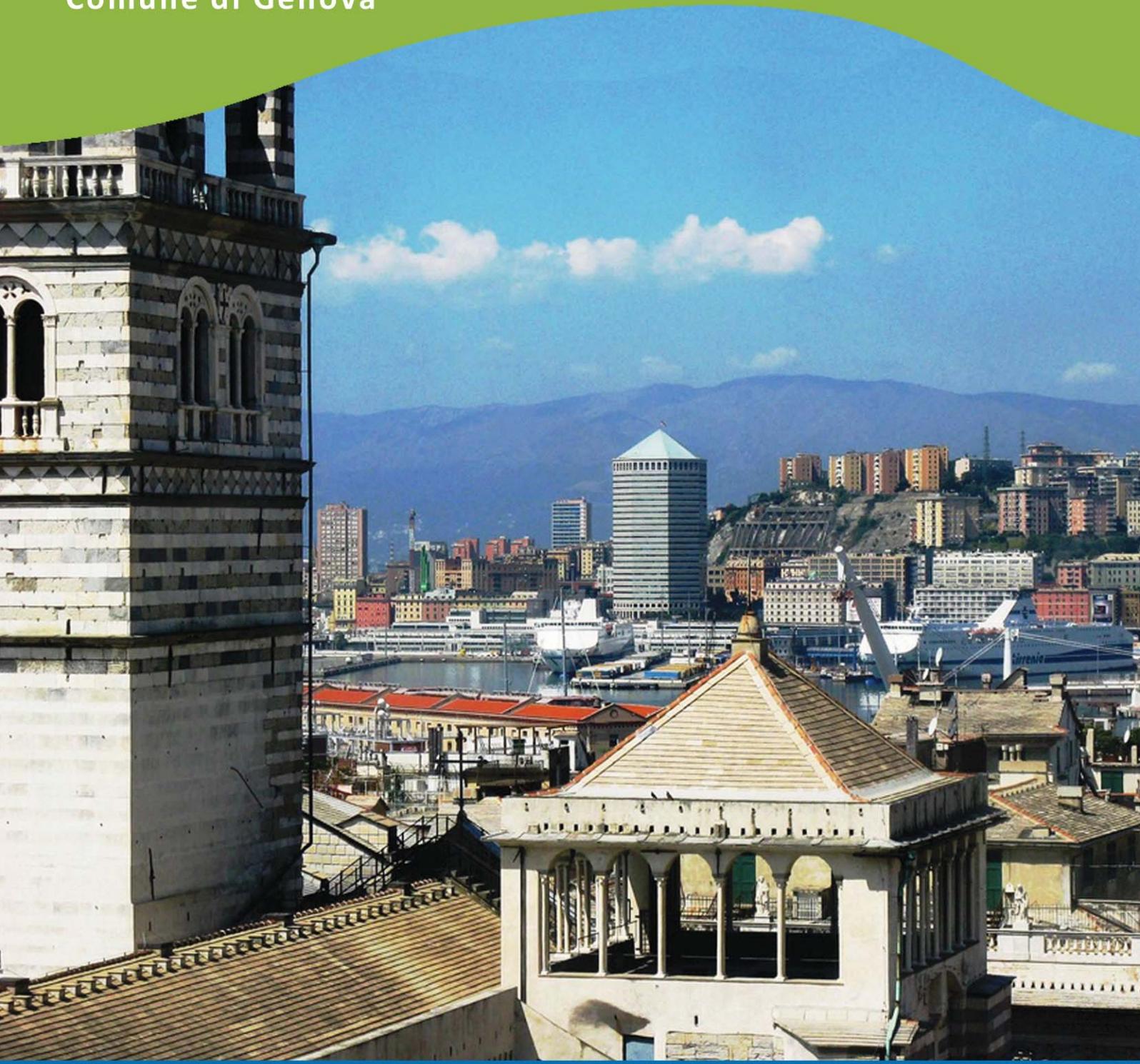


# Sustainable Energy Action Plan Summary



Comune di Genova





# SUSTAINABLE ENERGY ACTION PLAN SUMMARY

## LIST OF CONTENT

Chapter 1 - THE CONTEXT	2
Chapter 2 - GENOA – CITY BETWEEN SEA AND MOUNTAINS	6
Chapter 3 - BASELINE CO <sub>2</sub> EMISSIONS	11
Chapter 4 - VISION AND STRATEGY	18
Chapter 5 – ACTIONS	24
Chapter 6 - PROSPECTS AND ECONOMIC OPPORTUNITIES	44
ANNEX 1 – TEMPLATE (BASELINE AND SUSTAINABLE ACTION PLAN)	49
GLOSSARY AND ACRONYMS	56





## Chapter 1 THE CONTEXT

The Municipality of Genoa is one of the first cities in Italy to submit its Sustainable Energy Action Plan (SEAP) in accordance with the Covenant of Mayors initiative of the European Commission, whereby each city makes a voluntary and unilateral commitment to reduce its CO<sub>2</sub> emissions beyond the target of 20% by 2020. This will be achieved by means of measures in several sectors/fields of action in which the signatory governing bodies have specific competences: local transport, public and private buildings, renewable energy sources (RES) and innovative technologies.

The Action Plan, prepared in collaboration with the Liguria Regional Energy Agency and the CRUIE (Research Centre in Town planning and Ecological Engineering) of the University of Genoa, is the key document defining the government's energy policies for the next 10 years, with the aim of reducing CO<sub>2</sub> emissions.

The Municipality intends to increase the energy efficiency of council buildings, rationalise the transport system and create "transformation district" based on energy performance. More specifically, the SEAP includes a far-reaching series of actions in the following areas: local planning, through the local council's Urban Development Plan and Urban Mobility Plan (UMP); the built environment, including new buildings and refurbishment, by means of the introduction of more stringent energy efficiency requirements in the new set of Building Regulations; renewable energy sources, with the installation of photovoltaic plants in schools and sports centres; and in transport, thanks to a strategy promoting local public transport through the reorganisation and rationalisation of the system of urban mobility (protected axes, measures aimed at infrastructure and extension of the city's Blue Areas).

Genoa registered its adhesion to the Covenant of Mayors on 10 February 2009, this being a natural outcome of the long-standing commitment of the city to curbing its CO<sub>2</sub> emissions. Indeed, the Municipality of Genoa drafted its first Energy Efficiency Improvement Plan as early as 2001.

The objective of that project was to provide the local council with an initial energy accounting audit for the purpose of monitoring the energy consumption and associated emissions of the city, and so as to define an action plan with initial measures aimed at reducing energy consumption in residential and civil buildings as well as transport, replacing as far as possible highly polluting fossil fuels with more environmentally friendly – and where possible renewable – energy sources and studying new forms of mobility.

The investigation revealed areas with a great deal of potential for energy saving, rationalisation of consumption and use of renewable energy sources. It constituted a feasibility study for Genoa's introduction of a long-term policy designed to reduce greenhouse gas emissions and other pollutants by means of energy saving measures and the use of RES.

Later, in 2006, as part of Local Agenda 21, another study was carried out; this time the experts examined the most significant changes in energy consumption patterns in the Municipality stemming from the changes to the structure of supply and demand in previous years: the findings provided important information concerning the local energy situation ahead of the council's Report on the State of the Environment.



By means of Council Resolution 1/2009 of 13 January 2009, the local government adopted the 10-point master plan for sustainable growth for Genoa, which was devised as part of the definition of general strategies and planning criteria, and which constitutes the framework of reference for the significant sectors/fields of action of the city. The 10 points were drawn up by the Genoa Urban Lab, a project team set up by the architect Renzo Piano, and are as follows:

1. The future Genoa as a sustainable city whose identity and development are inextricably linked to the harnessing of its natural resources.
2. The green line and the blue line as expressions of the relationship between the compact city, green areas and the sea – a relationship to be preserved, improved and reconstructed, partly by identifying suitable ecological networks.
3. Recreate the relationship with green areas while improving the health and enhancing the quality of life of citizens. Recognise a virtual boundary between green areas and the compact city, beyond which the latter will not expand. Restore the balance between interstitial or green space and the built-up area, and create a network of routes and green spaces, irrespective of their size.
4. Recreate the city's relationship with the sea as a truly meaningful bond between the land and the water.
5. Build on built-up areas in the context of urban renewal and completion of existing buildings as opposed to further expansion. No new areas are to be built on the outskirts of the city since they would entail unsustainable social, environmental and economic costs, and generate unreasonable demand in terms of space and infrastructure.
6. Promote public transport in alternative to the private one, limit the building of new roads, encourage interchanges and park & ride facilities in the suburbs. Sustainability is pursued by means both of intermodal public transport and the adoption of alternative eco-compatible solutions.
7. Large and small projects for far-reaching urban transformation, as well as reclamation and regeneration of local suburban areas. Adopt a planning strategy that takes account of the varying scale of the individual projects: large projects require detailed planning of phases and organised forms of participation by stakeholders and the community at large, whereas small projects need to be launched quickly using a lean approach.
8. Urban quality as a prerequisite for every redevelopment project; the intrinsic value of the areas and their architectural appeal must be preserved and enhanced due to their fundamental impact on the quality of life of the community.
9. Social integration as a cornerstone of urban planning and architecture.
10. Competitions and tenders as tools for planning schedules and public projects, conceived as an opportunity for engagement and exchange both nationally and internationally (large-scale projects) as well as locally (small projects) so as to promote the effective participation of citizens in urban planning and development.

In this regard, special mention should be made of the reasoning behind the Municipality's adoption of an anti-sprawl policy in the form of the proposed boundary marking the relationship between the compact city and its green environs.

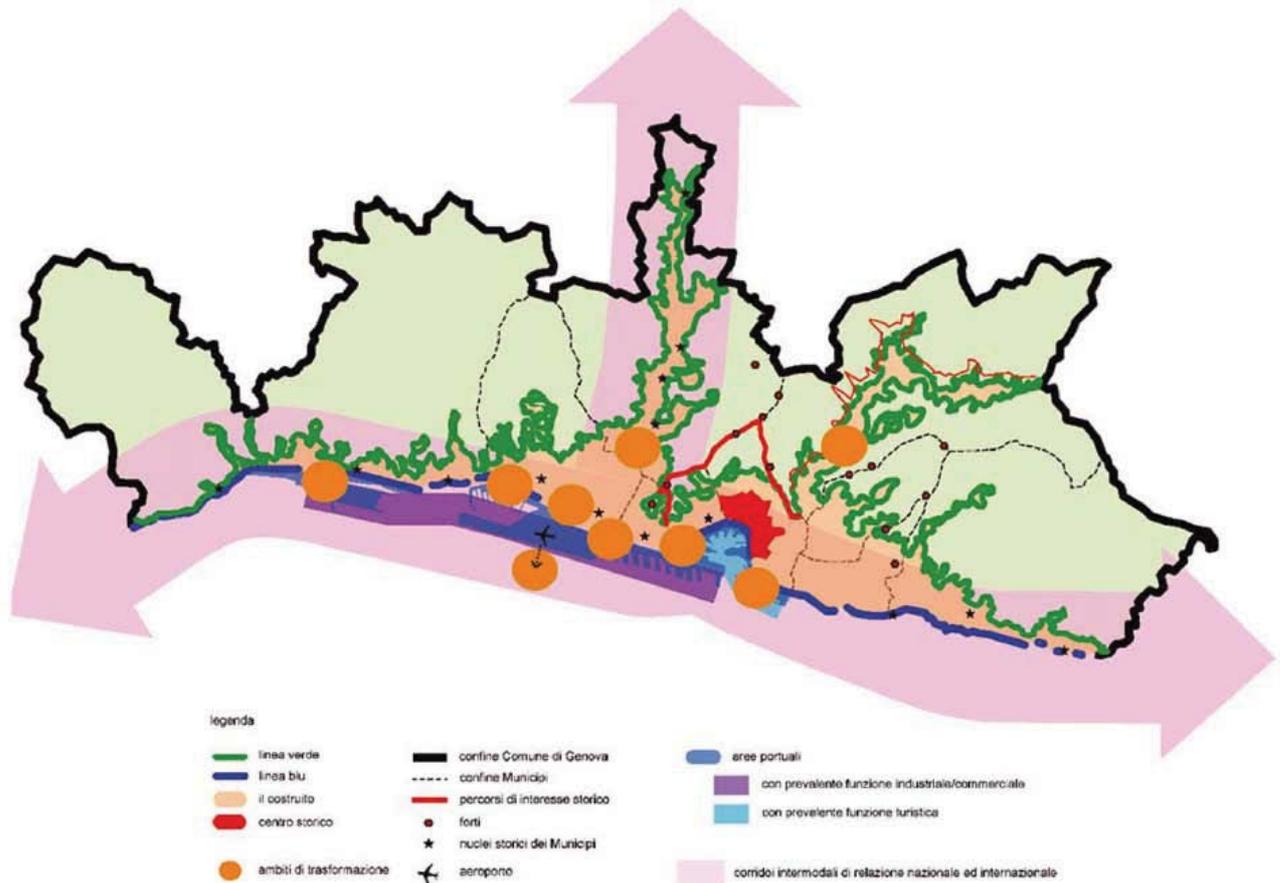


Figure 1 – The “Green line” and the “Blue line”

The “green line”, embracing the hillside built-up area, and the “blue line”, marking the boundary and relationship between the built environment and the sea, together entail an implosion of the urban growth of the city and the pursuit of sustainable development within these two boundaries, both qualitatively and quantitatively. The idea is to avoid dispersion and fragmentation of urban functions and market forces, thus avoiding the social and environmental repercussions, while striving to restore the ideal balance between the built environment and enhanced quality of life.

In this way, the transformation districts identified by the Urban Development Plan become an opportunity to improve the energy efficiency of the city.

The SEAP constitutes the firm and binding commitment of the Municipality to create a city that fulfils the following 5 strategic programs of the local council: new methods of government, the liveable city, the creative city, the accessible city, and the sustainable city.

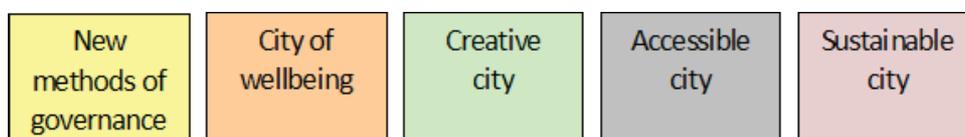


Figure 2 – Strategic programmes of Genoa City government



Consequently, the monitoring of this Action Plan dovetails with the verification and updating to be carried out as a result of the adoption and/or approval of the key planning documents that have been prepared by or on behalf of the Municipality recently.

Following approval of the Urban Mobility Plan, the forthcoming steps with the announcement of the council strategies will be the previously mentioned Urban Development Plan, at the end of 2010, and the drafting of the Municipal Energy Plan; the SEAP can be regarded as a preliminary experimental stage of the Energy Plan.

So the SEAP proposed by the Municipality of Genoa is not intended to be part of ordinary planning or the initiatives already launched, but rather it is a set of guidelines and methodology for the local authorities' approach to government of the city in the short- and long-term.



*Figure 3 – Genoa – The City between sea and mountains – The Blue Line*



## Chapter 2

### GENOA – CITY BETWEEN SEA AND MOUNTAINS

Genoa facts and figures:

Municipal area	244	km <sup>2</sup>
Built-up area	103	km <sup>2</sup>
City centre surface area	1.118	km <sup>2</sup>
Population	611.171	inhabitants
Resident families (source: Istat 2009)	300.708	families
Total homes	301.898	homes
Population density	2.509	inhab /km <sup>2</sup>
Average population density of the 10 largest Italian cities	4.000	inhab /km <sup>2</sup>
Income per family (source: Inland Revenue 2007)	31.448	€/family
Average income per Italian family	22.470	€/family



*Figure 4 – Genoa – The City between sea and mountains – The Green Line*

Further to these statistics, it should be noted that:

- In the last 20 years Genoa has suffered a veritable exodus, with consequent ageing of the resident population. At present the city has the same number of inhabitants as in the 1930s, and approximately 30% fewer than when the population peaked in the mid-1970s;



- The metropolitan area (the 7th biggest in the country in terms of population and the 4th largest with regard to geographical extension) has such a low population density largely on account of the local geography, with the rugged and thinly populated Apennine hills between the coastal strip and the metropolitan hinterland. **However, in the old town of Genoa there are roughly 19,000 inhabitants per km<sup>2</sup>, making this one of the most densely populated areas in Europe.**

The peculiar geographical configuration of the city of Genoa “sandwiched” between the coast and ranges of hills and mountains rising almost straight out of the sea and occupying some 70% of the territory, gives to the city its unique landscape and has strongly influenced its urban development and infrastructure system.

