ClairCity: Citizen-led air pollution reduction in cities

D6.2 Air Quality and Climate Related Policies in the Liguria Region, Italy – Baseline Analysis

March 2018

FINAL REPORT
This report is one of the five policy baseline reports that together form deliverable D6.2 (Bristol, Sosnowiec, Ljubljana, CIRA/Aveiro and Liguria). Its aim is to provide: 1) a description of the city/region’s air quality and climate change policies, placing them in the international, national and regional context; 2) an analysis of the role of citizens in these policies and their impact on citizens’ health and well-being; and 3) a discussion of the relevance of the findings of this report for the ClairCity project.
**Contributions and Acknowledgements**

The authors would like to thank the following people for their important contributions used in the preparation of this final document.

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Policymaker Summary

This report is part of the ClairCity (‘Citizen Led Air pollution Reduction in Cities’) project, funded by the European Union under the Horizon 2020 Research and Innovation Programme. The aim of ClairCity is to contribute to more effective citizen engagement with air quality and climate change policies and actions in cities. This has the subsequent aim of improving the future wellbeing and health of urban citizens in Europe and globally.

The report provides a baseline analysis of current air quality and climate change policies in the Liguria Region, Italy. The report analyses in more detail:

• The contextual factors influencing air quality and greenhouse gas (GHG) emissions;
• The influence of global, European, and national policies on Ligurian policymaking;
• The state of air quality and GHG emissions in the Liguria Region;
• Regional and local policies in Liguria and Genoa and the role of citizens and other stakeholders in these policies.

Main conclusions of the report are:

• The Liguria region is characterised by a Mediterranean climate and a mountainous geography. Predominant wind direction helps to reduce air pollution, but the limited possibilities for land-use due to the geographical situation lead to a concentration of port, industry, traffic, and housing in the coastal strip of Genoa and the overall coastal Liguria area – thus contributing to air quality problems.
• Emissions of air pollutants and carbon emissions in Liguria are decreasing due to EU, national and local policies. However, exceedances of NO\textsubscript{x} and O\textsubscript{3} concentrations are still problematic, as well as the risk of exceedances for PM\textsubscript{10}. The road and port transport activities are the main contributors to these problems.
• Local policies focus on energy efficiency and renewables such as: cleaner port activities (LNG, electrification), diverting transit road traffic away from the city, and improving and stimulating the increased use of public and rail freight transport. However, at the same time the number of scooter parking spaces in the city centre of Genoa was increased recently and lower car parking fees were introduced.
• Climate change in the Ligurian region is often framed as a threat to high quality agricultural products, but does not receive a high level of public attention. Still, NGO action is more related to climate change than to air pollution. Citizen actions are ambivalent. Protests against the harbour noise and emissions go hand in hand with citizens uprising against a ban on polluting vehicles. Cars and scooters are important means of transport to citizens and hence difficult to be given up.
**Contextual factors influencing air quality, greenhouse gas emissions and citizen practices in the Liguria Region**

Several characteristics (geography, climate, energy and transport) of the Liguria Region set the scene for the state of air pollution and GHG emissions, the governance and policies in these areas, and the role that citizens and other stakeholders (can) play in creating the problem and contributing to the solution.

The Liguria Region, in Italy, is a slim strip of land, along the coast of the Gulf of Genoa, located in between the sea and the steep hills. The territory is overall hilly, with an extensive forest area, and enjoys primarily a Mediterranean climate (except in the mountainous areas). Given its geography, previous urban development near the torrents and climatic conditions, climate change might be a threat in the Liguria Region concerning floods (e.g. Bisagno torrent overflowing), droughts, forest fires, and heat waves.

These geographical characteristics of the region limit the options for land use. The population of the region, with high density of elderly, is concentrated on the coast, mainly in Genoa, along with its industry and large harbour, both of which are unusually close to urban dwellings. Through an economy built around services (tourism) and industry, partly related to the ports of Genoa, La Spezia and Savona. The unemployment rate, which particularly affects the youth, is lower than the average in Italy and the EU, but it is greater that of north-west italian regions. Liguria’s economic growth in terms of GDP is lower growing than the national although the GDP per capita and the GDP per work-unit are higher than the national average.

