently in place at national level for the implementation of energy saving measures, while public buildings can take advantage of capital financing (ERDF funds) or Energy Saving Contracts. In the latter case, the investment is carried out by ESCos, which is paid back in a certain number of years, by energy saving. The largest investment is however the heating-cooling plant based on sea-water coupled heat pumps. In this case, the utility company distributing gas in the city of Genoa (and partially owned by the Municipality) seems to be the first operator to be involved.

Anyway, the connection to the DH system is foreseen only for those buildings which guarantee technical and economic feasibility. Below the inhabitants/surface which can be involved in the sea water coupled heat pumps district heating system.

	Current Thermal consumption (GWh)	Electrical	Surface (m^2)	Inhab.
residential	7.4		114,681	2,000
tertiary	1.3		33,088	

About Electrical network, available data on Mela Verde can be summed up as in the following map:

Figure 6: Electricity assets located in Mela Verde Area



3.3 Local renewable energy sources

Up to now within the Mela Verde area renewable energy sources are not used. For the future the introduction of sea water coupled heat pumps is investigated, and specifically the reversible type allowing to provide both heating in winter period and cooling in the summer period. It should be noted that only the winter service is recognized as renewable energy source. On the other hand, summer service will require additional

consumption. This could be obviated through the use of auxiliary photovoltaic panels. In addition, during spring and autumn is possible to implement the “free-cooling” directly using the cooling effect of sea water without a refrigerating machine, with more large energy savings.

Renewable sources within the Mela Verde area are several, such as photovoltaic panels, solar thermal technologies and sea water. The potential of renewable energy is very high:

- Regarding the solar energy systems, the solar irradiance values are high, especially if compared to other cities at similar latitude. Plus, the horizontal traditional building roofs allows more easy installation of photovoltaic or solar thermal panels.
- Considering instead the sea-water coupled heat pump technology, since it has a high availability of the resource, the exploitation is dependent only on limit of plants installation and on the possible interactions with the environment which should be pre-emptively assessed.

All the renewable energy sources considered in the Green Apple area are also available in the territory of Genoa. The use of seawater coupled heat pumps obviously relates only to the coastal belt of the Genoa Municipality territory (extent of 42 km).

So far there are no business models for the implementation of renewable energy sources plants.

Regarding the use of renewable energy sources, within the Green Apple area of Voltri the installation of sea-water coupled heat pumps is intended for public buildings air conditioning located along the coast and then for private residential buildings in close proximity. In this way, public buildings would be energetically independent and the Municipality would get an economic advantage. As early intervention, the proposal is to start with a pilot plant in order to test the effectiveness of the installation and later get to more installations along the coast. This first intervention could be further integrated with PV panels in order to minimize the energy consumption.

3.4 Mobility

Genoa has about 600,000 inhabitants that lives in 73.53 km^2, representing the 31% of the municipal area. About 302,000 trips are registered during the morning peak hours in the urban territory. In Figure 7 is represented the modal split related to trips in the morning peak hours (6.30-9.00) in the urban territory.

Considering motorized trips the values become about 60% for private motorized transport,10% by rail and about 31% by busses.

Both Highway and railway are very relevant in the urban mobility.

Highway, with its 7 toll gates, is very important in the distribution flows in the urban area: one toll gate “Genova Voltri” is located to the east of the SUL and connects the VTE, too.

The presence of 21 railway stations and the ticket integration between buses and railway carried out the growth of the use of the rail to move within the urban area.

The main road that cross the SUL connects western part of the city with the centre. In this road the service of public transport is performed by bus with a frequency approximately about 8 minutes. Other minor lines links the cost with districts on the hills (Figure 8).

Figure 7: Modal split

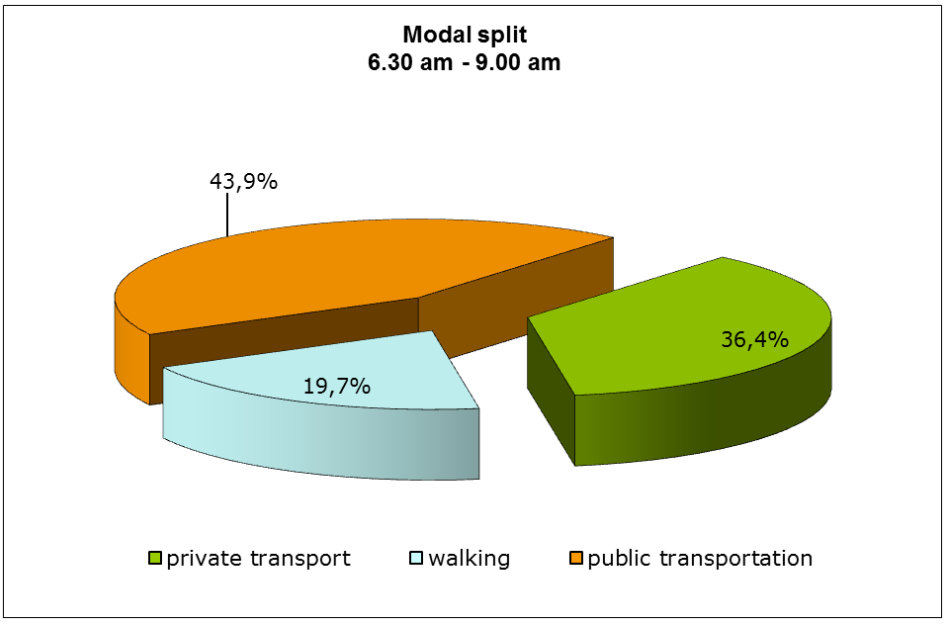
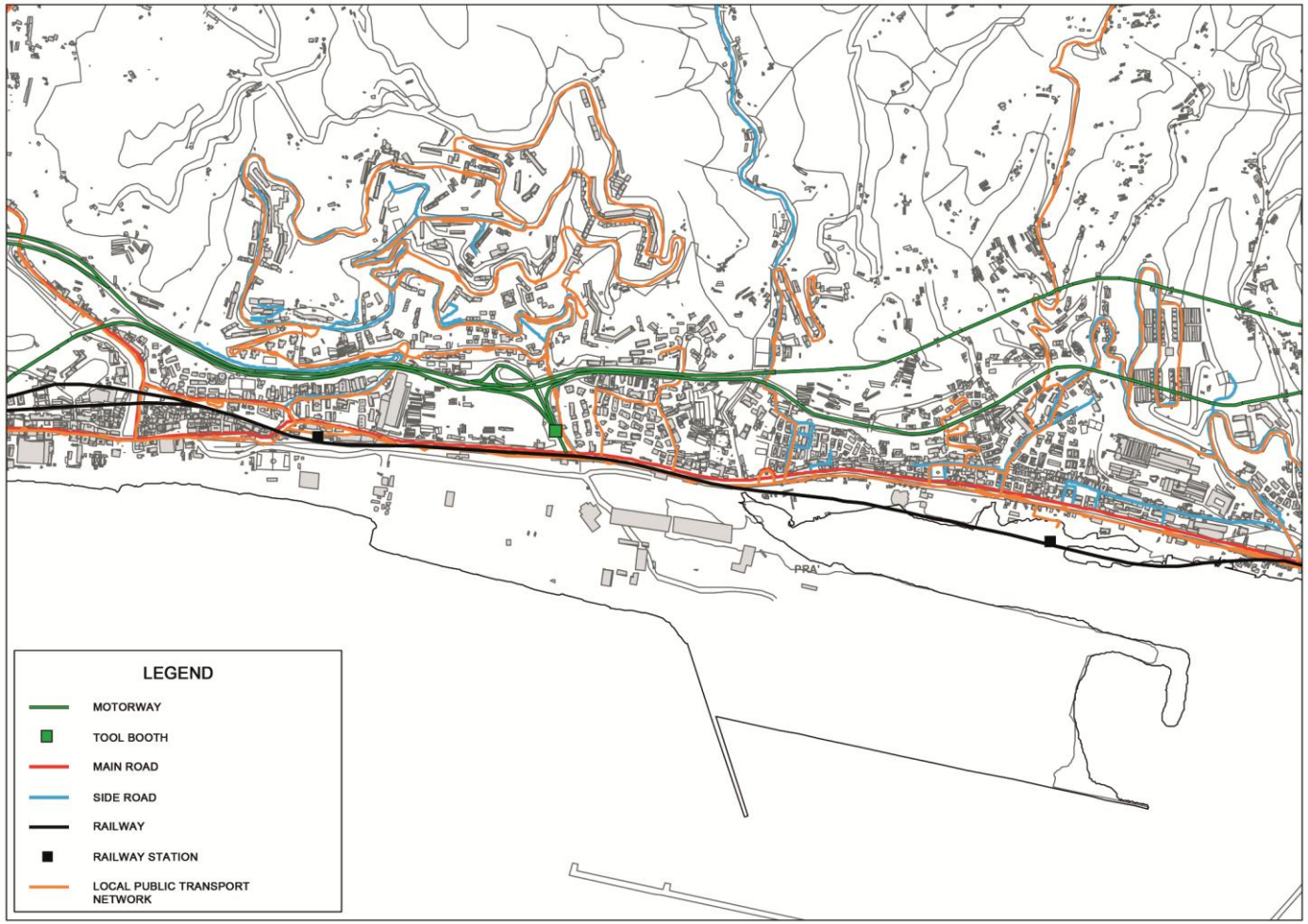
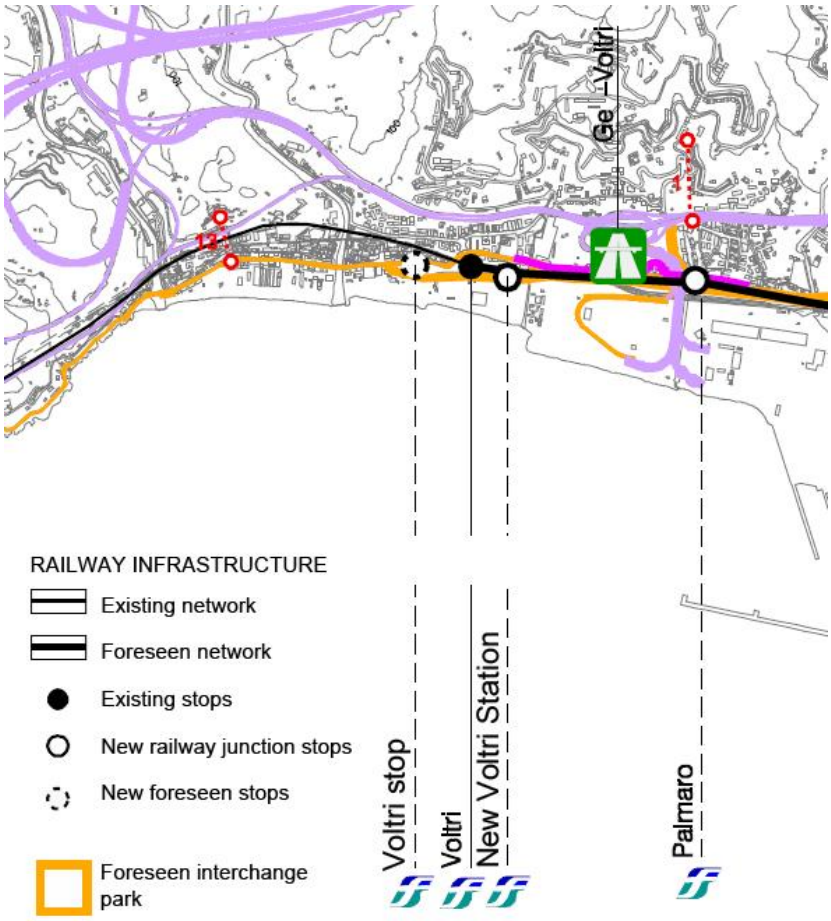


Figure 8: The mobility networks in the SUL area



A wide parking pricing policy, called “Blu Area”, has been adopted in all the central area of Genoa with positive results in terms of modal shift, habits change and public acceptance. The target area has been divided into smaller areas; within these areas the residents pay a subscription to park with no limit, while the non-residents have to pay on a time basis. In this way, as the areas are quite small, all the trips performed even within the central area of the city (and not only from outside) are subject to a charge which is dependent on the parking time. The only trips that are not subject to pricing are those crossing the centre. This number is anyway decreased in a significant way because of the re-organisation of circulation performed with the application of the last Urban Traffic Plan. This system is not applied in the SUL where parking lots are free.