The urban area of Genoa extends along the coast and in the valleys of the two main rivers – the Val Polcevera and Val Bisagno – so as to form a shape like the Greek letter pi,  $\pi$  (see Figure 3).

Most industrial and economic activity is concentrated on the west coast of the city, near the port and the Voltri logistic hub.



*Figure 5 – Genoa’s development along the coast-line and in the valleys*

The linear yet “polycentric” nature of the urban development of Genoa along these three axes, first and foremost the coastal strip, continues today, comprising the creation of new kind of “centres” whose main feature lies on their urban function (shopping centres, management centres, sports centres, etc.)

The fact that the coastal settlements consist only partly of residential buildings and largely comprise economic activities (including tourist and leisure facilities) has meant that the hillside areas, immediately behind the coast, have become residential suburbs, with arising problems especially related to mobility. Another point that should be underlined is the high population density in the old town, where the condition of the buildings is often critical in many aspects.



*Figure 6 – The Port of Genoa*

The buildings existing in the city of Genoa slightly exceed 33.000 items (2001 census), most of which were built between the 1920s and 1970s; 89% are residential buildings making a total of around 300,000 homes and flats. 68% of existing buildings are in a reasonable shape and around half of them have central heating for the whole block of flats (as opposed to individual heating systems).

Recent studies have pointed to specific heat consumption in the actual conditions of use of the heating systems in Genovese buildings (estimated taking into account start-stop operating regime) amounting to 151 kWh/m<sup>2</sup> per year, compared to the legally prescribed mean requirement value (Legislative Decree no. 192/2005) of 40 kWh/m<sup>2</sup> a year; this is above all due to the regulations which were in force at the time most of the buildings in question were constructed, and also because of the fact that there was a pronounced tendency in the last three decades of 20th century to build blocks in which each flat has its own independent heating system, resulting in low efficiency and high consumption. While it is not possible to provide an accurate technical assessment of the energy efficiency of the existing buildings, it can be stated with reasonable certainty that there has been a great increase in energy consumption in recent years, largely due to the growing demand for air conditioning and other cooling systems during summer months.

The decrease in urban population, due to the fact that births (albeit on the increase) are outnumbered by deaths, combined with a growing numbers of immigrants (currently about 7% of the population) has led to forecasts of an increase in the demand for homes over the next 10 years equivalent to about half the number of new homes registered during the last decade.

As stated above, geographic peculiarities, combined with the vocation of Genoa as a port and seafaring city, has influenced not only its urban development, but also its infrastructures (typically linear along the coast-line). The transport system is often inadequate and unbalanced, especially as regards the hillside suburbs. Another serious criticality is the inadequate overlap between local urban transport networks and the wider regional and national transport system. This issue applies both to rail and road transport. For this reason and also on account of the generally inadequate scale of infrastructure, access to the city is often problematic despite the fact there are two motorway routes in and out of Genoa (the A10 and A12) and two mainline railway stations (Genoa Brignole and Genoa Piazza Principe).



Figure 7 – The Navebus ferryboat shuttle



Figure 8 – Il Drinbus taxi bus on demand



Figure 9 – Granarolo rack and pinion railway



Figure 10 – Sant'Anna funicular

**“Bike-Lift”:** The major barrier hindering the development of cycling mobility in Genoa is the hilly terrain. However by using the funiculars and public elevators existing in Genoa, many of the hillside locations become comfortable departure points for relaxing and wonderful downhill bicycle rides.

The bike-lift concept exploits the same mechanism used by skiers when they go skiing to a mountain resort: to go from one place to the other, skiers do not take the direct or shortest route. They take the ski-lift to reach a high-elevation hillside location to start from, and then ski downhill towards their destination. Presently in Genoa, by using the two funiculars, the rack and pinion railway and the available 10 public elevators it is possible to reach by bicycle a large part of the residential hillside suburbs. Actually regulations of Genovese public vertical transport means allow taking Your bicycle with you into the cabin, but only for the uphill trip.

One encouraging statistic in the overall picture is the number of people who use public transports for their daily commuting (about 43% of the population); the reason for this high percentage of public transports usage lies in the even greater difficulties in using your own private car. The frequent traffic jams and the local government’s policy of assigning priority to public transports (So-called “assi protette” priority lanes for public transports and so-called “Blue Areas”, i.e. areas where parking management and parking pricing is adopted) strongly discouraging the use of private cars. The main means of public transport in Genoa is the bus, which is supplemented by other means including the Navebus (ferryboat shuttle), the Drinbus (taxi bus service on demand), and public elevators and funiculars serving the hillside suburbs. Typical examples for such vertical public transport systems are the historical



Granarolo rack and pinion railway, the Sant'Anna funicular (cable car system) and the Castelletto Levante public elevator (see photos), which mostly were built before World War and several even a century ago, by far before mass transportation and motorisation were yet to come.

Moving away from the city centre, recent studies have shown how the use of private vehicles in Genoa increases in suburban areas and how the most part of citizens living further away from the city centre use their cars instead of motorbikes or scooters to reach the centre. This is not only because of greater distances to cover, but also because of the weather, often less favourable in the hillside areas than on the coast-line.

Genoa has a subtropical, Mediterranean climate with dry summers. Unlike many other Italian cities that are similar in other respects, rainfall in Genoa is almost always higher than the annual mean figure, its annual pattern of humidity is the reverse of that typically found in other "Mediterranean" cities and it is windy all year round. However, this generally mild climate is subject to a great deal of variation with many microclimates precisely on account of the close proximity of the sea and mountains.

Thanks in particular to its specific landscape and favourable climate, Genoa has considerable potential for development both economically (with particular regard to tourism and the port) and environmentally. The many sunshine hours and frequent windy days mean the prospects are extremely good for the application of innovative technologies harnessing renewable energy sources (RES). Another opportunity is represented by the fact that Genoa and surroundings present low to medium population density and most of the local buildings are in a reasonable shape or even good state of repair. Another point of strength is the highly capillary transport network: once effectively restructured, rationally re-organised, and possibly expanded adequately to needs, the resulting impact could be very positive and effective in terms of reducing road congestion. An effective local public transport service aimed at continually enhanced quality and efficiency so as to further increase the customer base; will also mean fewer privately owned vehicles on the roads. New policies of development for the local economy will need to be devised and implemented in order to increase once again the capacity and competitiveness of the entrepreneurial and industrial system of Genoa.



## Chapter 3

### BASELINE CO<sub>2</sub> EMISSIONS

Il “Baseline Emission Inventory” (BEI)” quantifies energy flows and the amount of CO<sub>2</sub> emitted due to energy consumption in the territory of Genoa in the baseline year 2005, serving thereby as the reference against which the reduction targets and the actual achievements of individual actions and related emission reductions in 2020 shall be monitored and compared.

The following describes the results of the statistical analysis which have been implemented in accordance with the methodology and the guidelines issued by the Covenant of Mayor Office of the European Commission. Specifically energy production and consumption within the territory of the city of Genoa, and related CO<sub>2</sub> emissions are quantified as related to the sectors included in the SEAP, namely the civil (residential and tertiary) sector, local transports, locally generated electricity, district heating and cooling and CHP (Combined Heat and Power) plans. Since not to be addressed by the SEAP, the energy consumption data of industries and of long-distance transports (railway, highways, sea-and air-transport) are NOT reported.

The final energy consumption sectors included in the BEI are classified as follows:

- municipal buildings, equipment/facilities;
- tertiary (non municipal) buildings, equipment/facilities;
- residential buildings;
- municipal public lighting;
- municipal fleet;
- public transport;
- private and commercial transport.

Data collection for the development of the BEI has been implemented in view of the intention to launch a project for the creation of a **data-base** of energy data and information to be managed in future by the municipal administration. This municipal energy data base shall go beyond the specific needs as related to the actions planned under the SEAP and shall serve as basic instrument to support and enable the following on-going monitoring phase to be implemented during programme implementation.

The data resulting from the BEI as related to the municipal territory have been compared and basically validated against the statistical data available from the BEI of the province of Genoa and the data available from the energy and environmental data-base of the Liguria Region. They will probably require some further tuning which will become feasible once the municipal energy data-base will be available.

The results of the data analysis for year 2005 of the energy flows of Genoa City are displayed in the attached BEI template filed-in according to EC instructions and are summarised in the following table:


**Table 1 – Genoa city 2005 – Final energy consumption**

Category	FINAL ENERGY CONSUMPTION [MWh]								
	Electricity	Fossil fuels					Renewable energies		Total
		Natural gas	Liquid gas	Heating oil	Diesel	Gasoline	Other biomass	Solar thermal	
<b>BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:</b>									
Municipal buildings, eq.t./facilities	115.844	210.214		12.990	47.795			113	386.956
Tertiary (non municipal) buildings	690.854	1.189.323	70.772	138.311	54.575		32		2.143.868
Residential buildings	670.036	2.611.078	11.730		357.202		3.736		3.653.783
Municipal public lighting	37.800								37.800
Industries	non included in SEAP								
<b>Subtotal buildings, eq.t / f.ties</b>	<b>1.514.535</b>	<b>4.010.616</b>	<b>82.502</b>	<b>151.301</b>	<b>459.572</b>	<b>-</b>	<b>3.768</b>	<b>113</b>	<b>6.222.407</b>
<b>TRANSPORT:</b>									
Municipal fleet					30.676	6.618			37.294
Public transport	14.222	179			96.603	269			111.273
Private and commercial transport					200.000	1.505.628			1.705.628
<b>Subtotal transport</b>	<b>14.222</b>	<b>179</b>	<b>-</b>	<b>-</b>	<b>327.279</b>	<b>1.512.515</b>	<b>-</b>	<b>-</b>	<b>1.854.195</b>
<b>Total</b>	<b>1.528.757</b>	<b>4.010.795</b>	<b>82.502</b>	<b>151.301</b>	<b>786.851</b>	<b>1.512.515</b>	<b>3.768</b>	<b>113</b>	<b>8.076.601</b>

**Table 2 - Genoa city 2005 – locally generated electricity**

Locally generated electricity (excluding ETS plants , and all plants/units > 20 MW)	Locally generated electricity [MWh]
Wind power	-
Hydroelectric power	3.489
Photovoltaic	94
Combined Heat and Power	353.659
Biogas	72.522
<b>Total</b>	<b>429.764</b>

**Table 3 - Genoa city 2005 – locally produced heat/cold**

Locally generated heat/cold	Locally generated heat/cold [MWh]
Combined Heat and Power	242.647
<b>Total</b>	<b>242.647</b>

The following graphs showing the energy consumption of Genoa city allow to express some basic considerations as follows:

1. energy consumption of the civil (buildings, equipment/facilities of the residential and tertiary) sector represents the by-far prevailing use of energy;
2. natural gas is the main fuel source being used in Genoa city, and it is used primarily in the residential sector;
3. local transports in Genoa city are less pronounced (in comparison to the national average) which is evidence of the relatively high exploitation of public transports by inhabitants (approximately 43% of the population);
4. electricity consumption is significant and, what is more, growing in the tertiary sector, which is evidence of increasing use of summer air-conditioning;

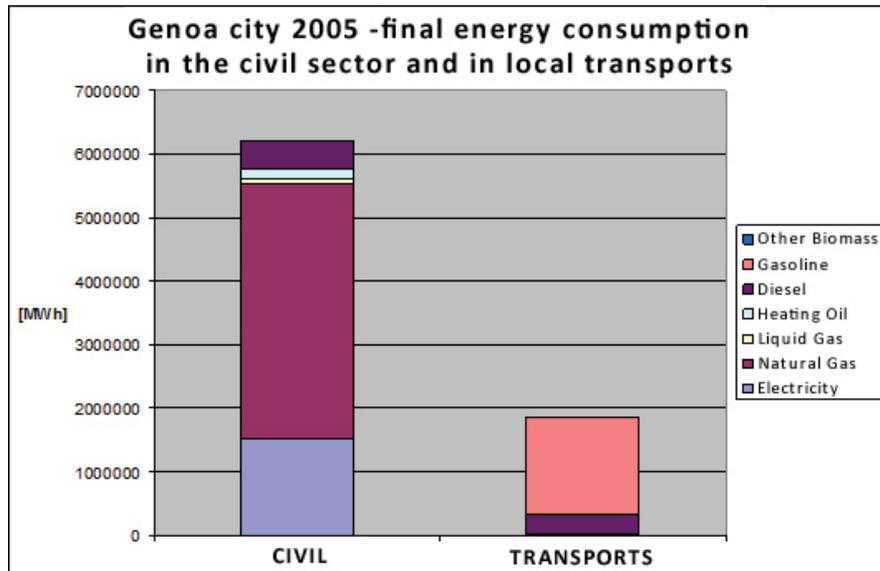


Figure 11 – Genoa city 2005 - final energy consumption in the civil sector and in local transports, subdivided per energy source [MWh].

Taking into account that the SEAP focuses primarily on the civil sector and on local transports, the following graph illustrates that, within these two sectors, CO<sub>2</sub> emissions present a structure subdivide in 3 large shares of very similar size, namely the CO<sub>2</sub> emissions resulting from electricity consumption, from natural gas consumption and from fuel consumption of local transports (gasoline + Diesel).

The CO<sub>2</sub> emissions arising from electricity and from natural gas consumption have an equal share of 35% each, whereas CO<sub>2</sub> emissions from local transports present a slightly lower share of 27%.

The high share of CO<sub>2</sub> emissions arising from electricity consumption, as compared to the apparently low share of final electricity consumption itself, is due to the known low efficiency of thermal power plants, in Italy as well as in Europe.

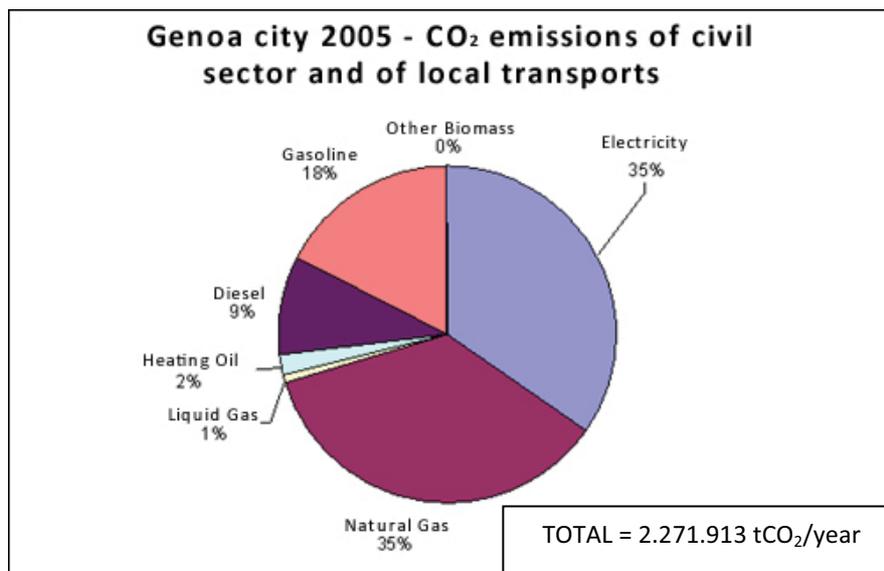


Figure 12 – Genoa city 2005 - CO<sub>2</sub> emissions of civil sector and of local transports subdivided per energy source



The following analysis of energy trends in time has been implemented by analysing the relevant statistical data available from the Ministry for Economic Development and from TERNA (national transmission grid operator). Unfortunately these data represent the provincial level, and not the municipal level. Nevertheless, since the population of Genoa City (totalling 610.000 inhabitants) represents roughly 70% of the population of the Province (totalling 885,000 inhabitants), the following analysis at provincial level are deemed to be sufficiently representative also at the municipal level.