In terms of energy, almost half of the final energy consumption in the region is accrued to residential and commercial buildings (heating/cooling), followed mainly by the services sector. The share of industry is rather small. The renewable energy production in the region is less than half the national average and the European average. The main sources of renewable energy in Liguria are hydroelectric energy followed by photovoltaic, wind and biogas for electricity, and biomass and heat pumps for heating.

Transport is a recurring priority in the region, and a major challenge at the local level, particularly in Genoa. The Liguria Region has a wide regional network of local public transport consisting of road transport, rail transport (including subway), maritime transport and other modes such as public elevators. However, due to the aforementioned geographic characteristics of the city and region, Genoa suffers from the high congestion of road and rail traffic. This is because both the highway node and the rail network (which supports regional, interregional, and long-distance passenger rail traffic as well as freight traffic) converge in Genoa. Furthermore, the city has an exceptionally high share of motorbikes and scooters (the highest in Italy).
Influence of international, European and national policies on air quality and climate change policymaking in the Liguria Region

In Italy, environmental issues (which include air quality and climate related issues) are national responsibility. Targets for air quality and GHG emissions are therefore set at the national level. The implementation and the compliance with normative is a regional task.

Air pollutant emissions in Italy overall have followed a downward trend since 1990, aided by emission reduction policies in the areas of transport and industry - prompted by EU regulation. However, air quality is still a problem at present, especially in the Po Region in Northern Italy and in large urban areas. Particularly problematic are NO₂ and PM₁₀ (and in turn O₃), whose levels persistently exceed EU limit values. As in some other EU Member States, the EU started infringement procedures against Italy to improve the situation. In a similar vein, GHG emissions - most of which being CO₂ – decreased by 16.7% in the same period, also thanks to EU-prompted industrial and transport policies.

It is observed that current air quality and climate related targets and policies are often sectoral policies, predominantly targetting sectors that impact air quality and GHG emissions (i.e. energy, transport and industry). Italian energy targets concerning energy saving and renewables are slightly more ambitious than the EU’s targets. Several financial schemes are at the disposal of public authorities to finance the transition. Recently new policies have entered into force to tackle biomass burning by households, which may cause problem to air quality in some (mainly non-urban) parts of the country. In the area of transport, policies revolve around supporting local public transport, rail transport initiatives for sustainable mobility, and financing schemes for electric mobility. A project that requires attention is the Terzo Valico high-speed train, which will connect the Ligurian port with Northern Italy and the rest of Europe. Its aim is to divert a part of freight traffic from road to rail. As for industrial policy, Italy has since 1988 a stricter industrial policy in terms of regulations on fuels for reducing industrial emissions (also for reducing residential emissions) than the Community legislation.

Air quality and greenhouse gas emissions in the Liguria Region and how citizens and other stakeholders affect these

Air quality and greenhouse gas emissions situation in Liguria

Air quality in the Liguria region is improving yet exceedances for NO₂ and O₃ are observed in urban areas (e.g. Genoa), and the region risks exceedances for PM₁₀. The downward trend has been the result of the measures taken to reduce industry emissions (EU legislation and the decommissioning of plants), harbour emissions (standards for fuels), and transport emissions (standards for diesel cars and traffic and mobility measures). GHG emissions have also decreased in the past decade as a result of similar transport and industry measures, as well as (to a lesser extent) the application of RES.
The current sources of pollutants (transport and harbour) are very close to where citizens live, which from an exposure perspective is undesirable. Overall, citizens are mostly exposed to road traffic emissions, supplemented by emissions from ships. The citizens’ contribution to local pollution concentration levels is primarily from road transport including cars and motorbikes. Industrial pollution is currently not the main problem from an air quality point of view, as decades of EU regulation have led to cleaner industries and the economic downturn which has led to the closure of the main polluting past industries.

**Ligurian policies for air quality and greenhouse gas emissions**

Currently no long-term targets and policy plans exist for air pollution or climate change on either a regional or local level. Nevertheless, several policies in the areas of energy, transport, industry, and the port are in place to pursue air quality and GHG emission objectives. Overall, the aim of these policies is to comply with EU limitation values. In other words, EU air quality legislation remains the key in stimulating measures across the sectors that affect air quality and GHG emissions by encouraging sectoral legislation, policies, and measures (in transport, energy, port, and industry sectors) at various governance levels (local, regional, national).