Figure 9: The infrastructure in the City Development Plan



The most relevant infrastructural intervention in Voltri will regard the railway “metro” station which will connect the western outskirt of Genoa directly to the centre thanks to a frequent service of small trains, similar to a metro system. A node with public transport terminal bus will be realised nearby the new railway station. Moreover the urban mobility plan foresees the realisation of an interchanging parking.

The future network is represented in Figure 9 that reports a map from the City Development Plan.

3.5 Use of ICT and smart grids (enabling theme)

In the City of Genoa, included in the area of Mela Verde, there is in place the so-called Telegestore which is a remote management system on which is based the Enel Smart Metering System.

Currently, the existing distribution grids is able to support the electricity requests of local customers. However, the future urban and infrastructural development of Mela Verde might require to implement innovative smart grids measures to increase the efficiency of grids and enable new innovative services (e.g. electric mobility and active demand).

Currently, the Smart Grids solution in place it is the Enel Smart Meter System by which Enel Distribuzione can perform bidirectional communication with the meters enabling the real time management of the grids thanks also to the collection of real time data. In particular, the Smart Meter system allows to easily read the consumption of Enel Distribuzione’s customers and remotely manage contractual operations. At the same time, it can gather relevant data on the quality of electricity supplies while monitoring, in real time, service continuity, intervening promptly in case of network failure or malfunctioning. The Smart Meter system can be seen as the “brain” of the Smart Grids being able to increase the quality of the service as well as to improve the energy and operational efficiency.

As previously stated there are in Genoa 396,734 smart meters installed.

Throughout the City of Genoa there are 17 Electric Vehicles recharging infrastructures that are managed and controlled by an ICT application so called Electric Mobility

Management System (EMMS) developed by Enel. The main functionalities of the EMMS are:

- Data acquisition and transmission of every single charge procedure
- Remote monitoring and availability check
- Recharge process remote control
- Customer info through display (Localization of the EV recharge stations).

4. Overall development visions, objectives and targets, future organization and management of the SUL from the policy perspective

4.1 Objectives, targets and KPIs, development vision and end-state of urban development

According to the Transform approach, the Implementation Plan is understood as a strategic document which can be used to support the development of a strategy for an urban area both, in terms of supporting and organizing the development process (mainly during its elaboration) and in terms of laying down the content related framework and important themes.

Before concentrating on Voltri, it seem to be useful to give a glance to others component cities, in order to better understand differences and similarities.

Differences in the understanding of the function of the IP may stem, amongst others, from two main factors: the different realisation phases the SULs are facing at the moment (just starting the development process versus already worked intensively for several years); contrasting planning ideologies that either favour a top –down development predominantly lead by guidelines or a municipally governed bottom up development.

Specifically, the main “intention” regarding IPs by the partners ranges from:

- a visionary framework in a rather open, bottom-up process (Amsterdam),
- to a process-orientated strategy to organize (Lyon) or structure a platform of dialogue between the most important stakeholders in order to come to a comprehensive strategy for the area (Vienna, Liesing Groß Erlaa),
- and finally to a more content-related, comprehensive strategy development (Copenhagen), the sharpening, deepening and enhancing of an existing strategy (Vienna, aspern Seestadt) or the speeding up of the implementation process in the next phase (Hamburg).

In the case of Genoa, due to the early stage of the SUL , the IP aims also to support **the promotion and the actual decision for a realization**. The understanding of the

Implementation Plan is closely connected to its embedding in the municipal landscape of programs and strategies, which are variously related to the Smart City conception.

As known, Smart City is above all an urban planning task and this also means that every society must develop a self-image along with a mission statement that serve a vision, define goals and set things in motion.

The challenge for Genoa is trying to decline this concept, referred to the overall city, to one selected small district: Green Apple in Voltri.

Before analysing the current local situation some theoretical assumptions are needed in order to comprehend the general objectives of the Genoa IP.

The perspective on green apple and the TRANSFORM approach

Smart cities are a considerable challenge for the entire urban apparatus. How do you ensure that new expansion areas can take advantage of all of the opportunities for redevelopment while at the same time enabling the historic sections of the city to progress in a smart way?

From an urban planning point of view, it is important to understand what the difference is between a new smart city and an existing city in which a smart project is being implemented. The latter may be easier to achieve (or fastest) but we know as well that a key factor of success in this context is not necessarily just the use of new technologies or solutions but also the revival of traditional elements. So, if the concept of the smart city is not to be used merely as a trendy shell, it is crucial to address the needs and special circumstances of a specific city, with all the richness of its background.

And when we speak about existing city, we straight refer to complexity.

Transform project has an interesting approach concerning urban complexity in our modern age, starting from one of the most important components of the city: energy.

TRANSFORM wants deliver a strategic energy **Transformation Agenda** for each of the participating cities, addressing main components that influence the chain of energy production and consumption, the potentials for efficiency, necessary stakeholder processes and a financial strategy. The transformation agenda will be made operation through detailed **Implementation Plans**, for specific districts per city. Both products

are supported by data analysis and qualitative support decision models and will prove that better economies are fount through integration of measures, sectorial views and through the cooperation of stakeholders.

The Transformation Agenda will be brought to the operational level in the form of an Implementation Plan, which will be drawn up for specific city districts.

Summing up, specific outcomes of TRANSFORM are:

- ★ Local Transformation Agenda for each of the participating cities
- ★ Implementation Plan for city districts

Why? This is one of the main reason of our project: as the DoW says “It is necessary to improve the link between strategy (Transformation Agenda), operations (Implementation Plan), the business model and the budget(cycles) of main stakeholders, in order to ensure the uptake of low carbon technologies and the further reduction of CO_2”.

In fact, Transform would like to contribute the criticality confirmed by EU: the climate and energy approaches of European cities adopted so far have not all proven to be successful in their implementation and link to the city budget, stakeholders’ budgets and aspects of time through respective investment agendas. At the same time, the implementation of measures (e.g. heating and cooling, energy storage, electric mobility, water purification, waste collection) at the district or project level has been disconnected from city scale strategies. The project intends to make a step further in this field, by providing a replicable and tested framework for the production of a strategic Transformation Agenda for the city as a whole, combined with district Implementation Plans.

Is still pending a matter of scale between city and district.

Transform address the question of scale “by combining the district scale in smart urban labs with the level of the city as a whole – the strategic level where transformation agenda’s will be made”.

But what is “right” (or suitable) the level of scale which requires a strategic approach?

And what is the “right” (or suitable) stage we need to deploy a strategy at?

How can be the city strategy declined at the district level? And can be this step useful to the operative interventions?

Reflecting on Green Apple, the Genoa Transform team answered positively to the last question.

So, the present Implementation Plan has the main aim to try to investigate what does it mean to apply the city-strategy (contained in the Genoa Transformation Agenda) in the planning activity that is needed for a smarter Voltri. The present tool can be defined as a sort of “experimental urban planning tool” which receives the indications of the project and tests them in “the middle of the field”. How? By means of the methodological steps built in the city-TA and here purposed again but at the district level.

Expected results: a visible advancement on the reasoning of the Municipality on Green Apple within its internal process towards the effective realization.

Why can be suitable for Genoa IP applying such a kind of approach?

For two main reasons:

- Voltri is now at a very early stage in its process: the district is already in search of a Municipal consensus that shall be evidently gathered in order to accomplish the interventions’ agenda. Therefore, it is not an operative level of implementation, but at the beginning of the elaboration of a coordinated design of individual selected projects. So, in the specific situation of the Genoa SUL, a step before the operative implementation (and preparatory to that) is needed.
- The previous step that is required for Green Apple is at the strategic level and need a tool which can deal with strategic contents. Above all the complexity of the fragmented ownership of the land (Municipality, National Railway and Port Authority) makes it necessary: we can say that complexity means strategy, definitely. The Transformation Agenda and its methodology were taken under consideration by the Genoa team as the approach suggested by the project that can be contribute to the development of the renewal of the area.

The district TRANSFORMATION agenda

For starting the process, some principles of the city TA are here synthesized.

As stated in the Working paper, the TA is not a new energy strategy, but it is a document in which the city explains what is the current situation of the energy planning and how the existing city strategy can be improved. The TA addresses the main components influencing the chain of energy production and consumption at city level: main infrastructure and sources of energy (thermal energy, electricity, gas) and efficiency potentials (i.e. macro approach at the metropolitan scale).

To improve the existing energy & climate strategy of the city: after an analysis of their existing energy strategy each city will formulate comprehensive actions and measure to improve it both from strategic and thematic levels.

Entering into the contents, in the “Part B – Evaluation of the city’s energy strategy (ex. SEAP) and transformation process” some operational steps are listed. In this section the city will proceed to an evaluation of its SEAP or city strategy progress, to compare its real development with the ideal one. This is achieved by coupling two approaches: the intake workshop and the city concept assessment. Based on the results of this two approaches, the city will identify the themes and strategic elements they will have to improve to achieved their energy and climate goal. These are the Key consideration, selected by the participants for the evolution of their IPs, that can contribute as well to the deployment of the strategy.

Translating that at the district level, we can adopt the following table:

T.A. CITY level	**T.A. DISTRICT level**
City Concept Assessment	District Concept assessment
City Intake Workshop	District Intensive Lab Session
City Key Considerations	District Key Considerations

From the city to the district concept assessment

In the city level, each city proceeds to the evaluation of its SEAP or city strategy progress by filling-in the city concept assessment.

Here below, the city document has been reported. Afterwards some comments on it are preparatory for the building up of a specific one for the SUL (see par. § 4.2).

The objective of the city concept assessment is to analyse the gap between the objectives of the SEAP (or other kind of “city energy strategy”) and the actual realisation (gap between expected and monitored impacts).

In Genoa case, the cited “plan” is not considered only the SEAP, but the synergy and integration between the SEAP and the Regulatory Masterplan (PUC in Italian), viewed by the Smart City process perspective.

The latter is not conceived exhaustively as an urban planning tool, but as a programmatic one; here, the city strategy is not relegated merely to the management of the land but, through the outline of oriented targets, declined in territorial matters, the general concept of the future urban process is driven. Above all in Genoa, where the process of urban renewal (consider the transformations occurred in occasion of the Colombus Exhibition of 1992 or Genoa Culture Capital of 2004) have been leading the city-image changes for more than two decades.

So, the Regulatory Masterplan and the SEAP are the crossroads of the deployment of the Genoa strategy: are they the tools that need to be evaluated by the questionnaire of the “concept assessment”.

Synthetically, the picture that comes from the two is a double-face image.

From one hand, the two plan have well-defined, timelined and monitored quantitative indicators, but they have not time-term budget plans. The Regulatory Masterplan does not consider by law economic aspects, but in the SEAP, budgetary indications are required and time horizons, too. However, the SEAP is not a compulsory tool within our legislative framework, even if it was adopted by the City Council, and so not mandatorily compliant or binding on others. In other words, we are speaking in terms of coherence and not of legal conformity.

Precise financial details are a lacking point for the urban planning and management tools in general, but another one is the most relevant one for the score of the implementation of a coordinated link between the city level strategy and the local district transformation.

Making comments on question 6), the PUC shows a well-performed variety and interaction of scales.

Otherwise, the SEAP does not deal with scales, but its aim of CO_2 reducing is expected to be achieved indifferently within the whole municipal territory, although it is not required that each district is able to contribute significantly to the general target. In this way, it is very “realistic”, because not all the neighbourhoods have improvable conditions to be exploited at the same manner, but at the same time the link between general energy targets and local territory is fable.

Within the SEAP there are no items related to Voltri, explicitly.

Many can be considered transversal to all the districts and able to be applied wherever, but there are not, in the planning instruments, energy description of the areas, the estimation of the potentials and the outline of situ-specific objectives. However, sometimes energy interventions are punctual and they need not a sophisticated land or landscape study. But speaking about areas of transformation, they can be quite wide and differently featured (and so differently exploited).