The following graph illustrates the trend in time of electricity consumptions in the Province of Genoa during the decade from 1998 to 2008:

- residential sector: electricity consumption remained stable / no significant variation in time;
- tertiary sector and public administration: shows a gradual but pronounced growth in electricity consumption, due to growing use of air-conditioning systems;
- reduction of consumptions for public lighting, as a result of already implemented energy saving actions;
- electricity consumptions of transports (since electrical de-facto all public) display significant growth during the decade, due to the trend towards electrification of public transports;
- industrial sector (non included in SEAP) shows, starting in 2004, a pronounced reduction in electricity consumption, specifically in the iron and steel sector, where electricity consumption have become half the previous value in just 3 years from 2005 till 2007;

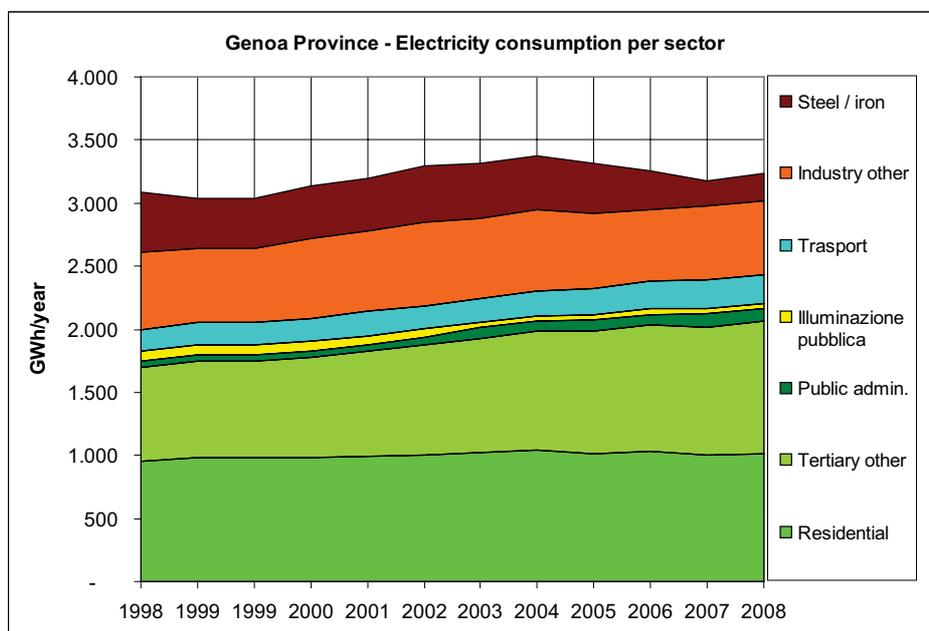


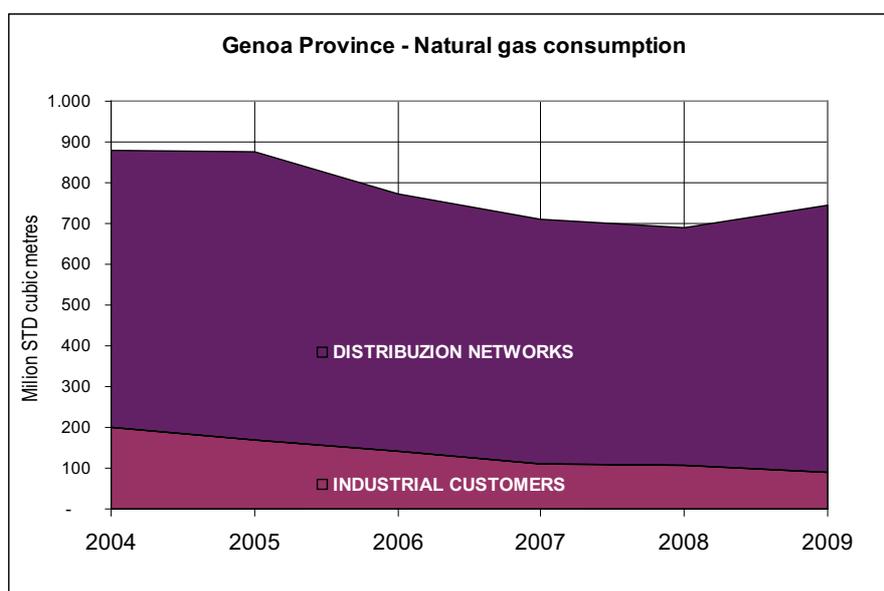
Figure 13 – Genoa Province - Final electricity consumption per sector [GWh].  
Data source: TERNA

As illustrated by the following graph, after 2005 and, as opposed to the growing electricity use, the consumptions of natural gas has fallen significantly and in both displayed market segments.



Compliant with expectations the larger industrial consumers supplied individually display a marked reduction in natural gas consumption to practically half the previous value in just 5 years.

Instead natural gas use of consumers supplied via the gas distribution network, i.e. belonging to the civil sector and minor industries, show a marked decreasing trend as opposed to electricity consumptions, especially if compared to the growing electricity use in the tertiary sector. Accordingly the counter-trend between electricity and natural gas consumption, specifically in the tertiary sector, is evidence of growing use of reversible air-conditioning / heat-pump systems providing for summer cooling as well as winter heating, replacing thereby part of the previous natural gas consumptions for winter heating.



**Figure 14 – Genoa Province - Natural gas consumption of individually supplied large industrial customers and of customers supplied via the gas distribution network [Mm<sup>3</sup>].**

**Data source: Ministry for Economic Development / SNAM Gas Network**

The following graph illustrates a significant reduction in overall fuel consumptions of transports in the Genoa Province during the decade from 1998 till 2010.

Disaggregate analysis shows that this reduction in transport fuel consumption has occurred only in the so-called “extra-rete” (non-network) market segment supplying wholesale companies, large industrial enterprises and service companies, public transports and administrations, road transport fleet operators, the agricultural and fishery sector.

Considering together (the sum) of gasoline + diesel consumptions, except for a temporary peak in 2002, fuel consumptions have remained basically constant throughout the decade.

Furthermore, in compliance with the change in composition of the national vehicle fleet, fuel consumptions show a marked shift from gasoline (which were decreasing) towards diesel consumption (which were increasing strongly).

These general trends are evident for the fuels distributed via the regular commercialisation network (non-highway petrol stations), as well as the fuels sold via the petrol stations on highways.

**The only market segment displaying a marked reduction in fuel consumptions is the so-called “extra-rete” (non-network). Since the “extra-rete” market segment supplies fuel to**



wholesale companies, large industrial enterprises, public transports and administrations, road transport fleet operators, agriculture and fisheries, the by far prevailing type of fuel used by these customers is Diesel.

The authors suspect that the marked reduction of “extra-rete” supplies in year 2002, although partially compensated by a temporary peak in both highway and non-highway fuel sales during same year, has its origin in the known reduction of industrial activities in the Genoa Province, and specifically the phase-out of steel and iron production facilities, which in turn has provoked a slow-down in demand for commercial road transportation of goods.

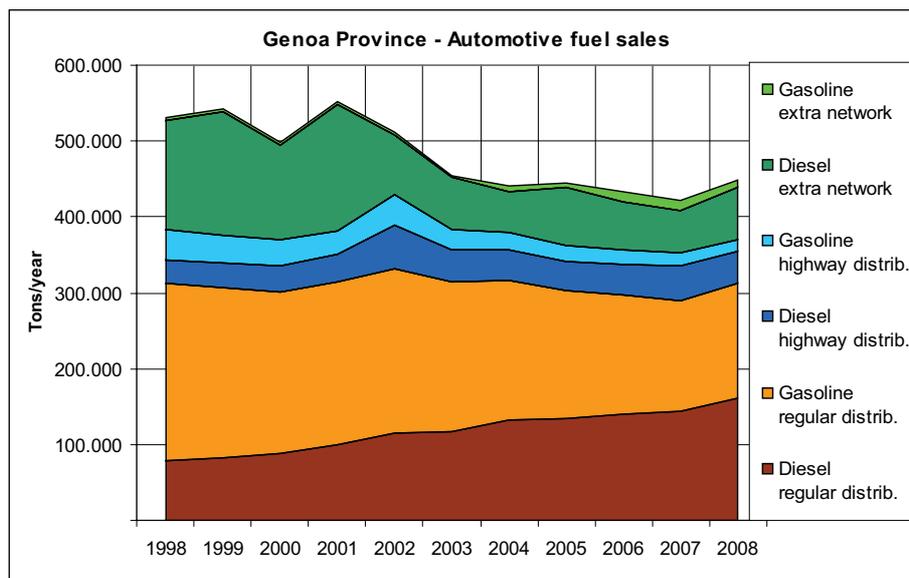


Figure 15 – Genoa Province - Automotive fuel sales in Genoa Province [t]  
Data source: Ministry for Economic Development

The results of the investigations carried out for the development of the year 2005 baseline scenario have been entered onto the attached SEAP baseline template and are given in the following summary table in terms of CO<sub>2</sub> emissions of addressed sectors within the city of Genoa.

In compliance with SEAP guidelines presented data do not reflect all CO<sub>2</sub> emissions of the city of Genoa, but only those emissions which have been generated by the sectors addressed by the SEAP, namely the civil sector and local transports. Accordingly the CO<sub>2</sub> emissions of larger industries and of long-distance transports are not included in the table.

The overall total of 2.271.913 tons of CO<sub>2</sub> emissions in year 2005 is the 100% reference value considered for comparison and quantification of all emission reduction targets and of effective results to be achieved by individual SEAP actions.


**Table 4 –Genoa City 2005 – CO<sub>2</sub> emissions generated by the civil sector and by local transports**

Category	CO <sub>2</sub> EMISSIONS [t]								Total
	Elettricity	Fossil fuels					Renewable energies		
		Natural gas	Liquid gas	Heating oil	Diesel	Gasoline	Other biomass	Solar thermal	
<b>BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:</b>									
Municipal buildings, equipment/faci	59.776	42.463		3.624	12.761				118.624
Tertiary (non municipal) buildings	356.481	240.243	16.348	38.589	14.571		6		666.239
Residential buildings	345.739	527.438	2.710		95.373		753		972.012
Municipal public lighting	19.505								19.505
Industries	non included in SEAP								
<b>Subtotal buildings, eq.t / f.ties</b>	<b>781.500</b>	<b>810.144</b>	<b>19.058</b>	<b>42.213</b>	<b>122.706</b>	<b>-</b>	<b>759</b>	<b>-</b>	<b>1.776.380</b>
<b>TRANSPORT:</b>									
Municipal fleet					8.183	1.647			9.830
Public transport	7.338	36			25.760	100			33.235
Private and commercial transport					56.192	396.276			452.468
<b>Subtotal transport</b>	<b>7.338</b>	<b>36</b>	<b>-</b>	<b>-</b>	<b>90.135</b>	<b>398.024</b>	<b>-</b>	<b>-</b>	<b>495.533</b>
<b>Total</b>	<b>788.838</b>	<b>810.181</b>	<b>19.058</b>	<b>42.213</b>	<b>212.841</b>	<b>398.024</b>	<b>759</b>	<b>-</b>	<b>2.271.913</b>

To summarise results, the assessment of the year 2005 baseline scenario has identified a number of criticalities, opportunities and reduction potentials for energy consumptions and related CO<sub>2</sub> emissions such as:

- **residential sector:** Energy performance improvement potentials of existing buildings are considerable and may be achieved via improvements of heating systems, by thermal insulation of building shells, and by the application of renewable energy systems namely solar energy systems (both PV and thermal);
- **tertiary sector:** Energy performance improvement in existing buildings may be achieved via improvements of air-conditioning and climatization systems, by thermal insulation of building shells, and by application of Domotics / building automation technologies;
- **local transports:** On-going policies to increase the supply of public transport means and infrastructures should be continued in view of a gradually growing electrification of public transport services, and specifically by further developing so-called vertical transports, namely public elevators, funicular and similar.



## Chapter 4

### VISION AND STRATEGY

At an outset it may be useful to describe where Genoa is heading. By adopting in January 2010 the 10 point master plan for sustainable development, the Genoa City government made a clear choice to change urban development strategies and regulations in favour of a climate- and environment-friendly sustainable development policy, intended to become integral part of urban regulations and planning regulations to be adopted and to become the fundamental reference framework for all future expansions and urban developments of the city.

A remarkable cultural change has been made by the city council in passing specifically the anti-sprawl policy to be adopted for urban planning in Genoa city, and to allow no-more further expansions in urban development, but to preserve instead the beauty and environmental value of the natural surroundings of the city, and to contain thereby urban developments within the presently reached boundaries defined by the so-called “green line” on the hillside and the “blue-line” on the sea-side.

Future urban developments and construction activities shall therefore be confined to the historically grown and already developed built-up areas. To allow for updates and changes in urbanisation, for restructurings and building improvements, clearly delineated “transformation districts” are to be defined and adopted by the city administration, but no more expansions into the natural surroundings will be considered acceptable. While being subject to specific regulations, these “transformation districts” will be designed to represent interesting market opportunities for market players such as the construction industry, building contractors, enterprises and citizen in need of a home, but contemporarily a very clear message has been launched against speculations in the building sector and spontaneous market developments aiming to further expand urbanisation into the hillside green-belt of the Genoa city.

The conservation of the green surroundings of Genoa city has become a planning priority to be enforced and implemented by exploiting specifically designed compensation mechanisms, which are being created to achieve a reasonable and conveniently balanced trade-off between the compelling necessity to no more allow for further urban expansions, and the need to create cost-effective investment opportunities for the building sector within the existing frame of the built-up area, specifically on existing buildings according to the motto to “**build only on the already built**”, which has been launched by the public administration as the basis of the latest urban development policy of the city government. Accordingly also on the sea-side the so-called “blue-line” defines a practically insurmountable boundary for urban developments and imposes a close relationship between the built-up areas of Genoa City and the sea, where various historical development phases of the city, of past and present industrial activities and of port facilities have left behind a considerable and visibly evident heritage of infrastructural facilities representing precious economic resources for the city.



*Figure 16 – View of Genoa*

Implementation and application of the above described urban development strategies and regulations implies de-facto a kind of implosion in the urban development of the city, where stakeholders are required to change attitude towards urbanisation and to adopt, instead of the traditional urban expansion approach with its never-ending demand for fresh and new land-surface for urban development, an entirely new viewpoint aiming to achieve environmental sustainability within fixed and therefore unalterable boundaries outlined by the hillside “green-line” and the “blue-line” on the sea-side.

To avoid dispersion and fragmentation of market forces and of functional urban facilities, the city administration is engaged in finding the right balance between the social and economic interests of citizens and enterprises on the one side, and environmental sustainability constraints on the other. While acknowledging the aim to preserve the historical and cultural peculiarities of the city, the city government intends to stimulate and to open the way for investments into technology innovations and market deployment of sustainable energy technologies by creating the awareness of the usefulness of energy performance and efficiency improvements among market stakeholder, enterprises, industries, the port authority and generally among Genovese citizens.

The pronounced de-industrialisation trend which heavily affected the economy of Genoa and its hinterland during latest decades, has generated the need to find new solutions and a way-out of the economic slowdown by launching and developing the attractiveness of the city for enterprises and economic activities different from the traditional heavy industry sector, and specifically by launching the image of the city in the tourist sector and in public opinion in general. Relevant economic opportunities are increasingly being created by systematically recovering and restoring the cultural, historical, seaside resort and environmental attractions of the city, such as the historical city centre with its museums, art



galleries, theatres, natural and built monuments and beauties, the aquarium of Genoa designed by Renzo Piano and the international exposition area.

The “blue-line” seaside area of Genoa, with its extensive marine port and air-port facilities, has a fascinating industrial history, which can be discovered by visitors in local museums and heritage centres. Shipbuilding, coal and iron steel making, and chemical manufacture have either been in the past, or are still today major employers of Genovese workers and citizens. To the west-end and the east of the long-stretched Genoa city shore-line there are several very attractive historical seaside resort facilities, which have fine beaches and cater well for tourists and holiday makers.

By confronting the results of the 2005 baseline with the “vision” for year 2020 described in the following pages, the major criticalities and affected sectors as well as related improvement potentials have been identified, and on this basis a considerable number of appropriate strategies and actions have been defined exploiting both conventional well-known technologies as well as new and innovative approaches to achieve the -23,7% CO<sub>2</sub> emission reduction target.