Energy ambitions revolve around overall energy efficiency and RES production ambitions, set by the EU. It should be noted that these RES targets particularly aim to increase energy produced from biomass combustion, which helps CO$_2$ targets but in a city environment can have a negative impact on air quality.

In the field of transport, efforts are being made by regional policy to improve and expand public transport. Policies concern primarily the improvement of service with the extension of the rail network, and the renewal of the bus fleet with more modern diesel busses. However, at the local level (in Genoa), although sustainable mobility is on the political agenda, there have been some issues and contradictions in its implementation. These include the expanded zones for scooter parking and cheaper car parking fees, along with difficulties for planning a suitable urban cycling infrastructure. A longer-term measure expected to alleviate the transport pressure in Genoa (next to the aforementioned Terzo Valico rail project) is the Gronda link road project, which is being implemented to push a part of transit traffic (which now goes through the city) outside of Genoa.

In industry, the main recent policy measures involve the closure of polluting industries prompted by the excess of air pollution and GHG emissions. In the harbour, some infrastructural projects are being implemented, such as the substantial electrification of the docks, and providing the means to supply ships with Liquefied Natural Gas (LNG) for 2018-2020. These measures go next to the expected growth of the port, which might offset the positive results obtained.
The role of citizens and other stakeholders in these policies

Citizens in Liguria are overall not especially active in the fields of air quality and climate. Environmental activism comes from a few NGOs, but air quality is not high up on their priority list. However cleaner transport and energy are topics they deal relating such work to carbon reduction rather than air pollution reduction. In addition, citizen actions are ambivalent: Protests against the harbour emissions (and noise) go hand in hand with citizens uprising against a ban on the most polluting vehicles. Citizens don’t seem to be willing to give up using private vehicles to improve air quality and to decrease GHG emissions. This lack of will and demands in the area of transport for better air quality and climate action do not facilitate development towards sustainable mobility.
1 Introduction

Clean air and climate change are two major environmental concerns worldwide. Many cities in Europe and globally are affected by air pollution and are at the same time major emitters of greenhouse gases. The policies on emissions reduction, to be more effective should consider the views of citizens on future quality of life in their city, and at the same time make citizens aware of the role of air pollution and climate change on their health and quality of life.

Contributing to such policies is a key objective of the Horizon2020-funded European ClairCity project (‘Citizen Led Air pollution Reduction in the City’). The project aims to address the relationship between citizens’ daily activities and the impacts of these activities on carbon emissions and air pollution, and ultimately on public health and wellbeing of citizens. Its objective is to contribute to effective citizen engagement with city policymaking on air quality and carbon emissions throughout Europe and worldwide.

Therefore, the project engages with citizens in four European cities and two regions: Amsterdam (NL); Bristol (UK); Ljubljana (SI), Sosnowiec (PL); the CIRA/Aveiro Region (PT); and, the Genoa/Liguria Region (IT). From the experiences gained in these pilot cities and regions, lessons will be drawn for city policymakers regarding effective and efficient, citizen-inclusive policies in the fields of air quality and climate change. The ClairCity project runs from May 2016 to May 20201.

This report is part of Work Package 6.1 of the ClairCity project (Figure 1-1), which is dedicated to examining the current status-quo of citizen-inclusive policymaking in the six pilot cities and regions, and it is part of the deliverable D6.2, which consists of the joint policy reports of Bristol, CIRA/Aveiro, Liguria/Genoa, Sosnowiec and Ljubljana.

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1 Further information on ClairCity can be found at www.claircity.eu and in the Amsterdam report (deliverable D6.1).
1.1 Objective of this report

The objective of this report is to review current air quality and climate-related policies in the city/region, their context and their interactions with daily practices of the inhabitants. In this examination, a focus will be put on energy and transport policies, as these are the two policy areas that have the most direct impact on air quality and carbon emissions in the city/region, while also achieving direct interaction with citizen behaviour.

The aim of this report is therefore to provide

- A description of city/region air quality and climate change policies and their international, national and regional context;
- An analysis of the role of citizens and other stakeholders in these policies; and,
- A discussion of the relevance of the findings of this report for city/region policymakers in general and for further work in the ClairCity project.