The absence of a “territorialisation” (or “territorial-action”) of the SEAP and its energy targets comes up as a crucial gap. Meantime, it is good the relationship between the PUC and the SEAP regarding energy targets: the overall strategy on Smart City contributed during these latest years to the alignment of the two instruments, as far as objectives are concerned.

From the IW to the ILS

From the TRANSFORM examples it seems that most of the cities are on the way or have at least planned to develop a program in order to structure future area-based developments in a similar way.

The SUL in Amsterdam can for instance be regarded as a part of a wider program.

In the other TRANSFORM cities, the SULs represent individual projects or rather pilot actions, nevertheless, there are already further municipal activities on the way: Hamburg currently develops a program to transfer the best practice experience from IBA Hamburg to other selected areas of the city, in Vienna a municipal initiative is currently being started in order to develop a standardized practice for an area-based, integrated spatial and energy planning process. Both Viennese SULs as well as the experiences from TRANSFORM cities will be taken as pilot cases for developing this

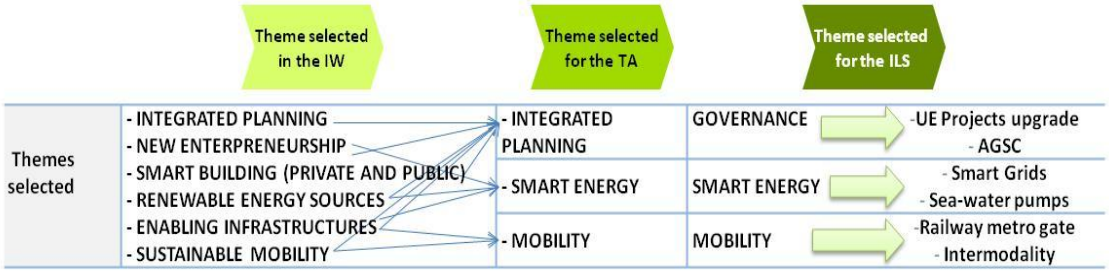
practice. Copenhagen plans to further develop such a program in case of positive experiences with the pilot implementation of Nordhavn.

In the case of Genoa, the question of coming up with a consistent planning process is very much to be considered as the outcome of Transform and the SUL. At the moment of writing there exists no formal decision on the realization of Green Apple. Questions concerning the organization, responsibilities and financing , as well as time frame of the implementation process are yet to be decided by the joined work of the stakeholders involved.

Starting from the general scopes of the Administration, the Transform team began reflecting on the relationship among the contents of the Transformation Agenda at the city level, the items of the Intake Workshop, the main aspects to be deepened during the ILS and the working groups (thematic and local) to be boosted consequently.

Here below, the resultant framework.

Figure 10: Relationship between IW, TA and ILS selected theme



For selecting key themes for Voltri, Genoa started from the process lead for the Intake Workshop.

In that occasion, Genoa used three sources for the down-selection process:

- **Smart Goals**: goals chosen by Mayor, Alder people and Directors of the Municipality
- **SEAP Actions**
- Smart City Vision as summarized in the **Smart City Decalogue's** Ten Points

During the IW participants, divided in six working groups, were invited to:

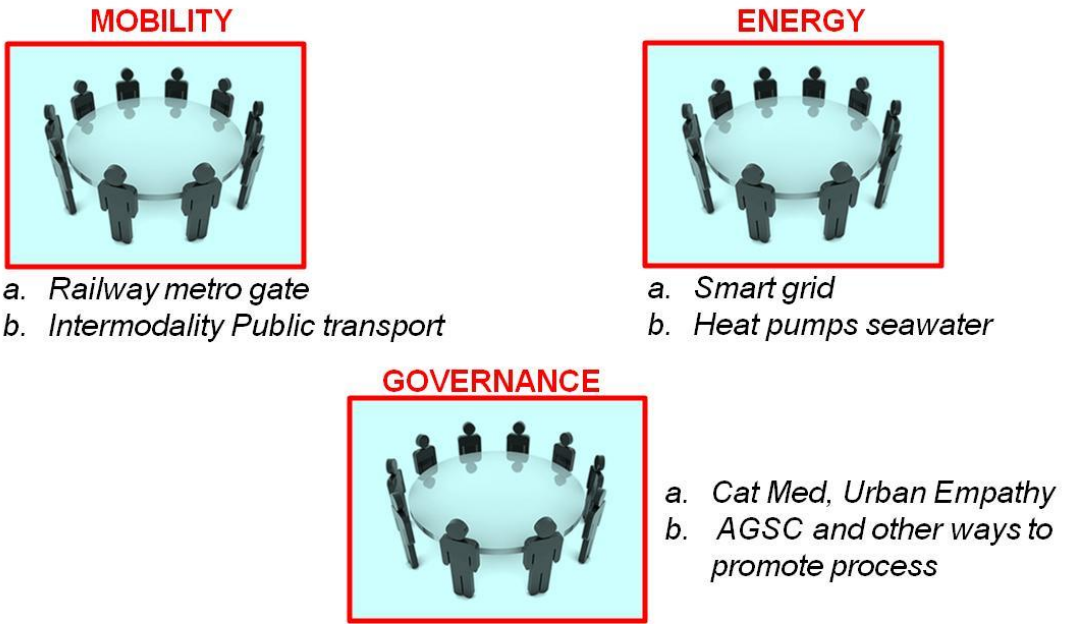
- Analyse Smart Goals and confront them with Smart City Decalogue
- Analyse SEAP actions and confront them with Smart Goals

- Prioritize Smart Goals
- Draw SWOT Analysis of Six Priority Themes

The process of selecting the IW themes is described in a more detailed way in the Genoa Transformation Agenda.
After the IW, and as a consequence of this, the Municipality, in the Transform process, try to align the outcomes of the work done on the city with what is under construction for Voltri. Finally, within the six of the IW, three main local themes were selected, according to those already decided for the Transformation Agenda.

So, the enabling themes for the ILS became:

Figure 11: Three ILS themes

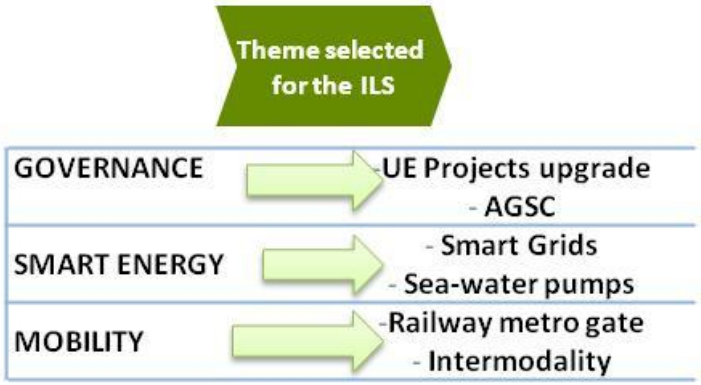


Within the three, other sub-categories were underlined to the participants in order to better deploy the topics.

The same interests were chosen for gathering local Working Groups and to approach the Key Considerations, useful for the TA.

Consequently, the main contents of the Implementation Plan on Green Apple are:

Figure 12: Three ILS themes



In the following paragraph, the above cited aspects will be deepened thanks to the results of the IW and ILS.

Regarding KCs

Following this approach, focused into three main themes (mobility, energy and planning), Genoa chose to be involved into the related Key Considerations Groups:

- KC 1 – Stakeholders management
- KC 3 –Smart grids
- KC 4 – Integrated Planning
- KC 5 –Heating & Cooling

In particular, the KCs 3 and 5 are followed by the local partners Enel Distribuzione and IRE Liguria and are both referring to the main theme Energy.

The reasoning about the KCs and their connections to the TA are still in development. Anyway, the first outcomes of this activity can summed up as a strategic issue which is feeding local strategy and boost local teams working on them.

The intention of the whole work will be describe if and how key consideration discussions at EU level can feed or be integrated in the local theme analysis, putting in evidence the benefits of these discussions, the limits, barriers, the evolution needed to make things change.

- In the Integrated Planning KC, we approached the matter starting with this question: Which measures can be named as “best practice” in your city?
- What are the experiences in linking urban planning with energy planning?

From the city baseline questionnaire to the SUL questionnaire

During the collection of KPIs phase, the Transform team was also occupied in grouping data and information about the environment status quo of the City.

Meanwhile, the first steps of the activities on Voltri started.

Following a more quantitative approach, two questionnaire were composed and filled-in.

The former related to a city current status with also some elements regarding the vision if the future in terms of quantitative targets. The latter was referred to the existence of data on the SUL , gathered at different level of details.

These two are a valuable base for drawing out some further findings and considerations.

The assessment of the two questionnaires makes feasible a wider comment on the foreseen KPIs for the monitoring of SUL projects.

These can be drawn out from a simple process of downscaling from the whole-city level to the Voltri district. Otherwise, if a serious taking into account of the specific features of the quarter is expected, a deeper regard shall be focused on.

Along the lines of the SEAP, we can affirm that a neighbourhood is supposed to be a contributor to the achievement of the whole-city target. At the same time, not equivalently in very part of the municipal territory: there are in fact different vocations and potentialities in it.

As known, the Genoa SEAP foresees a CO_2 reducing of 23.78% within 2020. Considering a potential “downscaling effect” on Voltri, we can calculate the contribution of the neighbourhood to the achieving of the entire target.

The process of downscaling can be treated in several ways, according to which categories of data we would like to use for the comparison:

- ★ percentage derived from: Voltri surface/whole Genoa surface
- ★ percentage derived from: Voltri urbanized surface/whole Genoa surface
- ★ percentage derived from: Voltri population/whole Genoa population

	Voltri at 2014	% Voltri/ Whole Genoa		% of expected Voltri contribution to SEAP target achievement
Surface	4,092.72 ha	2%	...downscaling SEAP target, the contribution of Voltri can be...	0.4%
Urbanized Surface	279,86 ha	4,3%		1%
Population	12,758 units	2,1%		0.5%

From the table above, we can see how the expectations can differ considering different characteristics of the neighbourhood.

Energy consumption is undoubtedly resulting from population' needs, but also availability of land to be exploited (for instance for the renewable sources) must be taken into account for the calculation of the quarter's potential and so, the possibility to contribute to the city-target achievement.

Afterwards, we will see how the projects thought for Mela Verde are able to contribute to the Genoa SEAP target and if they respect the downscaling effect.

4.2 Development strategies and priorities of future development activities

Following the planning out of the previous paragraphs, the approach towards the T.A. is going to be implemented in Voltri, at the district scale, with the same tools that we adopted for the whole-city area: the concept assessment, the focusing through the lab session, the choice of key considerations and quantitative measure at the local level.

Practising the T.A. at the district level some outcomes and reactions come up from the execution of the foreseen steps: some directly related to the single tool are in the paragraph, below. The more general ones, concerning above all the application of the Transform methodology, are included in paragraph § 6.

What does it come from the concept assessment?

A Green Apple concept assessment is here tried.

Evidently, when we speak about "plan", in this case, now we mean the Implementation Plan related to Voltri or in general the development process so far that can be found in existent previous Projects' documents.

Downscaling all the questions to the local situation of Voltri, the answers could be:

(1) Definition of objective(s): How is the (main) objective/aim of the Green Apple Implementation plan defined?

(a) Well defined components of the plan (e.g. CO_2-reduction, energy demand reduction, increase of renewable energy production or energy efficiency), using a clear quantitative and qualitative set of categories?

(b) Qualitative objectives only, which allow for different interpretations of how they can be reached best; or rather no explicit objectives – i.e. "the path is the way".

★ The answer are both. In the IP we have selected KPIs and qualitative objectives, because of the early stage of the implementation, the pilot projects are not sufficiently developed for assessing quantitative measure, above all financial.

(2) What is the underlying "philosophy" of the plan?

(a) Holistic and integrative approach, considering the interrelations between different components of the transformation agenda (e.g. the energy chain with respect to production, distribution and consumption).

(b) Segregated, additive approach. (Accentuation of individual sectors without consideration for interdependencies.

★ Quite segregated, because of the accentuation of categories of intervention, even if the overall framework was considered, especially concerning the Governance problems' complexity.

(3) Does the plan provide a specific timeline?