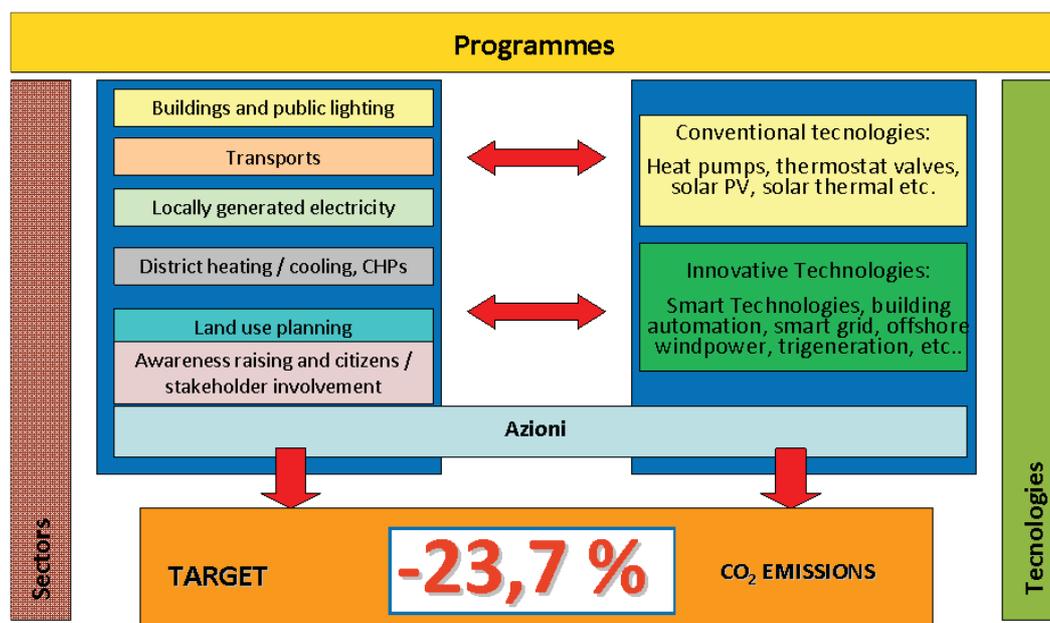


Figure 17 – Genoa City Government - Strategies and Programmes

Accordingly SEAP actions described in the following shall be implemented within the described historical, economic and social context and in compliance with the frame of development strategies and objectives on which over time consensus has matured and which today are shared by the city administration, by public stakeholders and by the citizenship. The individual sector and action-specific CO<sub>2</sub> reduction targets quantified in the following descriptions of planned actions are therefore expected to be reached by the widespread market deployment of already existing and well known conventional technologies, by exploiting existing synergies and by appropriate coordination of actions at local governance level. In addition, there are considerable potentials and opportunities to achieve even further reductions in energy consumptions and CO<sub>2</sub> emissions by adopting the wide spectrum of so-called “smart technologies” expected to reach market maturity in the near future.



The primary sectors and most promising potentials, where the city administration plans to intervene to make the “vision 2020” become reality are outlined as follows:

- **the building sector:** No doubt in Genoa city the building sector presents the largest potentials for energy saving, energy efficiency and renewable energy actions, and where measures to improve energy performance, and to achieve thereby considerable CO<sub>2</sub> emission reductions, are most promising. Envisaged actions will address both new buildings as well as the existing building stock. Specifically the measures to be adopted for new buildings will aim to increase the number of high quality and highly energy efficient buildings, whereas the existing building stock shall be addressed by more specific and diversified interventions designed to satisfy the requirements of the different sub-sectors namely public buildings, office buildings, public (social) and private housing, hospitals, school buildings etc.. Different from the residential sector, where natural gas represents the major energy source used, the tertiary sector absorbs specifically more electricity, which is a clear evidence for the higher potentials of actions aiming to renew and to improve air-conditioning systems and office lighting systems, as well as to introduce innovative building automation systems allowing to optimise the management of heating and climatisation systems, as well as of electrically powered systems and appliances.
- **Local transports and mobility:** the city administration intends to promote important actions aiming to improve mobility and accessibility of Genoa city by extending the provision and quality of public transports. Planned actions include the further development of surface and underground public transports, improvement and increasing the areas reserved for non-motorised cycling and pedestrian mobility, expanding the “Navebus” ferryboat shuttle service, enlarging intermodal transport provisions such as “bike-and-ride” (bicycle on public transports) and “Bike-Lift” opportunities (funiculars and public elevators used to reach hillside locations allowing for wonderful downhill bicycle rides towards destination), and to overcome thereby the hilly terrain barrier hindering the development of cycling mobility in Genoa. Specific targeted actions shall extend the bikelane network of genoa to improve safety and efficiency of non-motorized mobility and to encourage citizens to shift habits in favour of sustainable transport means.
- **Renewable energy sources:** besides the already considerable environmental benefits, exploitation of Renewable energy sources (RES) allows to reduce dependency on imported fossil energy sources and to effectively reduce greenhouse gas emissions. Accordingly there is a strong need to implement local energy policies aiming to encourage and to enhance the use of locally available renewable energy sources, and to make such policy become a key element of local government. Genoa city presents particularly favourable conditions for the application of solar energy systems, namely a considerable solar resources (comparable to Rome) much higher than other cities at similar latitude, and ideal orientation and exposure, since the city extends along the East-West oriented coast-line on mostly south facing hillside slopes. Furthermore the surroundings of the city present favourable topographic characteristics for the small hydropower plants and also the wind-resource along the coast is deemed favourable for windpower developments.



The most critical factor in this respect is the limited availability of land surface for the production of renewable energy: Potentials for ground-mounted solar systems of any kind are therefore limited. The major solar energy potential of Genoa city is definitely to be found on manmade structures, on building roofs and generally in the concept of building-integration. For same reason power generation potentials from biomass are limited to biogas from sewage treatment facilities and from the digestion of urban solid waste.

- Of particular relevance in terms of technical innovation and future market potential appears to be the initiative intended to realise an innovative floating offshore wind-power platform to be developed and built by Genovese industries and shipyards, the first pilot systems of which shall be positioned (anchored) in the sea close-by in front of Genoa City. In view of the generally much greater depth of the Mediterranean sea, as compared to the shallow waters of the North Sea and Baltic sea where offshore wind-power developments have taken place so far, the Genovese initiative presents promising potentials for the development of wind-power in the Mediterranean basin.
- **Land-use and urban planning:** the development of synergies (conceptual and temporal) between urban planning and development programs, and the integration of environmental safeguard criteria, renewable energy and energy efficiency requirements in the development process of urban planning instruments and regulations presents, considerable market potentials for sustainable energy technologies are expected to be stimulated, enabling thereby consistent CO<sub>2</sub> emission reductions. By acknowledging and preserving the urban development constraints outlined by the hillside “green-line” and the seaside “blue-line”, urban planning strategies and regulations shall favour the recovery for energy purposes of brownfield sites rather than the invasion and expansion into new Greenfield sites belonging to the city's green belt and hillside resorts.
- **Green public procurement:** In compliance with European legislation and the Italian National Energy Efficiency Action Plan, already since years the Genovese City administration goes beyond legal obligations and intends to commit all public administrations in the city to adopt binding green purchasing requirements for at least 30% of purchased products and services. All outsourcing of services, out-contracting for construction works and supplies of products and materials shall favour and assign priority to more environment-friendly solutions and to energy efficient products and facilities, allowing thereby to obtain considerable CO<sub>2</sub> emission reductions and to generate benefits for the environment and for the quality of life of citizens (less pollution, less toxic materials, less resource depletion, less waste etc.).
- Since many years the **distributed generation** concept exploiting locally available but dispersed energy sources is being considered as key element for the diversification of the energy supply mix allowing to reach independence from energy imports and environmental sustainability. Energy from Wind, solar, biomass, small hydropower, CHP cogeneration and trigeneration are the key technologies underlying the concept of distributed generation of electricity. In combination with energy saving and efficiency improvement actions, they are a powerful tool allowing to achieve considerable greenhouse gas emission reduction.
- **District heating / cooling networks:** increasing importance shall be assigned by Genovese public administrations to District heating and/or cooling networks fed by



CHP cogeneration or Trigeneration plants. At present the only major district heating facility existing in Genoa is the CAE power plant located at Sampierdarena operating since 1990. More widespread use of district heating and CHP is planned, including the use of the inverse absorption cycle for refrigeration purposes, which would allow to reach even higher efficiency and to reduce even more related overall fuel consumptions and CO<sub>2</sub> emissions.

- **Working with citizens and stakeholders** - Awareness creation, training and involvement of citizens: proposed actions shall aim to set-up information and training events to improve information and participation of citizens in local decision making on the subjects related to environmental safeguard, climate change, sustainability and energy issues. Actions will be designed taking into account the criticalities observed so far and the difficulties inherent in a process of effective participation. Access to scientific information allowing to compare alternatives correctly, development of initiatives and of training courses will be oriented in terms of content and methodology towards the basic principles of environmental sustainability, allowing citizens to become aware of irrational energy uses and to correct consumption habits accordingly. The Genoa city government intends to make the subject of “sustainable energy” and related best practices become a priority area in communication policies of the administration towards the general public and in its relationship with citizens.



## Chapter 5 ACTIONS

The following provides a brief description of actions planned under the SEAP, subdivided according to sector and by distinguishing between short-term (S) and long-term (L) implementations.

**Table 5 – Actions/ key measures per sector**

SECTORS and fields of action	KEY actions / measures per field of action	Expected energy saving per [MWh/a]	Local renewable energy production [MWh/a]	CO2 reduction target [t/a] in 2020
<b>BUILDINGS, EQUIPMENT/FACILITIES INDUSTRIES</b>				
<i>Municipal buildings, equipment/facilities</i>	EDI - S01 – Installation of thermal solar collectors on the roofs of sports centres		411	104
	EDI - S02 – Tenders /out-contracting for management of heating systems	27.100		5.474
	EDI - S04 – Energy Audits on school buildings			
	EDI - S05 – Development of municipal energy data-base			
	EDI - S06 – Retrofitting for heating systems (conversion from heating oil to natural gas)	45.390		12.664
	EDI - S07 – Multi-service Technology Agreement for local health centres of Liguria Region	47.576		12.760
	EDI - S08 – Energy saving in school buildings	16.539		4.715
	EDI - S09 – Energy management of the property owned by A.R.T.E. (local housing agency)	5.718		1.388
<i>Residential buildings</i>	EDI - S03 – Building Regulations	323.382		78.730
	EDI - L03 – Domotics – Home automation	169.330		34.662
<i>Municipal public lighting</i>	ILL - S01 – Energy efficiency measures for street lighting	10.816		5.581
	ILL - S02 – Replacement of traditional light bulbs with LED lighting for traffic lights	2.530		1.305
	ILL - S03 – Replacement of light bulbs on the flyover freeway	995		513
<b>TRANSPORTS</b>				
<i>Municipal vehicle fleet</i>	TRA-S10 – Rationalisation of use of the municipal fleet	185		50
	TRA-S11 – Renewal of the municipal fleet	667		179
<i>Public transports</i>	TRA-S01 – Protected axes	11.120		2.973
	TRA-S03 – Elevators and funiculars	3.706		991
	TRA-S06 – Extension of the Subway line	5.560		1.487
	TRA-S07 – Eco-friendly fleet transition plan	3.707		991
	TRA-S09 – Navebus	556		149
	TRA-L01 – Protected axes	14.826		3.964
	TRA-L03 – Elevators and funiculars	7.413		1.982
	TRA-L06 – Extension of the underground	5.560		1.487
	TRA-L07 – Eco-friendly fleet transition plan	3.336		892
	TRA-L09 – Strengthening of the local railway system	9.267		2.478



SECTORS and fields of action	KEY actions / measures per field of action	Expected energy saving per [MWh/a]	Local renewable energy production [MWh/a]	CO2 reduction target [t/a] in 2020
<i>Private and commercial transport</i>	TRA-S02 – Resident permit parking policy: extension of Blue Areas	77.838		20.812
	TRA-S04 – Infrastructures	5.560		14.866
	TRA-S05 – Environmental islands	25.946		6.938
	TRA-S08 – Interchanging hubs	5.560		1.487
	TRA-S12 – Goods Transport	7.413		1.982
	TRA-L02 – Resident permit parking policy: extension of the Blue Areas	77.838		20.812
	TRA-L04 – Large-scale infrastructures	18.533		4.955
	TRA-L05 – Environmental islands	25.946		6.938
	TRA-L08 – Interchanging hubs	5.560		1.487
<i>Other</i>	TRA-S14 – Soft mobility – Cycling facilities	1.853		496
	TRA-L14 Soft mobility – Cycling facilities	27.799		7.433
	TRA-S13 – Expansion of the car sharing service	7.413		1.982
	TRA-L15 – Wireless city network	20		5.000
<b>LOCAL ELECTRICITY PRODUCTION</b>				
<i>Hydropower</i>	PEL - S01 - Mini-hydropower		578	298
	PEL - S02 - Revamping and upgrading of Teglia hydropower plant		5.432	2.806
<i>Wind power</i>	PEL - S10 – Wind-farm Installation		31.500	16.254
	PEL - S11 – Wind-farm installation at Scarpino Landfill plant		132	68
<i>Solar Photovoltaics</i>	PEL - S06 - Agreement with private investors for the installation of solar PV systems on roofs owned by the municipal administration		5.295	2.732
	PEL - S07 - Installation of photovoltaic systems on roofs of schools		286	148
	PEL - S08 - Installation of photovoltaic systems at Monte Scarpino landfill plant		22	11
	PEL - S09 - Design of multifunctional complex for energy services in former market of Corso Sardegna		827	427
	PEL - L03 - Agreement with private investors for installation of solar PV systems on roofs owned by other public administrations		2.647	1.366
	PEL - L04 – Incentives for installation of hybrid solar panels roof of sport facilities		182	50
	PEL - L05 – Incentives for installation of hybrid solar panels roof by private companies		2.753	752
	PEL - S13 – Agreement with Enel for the realization of solar and wind power plants			



SECTORS and fields of action	KEY actions / measures per field of action	Expected energy saving per [MWh/a]	Local renewable energy production [MWh/a]	CO2 reduction target [t/a] in 2020
<i>Combined heat and Power</i>	PEL - L08 - Incentives for Installation of micro-CHP plants at hospitals, hotels, shopping centres and sports facilities		200.000	40.000
<i>Biogas (from municipal waste and sewage pants)</i>	PEL - S03 – Re-powering of energy from biogas plant at Monte Scarpino landfill facility		11.826	6.102
	PEL - L01 - Construction of an energy recovery plant from an Urban Solid Waste treatment facility		166.880	93.800
	PEL - S04 – Completion of energy from biogas production at Volpara sewage treatment facility		2.000	1.058
	PEL - S05 – Installation of energy production from biogas plant at Valpolcevera sewage treatment facility		1.600	814
	PEL - L02 – Installation of energy production from biogas system at Voltri sewage treatment facility		1.600	814
<i>Solar thermodynamics</i>	PEL - L06 - Construction of a parabolic solar dish thermodynamic power plant for electricity generation		175	90
<b>DISTRICT HEATING / COOLING, CHP PLANTS</b>				
<i>Combined heat and Power</i>	DIS - L01 - CHP / Trigenation developments and related district heating networks	385.000		77.000
<b>LAND USE PLANNING</b>				
<i>Urban planning</i>	PT - S03 - Municipal Energy Plan (PEC)			
	PT - S04 - City Urban Development Plan (PUC)			
	PT - S05 - Green urban plan			
<i>transports/mobility planning</i>	PT - S01 - Management of major events – Road transport planning regulation			
	PT - S02 - Urban Plans, Mobility and Traffic Management			
<b>PUBLIC PROCUREMENT OF PRODUCTS AND SERVICES</b>				
<i>Energy efficiency requirements/ standards</i>	PRO - S01 - Green Purchasing			
<b>WORKING WITH CITIZENS AND STAKEHOLDERS</b>				
<i>Advisory services</i>	PIN - S06 – Energy observatory			
	PIN - S07 – Energy Consultation			
<i>Awareness raising and local networking</i>	PIN - S03 - Environment Policy and Green Point			
<i>Training and education</i>	PIN - S01 - Communication and training			
	PIN - S02 - Training course for municipal administrators			



## BUILDINGS SECTOR

Results from the baseline analysis make evident that the buildings sector in Genoa is particularly energy intensive, contributing a large share in CO<sub>2</sub> emissions. Accordingly the subject requires to be addressed as a priority area for efficiency and energy saving actions. Actions foreseen in the buildings sector address both new buildings as well as existing buildings. Specifically concerning new buildings it is necessary to increase the number of high quality and energy efficient new building projects exceeding the efficiency requirements prescribed by national and/or regional law. The energy performance improvement actions to be implemented on existing buildings are described in the following under the related specific actions (municipal and private buildings, school buildings and residential).

However prior to starting actions, it is first necessary to implement energy audits on the buildings to be addressed by actions, in order to quantify the present performance of these buildings, and to identify most promising and cost-effective improvements. At this preliminary stage impacts of energy efficiency actions have been quantified on the basis of a limited number of assessed sample buildings and extrapolated to the whole universe of buildings planned to be subjected to actions.

**EDI - S01 – Installation of thermal solar collectors on the roofs of sports centres:** This action involves the installation of PV plants on the roofs of 9 municipal sports centres; the collectors will have a combined surface area of 624 m<sup>2</sup>. The energy produced, estimated at 410,634 kWh/year, will enable a reduction of 104 tons of CO<sub>2</sub> in 2020.

**EDI - S02 – Tenders /out-contracting for management of heating systems:** The objective is to restructure the management of heating plants in accordance with the current legislative requirements in order to improve the heating systems and their use, enhance efficiency, prevent waste of fuel and optimise operating hours, thereby cutting costs. Therefore, the action entails determining how many heating systems are to be put out to tender, defining the type of contract to be applied and the associated terms and conditions, setting the energy saving objectives for the contractor (or including them among the selection criteria) and determining the starting price and terms of payment.