The intended audience for this report includes policymakers, citizens and other stakeholders in the six ClairCity pilot cities/regions. The report is also intended to provide essential local information to other Work Packages of the ClairCity project.
1.2 Method

For a proper analysis of effective citizen-inclusive city air quality and carbon policymaking, the boundaries within which these policies operate need to be known. These are set in the first place by the specific local conditions of a city/region, its geography and climate, demography, economy and the existing governance structures of a city. In the second place, they are set by existing international and national policies, which determine the legal and formal room for manoeuvre of city/region policymakers. Together, these two boundary conditions give a view of what can be done by local policymakers. They are discussed in Chapters 2 and 3 of the report.

Another question is what should be done by city policymakers addressing citizens in policymaking. To answer that question, it is important to know what the impact is of citizens compared to other stakeholders in the city in causing air polluting and carbon emissions. For that purpose, in Chapter 4 first the role of the various stakeholders in pollutant concentration and emission trends in the city/region is examined.

After that what is done by local policymakers for citizen-inclusive air quality and climate policymaking in the city is examined. This is done by outlining key policies in the city/region, the policy instruments used and the way these address citizens. Politics and finance behind these policies are also examined. This analysis is not limited only to the direct influence of city policies on citizens’ daily practices - e.g. by direct regulation, awareness campaigns or the provision of information - but it is also aimed at the indirect influence of policymaking on these practices by setting the social and physical infrastructural conditions for these practices via, for example, financial incentives for preferred behaviour, or by removing administrative barriers and by providing the necessary infrastructure for such behaviour. Also, it is examined in what way citizens themselves influence policymaking as voters, policy participants, protesters and initiators of policy relevant activities and projects.

Finally, in Chapter 5 the previous findings are brought together and discussed to identify what the lessons are that can be learned from current city/region policies for successful citizen-inclusive air quality and climate policymaking in the future.
The analysis thus focuses on the following key questions:

**Leeway for local policy-making**

1. What are specific local conditions that determine the context of local air quality and carbon policymaking?
2. In what way are the ambitions of local policymakers in the field of air quality and climate change enhanced or hindered by international and national policy levels?

**Roles of citizens in policy-making**

3. What is the role of citizens in causing local air pollution and carbon emissions, next to that of other stakeholders?
4. What are local policy targets and instruments, in what ways do these policies affect citizens and how are these policies affected by political and financial preconditions?
5. What is the role of citizens in local policymaking as voters, policy participants, protesters and initiators of policy relevant activities and projects?

**Success and fail factors of local Citizen-inclusive policies**

6. Which factors found in the city/region are most relevant to the success or failure of citizen-inclusive local air quality and carbon policymaking?
7. What lessons can be learned for other Work Packages in the ClairCity project?

These questions are addressed in this report based on an extensive review of relevant literature and on interviews with some of the key stakeholders in the city and the region. Relevant stakeholders in this respect include members from city council and city authorities, regional authorities, business stakeholders in the city, independent researchers and experts, NGOs and citizen initiatives that are active in the city.

**1.3 Outline**

In short, this report is structured as follows:

- Chapter 2 sets out the specific local characteristics of the pilot city/region relevant for air quality and climate change policymaking;
- Chapter 3 examines the global, European and national context of city/region policies;
- Chapter 4 analyses air quality and carbon emission trends, the role local policies, and the role of citizens influencing these policies; and,
- Chapter 5 presents the policy conclusions of the report and discusses the relevance of the findings for the other activities in the ClairCity project.
2 Liguria Region: Key characteristics relevant to air quality and climate policies

The physical, economic, and cultural characteristics of a region and city play a role in explaining the existing practices of citizens, as well as in potential opportunities and barriers to changing these. Geography and climate, for instance, influence heating behaviour, and geography and the economy influences transport behaviour (commuting and business displacements). Besides those, energy and transport features of a place, both of which are core to ClairCity work, are also important to consider for understanding air quality and carbon emissions in a city or region. Against this backdrop, this chapter provides an overview of key characteristics of the Liguria Region that are relevant for understanding air quality and climate policies, citizen behaviour and practices, and how air quality and CO₂ emissions influence the daily activities of citizens. We address these aspects within the context of the national situation. When addressing transport, we also zoom in to the situation in the capital city of Liguria, namely Genoa.