(a) Cleary defined milestones for short-term, mid-term and long-term targets as well as for the implementation of measures.

(b) Flexible and open timeline.

★ Not at all. The roadmap was figure out but without any mandatory milestones. Regarding individual projects (e. G. Mobility), there are some intervention that area precisely scheduled, due to the national infrastructural program.

(4) Is the achievement of objectives monitored?

(a) A system of monitoring is in place which observes the transformation process and provides regular progress reports – with possible adjustments.

(b) The process is designed to an open and flexible program. Specific objectives are negotiated on an ongoing basis.

★ Objectives related to Voltri have been inserted in the Municipal Strategic Documents (§…) and so "centrally" monitored, but there no explicit reference to the asset outlined in the present IP within the municipal documents.

(5) Is technical and social innovation (e.g. new energy producing technologies, changing consumer behavior) taken into consideration as an accelerator/catalyst for the city concept?

(a) The plan outlines the significance and possible directions of innovation as well as the ability to influence it.

(b) The plan does not reflect the potential impact of innovation. It does not attempt to stimulate and govern innovation.

★ Pilot projects inserted in the IP are quite innovative, so the answer could be a).

(6) Does the plan reflect the spatial differentiation in terms of city scales (e.g. building-, quarter-, district- or area-scale)?

(a) High level of differentiation with an integrative view on different city scales.

(b) City considered as homogeneous space.

★ Downscaling form the city level to the transformation lot of Voltri, the IP project map assigns for every parcel of land a different destination, according to the PUC and the results of the ILS.

(7) Does the plan concern other themes of politics/governance?

(a) Integrated in other political concepts (multilevel governance).

(b) "Stand alone" plan.

★ Of course. It is one of the main objective of the IP.

(8) What is the role of Stakeholders?

(a) Systematical, continuous participation in developing and implementation of the city concept (e.g. theme and agenda setting, part of governance).

(b) Selective, isolated participation, mainly priority for administrative acting.

- ★ The IP, thanks to the IW and the ILS (and the work done by the previous EU projects) will be deployed thanks to a great participation. About the ways of a systematic stakeholders contribution, the City certainly will turn to the AGSC for having involvement at every level (Public, private, people), but they are not planned yet.

(9) Which other participative elements are included in the plan?

(a) A wide offer of options for participation, priority of action planning and experimental approaches.

(b) No explicit offer of options for participation.

- ★ See before

(10) Does the plan ensure a coordinated action within the administration?

(a) Comprehensive tasks are explicitly named and considered in the organizational processes.

(b) No coordinated action between different administrative areas.

- ★ See answer to question 4).

(11) How well is the plan integrated in and secured by medium-term budget plans?

(a) The plan is secured, all measures are examined with regard to their financial dimensions and designed accordingly.

(b) Open financing depending on recurring negotiations.

(c) Presence of industrial partners willing to implement and investing on new technologies.

- ★ Financial items are not developed, yet, but industrial partners have already express their interest (above all Enel).

(12) Which energy themes are included in the city concept? Please, specify and list the energy themes.

(a) Smart Grids technologies aiming to increase the hosting capacity of the grid and its stability. Smart meters are considered as a key technologies of a real smart grid.

(b) Electro mobility system and related recharge infrastructures stations.

(c) Customers awareness achieved through in-home display.

(d) Broadband communication to speed up the flow of data.e) RES and waste energy resources combined systems.

(e) Building energy saving and efficiency.

- They are precisely listed and deepened in the chapter 4) and 5).

The first results of the Concept Assessment, that can be taken into account for implementing the further steps of the Green Apple process, are:

- **Updating the SEAP considering the project on Voltri**. When the SEAP was drawn up the Cat Med Project was not finished yet: so, the intentions on Mela Verde were not stable and confirmed. So, no record on it were inserted into the sustainable energy plan. An updating of the plan can be suggested as a specific outcome of the present work: for making Voltri able to be considered and financed it is necessary to gather consensus regarding sustainable measures and actions to be carried on within the municipal territory. So, the SEAP is the appropriate planning tool for making aware the Municipality in itself of the process that has been done so far since the 2009.
- **Request of a database tool as a technical mean** for gathering information with an adequate level of sophistication and functionalities apt to an energy dashboard, able to revise the current stage but also the drawn out previsions. Regarding that, the Transform project provides a Prototype Quantitative Decision Support Model, in order to offer cities the knowledge of how to set up smart city analytics. WP3 recognizes the information required by stakeholders to make decisions and the format within which it needs to be provided (e.g. GIS maps, financial parameters). It consolidates existing datasets and then processes them to make this information available to decision makers. This is used in combination with the methodologies developed in WP2 to assist cities in producing a Transformation Agenda. The use of data, the possibility to bring in end users for the generation of data and the use in practical applications and the use of analytics to search for better economies in scenario's are an innovative step towards smart city planning. At the district level, it can be also used by local partners in developing projects, thanks to the contribution of a tool which helps in deepening and assessing feasibility aspects. The District Concept Assessment shows the lasting gap between, form one side, the foreseen actions that could be lead and, from the other, the characteristics of the territory: without an intermediate step, able to verify the correspondence of the

two sides, the potentials of the area risk not to be exploited and the planning actions to be programmed without a consistent background of information.

- **To perform an energy Atlas.** These kinds of tools try to bring the answers to a series of interesting questions: How much energy is consumed in my neighborhood? How much energy is used by that enterprise? Where are the opportunities for solar energy? Where for wind energy?
  For the programming activity, Genoa considers as an opportunity the usage of a mapping tool with the characteristics of a DSS, although Municipality knows very well that availability of data is not a trivial matter and the involvement of all the actors in the process is a preliminary governance step which is crucial for the implementation of the technical instruments.

What does it come from the IW and the ILS?

The Intensive Lab was a rich working session of three days that accelerates the process of gathering the consensus around the proposed **Implementation Plan on Mela Verde**. It made use of the latest design thinking methods, inserting innovative ways of working into existing stakeholder involvement processes.

The working method started by defining joint actions, in which stakeholders focused their commitment for the implementation of the selected measures.

Through this exchange, the quality, the pressure and the innovative character of this implementation was increased. The impact of the ILS provided valuable learning conclusions about various types of aspects, supporting transform team in addressing its message to the Municipality and the citizenship.

As previously said, experts and stakeholders were divided in three groups, according to their role, with three general leading questions (assignments):

- How can we drive Green Apple to a concrete realization?
- In which sense could the SUL's designing contribute to a smarter Genoa?
- What is the added value of the ILS methodology?

Figure 13: Three ILS themes

Working groups were divided in four sessions, thought as a step by step process:

(1) Development and common understanding

(a) Technicians describe situation

(b) Technicians listen to questions, suggestions, advice

(c) SWOT analysis

(2) Goal and actions:

(a) How can we involve Private, Public, People (PPP)?

(3) Roadmap writing

Here are reported the Swot analysis activities that were done; afterwards some conclusions useful for the path of Mela Verde, from two points of view: governance and technical feasibility.

Energy

The Energy working group focused on two topics:

- conditioning technologies
- smart grids.

SWOT Analysis: ELECTRIC MOBILITY	
STRENGTHS – Setting up upgraded urban services based on Smart Grids technologies – Ensuring a perfect interoperability with existing recharge infrastructures – Simplicity and security of recharging process: recharge infrastructure system put in place by Enel Distribuzione acknowledges membership cards (linked to a contract) provided by all free market operating Vendors – Limited environmental impact by installing the recharge station on existing parking areas	**WEAKNESSES** – Few electric vehicles in urban area – Risk of breaking interoperability if installation follows a “Service providing” instead of a DSO model – Possibility of vandalism
OPPORTUNITIES – Municipalities can lead, support and spread sustainable mobility – scale up the decarbonisation of the whole mobility chain – integrate Mela Verde with existing recharge infrastructures downtown – Possibility to extend existing eclectic car sharing	**THREATS** – Need to invest and operate in the Low Voltage grid for implementation of recharging infrastructure – Slow administration and approval procedures – Need to identify a service/business model and have a stable regulatory framework

SWOT Analysis: ACTIVE DEMAND/SMART INFO	
STRENGTHS – Easy to install – Provides end-user with certified data collected by Smart Meter (electricity consumption and production) – Provides end-user on standard USB interface – Privacy protection: each Smart Info is bindingly linked with its own Smart Meter	**WEAKNESSES** – Tariff profiles currently provided by Vendors do not always consent end-users consumption awareness – At the moment Smart Info does not show electricity consumption of each in-house appliance
OPPORTUNITIES – Enabling innovative and added value services (suggestions on replacement of low energy efficiency devices) – Facilitating development of interfaces that will enable a fast and easy data access collected by the Smart Meter – facilitating awareness of electricity consumption data improving related consumption	**THREATS** – distribution at national level of Smart Info is not regulated presently – Smart Info is does not consent electricity consumption real time analysis showing inefficient appliances in need of replacement

SWOT Analysis: PUBLIC LIGHTING	
STRENGTHS – Technological upgrade of public lighting system with SSL technologies – Energy savings and reduction of maintenance costs – Enabling remote control of system and tailor-made lighting profiles of each lighting post – Improving quality of light benefitting security and aesthetics	**WEAKNESSES** – Need for initial consistent investments – Need for connectivity to enable the system communication
OPPORTUNITIES – Added value services (sensors) integrated in public lighting infrastructures, optimizing use of existing infrastructures without replacing them	**THREATS** – Need to share measures to be implemented with competent entities, such as Port Authority, Municipality, Police, etc.

SWOT Analysis: SEA WATER COUPLED HEAT PUMPS	
STRENGTHS – It is a Renewable energy source during winter – No local CO_2 emissions – Free source of energy – High efficiency – Simple technology	**WEAKNESSES** – Digging and laying costs – Pipeline length – Building position (a.s.l.)
OPPORTUNITIES – Energy cost savings – Integration with RES (electricity) – CO_2 emissions decrease – management optimization through controlling systems – Pilot projects on public buildings	**THREATS** – Authorization process (water, street digging, etc.) – Ownership – Stakeholder involvement – Citizen involvement

Mobility

Considering foreseen key-interventions in Voltri, two topics investigating the realization of the new railway metro station have been chosen.

The first one is related to the "gateway" role assumed by Voltri and the second to the overall organization of the system of "Intermodality".

SWOT Analysis: RAILWAY METRO GATE	
STRENGHTS – Possibility to build a park-and-ride facility – Metro line to the westernmost part of the city – Areas available for "soft" mobility paths – Specializations of metro and railway lines – Increased frequency and interchange – Technological improvement	**WEAKNESSES** – Availability of rolling stock – Highway overpass (improvement) – Alignment of the different project phases (timing) – Few areas for car parks
OPPORTUNITIES – Planning small connections – More reliable (competitive) system – Easy orientation – Single scale of fares – Improvement of the goods modal split – Recovery of materials	**THREATS** – Proximity of the station to the urban centre – Plurality of stakeholders – Integrated ticketing is essential – Continuous regulatory evolution

SWOT Analysis: INTERMODALITY	
STRENGHTS – Park-and-ride facility – General re-planning of areas (improved liveability)	**WEAKNESSES** – Few parking lots – No other available areas – Underground bypass to park near the toll booth (not financed and difficult to construct)
OPPORTUNITIES – Infomobility system informing about parking lots availability – Availability of the area where to construct a bus terminus (demolition) – Licenses for "soft" interventions – More opportunities for trade – Interchange (bicycles) – Navebus (boat service)	**THREATS** – Using cars to get to the park near the station – Lengthening time thus leading to increasing costs – Critical issues on public domains allocated free of charge (agreements) – Infrastructural (not urban) project – National laws on cycle paths

Governance

Most significant considerations emerged are highlighted, also in connection with other topics.