**EDI - S03 – Building Regulations:** The Building Regulations of the Municipality of Genoa are designed to reduce energy consumption and CO<sub>2</sub> emissions by means of measures for new and existing buildings, with the introduction of more stringent requirements than those currently in force at regional and national level in Italy. The complementary sub-actions intended to help reach the ultimate energy saving objective are as follows: information campaigns dealing with the new requirements introduced in the Building Regulations; refresher/ upgrading courses for property managers; document checks so as to ensure the correct application of the Building Regulations on the part of architects; work-in-progress inspections; and checks of the correct application of Energy Certification.

**EDI - S06 – Retrofitting for heating systems (conversion from heating oil to natural gas):** The goal of this action is to raise public awareness concerning the implementation of a campaign of retrofitting for heating oil systems. The local council will launch information campaigns and coordinated actions in conjunction with local property managers, so as to facilitate the conversion of Genoa's heating systems; to this end, use will be made of the



Ministry's tax incentives (55% tax allowance), which have been largely disregarded up till now.

**EDI - S07 – Multi-service Technology Agreement for local health centres of Liguria Region:**

The main objectives of the agreement are to curb atmospheric emissions, minimise costs and enhance the quality of the services of local health centres. Energy saving measures include investments in retrofits for heating oil systems, the installation of 5 new cogeneration plants, and improved routine and extraordinary maintenance, so as to raise quality standards and reduce environmental impact.

**EDI - S08 – Energy saving in school buildings:** The set objective of the proposed action is to reduce energy consumption and CO<sub>2</sub> emissions in local schools by means of sub-actions aimed at minimising waste and heat loss, improving plant efficiency and harnessing RES. The concrete measures designed to achieve substantial energy saving in Genoa's school buildings are as follows: improvement actions recommended in the findings of energy audits; the installation of PV plants; the use of Energy Certification as a means of ensuring that the necessary measures are effectively implemented; the use of the Record of Assessment for school buildings; and monitoring of energy consumption.



*Figure 18 – Buildings at Piazza delle erbe*

**EDI - S09 – Energy management of the property owned by A.R.T.E. (local housing agency):**

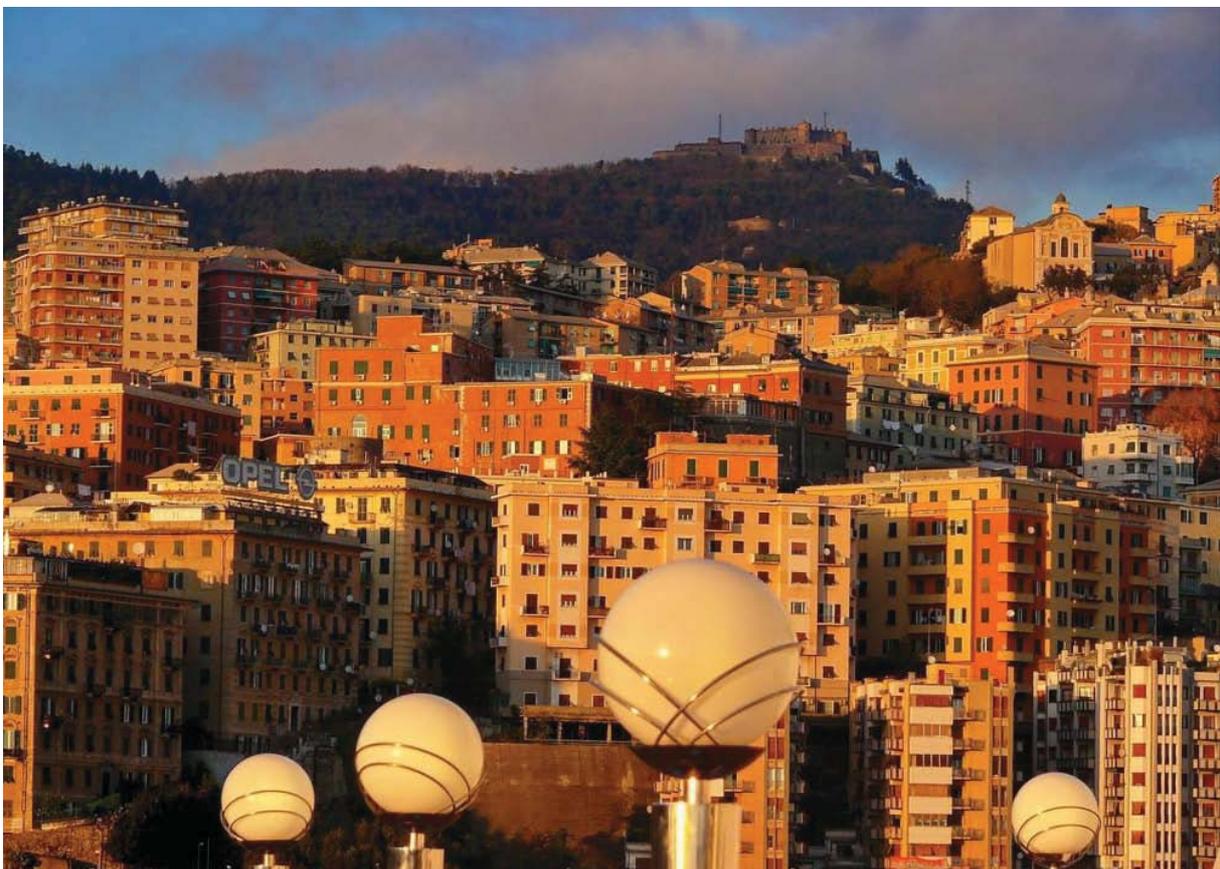
The aim of this action is to reduce the energy consumption of existing blocks of flats used for council housing and to limit the consumption of the new buildings that ARTE plans to construct. Measures include: retrofitting for central heating systems with the installation of more efficient, cleaner boilers; installation of energy production systems using RES;

renovation of buildings so as to improve their heat insulation; creation of a council housing energy consumption database that can be readily updated and consulted; and the introduction of an energy service contract guaranteeing quality maintenance, more efficient building system management and containment of the prices of renewable energy sources.

**EDI - L03 – Domotics – Home automation:** This action intends to gradually increase the use of so-called “domotics” (building automation) technologies, thereby obtaining significant energy savings in buildings, starting with large-scale premises in the tertiary sector, and then disseminating the technologies in question also in residential buildings. More specifically, the intelligent control technologies planned to be employed will address lighting, winter heating and summer cooling, and the use of smart window management and shading systems allowing to detect and identify open windows, the effective presence of people, daylight intensity allowing thereby to adapt and switch on/off climatisation and lighting system in individual rooms according to effective needs. The project involves selecting suitable tertiary sector buildings, publicising the results obtained, and launching the subsequent programmes, firstly, for tertiary sector domotics, and then for home automation.

## PUBLIC LIGHTING

The large majority of lamps installed throughout Genoa City, whether they be street lighting lamps or traffic light lamps are of the low efficiency conventional type. Accordingly there are important potentials for energy savings and significant reductions of CO<sub>2</sub> emission by replacing these lamps with modern high-efficiency lamps:



*Figure 19 – Public Lighting*



**ILL - S01 – Energy efficiency measures for street lighting:** The objective is to reduce energy consumption and thus curb CO<sub>2</sub> emissions by using state-of-the-art energy saving light bulbs (more lumens per watt). In particular, it is planned to use energy-efficient LED lighting and reduce the level of street lighting on the ground in those areas where there is relatively little night-time traffic.

**ILL - S02 – Replacement of traditional light bulbs with LED lighting for traffic lights:** The aim of this action is to replace traditional incandescent traffic lights with new high efficiency LED arrays, so as to reduce energy consumption and CO<sub>2</sub> emissions. Also, compared to a regular incandescent light bulb, LED bulbs offer greater brightness and intensity, with virtually no maintenance and replacement costs.

**ILL - S03 – Replacement of light bulbs on the flyover freeway:** This action is designed to reduce energy consumption and CO<sub>2</sub> emissions by replacing traditional light bulbs with energy-efficient bulbs. The action involves replacement of the light bulbs fitted in the 1000-plus street lights on the “Aldo Moro” flyover freeway, which is more than 6 km long, with high efficiency LED bulbs.

*In year 2020 the actions planned to be implemented in civil buildings and in the public lighting sector are expected to achieve emission reductions totalling about 9% of the sectorial CO<sub>2</sub> emissions, namely about 160.000 tons annually. In overall terms, this reduction corresponds to about 7% of total SEAP baseline CO<sub>2</sub> emissions in the Municipality of Genoa.*

## TRANSPORT SECTOR

It is planned to implement a system of urban mobility intended to enable easier access to and movement around the city thanks to alternative means of transport, policies favouring surface and underground local public transport, cycle paths, pedestrian precincts, intermodal use of public elevators and funiculars and the introduction of more water-based transport.

**TRA-S01 – Protected axes:** As part of a broader strategy of creation of an “innovative system of surface transport”, this action involves the establishment of dedicated public transport priority lanes on the following routes: Molassana – De Ferrari – Molassana and Marassi – De Ferrari. The actual efficiency of the system will depend on its integration with both public-public and public-private interchanging hubs. The anticipated budget amounts to approximately 60% of forecast spending for the UMP by 2020.

**TRA-S02 – Resident permit parking policy:** extension of Blue Areas - The expansion of the Blue Areas (resident permit parking program and priced parking for non-residents) entails an initial 2-year experimental phase with the gradual introduction of the system in other suburbs following consultation with stakeholders and accompanied by assessment of the results among local residents. The areas concerned are the lower Val Bisagno, San Fruttuoso, San Martino and Marassi. According to the UMP, the costs of planning and design are of the order of Euro 2 million.

**TRA-S03 – Elevators and funiculars:** Creation of vertical lift systems consisting of elevators and funiculars for the densely populated hillside areas and/or intermodal hubs within the system of urban mobility (e.g. train stations). Clearly, in this case as well, the interchanging



aspect is key. New elevators/funiculars are planned for Principe-Oregina, the link between Brignole Station and Piazza Manin, the suburb of Quezzi and the new Villa Scassi Hospital. The total estimated cost for the 4 new elevators/funiculars is around Euro 128 million.

**TRA-S04 – Infrastructures:** These actions are aimed mainly at reducing traffic congestion on the west coast of Genoa and are as follows: extension of Lungomare Canepa and building of a road on the right bank of the Polcevera creek.

**TRA-S05 – Environmental islands:** The so-called “environmental islands” are the result of a combination of measures designed to:

- prohibit or penalise private vehicle traffic in the areas concerned
- reduce the amount of roads available for private traffic and the average speed of vehicles
- guarantee optimum road safety
- favour the flow of public transport and the mobility of cyclists and pedestrians.

3 areas are involved in the short term: Via Canevari (Val Bisagno), Via Piacenza (Val Bisagno) and Sampierdarena. The total forecast budget is about 1.5 million euros, half of which for the suburb of Sampierdarena alone.

**TRA-S06 – Extension of the Subway line:** Extension of the existing line from De Ferrari to Brignole (with a link to the adjoining mainline station). The Brignole subway stop is located right next to the train station, using two platforms to the north of those used by regional and national rail services, thus enabling a quick and convenient connection between the metro and mainline stations. Escalators and pedestrian underpasses provide access to city buses and coaches to other destinations, while there are walkways leading to the surrounding inner city suburbs. The opening of the De Ferrari-Brignole extension of the subway should facilitate the interchange and onward flow of passengers between the train station and the city centre. The total estimated budget for this action is approximately 240 million euros.

**TRA-S07 – Eco-friendly fleet transition plan:** By means of the pre-existing CIVITAS-CARAVEL project, the local bus company AMT made plans to introduce about 80 new eco-friendly vehicles (Euro5, Euro6 and EEV) replacing the highly polluting Euro 0 buses and also implemented other measures (e.g. the installation of filters) designed to reduce environmental impact. The entry into service of the new buses is currently underway; it is planned to purchase another 40 new buses by 2014. The total budget amounts to around 50 million euros.

**TRA-S08 – Interchanging hubs:** In the “network” system, the main public-public interchangers (Brignole, Principe and Sampierdarena) are crucial in terms of guaranteeing efficient service. The following interchangers are planned: Val Bisagno (in view of for the protected axes from Molassana to Staglieno), Brignole (interchange with local and district buses, mainline and underground rail services, taxis and bike sharing) and Principe (interchange with local and district buses, mainline and underground rail services, taxis and bike sharing). The estimated cost of the UMP for these three hubs is approximately 11 million euros.

**TRA-S09 – Navebus:** As part of the Regional Operational Programme LIGURIA (2007-2013) - AXIS 3 - URBAN DEVELOPMENT, it is planned to add a new stop at Voltri-Prà on the commuter ferry service. This will involve the construction of a 7000 m<sup>2</sup> wharf, the idea being that the additional stop will encourage a substantial number of citizens who currently drive from Prà to the Porto Antico area to leave their cars at home and travel by boat instead. The



total estimated cost of this project is around 2 million euros plus 15,000 euros as year maintenance costs.

**TRA-S10 – Rationalisation of use of the municipal fleet:** There are two actions planned to support the reorganisation and rationalisation of use of the local council's vehicles: firstly, the creation of centralised management both of purchasing (General Affairs Department) and of use (Fixed Assets Management Department) of the pool of municipal vehicles; and, secondly, the promotion and expansion of the car sharing service within the local administration with particular regard to the main local government offices located in different parts of the city (Matitone, Palazzo Tursi, Corso Torino).

**TRA-S11 – Renewal of the municipal fleet:** This action consists of three highly complementary sub-actions. The phasing out of non-compliant vehicles will involve about 10% of the current fleet by 2014 plus the replacement of a further 60 old vehicles with more eco-friendly models. This divestment is part of a renewal program whereby, for every new purchase, two old vehicles will be sold (i.e. at a ratio of 1:2). Finally, the Green Public Procurement rules, imposed partly by new EU legislation and introduced by the Municipality of Genoa, include environmental criteria among the parameters to be taken into account when awarding tenders in this field.

**TRA-S12 – Goods Transport:** Certain areas have been made off limits for non-commercial private vehicles during the experimental phase of the Progetto Europeo Mercurio, which is currently in progress ahead of its permanent full-scale introduction. The set objective of this action is the rationalisation of the traffic generated by the commercial vehicles driving around the old town and the optimisation of that goods transport, simultaneously fulfilling the needs of delivery vehicles and also of pedestrians/residents, who understandably want a healthier environment with less noise and air pollution. Local improvement actions will be required in the areas that are off limits to all traffic except commercial vehicles. To this end, expenditure of the order of 700,000 euros has been forecast.

**TRA-S13 – Expansion of the car sharing service:** In order to discourage the use and/or purchase of privately owned vehicles by motorists who normally do less than 9000 km a year (threshold identified in a study conducted by the car sharing Initiative, below which it is uneconomical to buy and run a car), it is planned to expand the car sharing fleet, extend the network to suburbs where it is not yet offered, upgrade the online systems and services and sensitise potential users. The car sharing service is funded directly by the Ministry of the Environment.

**TRA-S14 – Soft mobility – Cycling facilities:** In line with the aims of sustainable mobility, Genoa is promoting new models of non-motorised soft mobility in order to reduce traffic congestion, noise and air pollution and, at the same time, improve the quality of life for citizens by means of cycle paths and lanes. Central to this policy is the MoBike initiative (bike sharing service). Priorities for this action include the continuity of routes for cyclists, in accordance with the Urban Mobility Plan, ease of access for cyclists to shopping centres and other services and facilities, intermodal connections with the local public transport network and synergies generated by environmentally sustainable redevelopment. To this end, new cycle paths and lanes will be opened and the MoBike project – whose success depends greatly on the availability of safe routes for cyclists – will be promoted, targeting potential new users. The initial phase of the work involved is worth approximately 1.8 million euros, plus anticipated marketing and promotion costs amounting to around 15,000 euros.



**TRA-L01 – Protected axes (priority lanes for public transports):** as part of the strategy to create “innovative system of surface transport”, the following new priority public transport lanes) shall be implemented: De Ferrari-Sampierdarena, Nervi-Brignole (extension), Brignole-Foce (extension). This will speed up the public transport service and make it competitive with private vehicle use. The measures involved are included together with those of Action TRA-S01, making a total amount equivalent to about 60% of the cost of implementation of the UMP.

**TRA-L02 – Resident permit parking policy:** extension of the Blue Areas: The Blue Areas are part of the policies regulating demand: the intention is to discourage city users from driving into town and also to discourage city residents from using their cars to get around Genoa. The extension of the Blue Areas is another step towards a more far-reaching system limiting access to non-residents and favouring public over private transport. By 2020 the Blue Areas will be extended to cover Pegli, Sestri Ponente and the east coast of Genoa. The associated costs according to the UMP amount to around 2 million euros.

**TRA-L03 – Elevators and funiculars:** As stated previously, if people are going to leave their cars at home, specific geographical configuration of Genoa requires the use of alternative means of transport in order to enable them to reach the densely populated hillside suburbs, as well as existing or planned hillside facilities. This means elevators and funiculars instead of vehicles, which pollute even more than normal given the steep winding roads leading to the hills above the city. A case in point is the suburb of Di Negro. Another example is the new Erzelli Scientific & Technological Park. In both cases it is planned to install public elevators with stops at several levels so as to access the coast. The total estimated cost for these lifts is about 180 million euros.

**TRA-L04 – Large-scale infrastructures:** The general objectives of the infrastructure projects are: increased infrastructure for vehicles travelling on arterial roads in Genoa, reduction of traffic congestion on inner city roads and reduction of noise and air pollution. More specifically, the so-called “Gronda” (link road project) is designed to allow traffic to cross from one side of Genoa to the other without going through the city centre by means of the new motorway link to be built in the hills. In addition to the Gronda, other key strategic projects for Genoa are the redevelopment of the San Benigno port hub and the tunnel under the port. Given the size and complexity of the measures, at present it is not possible to estimate the costs of construction and management of the infrastructure concerned.

**TRA-L05 – Environmental islands:** This action entails (in synergy with other actions described elsewhere): the redevelopment of public areas and measures intended to greatly reduce private vehicle traffic; an increase in pedestrian precincts; the addition of limited traffic zones and bus lanes; new pay parking zones; the centralisation of traffic signal coordination; and integration with the air and noise pollution monitoring network. The suburbs involved are Sestri Ponente, Pegli and Nervi. The investment is worth approximately 1 million euros, 70% of which is earmarked for Nervi.

**TRA-L06 – Extension of the underground:** Extension of the existing line from Brin to Canepari (new Canepari station). Completion of the Val Polcevera line will thus be achieved by the addition of this new stretch of roughly 550 metres. Part of the new track will be above ground and part on the existing Campasso railway line for goods trains. The opening of the Brin-Canepari stretch should facilitate the interchange and onward flow of passengers between the Valpolcevera outskirts and the city centre, reducing the time required to cover



the same distance using surface transport. According to the UMP, the cost of this action is about 80 million euros.

**TRA-L07 – Eco-friendly fleet transition plan:** In line with AMT's short-term policy and the current project to upgrade the fleet and make it more environmentally friendly, it appears likely that, subject to the availability of funding, there will be a new round of purchases at least as extensive as the one that is now in progress (2009 to 2014). The anticipated cost, estimated on the basis of the expenditure incurred for Action TRA-S07, amounts to around 50 million euros.

**TRA-L08 – Interchanging hubs:** The innovative network system is linked to the main local transport infrastructure, bringing home the importance of the careful design of interchangers, whether they are connected to park & ride facilities, mainline train stations or the underground. In the long term it is planned to set up four new interchangers: three private-public (San Benigno motorway exit, Genoa Pegli Navebus wharf and Genoa Nervi motorway exit) and one public-public hub (Sampierdarena). The planning and creation of these interchangers will entail spending amounting to 4% of the total expenditure provided for by the UMP.

**TRA-L09 – Strengthening of the local railway system:** On an urban/local level, the railway network improvement detailed in the UMP consists of two main types of action: the first regards the track and rail infrastructure generally and comprises a fourfold increase in the number of lines (local traffic vs. through trains and/or long-distance rail services) and the extension of the Voltri rail link (construction of a new tunnel in the Val Polcevera and renovation of the old bridge on the branch line); the second set of actions concerns the construction or redevelopment of several local stations (Palmaro, Cornigliano Bombrini, Voltri and Sampierdarena) with the associated urban planning measures required to ensure that the new buildings are both functional and environmentally sustainable in their local settings. Four separate sub-projects will be carried out: Genoa Voltri Station; extension of the Voltri rail link; Genoa Sampierdarena Station; an increase of six times the present capacity of the rail link between Principe and Brignole Stations plus work in and around Brignole providing easy access to and links between the station, the underground, buses and the local area. Also, several new local stations will be built at the following locations: Pegli Lido, Multedo, Sestri Ovest (Erzelli), Palmaro and Bombrini. The total cost of this work has not yet been calculated.

**TRA-L14 Soft mobility – Cycling facilities:** The second phase of promotion of the use of bicycles to get around Genoa will be implemented by opening new cycle paths and cycle parking facilities on the most suitable routes along the east coast of Genoa, as set out in the Urban Mobility Plan. More specifically, it is planned to extend the existing cycle paths and the associated facilities (cycle parking, etc.) as well as the bike sharing (MoBike) service. The estimated cost of the investment is around 2.5 million euros.

**TRA-L15 – Wireless city network:** This action intends to implement a wireless city network allowing Internet access to all citizens and visitors of the city through their own portable notebook, laptop computer, tablet-PC, and smart-phone or whatever other IT device allowing for wireless access. New and improved information services related to the Genoa will become available, such as real-time information on public transports, booking services, web-access to public offices and local administrations, health-care services, assistance for the elder, for taxpayers, access to university services, tourist information, cultural events and many others. The project belongs to those types of actions, able to provoke a so-called



de-materialisation effect on economy. Specifically the action is expected to reduce the local mobility demand, and as result the related energy consumption, since users will mostly be able to obtain whatever they need without having to physically move (and travel) from wherever place they will be using the service to the location where the requested information or service is available or being generated. The effect on mobility demand (and on elated energy consumption) is difficult to predict but no doubt it will not be “zero”. An estimate of approximately 1% reduction in mobility demand appears to be a plausible and realistic figure. Accordingly, the resulting energy saving effect may be estimated to be roughly 20.000 MWh annually (equivalent to 2 million litres of automotive fuel) and the resulting reduction in CO<sub>2</sub> emissions will be roughly 5.000 tons of CO<sub>2</sub> annually.

***In year 2020 the actions planned to be implemented in local transports are expected to achieve emission reductions totalling about 22,8 % of the sectorial CO<sub>2</sub> emissions, namely about 113,000 tons annually. In overall terms, this reduction corresponds to about 5 % of the year 2005 SEAP baseline CO<sub>2</sub> emissions in Genoa City.***

#### LOCAL PRODUCTION OF ELECTRICITY

Individual planned interventions are briefly described as follows:

**PEL - S01 - Mini-hydropower:** the Torre Quezzi hydropower plant is planned to return to operation. The plant exploits water from the Valnoci reservoir which feed the aqueduct of Genoa. A new 110kW turbine-generator shall be installed.



**Figure 20 –Solar PV plant on roof of building owned by ARTE Genova**

**PEL - S02 - Revamping and upgrading of Teglia hydropower plant:** The plant exploits water from the Busalietta reservoir feeding the aqueduct of Genoa. Plant Repowering consists in replacing existing turbines with more efficient Francis turbines. The two groups will generate 400kW and 1000kW respectively.



**PEL - S10 – Wind-farm Installation:** in a wind park of 18 MW shall be installed consisting of 12 turbines of 1.5 MW each. The wind power potential of the site has been estimated based on the Italian Wind-Atlas developed by ENEA DIFI ERSE in collaboration with the University of Genoa. Siting shall take into account the suitability for the Genovese territory.

**PEL - S11 – Wind-farm installation at Scarpino Landfill plant:** an area of the Monte Scarpino landfill surface shall accommodate three mini-turbines of 20 kW feeding the grid.

**PEL - S06 - Agreement with private investors for the installation of solar PV systems on roofs owned by the municipal administration:** roof surface exploitation rights shall be granted to an energy operator company or ESCO responsible for operation and maintenance of systems and facilities.

**PEL - S07 - Installation of photovoltaic systems on roofs of schools:** 20 kW solar PV systems shall be installed on the roofs of 13 schools.

**PEL - S08 - Installation of photovoltaic systems at Monte Scarpino landfill plant:** the landfill area of Monte Scarpino is subject to re-environmentalisation. A 20kW solar photovoltaic power system feeding the grid is planned. Future expansion is being considered.

**PEL - S09 - Design of multifunctional complex for energy services in former market of Corso Sardegna:** Former vegetable market shall host a 33 kWp solar photovoltaic system on the roof of the building intended for residential use.

**PEL - L03 - Agreement with private investors for installation of solar PV systems on roofs owned by other public administrations:** envisaged installations shall be implemented on the roofs of public buildings located in Genoa but owned by regional, provincial or other public bodies (ARTE Genoa, hospitals, University of Genoa, and others).

**PEL - L04 – Incentives for installation of hybrid solar panels roof of sport facilities:** incentives for the installation of hybrid solar thermal / PV systems shall be granted, since expected to reduce surface requirements, installation, operation and maintenance costs in comparison to separate systems. The action addresses specifically sports facilities and particularly swimming pools.

**PEL - L05 – Incentives for installation of hybrid solar panels roof by private companies:** incentives for the installation of hybrid solar thermal / PV systems shall be granted, since expected to reduce surface requirements, installation, operation and maintenance costs in comparison to separate systems. Approximately 1600 m<sup>2</sup> are planned to be installed. The figure will be updated as necessary in biennial SEAP review.

**PEL - L08 - Incentives for Installation of micro-CHP plants at hospitals, hotels, shopping centres and sports facilities:** action shall stimulate CHP installations by private companies. Proponent will be assisted by the municipal administration to obtain all required permits, and technical advice for the development of an appropriate business plan. Main target recipient shall be clinics, hotels, shopping centres and sports facilities managed by private enterprises.

**PEL - S03 – Re-powering of energy from biogas plant at Monte Scarpino landfill facility:** a 1,5MW<sub>e</sub> power generator unit shall be added to the 6 existing.

**PEL - L01 - Construction of an energy recovery plant from an Urban Solid Waste treatment facility:** after separate waste collection the waste residue after recycling shall be used to produce energy by the following two plant units:

1. anaerobic bio-digester section for treatment of organic matter, with biogas energy recovery by means of a 4,5MW<sub>e</sub> internal combustion engines, the plant shall benefit from green certificates;



2. dry fraction treatment section by gasification of waste, syngas production by gasification will be 95MW<sub>t</sub> and electricity fed into the grid approx. 25 MW<sub>e</sub>.

**PEL - S04 – Completion of energy from biogas production at Volpara sewage treatment facility:** power generation from biogas is planned to be increased to total 260 kW. Four Capstone micro turbines CR of 65 kW<sub>e</sub> are presently operating. Since start-up in October 2008 operation has not been satisfactory and requires fine-tuning and optimisation. Proposed action shall optimise management and operation of the plant in order to exploit its full potential.

**PEL - S05 – Installation of energy production from biogas plant at Valpolcevera sewage treatment facility:** A 200 kW<sub>e</sub> power generator from biogas energy shall be fed from the Valpolcevera digester and sewage treatment facility. The new plant will be similar to the one operating at the Volpara sewage treatment facility.

**PEL - L02 – Installation of energy production from biogas system at Voltri sewage treatment facility:** A new 200kW<sub>e</sub> generator unit shall be fed from the digester at Voltri sewage plant. The new plant will be similar to the one Volpara sewage treatment.

**PEL - L06 - Construction of a parabolic solar dish thermodynamic power plant:** envisaged system shall have a capacity of approximately 100 kW, and serve primarily as a demo-plant, since the solar source in Genoa is probably not sufficient to allow the system to reach cost-effectiveness. However, the demonstration value of the plant, the possibility to demonstrate plant operation to people (especially students) and to have them get acquainted with the technology justifies the cost of the action. Furthermore technological spin-offs from the project are probable.

***In year 2020 the actions planned to be implemented for local electricity production are expected to achieve emission reductions totalling about 168,000 tons annually, corresponding to about 7,4 % of the year 2005 SEAP baseline CO<sub>2</sub> emissions of Genoa City.***

**DIS - L01 - CHP / Trigenation developments and related district heating networks:** A long-term planning action shall be implemented to achieve significant developments in urban district heating / cooling: the envisaged CHP power plant configuration will probably be a larger size combined cycle unit allowing to ensure the required high efficiency, reliability and heat exploitation factor. Plant construction will probably take 3 to 5 years. Identification and quantification of potential heat customers, the design of the heat distribution network and related substations will probably require at least the same amount of time. By 2020 we assume to be able to install a total power plant capacity of about 60 MW<sub>e</sub> and 50 MW<sub>t</sub> thermal rating, assuming 2 power plants to be installed of size and characteristics similar to the present Sampierdarena power plant.

## **LAND USE AND ENERGY PLANNING**

Territorial energy planning requires to develop first of all the overall picture of the present scenario by adopting an interdisciplinary and integrated approach allowing to assess and to map all energy consumptions, existing energy sources and potentials for future developments, specifically in terms of locally available renewable energy sources, and to develop energy development scenarios aiming to quantify future energy demands and



possible supply sources based on demographic forecasts and on defined urban development and territorial planning scenarios.

**PT - S01 - Management of major events – Road transport planning regulation:** The road transport planning regulation responds to the need of the city administration to have available a planning tool allowing to technically assess the mobility and traffic congestion reality of the city, by quantifying the mobility demand of citizens, of enterprises and of visitors. Specifically the large number of major exhibition events and/or seasonal events held in Genoa, such as the Salone Nautico, Euroflora, sporting events of international relevance, White Nights, etc. generate considerable additional mobility demand, which the planning authority needs to be able to assess in neutral and objective terms, in order to be able to respond to changing needs in a flexible, possibly non-bureaucratic manner, allowing also for temporary infrastructural solutions. The objective is to make available to planning authorities an appropriate tool able to assess and to manage also the sources of extraordinary additional mobility demand in order to be able to respond to the effects on mobility generated by major events, and to reduce thereby conflicts between residents and visitors coming from outside the city, bearing in mind the overall aim to avoid significant degradation of the quality of life of residents.



*Figure 21 – Panoramic view of Genoa*



**PT - S02 - Urban Plans, Mobility and Traffic Management:** the city Administration adopts a number of planning tools for the regulation of transports and to provide for an adequate level of governance. Specifically the planning tools are the following:

The PUT (Urban Traffic Plan) is a sector specific plan for implementation of short-term operational actions serving to optimize intervention planning and road space management. The fundamental methodological steps in the development of an Urban Traffic Plan are: the diagnostic analysis, identifying development objectives, formulation of intervention strategies and control objectives.

The Urban Mobility Plan (PUM) as per law 340/2000 serves instead as a medium to long term planning tool at mobility system level. In this context the term "mobility management" does not refer to actual planning instruments, but policies which may result in many different initiatives, promotions, experimentations, aimed to create awareness of problems arising from traffic congestions and appropriate remedies aimed to preserve a high quality of life for residents and visitors (planning of commuter mobility demand between home and work, between home and school, number of employed by companies, carpooling needs, soft mobility, etc).

**PT - S03 - Municipal Energy Plan (PEC):** The PEC is the natural continuation of the work done so far by the administration for the establishment of the SEAP. The PEC will serve to establish a relationship of mutual updates from other municipal planning tools aiming to avoid or at least settle conflicts between land use and urban development actions and the need to preserve the environment. Important links can be envisaged between the Urban Energy Plan and the Strategic Environmental Assessment, serving for evaluating the trade-offs between urban development needs and the effective sustainability of development initiatives planned to be implemented on the territory. Thus, the sustainability of planned energy activities in other parts of planning may become an expected output from the PEC, taking into account the environmental implications of energy actions within the administrative boundaries (e.g. the transport sector).

**PT - S04 - City Urban Development Plan (PUC):** the Urban Development Plan of Genoa city aims to assign priority to sustainable development in order to favour the welfare of citizens. The close relationship between urban developments and urban transport demand affects directly energy consumptions and consequent production of air-pollutants and noise: as known, in Italy the settlement of regulatory conflicts is still solved by municipal zoning. Energy planning will therefore have a key role in updating the PUC. Integration of energy variables allows us to quantify energy consumption and supply from existing and potential renewable energy sources, and to develop scenarios for the assessment of future energy demand based on demographic and urban development forecasts. The process of updating the PUC is currently underway. Adoption and approval is expected by end of year 2010 or early 2011.

**PT - S05 - Green urban plan:** The City administration is presently preparing the new plan green urban plan serving to develop, manage and define the role of green spaces in Genoa, and the Regulation of the green serving to protect existing trees in the city and to regulate the use of green spaces by citizens. The action starts from the need to increase quantity and quality of outdoor green spaces, through implementation of appropriate maintenance and restructuring procedures, and identifies innovative management forms for large urban parks. The action continues by identifying sponsorships from local stakeholders for urban green areas, and recovery of degraded natural environments



through the retrieval and subsequent use of EU funded projects, ensuring thereby proper use of public parks, in order to limit extraordinary maintenance actions to the minimum required.