SWOT: CAT MED AND URBAN EMPHATY	
STRENGHTS – Beauty – Cultural heritage – Villa Duchessa – Paper factories (Cartiere) – Landscape as place to live in not only to contemplate – Endogenous quality of life and urban landscape (climate, pre-existing image) – Social cohesion – Strong social network – Completed projects (SAU 2002)	**WEAKNESSES** – Exchange parking close to the sea – Public transport system – Difficult & long procedures – Time (timing) – Funding – "Exhausting methodology – Too many discussion groups, few results – Low knowledge of real situation – Incoherent prioritization – Interaction between master plan and Smart process
OPPORTUNITIES – Create an exchange parking in industrial areas – Small is beautiful – Strong role of associations – Waterfront , seaside, beach – No need to involve other neighbour cities – Smart Citizen – "Puzzle" actions consent flexible differentiated public or private innovative solutions – Find business model – Increase population (new inhabitants?)	**THREATS** – Economic crisis – Bureaucracy – Continuous changes in law – Uncertainty of law – Too many authoritative institutions in planning process – Cross prohibitions – Different, long, not synchronized timings – Uniformity and homogeneity

SWOT Analysis: AGSC AND OTHER WAYS TO PROMOTE PROCESS	
STRENGHTS – Genova Smart City Association: added value – Information and communication	**WEAKNESSES** – Little Information and communication – Lack of internal communication – Energy efficiency in Heritage building – Too negative ☹
OPPORTUNITIES – Diversify strategy for each public building – Reconstruction and retrofitting should go together – Energy efficiency in Heritage building: develop creative solutions – Demonstrator pilot projects – VOLTRANO: annexing to Merano!	**THREATS** – Multiplicity of actors

As a conclusion of the work on the ILS, two further considerations can be drawn up from the evolving process of Mela Verde:

- Every design aspects that were cited shall/can be object of negotiation and contracting phases among the principal stakeholders. So, **from the governance point of view**, there is a process to be set up, especially regarding Port Authority and the National Railway Company, which are owners of the land and committed in the civil works that will be executed. The process will concern the financial as well as the physical aspects, if needed; for example the location of the new interchange station can be an item of discussion, gathering the proposals of the local population, ...but also the organization of the intermodal node can be designed and checked by the three public entities together, in order to capture the widest added value derived from the existence of the new infrastructure for all of them.
- **Concerning the technical feasibility**, the interventions that were hypothesized are all technical feasible in theory: there is the space, the right technology is available and so on... But some crucial points have to be deepened to perform an effective implementation and investment plan. Energy potentials are not enough to sustain and justify financings or investments, some more specific requirements are needed in order to follow up the first ideas. Generally speaking, the lacking steps are the calculation of benefits and costs and/or a detailed business plan regarding all the projects (or the individual ones) on Mela Verde. This for figuring out a payback period and logic of private-public partnership to be set up for the building up (not only physical) of the interventions.

These results of the ILS are useful for answering to the questions posed by the following paragraph of the Implementation Plan: how to envisage the future management and organization of the SUL.

Identification of KPIs

Starting from the general KPIs chosen by Genoa in order to perform energy efficiency and saving that are inserted in the SEAP, we can consider CO_2 reducing as a key-target also for the Smart Urban Lab, or better, verifying if the interventions foreseen for Mela Verde are along those lines and can contribute to the general achievement of the SEAP city targets.

In the following table, interventions envisaged for Mela Verde are described. For each interventions were calculated the total amount in terms of reduced CO_2 tons, derived from the concrete realization.

In Mela Verde, three are the design categories that were treated: interventions on energy system, ICT support and mobility.

Regarding those, for the latter two, we have already existent in the SEAP actions' list: metropolitan wireless system and metropolitanization of the railway system.

As far as the interventions on sea-pumps and electric mobility there are not existent in the SEAP, so they are "new" contributions to the general reducing calculation.

Trying to sum them up:

	tCO_2 (estimations)	**Weight on the Genoa SEAP**
Energy ("new" buildings and renewable sources)	1,371	0.06%
Metropolitan wireless and ICT support	505	0.02%
Mobility (railway and intermodal change)	206	0.009%
	Tot.	0.09%

Energy use (heating)	8.7 GWh/year	1.4 GWh/year
Emission of CO_2 and/or CO_2-equivalent	1,759 tCO_2/year	694 tCO_2/year
Local energy production from renewable energy sources	0	5.5 GWh/year

From these results, some reflections can be made:

- First of all, that the work done on the SUL yields for the SEAP another "new" contribution to the general achievement of the CO_2 target that amounts to 1371 tons (namely -0.06% of the today consumptions). As mentioned above, the insertion of a new record within the SEAP actions' list is welcomed and wished.
- Considering what already said about the "downscaling effect" from the city-level of the SEAP target to Voltri-level (analysing different categories of comparison), we remember that the contribution (CO_2 reducing) expected by the area was foreseen in terms of -0.5% (according to the "population" downscaling process), -0.4,% (considering the contribution scaled on the total municipal surface) and finally, -1% taking into account the real urbanized area of Voltri on the whole Genoa one. From

what said above in the table, the interventions predicted for Mela Verde would score totally -0.09%, so the foreseen contribution that we are able to realize in Voltri seems not to be aligned on that expected according to the three categories. But there are also other SEAP actions which are not related only to Voltri that have an application also there (interventions on schools, on domestic plants,...).

- Consequentially, we can see how difficult is to envisage a quantitative result at the neighbourhood scale, lacking a tool where scenarios can be analysed in a territorial way (localisation characterized by geographical features, energy potentials, binding urban planning instruments,...). For this reason, it seems to be worthwhile what already discussed about the opportunity to adopt an Energy Atlas or similar.

4.3 Future management and organization of the SUL

Context and challenges

Within the TRANSFORM context, the SUL areas show different conditions and situations, framework conditions in the cities (and countries) differ as well, thus key considerations or “game changers” vary considerably between the SULs.

The greatest difference lies between SULs with largely existing urban development with the focus on transforming the building stock and SULs representing new urban quarters, planned from scratch. A game changer in the former is getting owners and users of existing properties on board, whilst in the latter it is more about the integration of developers and utility companies as partners for investing in a the future new area system.

So, if conditions are different, this can be an aspect of divergence among the SULs also concerning the implementation phases: Although they are in diverse status of their development, some critical points are in common: some items, suggested by other partners, are meaningful for Voltri, too. Especially:

- Development of successful participatory models, end-user involvement, behaviour.
- Feasible business models for private investment applicable under existing laws and rules and interesting for banks or other financial institutions or companies to invest and support the action or project.
- Involving important stakeholders, agreement to a holistic development.

In particular, for Mela Verde, some key considerations as “game changers” were signalled from the very beginning of the project.

- Internal organisation within the authority, secure commitment.
- Financing of municipal project management.
- Feasible business models for private investment (e.g. for new or existing energy efficient buildings).
- Financing of municipal project management.
- Feasible business models for private investment (e.g. for new or existing energy efficient buildings).
- Participatory models, end-user involvement, behaviour.
- Involving important stakeholders, agreement to a holistic development vision.

As Genoa is just starting the process, main fields of activity at the moment concentrate on convincing major stakeholders and the municipality to give their commitment for realization of the project and on obtaining project finance.

Genoa “game changers” in details:

- How to implement the project, i.e. how to ***trigger the actual realization of the planned smart district*** in the context of a strong economic crisis and spending review translating into no (very limited) resources for urban developments;
- How to ***involve stakeholders***.
- How to ***involve the main industrial actors***, RFI (Italian Railways) and Port Authority at the same time promoting and guiding a strong participation process with the population and other stakeholders.
- How to ***find feasible business models applicable*** under existing laws and rules and interesting for banks or other financial institutions or companies to invest and support the action or project, also considering the very tight spending situation of many countries and specifically in Italy

Considering the main procedural challenges to be addressed, probably about Genoa we can speak of governing the process with two very powerful private stakeholders (RFI and Port Authority) which can strongly influence the development largely together with external factors as e.g. national economic and financial issues.

Generally speaking, political commitment (e.g. from the Mayor or from the Municipal Council) or at least the commitment of high level administrative representatives is

crucial for the realization of such an ambitious project as it is the SUL development. Although a general commitment to smart cities activities and resource efficient development can be stated in all cities, the specific acknowledgement referring to the development of the SUL area is still missing for Voltri, which is an urgent and difficult task for the leaders of the development.

For Genoa SUL, the involvement of public/private stakeholders is the most important challenge from the viewpoint of the process (planning and performing). This challenge can be summarized: how to convince public/private actors to involve themselves in the process, which should match the overall targets of the envisaged development as a smart urban lab?

Deepening the concept, Port Authority and National Railway Company are obviously involved in the development of their own lands, but the great point is how to switch from a mix of competencies scenario (even if very well assorted) to a shared intention of building up a transformation process for a smart district in Mela Verde.

Who will be committing to the implementation plan?

At this stage it is too early to know, as too many variables are at stake. Transform and the Implementation plan are expected to be part of the process promoting and supporting the actual realization of the Green Apple. However, the first commitment will have to come from the Municipality, rapidly followed by a joint agreement among the three main stakeholders.

The Genoa Smart City Office will be in charge of putting together information, data, proposals from all involved municipal offices and the other partners and subcontractors. The Genoa Smart City Office is in charge of the smart city transformation process overall, but other departments or players are in charge of the other various parts of the process. Genoa Smart City works as facilitator but has no actual power on matters competence of other departments. Assessment of resources and capacities will therefore have to be done in a second phase.

In the Municipality the concerned offices are:

- Genoa Smart City Association
- Energy and Environment
- Urban Planning

- Mobility
- ICT
- Planning & Organization
- ARE
- Enel
- International Relationships

The area has a number of owners including:

- Municipality
- National Railway Company RFI owning the station and surrounding areas, necessary for the conversion of the area
- Port Authority in charge of all matters concerning port activities and areas near the sea or dedicated to maritime activities
- Capitaneria di Porto which is the national Army Department in charge of controlling legal, safety, security, proprietary issues of land included in the State owned coasts
- Local Fishermen's Associations having their boats and buildings in the area
- Local Sports Associations
- Local Naval Repairing Companies
- Commercial activities
- Cultural Associations
- Villas

The description of the interaction between Port Authority and City Government concerns both legal requirements and political discussions and agreements.

The first step will be entering into a bigger detail from a technical point of view, i.e. the GTT will start on the existing papers and projects, including the Cat Med Green Apple, the Urban Plan, the SEAP, the Municipality's internal planning, Port Authority's Development and Energy Plan, Railway Company (RFI)'s Development strategy and projects, and elaborate a draft proposal of next steps.

This will then be validated by the political level, both at City and District Level. Meetings will be organized and once the overall idea of implementing the project is approved, possibly in a formal document, it will return to the technical level.

At this point a first analysis of resources, costs, possible funding will be started with all stakeholders, and at the same time the citizens' involvement will be continued.

The actual realization of the Mela Verde depends on a number of factors including many which are not controlled by the Municipality, such as the Port Authority's and the Railway Company's decisions on their development and investment.

Meetings at political level with these two main players are already being organized in order to work towards a commitment to the realization of the Green Apple District. Once the high level political agreements are made and translated into formal documents, the Municipality will organize a dedicated Working Group including offices working in Transform.

The following players will work in the project at a technical and/or political level:

- Municipality
  - Urban Planning Department: Project Development and connection with Urban Plan, as well as connection with Port Authority's and RFI's urban projects.
  - Smart City Department: smart city strategy and connection to Transform and other existing projects related to Mela Verde
  - Energy & Environment Department: following SEAP directions and overall respect of energy goals and strategies
  - Planning and Organization Department: including all actions in the Municipality's internal planning ("RPP", Relazione Previsionale Programmatica, Planning Report which translates the Mayor's Strategies and Goals into concrete actions and goals for each director) and facilitating the process
  - Mobility Department: respect of Urban mobility Plan and all connected mobility issues.
  - Public Works Department: all issues connected to realization and authorizations
  - Legal Department and Secretary General: issues involving legal aspects and formal approvals
  - Finance Department
  - Municipio (District): citizens involvement and participation management

- Totally or partially publicly owned companies
  - Each company will take part for its own field of competence:
  - AMIU for waste management,
  - AMT for public transport, Aster for maintenance,
  - Iren for water management,
  - GRG for gas.
  - Are Liguria for energy planning
- Other institutions
  - Regione Liguria for authoritative purposes (environmental impact assessment) and overall involvement in the project
  - Port Authority
  - Architectural and Beaux Arts Approving Institutions
- Research
  - University of Genoa various departments
- Others
  - Associazione Genova Smart City for promoting and facilitating the whole process, helping in stakeholder involvement and technical scientific supervision
  - Enel for electricity and smart grids
  - RFI for railway connections and project
  - Local Sports, Fishing, Agricultural Associations
  - Local Companies

Most will be based on discussions already held during the Transform process as well as in previous occasions (Urban Plan approval, SEAP, Smart City process) but as the project is still only at a planning level, its eventual realization will certainly require further and thorough discussions and agreements on the matter.

For understanding the “governance archipelagos” can be useful also to deep the involvement and the commitment of each of the cited stakeholders, considering their proper fields of interventions and competencies. We use the sector categories of the PESTLEGs in order to classify them.

Starting from the City Stakeholder mapping, a SUL one has been extrapolated.

According to the legend, the following chart express the differences between the City mapping and the SUL ones, considering the diverse categories of the PESTLEGS. Those which do not show meaningful disparities were omitted (economic, technical, legal, environmental and spatial).

- C - Current
- S - Current sectoral/ special area only
- R - Required

Political

City

Stakeholder Political	Role	„Owner" Planning	Consultation	Coordination	Awareness Building	Decision Making	Approval	Funding & Financing	Implementation	Monitoring
National		S				S	S	C		
Regional Government		S	S		S	S	S	S		
City Council		C			C	C	C	C		
Mayor's Cabinet		C		C	C	C	C	C	C	C
Port Authority		S	S	S	S	S	S	S	S	S
Local Council				S	S				S	S
	differencies									

District

Stakeholder Political	Role	„Owner" Planning	Consultation	Coordination	Awareness Building	Decision Making	Approval	Funding & Financing	Implementation	Monitoring
National Government		S				S	S	C		
Regional Government		S	S		S	S	S	S		
City Council		C			C	C	C	C		
Mayor's Cabinet		C		C	C	C	C	C	C	C
Port Authority		S	S	S	S	S	S	S	S	S
Local Council			C	C	S				C	C

Social

City

Stakeholder Social	Role	„Owner" Planning	Consultation	Coordination	Awareness Building	Decision Making	Approval	Funding & Financing	Implementation	Monitoring
Municipality		c		c	c	c	c	c	c	c
Local Council		s	s		s				s	s
Genova Smart City Association		s	s		s					s
Associations		s	s		s				s	s

differencies

District

Stakeholder Social	Role	„Owner" Planning	Consultation	Coordination	Awareness Building	Decision Making	Approval	Funding & Financing	Implementation	Monitoring
Municipality		c		c	c	c	c	c	c	c
Local Council (Municipio)		c	c		c				c	c
Genova Smart City Association		s	s		s					s
Associations		s	s		s				s	s

Governance

City

Stakeholder Governance	Role	„Owner" Planning	Consultation	Coordination	Awareness Building	Decision Making	Approval	Funding & Financing	Implementation	Monitoring
City Council		c		c	c			c		c
Mayor's Cabinet		c		c	c	c	c	c	c	c
Local council (Municipio)		s	s	s	c	s	s	s	c	c
Genova		s/r	c/r	s/r	c	s	s	s	c	c
Other Associations		s	s	s	c	s	s	s	c	c

differencies

District

Stakeholder Governance	Role	„Owner" Planning	Consultation	Coordination	Awareness Building	Decision Making	Approval	Funding & Financing	Implementation	Monitoring
City Council		c		c	c			c		c
Mayor's Cabinet		c		c	c	c	c	c	c	c
Local council (Municipio)		s	c	c	c	s	s	s	c	c
Genova Smart City Association		s/r	c/r	s/r	c	s	s	s	c	c
Other Associations		s	s	s	c	s	s	s	c	c

Obviously, the most relevant point is the “augmented” role of the Local Council at the district level in comparison with the city-wide one, although it has not the power to decide or to approve. We can affirm that its intervention is crucial in awareness and consensus building and in some aspects of implementation and monitoring matter.

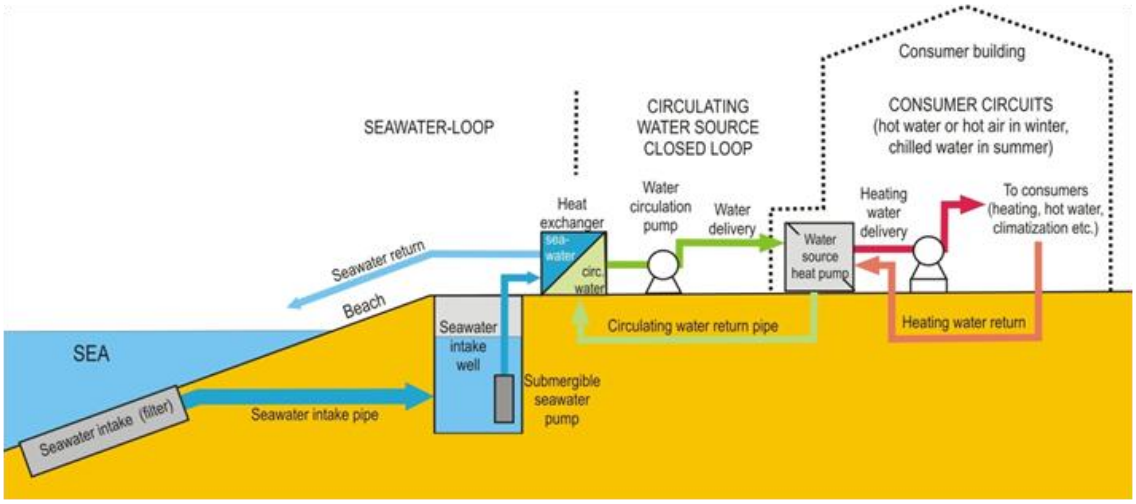
Speaking about Voltri, the Municipio (District) played an important role also in the previous project: the capability of gathering population associations and be representative of that part of the city (also from the political point of view in the City Council) is a strong characteristic within the governance dynamics. This positive feature is very meaningful for Mela Verde and cited a lot even in the swot analysis we made during the ILS.

5. Implementation measures, key actors for future realization

5.1 Energy systems and networks/Buildings and renewable sources

Specifically the basic idea behind this proposal is to exploit the nearby sea as an enormous heat-source for space heating and any other low-temperature heating purpose (e.g. domestic hot water etc.) as well as for cooling in summer. Namely the heat contained in the seawater shall be extracted by means of a number of seawater intake and heat-extraction systems installed along the coastline, and to distribute the heat obtained from the seawater to nearby buildings by means of a closed-loop heat distribution piping network similar to a district heating network, but containing a heat carrier fluid (mix of glycol and fresh water) operating at a temperature only slightly different (5-10°C) from seawater temperature.

Figure 14: Basic concept of a seawater-coupled heat pumps system



Each seawater-intake and heat extraction facility will therefore consist of the following subsystems:

- Seawater intake including Filter bed and screens positioned at the sea-bottom at an adequate depth (typically 5-10 meters) and distance from the beach
- Two pipes from the intake to the equalization pool, one for the water intake, the other to return the water to the sea after the exploitable heat has been extracted.

To ensure appropriate water-flow by gravity (without a pump) both pipes will need to be laid at least 2 metres below sea-level, i.e. they will pass the beach underground remaining completely invisible to the public.

- Equalization pool located inland behind the beach and covered by structure similar to a common 20 foot transport container. The container and pool unit will include the following subsystems
  - Seawater circulation pump (submersible type)
  - Appropriate screens and related auxiliary systems designed to allow for simple maintenance and cleaning of all submerged systems subject to marine fouling
  - Chlorination system allowing to reduce marine fouling.
  - Heat-exchanger serving to exchange heat between the upstream seawater circuit and the hydraulically separate downstream heat carrier circuit (containing a mix of glycol and fresh water) used to transport and distribute to consumers the heat (or cooling effect) extracted from the seawater.
  - Circulation pump serving to circulate the heat carrier fluid through the downstream closed-loop heat distribution network and served consumer facilities.
- A closed-loop piping network will serve to transport the extracted heat (or cooling) from the seawater intake facility to consumer facilities. The network will consist of two pipes, one for the supply flow towards heat consumers and the other for the return of the heat carrier fluid to the intake facility after exploitation of the heat by consumers.

The heat originally extracted from the seawater and then supplied to consumer facilities by means of the heat carrier fluid circulated in the heat distribution network shall then be warmed-up to a higher temperature level by means of one or more heat-pumps allowing to supply the obtained heat to the envisaged consumer devices at the required temperature level (in winter for heating purposes typically 40-50°C – in summer for cooling purposes typically 16-20°C).

Accordingly downstream the heat-pumps, normal (standard) space heating (and/or cooling) distribution systems will be adopted to distribute the heat (or cooling) within buildings to individual heating devices (fan-coils, floor-heating systems and similar).

Benefits expected to be achieved

The following benefits are expected to be achieved by adopting at Mela Verde the envisaged seawater-coupled heat-pump systems:

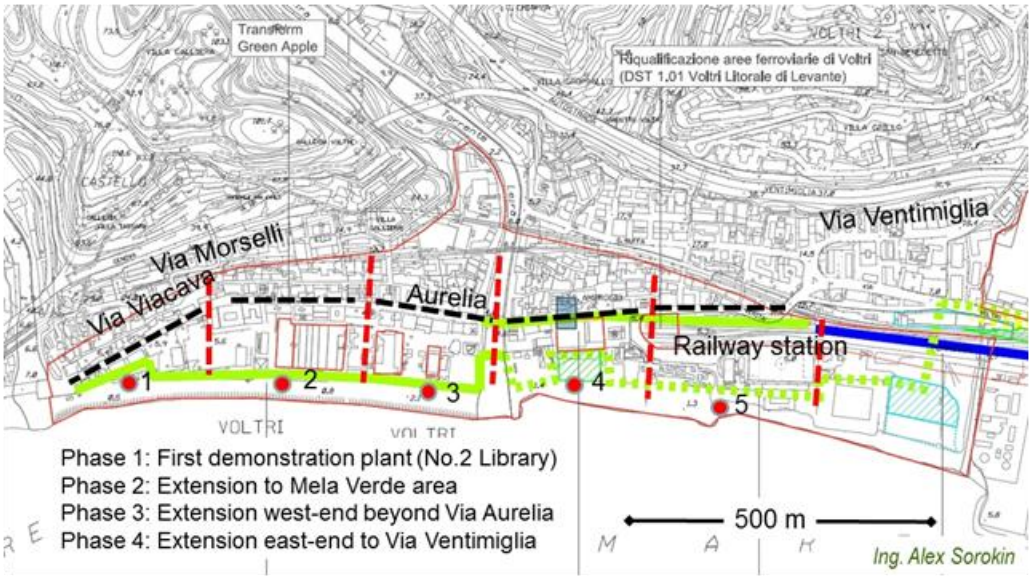
- Substantial energy savings by switching from fossil fuel boilers to heat-pump systems.
- Significantly higher efficiencies than with standard air-coupled heat-pumps by exploiting the efficiency advantage of water-coupled heat-pumps (average COP = 4-6 instead of 3-4), and …
- Renewable energy production since the heat energy produced by heat pumps is at least partially considered a renewable source (as per EU Directive 2009/28/EC)
- Reduced energy consumption (both primary and final) and, consequently…
- Cost savings for consumers due to lower energy consumption
- Increased comfort for consumers since proposed systems will be reversible, i.e. able to provide also cooling during summer (not considered as renewable energy)
- Possibility to exploit the free-cooling mode by using seawater cooling directly to cool supplied buildings, without consuming electricity to operate chillers and/or heat pumps
- Substantial environmental improvements, local atmospheric pollution generated by proposed heat-pump systems will be ZERO, and also overall (upstream) pollution generated by power plants supplying the consumed electricity will be significantly less than with previous fossil fuel boiler systems
- Reduced greenhouse gas (CO_2) emissions,
- Reduced fossil fuel imports and reduced dependence on fuel supplies from politically unstable foreign origins
- Real-estate properties supplied by the proposed systems will increase in value,
- In future electricity is expected to be increasingly produced from renewables. As a result also electricity consuming heat-pumps will become more and more renewable sources
- Reduced risks of future energy price escalations (3-10% annual increases are forecasted for fossil fuels)
- Price stability – heating costs will depend more and more on costs of power from renewables (which depend only on known i.e. certain initial investments, and not on volatile future fossil fuel prices)

- reduced risks from fuel spills due to upstream fuel transports, processing and storage.
- Fire and explosion hazard risks = ZERO – No need for related preventive measures leading to related cost savings.
- No need for otherwise (for boilers) required stacks/chimneys and other fume and exhaust gas evacuation means, leading to related investment cost savings.
- Adopting low to medium temperature heat sources encourages investments in building envelope efficiency, and installation of low temperature heat distribution (radiant floor, duct coils, pavement heating, domestic water heating)
- Paradigm shift in urban energy planning, integrating the exploitation of sea water into district heating concepts into standard decision making.