***Planning actions are fundamental to prepare the ground and to maximise the effects of concrete actions serving to reduce energy consumptions and CO<sub>2</sub> emissions, but as such they cannot affect related phenomena directly. On the other hand, since budgeting decision are made on the ground of expected benefits, the project team decided to quantify planning effects by assigning to planning actions a lump-sum beneficiary effect of 0,5% of the year 2005 SEAP baseline CO<sub>2</sub> emissions in Genoa City.***

## **PUBLIC PROCUREMENT OF PRODUCTS AND SERVICES**

The actions proposed in the field of green procurement are the continuation of on-going activities of the Administration in compliance with legal requirements and city council decision on environmental sustainability. In general the City of Genoa promotes green procurement as follows:

- New furniture made from recycled wood and non-toxic materials (to be certified) and electrical appliances of highest possible energy class;
- Electronic devices (PCs, printers, monitors etc.) must consume little energy and consumables (e.g. printer cartridges) must be recyclable;
- Textiles and shoes must be made of non-harmful materials, if possible, recycled materials;
- more than 70% of paper must be recycled, and the remainder must comply with low environmental impact regulations (lower thickness and come from less energy-intensive production);
- Vehicles (both own and those owned by contractors) must comply with low emission requirements, possibly bi-fuel. The municipal vehicle fleet is presently being modernised by adopting less polluting vehicles or, wherever possible, electric vehicles.

**PRO - S01 - Green Purchasing:** According to the European directives, the Italian Ministry of Environment and Protection of Land and Sea has developed the "Green Public Procurement National Action Plan" (NAP GPP), to which all public authorities are obliged to comply. Accordingly green procurement aims to minimise the use of non-renewable resources (raw-materials) and especially energy from fossil fuels, reduce CO<sub>2</sub> emissions, and reduce the use of hazardous substances and waste. The Genoa City Council intends to commit at least 30% of expenditures in green purchasing.

***Technically it is possible to quantify only the use of recycled paper, for which precise monitoring data are available. CO<sub>2</sub> emission reductions in year 2020 from the use of recycled paper are expected to amount annually to approximately 80,000 kg (estimated over the entire life cycle).***



## PARTICIPATION AND AWARENESS CREATION

The proposed actions aims to Involve citizens and stakeholders" in a dialogue on the subject of energy sustainability as a methodology for public decision making, to reduce the distance between the municipality and citizens, to respond in a timely and appropriate manner to specific needs of local communities, to improve transparency, to provide access to correct technical information and guidance to citizens concerning the principles of public accounting and transparency. Actions shall involve stakeholders and social groups, such as the Liguria regional government, the Genoa Province government, the Port Authority, Chamber of Commerce, Industry associations, professional bodies, trade associations, representatives of citizens, municipalities etc.

Due to the nature of the action (participation and awareness creation) it is not possible to quantify the related beneficial effects on energy consumption and on CO2 emissions. However, indirectly the action improves awareness of citizens and induces reduced consumptions.

**PIN - S01 - Communication and training:** behaviour of citizens is a key element to achieve goals for environmental safeguard and for energy savings. Participatory processes shall therefore be launched by the city administration through an effective communication campaign, aimed to create awareness creation among citizens and the general public: specific information, training and education events shall be implemented at schools and other education facilities, and in collaboration with energy sector stakeholders. A municipal thematic website shall be created where citizens and the interested public may obtain answers to questions, technical advice and support on all energy related matters, as well as through newsletters and workshop events.

The general aim and idea behind the action is to induce citizens s well as enterprises to spontaneously change their habits in favour of more sustainable and environment-friendly behaviours, to improve the relationship of trust between citizens and Public Administration, and to create a network allowing citizens to access complete and correct information and to stimulate cooperation in the field sector.

**PIN - S02 - Training course for municipal administrators:** problem-oriented and conscious behaviour of municipal staff and personnel would help to achieve environmental safeguard objectives reducing thereby inefficiencies and dispersion of resources. Furthermore related activities promoted and implemented by employees and staff-members of the public administrators are likely to become good-practices and examples to be up taken by citizens. The objectives of this action are therefore to inform and train specifically the staff members of the Municipality of Genoa through a series of basic training courses and of more specialized courses. Furthermore, taking advantage of good example such as for instance the "Green Champions" Scheme adopted by the Manchester City Council, the intention is to identify particularly effective individuals and to have them act as "Green Volunteer" helping thereby the administration to encourage more environment-friendly and sustainable behaviour among colleagues.

**PIN - S03 - Environment Policy and Green Point:** the Green Point (counter for the decrease in resource consumptions) and the Territorial Laboratory for Healthy Environment Education Genoa are specialised facilities supporting operators who work in the field of awareness creation and education, training and communication on matters related to environment



safeguard. These structures aim to promote environmental education initiatives and help develop the ideas of those who wish to actively contribute to disseminate culture and information on social and environmental sustainability, through the implementation of projects and operation of the forum, to make the local development more sustainable, more equitable and environmental-friendly.

The general aims of the action are to improve the quality of life in the addressed territory and develop energy policies with a view to environmental sustainability: specifically, by improving of the above means to develop collective responsibility about the quality of the environment.

**PIN - S06 – Energy observatory:** a proactive and consultative body will be created to act as an institutionalized group to ensure the required coordination between all municipal agencies and departments involved in matters related to energy, in order to create effective synergies in view of the need to adopt a common approach in the analysis of individual problems and suggest possible solutions and measures for improvements. The observatory will also provide technical support for decision making aiming to reduce energy consumption and CO<sub>2</sub> emissions in Genoa City, by developing thematic papers and reports on related specific issues. The action shall arrange also for the creation of energy observatories in individual municipal districts of the City (Municipal Energy Observatory), involving representatives from the municipality, from stakeholders, professionals, and concerned citizens.

Having more detailed knowledge of their own territory and related energy needs, members of district energy observatories will be invited to formulate suggestions and ideas to be discussed at both district and central level. The action is integral part of the general policy of improving municipal services by adopting innovative methods of governance of the city.

**PIN - S07 – Energy Consultation:** creation of a consultation board on energy related issues is deemed necessary to establish an area of confrontation, allowing the administration to benefit from proposals and suggestions from citizens and associations, in order to achieve greater effectiveness and efficiency in local public services in view of the objectives set by the SEAP. The consultation will:

- Make proposals for the implementation of policies, projects and programs of interest to citizens;
- Propose participations of the Municipality in projects promoted by associations, and to establish thematic working groups coordinated by a responsible reporting to the Consultation;
- Promote the implementation of studies, analysis and investigations of interest for citizens.

The meetings of the consultation will take place upon formal invitation by the mayor or by the assessor responsible for relations with consumer associations.

***As such, actions for awareness creation among citizens and stakeholder do not affect energy consumptions and CO<sub>2</sub> emissions directly, but act as a powerful tool to amplify the effects of other actions. On the other hand, since budgeting decision are made on the ground of expected benefits, the project team decided to quantify planning effects by assigning to awareness creation actions a lump-sum beneficiary effect of 0,5% of the year 2005 SEAP baseline CO<sub>2</sub> emissions of Genoa City.***


**Table 6 – Synthesis of action results (per sector) and expected CO<sub>2</sub> emission reductions**

SECTORS & fields of action	Expected energy savings per measure [MWh] in 2020	Local renewable energy production target per sector [MWh] in 2020	CO2 reduction target per settore [t] in 2020	Contribution of action to overall target
Buildings, equipment/ facilities	649.375		157.896	6,9%
Local trasport	453.183		112.809	5,0%
Local electricity production		433.735	167.590	7,4%
District heating / cooling, CHPs			77.000	3,4%
Land Use Planning			11.360	0,5%
Public procurement of products and services				
Working with citizens and stakeholders			11.360	0,5%
Other				
<b>OVERALL CO2 EMISSION REDUCTION TARGET</b>			<b>538.014</b>	<b>23,7%</b>
Baseline 2005 total CO2 Emissions			2.271.913	100,0%



## Chapter 6

### PROSPECTS AND ECONOMIC OPPORTUNITIES

Since centuries the city of Genoa and its port plays a leading role in the Mediterranean as a natural transportation and business hub connecting Central Europe to the area of the ancient "Mare Nostrum". Besides the port activities, the city's economy has its roots in the great **industrial tradition** which, beginning from the late nineteenth century, has contributed substantially to the economic growth and industrialization of the region and all of Italy. Following World War II, Genovese large enterprises have played a key role world-wide in the sectors of **energy and power plants, construction of large industrial facilities, in steel & iron production and in shipbuilding.**

Nevertheless since the 1980's, the development model based on large state-owned enterprises began increasingly to suffer an economic downturn, and was gradually displaced by new high-tech industrial companies operating in technological innovations centred around "**Information Technologies**" (IT), specifically in the fields of robotics and industrial automation, in electronics and in telecommunications as applied to conventional electromechanical systems, to industrial facilities and in shipbuilding.



*Figura 22 – Porto Antico area*

According to the CENSIS data in 2001 industries in the Liguria region showed remarkably positive development indicators in terms of employment and innovation. In Genoa the number of people employed in research, in information technologies and in advanced services reached a share of 10.6% of the total employees, a figure which exceeded the national average of 9,4% and placed the Genoa Province at 4th position in the ranking of innovative Italian provinces.



Today Genoa displays a **highly diversified knowledge based economy** offering a wide range of products, services and job opportunities based on a considerable number of high-tech companies ranging from small to large enterprises, subsidiaries of multinational corporations, university and industrial spin-offs, and young newly founded companies specialized in specific innovative technology developments.

The candidature of the Municipality of Genoa for the title of European "Smart City" aims to strengthen and consolidate a new development strategy adopted by the city government in favour of sustainability, namely sound and environmental-friendly economic development. The objectives of the Smart City project are basically twofold: reducing Greenhouse gas emissions, and developing clean and environment-friendly technologies. Coincidentally these aims of the smart-city initiative blend perfectly with the those of the Covenant of Mayor.

The general aim of the initiative is to activate a transformation process in economy in a way to enable Genovese industrial enterprises to take advantage of opening market opportunities in the field of clean and sustainable technologies, and to have Genoa take the lead in environment-friendly, energy efficient and cost-effective actions against climate change. The initiative is thereby supported by the Faculty for Engineering, Confindustria (national industry Association), ANCE - Assedil Genoa, SIIT Distretto Tecnologico, and major industrial players from the energy sector. The main subjects addressed by the initiative are: infrastructures, the port, buildings, environment, energy and transports. Accordingly the objectives of the Smart City initiative of Genoa City are as follows:

1. **Better quality of life** – the transformation of the economy aims to improve the energy efficiency of economic activities, safeguard the environment and reduce GHG emissions improving thereby living and working conditions for citizens. Genoa shall become an attractive city to live in, to work in, and to be visited by tourists.
2. **development of businesses and employment** - The highly diversified business environment in the city based on both small and large enterprises, of which many are engaged in high-tech developments, and the close liaison with Genovese research facilities, makes Genoa be a well-positioned location for investments in industrial developments presenting remarkable innovation and economic development potentials. The Smart City project is expected to create market opportunities for new technology development and employment opportunities, creating thereby an attractive business environment for both foreign and national investors
3. **Research investments** – specifically in high-tech developments shall strengthen and consolidate the strong point of the economy of the city. The Genoa Smart City project will thereby support the link between research and industry and focus resources on applied research leading to practical economically and environmentally sustainable business opportunities, while stimulating international access and the arrival of foreign researchers to the Genovese Centre for knowledge and technological innovation.
4. **training and job opportunities for the young** – In the industrialized world, human capital is becoming the main critical factor enabling long-term economic growth. An attractive city environment for education and interesting job opportunities requiring knowledge and technological expertise shall therefore attract human resources to Genoa to achieve a “brain gain” (as opposed to “brain drain”) allowing talented



young people to invest in Genoa their knowledge and expertise in sustainable growth and the creation of qualified jobs.

Taking into account the aims of the Covenant of Mayors initiative, the following gives some examples of smart technologies expected to reach market maturity in the next future, and which are deemed promising to achieve substantial reductions in energy consumptions and CO<sub>2</sub> emissions:

**Domotics / Smart-Building / Building-Automation:** These terms embrace a wide range of different information technologies and applications tailored to manage buildings by means of integrated and fully automatic computerised systems able to provide a multitude of features, functions and services. Most common Implementations typically aim to provide supervision and control functions for the automatic management of indoor lighting and of climatisation systems. In addition to such comfort oriented services, building automation systems are typically able to provide also for active safety and for security services, as well as for the remote management of devices or equipment present in the envisaged building facility. Building automation systems typically allow to improve and optimise the energy consumptions in buildings, especially for winter heating, summer cooling, and for lighting, and to achieve thereby significant energy savings in terms of both thermal energy and electricity.

**Wireless City Network:** once completed the network shall cover the entire city of Genoa and allow Internet access to all citizens, visitors and tourists via their own portable notebook, laptop computer, tablet-PC, smart-phone or whatever other IT device equipped with a wireless access interface. New and improved real-time information services related to Genoa shall become available, such as information on public transports, real-time traffic info, booking services, web-access to public administrations, health-care services, assistance for the elder, for taxpayers, access to university services, tourist information, cultural events and many other. The initiative is expected to provoke a so-called de-materialisation effect on local economy. Since users will be able to satisfy most of their day-to-day needs via the wireless city network, without moving / travelling physically, the expected reduction effect on mobility demand and on related energy consumption, although difficult to predict, will not be "zero".

**"Smart Grids":** Historically the power network was designed to "broadcast" electricity produced by few large central power generators to a large number of consumers. Instead the "smart-grid" concepts turns this traditional view to the opposite, allowing the network to absorb productions from large numbers of distributed small-size generator units (either mini-CHP units using fossil fuels, or renewable sources like wind, solar PV, biomass and biogas). To enable the management of such by-far more complex generation configurations, the network needs to become "intelligent" i.e. able to monitor in real-time the operating parameters of millions of network nodes and, in case of abnormal operating conditions, activate corrective actions instantaneously allowing the affected network node to return automatically to normal operation (self-healing capacity).



The complexity of the task requires "smart grids" to combine their bi-directional power flow feature with intelligent "smart" technology, which in turn allow for many other "smart" services such as: remote real-time meter readings including time-variable tariff rate readings, to select most convenient time-periods to operate high-power appliances (typically during off-peak periods during the night), capability of the network to absorb high contribution shares from intermittent renewable power sources (wind and solar), demand-side management (DSM), dissemination of "e-mobility" charging stations for electric vehicles, configured to operate in "Smart charging" mode i.e. remote controlled by the network dispatcher contributing thereby to electricity network balancing.

The Genovese economy has become an increasingly innovative, knowledge-based economy aiming to maximize the value of its industry and to solidify its position as a primary Gateway connecting between Central Europe and the Mediterranean basin. Its vital role within the European transport systems is made evident by the large traffic volumes transiting the port of Genoa. Although hampered by inadequate land-based infrastructures, specifically in the railway sector, and once the transition period has been overcome, the Genovese port activities have returned to grow.

An innovative kind of floating wind-power offshore platform, therefore suitable for application in the deep waters of the Mediterranean, is expected to be developed by industries and shipyards in Genoa, different from the current offshore wind-power technology designed for application in the relatively shallow waters (<30 metres) of the North Sea and the Baltic Sea.

Genoa today is not only an industrial sea-port city. It is also an ancient / historic city of art, the birthplace of Christopher Columbus, a city of ancient traditions and culture offering many monuments as tourism sites like the 14th-century Palazzo Ducale, Palazzo Rosso, Palazzo Bianco, the renovated harbour area (Porto Antico), the Aquarium, the international Fair-ground, many museums, villas, parks, historic locations in the neighbourhood like Boccadasse, and beach resorts at the east and the west end of the city. While maintaining traditional industry and sea-port facilities, Genoa is presently engaged to recover and develop its natural, historic and cultural beauties including the port as a fundamental tourist attraction of the city. While promoting an image of the city linked to the sea and the different cultures sharing the Mediterranean shorelines, the city administration aims to maximise the usability and value of the waterfront and to restructure urban mobility in a way to increase prosperity and livability of the city for citizens.

The SEAP offers the city an opportunity to further develop and to modernize the historical vertical transport systems in Genoa, consisting of 2 funicular (cable-car) systems, 1 rack & pinion railway line and 10 public elevators. Being these facilities by far more energy efficient than any modern alternative, and apparently of minor importance, by adopting the intermodal "bike lift" concept (similar to the use of ski-lift by skiers in mountain resorts) the Genovese hillside locations served by vertical transport systems may become comfortable departure points for relaxing and wonderful downhill bicycle rides. Accordingly these historical public transport facilities may effectively contribute to promote pedestrian and non-motorized cycling mobility, thus contributing to reduce energy consumptions and CO<sub>2</sub> emissions, while adding to the tourist attractions of the city.



As often happens with technical solutions for sustainability, the SEAP ends up to promote the return to a good idea of the past, developed and adopted prior to mass motorization, and therefore particularly appropriate to promote non-motorised mobility. Further developments of the concept will obviously require integration of the “good idea of the past” with modern automation technology in order to maximise comfort and usability for users, and to minimise operating costs for the service operator.

Climate change and environmental safeguard issues in general represent both challenges and opportunities. The challenge is to develop financing and programs to reduce CO<sub>2</sub> emissions rapidly; the opportunity is to use these programs to develop green jobs and firms that export green products and services. In fact the “green” sector of global economy is by far the fastest growing in the world, and the City of Genoa is well positioned to take advantage of this opportunity.

The city government of Genoa has decided to join the European Covenant of Mayors initiative and to achieve thereby, through the SEAP and the implementation of the actions described in this document, a substantial **reduction in CO<sub>2</sub> emissions in year 2020 totalling 23.7% of the year 2005 baseline** emissions of the city. By launching the new sustainable development model addressing climate change and sustainable energy, the Genoa city government intends to take advantage of the economic opportunities and market potentials of the innovative, sustainable and environment-friendly low carbon technologies expected to reach market maturity in next .



# Sustainable Energy Action Plan (SEAP) template

This is a working version for Covenant signatories to help in data collection. However the on-line SEAP template available in the Signatories' Corner (password restricted area) at: <http://members.eumayors.eu/> is the only **REQUIRED** template that all the signatories have to fill in at the same time when submitting the SEAP in their own (national) language.

## OVERALL STRATEGY

### 1) Overall CO2 emission reduction target

(%) by **2020**



Please tick the corresponding box:

- Absolute reduction
- Per capita reduction

### 2) Long-term vision of your local authority (please include priority areas of action, main trends and challenges)

Starting from the analysis of the data and results achieved thank to the filling-in of the Baseline Emission Inventory (BEI) and according to strategical development axes of the Municipality of Genoa (Administration governance programme 2007-2012, PUC (Municipal Urban Plan) and the 10 points for a sustainable urban development drawn-up by UrbanLab) the Municipality of Genoa identified the main sectors of operation and actions to carry on in the short and long-term in order to achieve a reduction of CO2 emissions. The long-term strategy has been drawn-up in order to achieve the objectives of the "Genova Smart City" project. Main fields of operation are: buildings and urban equipment, public lighting, mobility and transport and local production of electricity. Items taken into consideration in SEAP involve many different sectors of the Local Administration which are now demanded to ensure the coherency among the SEAP and their development strategy and operational planning instruments. As detailed for any action in SEAP, the achievement of the CO2 reduction objective is the result of three elements: the application of standard technologies, the efficient implantation of the Action Plan and the good coordination of local governance policies. Even if the application of innovative technologies as domotics or artificial intelligence could give a limited contribution in terms of "quantity" of energy saving, it could represent an important added value for the development of the Genoese industrial system.

### 3) Organisational and financial aspects

Coordination and organisational structures created/assigned	The Municipality of Genoa in order to strengthen its energy policy created a specific Energy Office with a task of management and coordination, became a shareholder of the Regional Energy Agency of Liguria Region (ARE) and has strengthened its collaboration with ARE and the University of Genoa in the Energy field. Furthermore, the Municipality has put into operation a Technical Support Structure for the compilation and implementation of the SEAP. This is an inter-departmental structure within the Municipality coordinated by the Environment and Energy Department and involving all affected Directions and Public Agencies and Societies; a technical and scientific support is ensured by ARE Liguria and the University of Genoa.
Staff capacity allocated	Energy Office of the Municipality of Genoa with the support of ARE-Regional Energy Agency of Liguria Region and CRUIE - Research Centre in Town-planning and Ecological Engineering of the University of Genoa
Involvement of stakeholders and citizens	Association of professions, University, Professional Committees and Colleges, Environmental Associations, Consumers Associations, Trade Unions and Volunteering Associations, Public Agencies and Societies
Overall estimated budget	Concerning the 2010 Budget the Municipality foresees: 2 mln/€ for the realization of renewable energy systems on municipal buildings; 500.000€ to co-funding with regional funds the realization of photovoltaic systems on schools; 285.000€ for the dissemination of energy savings principles and the intelligent use of renewable energies. Further 200.000€ are foreseen in 2011, 2012 and 2013 to improve energy savings and for dissemination actions. Concerning transports costs, funds are indicated in the PUM (Urban Mobility Plan) 2010 .
Foreseen financing sources for the investments within your action plan	Further funds for the implementation of the Action Plan will be found through the participation to European, National (Ministry) and Regional funding programs and/or through self-financing actions. The Administration will evaluate other possible models of financing: Ministry revolving fund, third party financing, leasing: capital/operative, Esco, public and private partnership...
Planned measures for monitoring and follow up	Action Plan monitoring is one of the main tasks of the Energy Office which has to ensure the coordination and coherence among Action Plan implementation and other existing and foreseen programmes and plans of the Public Administration ("Mappa dei programmi strategici"). Detailed monitoring measures are identified for any actions.

Andate alla [seconda parte del modulo SEAP ->](#) relativa all'inventario di base delle emissioni del vostro comune

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## BASELINE EMISSION INVENTORY

### 1) Inventory year

For Covenant signatories who calculate their CO2 emissions per capita, please precise here the number of inhabitants during the inventory year:

[?](#) Instructions

### 2) Emission factors

Please tick the corresponding box:

- Standard emission factors in line with the IPCC principles  
 LCA (Life Cycle Assessment) factors

Emission reporting unit

Please tick the corresponding box:

- CO2 emissions  
 CO2 equivalent emissions

[?](#)

### 3) Key results of the Baseline Emission Inventory

**Green cells are compulsory fields**

**Grey fields are non editable**

#### A. Final energy consumption

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Category	FINAL ENERGY CONSUMPTION [MWh]															Total
	Electricity	Heat/cold	Fossil fuels							Renewable energies						
			Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Plant oil	Biofuel	Other biomass	Solar thermal	Geothermal	
<b>BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:</b>																
Municipal buildings, equipment/facilities	115844		210214		12990	47795								113		386956
Tertiary (non municipal) buildings, equipment/facilities	690854		1189323	70772	138311	54575							32		2143868	
Residential buildings	670036		2611078	11730		357202							3736		3653783	
Municipal public lighting	37800														37800	
Industries (excluding industries involved in the EU Emission trading scheme - ETS)															0	
<b>Subtotal buildings, equipments/facilities and industries</b>	<b>1514535</b>	<b>0</b>	<b>4010616</b>	<b>82502</b>	<b>151301</b>	<b>459572</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3768</b>	<b>113</b>	<b>0</b>	<b>6222407</b>
<b>TRANSPORT:</b>																
Municipal fleet						30676	6618									37294
Public transport	14222		179			96603	269									111273
Private and commercial transport						200000	1505628									1705628
<b>Subtotal transport</b>	<b>14222</b>	<b>0</b>	<b>179</b>	<b>0</b>	<b>0</b>	<b>327279</b>	<b>1512515</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1854195</b>
<b>Total</b>	<b>1528757</b>	<b>0</b>	<b>4010795</b>	<b>82502</b>	<b>151301</b>	<b>786851</b>	<b>1512515</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3768</b>	<b>113</b>	<b>0</b>	<b>8076601</b>

Municipal purchases of certified green electricity(if any) [MWh]:	
CO2 emission factor for certified green electricity purchases (for LCA approach):	

**B. CO2 or CO2 equivalent emissions**

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Category	CO2 emissions [t]/ CO2 equivalent emissions [t]															Total	
	Electricity	Heat/cold	Fossil fuels								Renewable energies						
			Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Biofuel	Plant oil	Other biomass	Solar thermal	Geothermal		
<b>BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:</b>																	
Municipal buildings, equipment/facilities	59776		42463		3624	12761											118624
Tertiary (non municipal) buildings, equipement/facilities	356481		240243	16348	38589	14571							6				666239
Residential buildings	345739		527438	2710		95373							753				972012
Municipal public lighting	19505																19505
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																	
<b>Subtotal buildings, equipments/facilities and industries</b>	<b>781500</b>	<b>0</b>	<b>810144</b>	<b>19058</b>	<b>42213</b>	<b>122706</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>759</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1776380</b>
<b>TRANSPORT:</b>																	
Municipal fleet						8183	1647										9830
Public transport	7338		36			25760	100										33235
Private and commercial transport						56192	396276										452468
<b>Subtotal transport</b>	<b>7338</b>	<b>0</b>	<b>36</b>	<b>0</b>	<b>0</b>	<b>90135</b>	<b>398024</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>495533</b>
<b>OTHER:</b>																	
Waste management																	
Waste water management																	
Please specify here your other emissions																	
<b>Total</b>	<b>788838</b>	<b>0</b>	<b>810181</b>	<b>19058</b>	<b>42213</b>	<b>212841</b>	<b>398024</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>759</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2271913</b>
<b>Corresponding CO2-emission factors in [t/MWh]</b>	<b>0,516</b>	<b>0,000</b>	<b>0,202</b>	<b>0,231</b>	<b>0,279</b>	<b>0,270</b>	<b>0,263</b>	<b>0,000</b>	<b>0,000</b>	<b>0,000</b>	<b>0,000</b>	<b>0,000</b>	<b>0,202</b>	<b>0,000</b>	<b>0,000</b>	<b>0,000</b>	
CO2 emission factor for electricity not produced locally [t/MWh]																	

**C. Local electricity production and corresponding CO2 emissions**

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Locally generated electricity (excluding ETS plants , and all plants/units > 20 MW)	Locally generated electricity [MWh]	Energy carrier input [MWh]											CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for electricity production in [t/MWh]		
		Fossil fuels					Steam	Waste	Plant oil	Other biomass	Other renewable	other				
		Natural gas	Liquid gas	Heating oil	Lignite	Coal										
Wind power	0														0	0
Hydroelectric power	3489														0	0
Photovoltaic	94														0	0
Combined Heat and Power	353659														176829	0,45
Biogas	72522														14504	0,2
<b>Total</b>	<b>429764</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>191333</b>		

**D. Local heat/cold production (district heating/cooling, CHPs...) and corresponding CO2 emissions**

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Locally generated heat/cold	Locally generated heat/cold [MWh]	Energy carrier input [MWh]										CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for heat/cold production in [t/MWh]		
		Fossil fuels					Waste	Plant oil	Other biomass	Other renewable	other				
		Natural gas	Liquid gas	Heating oil	Lignite	Coal									
Combined Heat and Power	242647													109191	0,45
District Heating plant(s)														0	0
Other Please specify: _____														0	0
<b>Total</b>	<b>242647</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>109191</b>	

4) Other CO2 emission inventories

If other inventory(ies) have been carried out, please click [here ->](#)

Otherwise go to the [last part of the SEAP template ->](#) dedicated to your Sustainable Energy Action Plan

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TRANSPORT:							353183	0	112809
<i>Municipal fleet</i>	TRA-S10 – Rationalisation of use of the municipal fleet	Municipality of Genoa - General Affairs Department	2010-2014		185		50		
	TRA-S11 – Renewal of the municipal fleet	Municipality of Genoa - General Affairs Department	2009-2015		667		179		
<i>Public transport</i>	TRA-S01 – Protected axes	Municipality of Genoa - Mobility Department	2009-2014			11120	2973		
	TRA-S03 – Elevators and funiculars	Municipality of Genoa - Mobility Department	2009-2014	128000000	3706		991		
	TRA-S06 – Extension of the underground line	Municipality of Genoa - Mobility Department	2009-2011	238167612	5560		1487		
	TRA-S07 – Eco-friendly fleet transition plan	AMT	2009-2014		50000000	3707	991		
	TRA-S09 – "Navebus" (Bus-boat)	Municipality of Genoa - Mobility Department	2009-2014		2000000	556	149		
	TRA-L01 – Protected axes	Municipality of Genoa - Mobility Department	2014-2020			14826	3964		
	TRA-L03 – Elevators and funiculars	Municipality of Genoa - Mobility Department	2020-2020		180000000	7413	1982		
	TRA-L06 – Extension of the underground line	Municipality of Genoa - Mobility Department	2020-2020		126700000	5560	1487		
	TRA-L07 – Eco-friendly fleet transition plan	AMT	2014-2020		50000000	3336	892		
TRA-L09 – Strengthening of the local railway system	Municipality of Genoa - Mobility Department	2020-2020			9267	2478			
<i>Private and commercial transport</i>	TRA-S02 – Resident permit parking policy: extension of Blue Areas	Municipality of Genoa - Mobility Department	2009-2014		2000000	77838	20812		
	TRA-S04 – Infrastructure	Various Responsibles	2014-2019			5560	14866		
	TRA-S05 – Environmental islands	Municipality of Genoa	2014-2019		750000	25946	6938		
	TRA-S08 – Interchanging hubs	Municipality of Genoa - Mobility Department	2014-2019		11000000	5560	1487		
	TRA-S12 – Goods Transport	Municipality of Genoa - Mobility Department	2020-2020		700000	7413	1982		
	TRA-L02 – Resident permit parking policy: extension of the Blue Areas	Municipality of Genoa - Mobility Department	2020-2020		2000000	77838	20812		
	TRA-L04 – Large-scale infrastructure	Various Responsibles	2020-2020			18533	4955		
	TRA-L05 – Environmental islands	Municipality of Genoa and Involved Sub-municipalities	2015-2020		1000000	25946	6938		
TRA-L08 – Interchanging hubs	Municipality of Genoa - Mobility Department	2014-2020		13000000	5560	1487			
<i>Other</i>	TRA-S14 – Soft mobility – Cycling facilities	Municipality of Genoa - Mobility Department	2010-2014		1995000	1853	496		
	TRA-L14 – Soft mobility – Cycling facilities	Municipality of Genoa - Mobility Department	2014-2020		2500000	27799	7433		
	TRA-S13 – Expansion of the car sharing service	Municipality of Genoa - Mobility Department	2014-2019			7413	1982		
	TRA-L15 – Wireless city network	Municipality of Genoa	2020-2020			20	5000		





**GLOSSARY AND ACRONYMS**

SHW.	Sanitary hot water	IPCC	International Panel for Climate Change
AMGA	Azienda Municipalizzata Gas e Acqua	ITS	Information Technology System
AMI	Azienda per la Mobilità e le Infrastrutture	LAN	Local Area Network
AMIU	Azienda Multiservizi e di Igiene Urbana	LCA	Life Cycle Assessment
AMT	Azienda per la Mobilità e i Trasporti	LED	Light-Emitting Diode
ARE	Agenzia Regionale per l'Energia - Liguria	LV	Low voltage
ARTE	Azienda Regionale Territoriale per l'Edilizia	ICE	Internal Combustion engine
ASTER	Azienda Servizi Territoriali	REAP	Regional environmental energy plan
BEI	Baseline Emission Inventory	MEP	Municipal Energy Plan
CAE	Consorzio AMGA Energia	PEPESEC	Partnership Energy Planning as a tool for realising European Sustainable Energy Communities
CHP	Combined Heat & Power (cogeneration)	POR	Programma Operativo Regionale
CASA	Construction activity start announcement	UDP	Urban development plan
CoM	Covenant of Mayors	UMP	Urban Mobility Plan
CRUIE	Centro di Ricerca in Urbanistica ed Ingegneria Ecologica	OUP	Operational Urban Plan
CASD	Construction activity start declaration	UTP	Urban Traffic Plan
DiFi	Dipartimento di Fisica dell'Università degli Studi di Genova	PV	Photovoltaic
DNI	Direct Normal Irradiation	RES	Renewable Energy Sources
EC	European Commission	SEAP	Sustainable Energy Action Plan
EE	Energia Elettrica (electricity)	SSL	Strutture Sanitarie Liguri (regional Health Service)
EER	Energy Efficiency Ratio	TEN-T	Trans European Network of Transport
EEV	Enhanced Environmentally-Friendly Vehicle	TOE	Tons of oil equivalent
EPBD	Energy Performance of Buildings Directive	TPF	Third party financing
ESCO	Energy Service Company	LPT	Local public transport
ETS	Emission Trading System	PRT	Private transports
GIS	Geographical Information System	EUE	European Union
HV	High Voltage	USW	Urban solid waste
LPG	Liquefied Petroleum Gas	SEA	Strategic environmental assessment
CSI	Car Sharing initiative	WAN	Wide Area Network
		ZEV	Zero Emission Vehicle



Comune di Genova

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