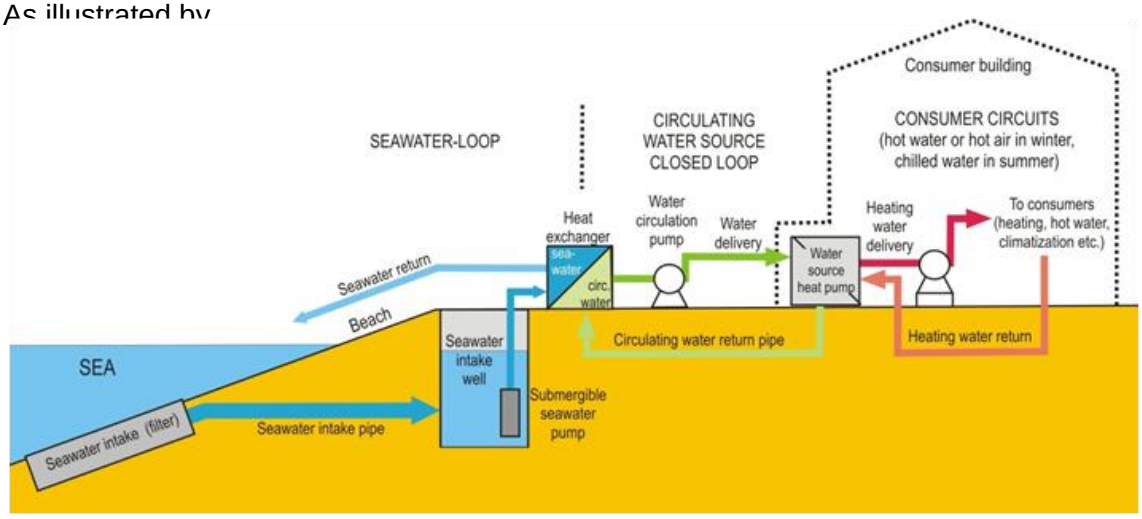
Programme implementation

Generally the programme shall focus at least initially on public buildings and pave the way for the development of urban district heating and cooling networks, aiming to provoke a replication effect also in privately owned buildings.

Figure 15: Map of Mela Verde: proposed locations of seawater intake systems and individual areas to be covered by each heat distribution system



As illustrated by



15, to limit the length of the heat-carrier distribution network, as a first hypothesis, the project team has subdivided the Mela Verde area in 5 sub-areas located along the coast-line, to be served each individually by one seawater-intake facility positioned at the beach, and the related heat distribution network.

It may be possible to reduce the number of seawater intake system required to cover the Mela-Verde area to 2 or 3 units. This issue will have to be decided at a later stage, based on a further technical and economic optimisation of project parameters and required permit applications, as long as resulting pumping losses (and related energy costs) for the circulation of the heat-carrier fluid to further distant consumer facilities will remain negligible.

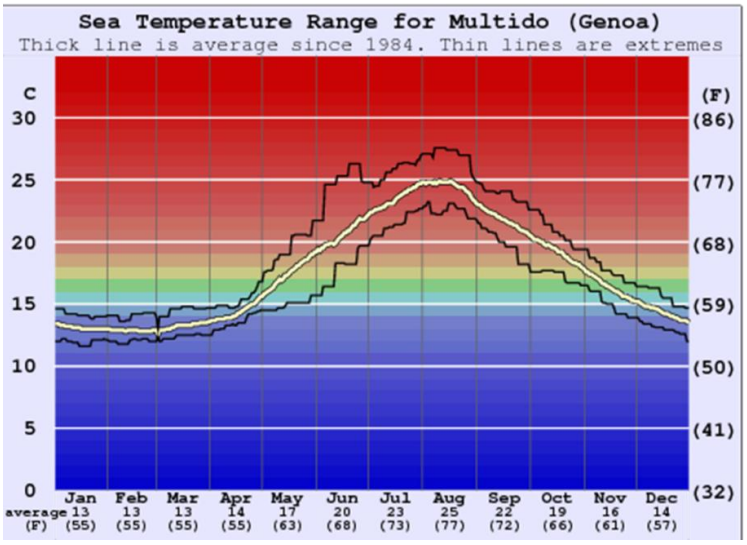
Actually there are two options to be considered and allowing to obtain the envisaged heating energy and cost savings, depending mainly on organisational considerations, namely by realising a:

- **Centralised seawater-coupled district heating system** based on one (or two) larger heat pump facilities located near the seawater intake systems, and which would each supply large quantities of heat to many buildings by means of a conventional district heating (closed-loop piping) network, and which would distribute the heat-carrier at a conveniently higher than ambient temperature level of about 50°C. In this case all involved technology (all plants) will be installed, managed and maintained by a service provider (district heating operator), and

consumers will simply buy the heat at the normal higher temperature level from the operator and need not bother about technicalities.

- **Distributed seawater-coupled heating system**: in this case each individual building will be heated (and cooled) by its own individual heat-pump system, and the heat carrier fluid (glycol/fresh-water mix) will be circulated to consumer buildings at ambient temperature (resulting distribution heat losses will therefore be ZERO and piping need not be thermally insulated). Accordingly the individual heat-pump systems serving to obtain the required higher temperature level will be installed decentralised, typically in the basement of each individual building (possibly in the exiting boiler room), and probably owned, operated and maintained by the consumer/building owner. Accordingly the consumer/building owner will buy the obtained seawater heat at ambient temperature from the service provider company operating the seawater intake(s) and related heat distribution network. The advantage for the consumer in buying such seawater heat (obviously at a lower rate) instead of using heat from the external air, will stem from the significant electricity savings achieved by the water-coupled heat-pump systems as compared to standard (less efficient) air-coupled heat pumps, which otherwise (without the seawater heat) would need to be adopted.

Figure 16: Typical annual temperature profile of seawater in Genoa, intended to be used as heat-source for the envisaged water-coupled heat-pump systems.



Depending on the depth of the seawater intake, the actual temperature might be lower (advantageous in summer for cooling purposes).

The question whether at Mela Verde the centralised or the distributed approach shall be implemented, or eventually a combination of both solutions, cannot be decided at this stage, and will be the subject of further investigation.

A first assessment of the territory to be covered, the distances and the physical barriers to be overcome by the associated distribution piping networks, has induced the project team to identify 4 distinct development phases for the implementation of the programme, which will probably take several years. At this preliminary stage the probable development phases are proposed as follows:

Phase 1: **"Biblioteca" and surroundings:** a single first demonstration system of limited extension shall be realised, consisting of 1 seawater intake facility (identified by No. 2) as well as the related heat-carrier distribution piping network, covering a limited area centred around the so-called "teatro/biblioteca" building (the largest in the Mela-Verde area) including some other nearby (probably publicly owned) buildings such as the "Liceo" (High school).

Phase 2: **Extension to Mela-Verde area:** three further seawater intake facilities (named no. 1, 3 and 4) shall be realised, including the related heat-carrier distribution network limited initially only to the Mela-Verde area along the coast-line up to Via Camozzini (= Via Aurelia (ancient Roman name) main street parallel to the coast-line)

Phase 3: **Extension beyond Mela-Verde area:** one further seawater intake and distribution facility (No. 5, the last at the east-end) shall be realised to cover the area between the coast-line and the railway station. Furthermore a first extension beyond Via Camozzini (main street) at the west-end shall be implemented, covering the areas around Via Viacava and Via Morselli.

Phase 4: **Extension to Via Ventimiglia:** The distribution network at the east end of Mela-Verde (No. 5) shall be extended beyond the railway station to cover the most distant residential buildings area in Via Ventimiglia.

From the beginning the sizing and design of all systems shall take into account the envisaged final extension. Accordingly, at the beginning, the seawater intake facilities and the first sections of the distribution piping networks will necessarily be oversized, in

order to avoid bottlenecks and allow for further network extensions during the later development phases.

Data collection

So far the data collection activities carried out by the project team on the Mela-Verde area allowed us to identify to be of interest a total of 58 buildings and facilities, and all these buildings (100%) have been quantified in terms of:

- address and localisation/geographical coordinates,
- external above-ground dimensions,
- Number of above-ground storeys.

Concerning other parameters likewise crucial to achieve project aims, the following progress has so far been reached:

Data available for:	No. of buildings	%
Resident inhabitants	26	45
Fuel type used	22	38
Heating energy consumption	40	69
Total of investigated buildings	58	100

Since heavily misleading and therefore deemed unacceptable to put missing data = ZERO, the project team decided to estimate crucial missing data on the basis of the best available evidence. Specifically, as long as exact reliable data from the field remain unavailable, for the time being missing crucial data are being estimated on the basis of typical indicator values (such as type of building use, surface per inhabitant, energy consumption per surface area etc.) collected from the average of similar buildings located in the neighbourhood.

Accordingly the following preliminary quantifications and sizing results produced by the project are based primarily on the available data from the field, but do also include and take into account crucial missing data, which are therefore estimated for the purpose. Data collection activities shall in fact continue for the whole duration of the Transform project, and sizing calculations, figures and data will be continuously updated as soon as new data from the field become available, allowing thereby to continuously improve and increase reliability and robustness of sizing results and project outcomes.

The following Table provides an overview over the proposed development programme by identifying for each individual seawater intake facility and for each development phase the served area (centred around an identified building, street or location), the number of supplied buildings (mostly 4-8 storey residential buildings and service sector facilities), the related resident population (Inhabitants), and the annual heating energy demand.

Mela Verde: Heath and Energy demand quantification and development Programme for seawater-coupled heat pump systems								
Seawater Intake facility	Area covered (centred around)	No. of supplied buildings	No. of inhab.	Heating demand	Development phase			
				MWh/year	1	2	3	4
Intake 1 (west-end)	Via C. Camozzini	4	116	580		2		
	Via A. Viacava	7	256	570			3	
Intake 2 (central-west)	Via C. Camozzini	10	313	2140	1			
	Via E. Morselli	7	307	1330			3	
Intake 3 (central)	Via C. Camozzini	7	223	670		2		
Intake 4 (central-east)	Via Don G. Verità	5	90	600		2		
Intake 4 (east-end)	Railway station + Via Ventimiglia	18	611	3600				4
PROGRAMME TOTAL		58	1915	9490				

The following Table provides an overview over the expected technical performances, benefits and investments required for the implementation of the proposed development programme for seawater-coupled heat-pump systems to be installed at Mela-Verde. The investment figures presented in the table reflect overall investments including the seawater intake facilities, the related heat distribution piping networks as well as all new heat-pump capacities to be installed under the programme.

All implementations foreseen by the programme present reasonable investment payback between 6-10 years and appear therefore to be sufficiently cost-effective. From these first preliminary estimates, seawater intakes No. 3 and No. 4 present the lowest cost-effectiveness, because the heat demand of the covered areas has resulted to be relatively small, making it more difficult to recover related investments. Accordingly it might be more convenient to combine the two intakes No. 3 and 4 into one single larger unit plus the related distribution network. In general, it appears likely that further optimization of project parameters will allow to reduce costs and to improve the cost-effectiveness of the proposed programme.

Mela Verde: Development Programme for seawater-coupled heat pump systems performances, benefits and Investments									
Seawater Intake facility	Programme development phase	Consumer heating demand	Electricity consumed (heat pumps + circulation pumps	Distance covered by network	Benefits			Investment cost	
					Primary energy saved = renewable	Energy input cost savings	Avoided CO_2 emissions	SW intake + distribution+ heat pump	Payback time
		MWh/ year	MWh/year	m	MWh/ year	Euro/ years	tCO_2/ year	Euro	years
Intake 1 (west-end)	Phase 2	580	110	200	442	48,000	85	365,000	7.6
	Phase 3	570	100	200	442	48,000	85	265,000	5.5
	Total	1,150	210	400	884	96,000	170	63,000	6.6
Intake 2 (central-west)	Phase 1	2,140	390	400	1652	18,000	316	1,150,000	6.4
	Phase 3	1,330	240	400	919	103,000	173	628,000	6.1
	Total	3,470	630	800	2,570	283,000	489	1,778,000	6.3
Intake 3 (central)	Phase 2	670	120	500	503	55,000	96	530,000	9.6
Intake 4 (central-east)	Phase 2	600	110	500	464	51,000	89	530,000	10.4
Intake 4 (east-end)	Phase 4	3,600	650	900	2,762	302,000	528	1,976,000	6.5
TOTAL PER PHASE	Phase 1	2,140	390	400	1,652	180,000	316	1,150,000	6.4
	Phase 2	1,850	340	1,200	1,410	154,000	269	1,425,000	9.3
	Phase 3	1,900	340	600	1,360	151,000	257	893,000	5.9
	Phase 4	3,600	650	900	2,762	302,000	528	1,976,000	6.5
PROGRAMME TOTAL		9,490	1,720	3,100	7,184	787,000	1,371	5,444,000	6.9

To sum it up:

Renewable energy at project completion	Saved CO_2 at project completion
5586 MWh/year	1065 t CO_2/year

5.2 Mobility

Metropolitanization of the Railway system			
Start of implementation	Not yet defined	**(Planned) Completion**	2020, but not yet defined precisely
Description of the measure	The new railway station in Voltri will be realised within the project of updating of the Genoa rail node. This project will permit to obtain a “metro rail”. The number of train for the urban service should increase and stimulate population in using public transport. Currently key actors are discussing about layout of the new railway station and of the area for moving goods. The new disposition of the railway station. should vacate areas that could be used for new urban functions. Moreover a parking area should be realised sea side, nearby the railway station.		
Key-actors	RFI, Regione Liguria, Comune di Genova, Vte, Autorità Portuale		
Target group	Commuters, Public transport users, commuters		
Financing	-		
Publicity, participation	-		

Intermodal hub			
Start of implementation	Not yet defined	**(Planned) Completion**	2020, but not yet defined precisely
Description of the measure	An intermodal hub should be realized nearby the new railway station in order to improve accessibility of the station, both for pedestrians, cyclists and public transport. Maybe public transport network will be revised in Voltri area for a better functionality of the intermodal hub.		
Key-actors	RFI, Regione Liguria, Comune di Genova, Vte, Autorità Portuale		
Target group	Commuters, Public transport users, commuters		
Financing	-		
Publicity, participation	-		

Electric Mobility			
Start of implementation	Not yet defined	**(Planned) Completion**	Not yet defined
Description of the measure	Electric vehicles play a key role to considerably reduce the CO_2 emissions from the conventional fossil fuels along with to fight against air pollution in urban areas. Smart Grids, through the advanced management of recharge infrastructures, will foster the roll-out of a sustainable mobility. The technological solution for the electric vehicle recharge infrastructures is based on the Electric Mobility Management System developed by Enel Distribuzione, that enable the installation and management of two different recharge stations: Pole Station, public recharge stations installed in strategic city's spots and Box Station, recharge devices that can be hanged at the garage wall to easily self-recharge the private vehicle.		
Key-actors	Municipality – DSO – Port Authority – Rete Ferroviaria Italiana		
Target group	Public (municipalities services) and private users		
Financing	Municipalities budget complemented with the use of other funds such as Structural Funds, Piano Città, etc.)		
Publicity, participation	Through the Local Association of Genoa Smart City. Moreover citizens might be involved also through a car sharing services of electric vehicles within the city counting also on the already 17 recharging infrastructures in place.		

5.3 Use of ICT and smart grids

Smart grid			
Start of implementation	Not yet defined	**(Planned) Completion**	Not yet defined
Description of the measure	A Smart Grid is a smart electricity able to integrate all the actions of the users connected to it, such as energy producers, costumers, prosumers, in order to distribute electricity in a sustainable, safe, efficient and cost-reduction way. Smart Grids apply innovative systems along with cutting-edge technologies for monitoring, control and communication in order to: – integrate the distributed energy resources such as renewable energy plants – foster the active participation of the end-users into the electricity markets (e.g. enabling the Active Demands) – promote the development of a smart recharge infrastructures for electric vehicles and offshore power supply (so called Cold Ironing) – spread a smart public lightings system through the use of LED technologies and remote control and management systems – enable the added value services (security systems – smart parking). The main Smart Grids measures that can be planned in Mela Verde are the following: (1) **Electricity Grids preparation and empowerment:** as previously stated, in order to make the electricity distribution grids capable to enable new		

	added value services there must be foreseen the implementation and installation of smart grids devices aiming to increase the hosting capacity of the grids, to ensure the grids stability and so on. (2) **Active Demand/Smart Info:** Enel smart info is a smart devices that will enable the end-user to be always aware on the electricity consumption data collected by the smart meters and to optimize its electricity consumption heading toward more efficient behaviour. Perfectly integrated with the remote management system (Telegestore), Enel smart info provides an easy access to the data through an dedicated display, a computer and/or a smart phone.
Key-actors	Municipality – DSO – Port Authority – ESCO – RFI
Target group	Citizens
Financing	Public private partnership along with innovative tendering procedure along with the use of Structural Funds/Piano Città
Publicity, participation	Through the Local Association of Genoa Smart City

Public Lighting			
Start of implementation	Not yet defined	**(Planned) Completion**	Not yet defined
Description of the measure	The replacement of conventional and low-efficient public lightings system with LED technologies will enable energy savings along with the costs reduction related to the maintenance of the system. The LED Archilede® systems, developed by Enel, enable to achieve up to 80% of energy savings compared to the conventional technologies as well as to extend the time life of the lighting plants up to 100,000 working hours which means roughly 24 years of normal operating conditions. The remote control system enables to tailor-made, from remote, the lighting profile of each individual lighting post as well as to increase the quality of the service by identifying in real time the service disruption. A smart public lighting net (Smart Lighting) can host smart devices enabling to provide added value services such as video surveillance, Wi-Fi connection, traffic and environment monitoring, …)		
Key-actors	Municipality, ESCO, Technologies Providers		
Target group	Municipalities (public lighting infrastructures)		
Financing	Municipality budget for the purchase of LED technologies and or release a call for tender for the management of the lighting system.		
Publicity, participation	Through the Local Association of Genoa Smart City.		

6. Reflection – preliminary assessment

In order to foreseen further steps, two sorts of conclusions were provided: those considering the SUL implementation and those more related, in a general way, to the Transform approach to the problem.

For drawing out conclusions on the district work, Genoa did not use PESTLEGS as its methodology for its ILS, so the dialogue proceeded with a general roadmap related to the gathering of the consensus and some concluding remarks, useful to help the city in its commitment for Green Apple Project.

Figure 17: Voltri Mela Verde road map

The Intensive Lab Session proved to be a unique opportunity of putting together all involved stakeholders in a thorough and frank discussion of possible developments, barriers, opportunities and ways to promote the process.

Locally, results from ILS will be used in further promoting Voltri Smart "Mela Verde" District actual realization giving decision-makers a clear, detailed and shared view and also highlighting possible ways, instruments, actions to be taken.

Partial answers to the **general leading questions** emerged:

- ***How can we drive Green Apple to a concrete realization?***
  - Gaining political commitment
  - Finding enabling business model
  - Finding funding
  - Developing smart grids and linked concrete applications of smart management
  - Strengthening dialogue and connections among key players, i.e. Municipality, Port Authority, RFI, Municipio (Local Council)
  - Developing the "Agenzia Smart Sviluppo Voltri" – ASSVO, an operative agent with manpower and resources to facilitate and steer the process (meetings, communication, feasibilities, updating the Masterplan. This agencies could become the main agent and player in order to bargain the framework agreement with PA, RFI and the city, plus achieving the "one concession" idea in the agreement.
  - The citizens of Voltri and the political representatives from the city level will need to significantly guide and support the activities of ASSVO (round table, board etc..)
  - It will be essential to define and implement 2-3 lighthouse projects in order to give a clear signal to public and private partners and to the residents that this area will be upgraded (e.g. boardwalk #2, library/theatre + school refurbishment combined with innovative heat pump energy supply
  - Reinforce the upgrading of existing buildings and energy systems in the residential part of the area, to better represent this issue in the Masterplan and in the smart energy development perspective
- ***In which sense could the SUL's designing contribute to a smarter Genoa?***
  - Demonstrate feasibility of *transformation* into a smart(er) district
  - Gather stakeholders around one common table and show concrete advantages of cooperation
  - Prove feasibility of new business models
  - Show possible energy savings and greenhouse emissions reductions

- The “Railway Metro Gate” idea should be extended into a “innovation gateway” for the city of Genoa, with a concretely show-case and integrated pilot project for replication in other parts of the city (and in other cities) but also with a living lab for young innovators, students and entrepreneurs

- ***What is the added value of the ILS methodology?***
  - Putting together stakeholders to discuss very concrete issues in an open, friendly pro-action context
  - Working on an active role for Genova Smart City Association: bringing together enterprises, University, students and NGOs to participate in smart pilot projects in Voltri
  - Concentrating important aspects in a short period of time
  - Analysing and highlighting SWOTs

From the governance process point of view, collaboration between Port Authority and Municipality offers the opportunity to develop a project for a strong and effective integrated urban planning in one of the most problematic and complex areas of the city, with high social tension and difficult social integration, yet it is essential for the new Master Plan, the new Port Master Plan e the new Urban Master Plan.

This is a ***brand new project for the Italian planning system***, in line with the new European Regulation on port activities and can be somehow the example for the new ***Italian regulations in the framework of the Port Law No. 84/94 reform***, also for an effective integration with environmental policies.

So, an area that can be considered as an important starting point for the local system of the western part of Genoa, which foresees ***urban transformations connected to use of the urban railway line as city metro*** thanks to a strong enhancement of public transport, a cycling path that will connect about 10 kilometres on the coastline. In addition, some advanced solutions for a sustainable energetic development and an improvement in energy efficiency will lead to a sharp fall in energy consumption and a significant air pollution abatement.

There are also ***open question and potential improvements,*** as, for instance:

- Energy Working group results seem much dominated by Smart Grid concept (Active Demand/Smart Info, Electric Mobility, Public Lighting) and ENEL influence;

the innovative heat pump concept apparently was only one of a number of project ideas (with much less relevance in terms of innovation and energy savings).

- The heat pump concept should be clearly linked to all refurbishment projects, public and private.
- No presence of PV in the area.
- Could e-mobility (also as e-scooters) become a relevant mobility means to access the railroad from the hilly regions – with a larger number of charging stations in or near the railway station ?
- Combine street light posts with charging cable plugs for e-cars/e-scooters, thus increase greatly the number of available posts.
- Could cable cars (modern, individual steered multi-cabin systems) be a relevant new means of mobility for the hilly sections of Genoa, extending the traditional elevator-approach ? (e.g. Perugia)

Starting from results, ***further studies should be made*** into technical aspects, such as development of sea-water coupled heat-pumps or implementation of smart grid connected tools, but specially into business models useful for triggering works in the current overall economic crisis hitting Italian (and not only) economy thus permitting a virtuous cycle leading to the district's transformation, job creation, energy efficiency and consumption reduction, diminishing CO_2 emissions and overall climate and quality of life sustainability.

In the context of Transform Project, Genoa's ILS is an interesting showcase of the preliminary phases in an ambitious urban smart development, which will help Buddy Cities and others interested in replication better understand the steps to be taken in the process towards a smart district and a smart city.

The present IP offers a matter of debate regarding the crucial question on how downscaling energy planning from the city-wide to the district level, using the Transform approach.

What it came up is a photograph of different colours: from one hand the work already done permit to take into account the complexity of the case; from the other, such kind of awareness makes the Municipality and the other involved actors conscious of the limits and the gaps of the process so far.