2.1 Geography and climate

The Liguria Region is a coastal region located on the north-west of Italy, bordered by France on the western side, by the Piedmont (Italian) Region on the northern side, and Emilia Romagna and Tuscany (Italian) regions on the eastern side. Liguria occupies an area of² 5,420 sq. km that goes from Ventimiglia (city in the west) to La Spezia (city in the east), between the Ligurian sea and Alps and Apennines mountains. Genoa (Genova), located in the centre of the region is its capital. The Region looks like a slim strip of land along the coast of the Gulf of Genoa. The territory of Liguria is primarily hilly and mountainous with flatter areas along the coast. Up to 90% of the dwellings are concentrated on the coast accounting for 5% of the entire regional area.³ Over 75% of the Liguria Region is forest. The Region also has rivers – shorter in the central part of the Region and longer along the edges. The Bisagno torrent is one of the main waterways in the area around Genoa.

Climate varies from the coast to the interior: Two thirds of the territory along the Mediterranean Sea enjoy mild winter and summer temperatures the latter being mitigated by the sea breeze. There is limited precipitation, which is concentrated in a few spring and autumn days\(^4\). As the altitude increases, the climate is harsher: snow persists in winter and rain is more abundant. The mountains in the north protect Liguria from the northern winds and the presence of the sea results in milder temperatures, at the same time these characteristics also make the region very humid\(^6\).

Genoa is an old and densely populated city with a large harbour and mountains in the background as illustrated in the map above. The harbour of Genoa extends 22-kilometres along the coastline, occupying a total surface area of approximately 6 million sqm of land and 14.5 million sqm of seawater. The geographical configuration of Genoa has historically been determinant for spatial planning, forcing all main roads to go right through the city. Prevailing wind direction blow pollutants away from the city of Genoa to the sea.

\(^4\) Centro Meteo Italiano (2011) *Il clima della Liguria*
\(^5\) Regione Liguria (2016) Piano di risanamento e tutela della qualità dell’aria e per la riduzione dei gas serra
\(^6\) Centro Meteo Italiano (2011) *Il clima della Liguria*
Such geographic, climatic and spatial characteristics are relevant when analysing air pollution.

The main sources of emissions (industrial plants, roads, major urban centres, ports) are located in the flat areas of the Liguria Region, along the coast. In Genoa for example the port is adjacent to urban areas (with distances up to 100 meters in the most extreme). The city has also narrow streets congested by road traffic.

The territory is extremely vulnerable to floods risks and landslides, which are of main concerns in the Region. Heavy rains, localised and of short duration, can bring risks for the small Ligurian basins. Climate change could also potentially increase flood risks in these small river basins.

Therefore, flood risk prevention, protection and security of risk areas is at the center of Regional policies and in particular the Genoese area of the Bisagno torrent. In fact, Italy is one of the European countries with the highest vulnerability to floods, and has the largest population living in flood-prone areas. Approximately the 81.2% of Italian Municipalities face risks of landslides and floods, and up to 6 million people live in areas of high risk. According to a report of an environmental association in collaboration with the Italian environment Ministry, since 2010:

- 140 people have died as a result of flooding in Italy;
- 204 extreme weather events, have taken place including floods and landslides, affecting 101 municipalities across Italy;
- Over 32,000 people have been evacuated as a result.

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8 European Commission (2017) Regional Policy, InfoRegion, ROP Liguria ERDF
9 EEA (2016) Flood risks and environmental vulnerability — Exploring the synergies between floodplain restoration, water policies and thematic policies
10 Legambiente / Italian Ministry of Environment and Protection of Natural Resources (2016) [Italian cities facing climate challenge](https://www.legambiente.it/programmi-pronostico-cambiamenti-climatici-strategie-degli-urbani)
Table 2-1: Main findings geography and climate characteristics of Liguria

<table>
<thead>
<tr>
<th>Geography and climate</th>
<th>Facts and characteristics</th>
</tr>
</thead>
</table>
| Temperature           | • Mediterranean climate 2/3 of the territory – mild winters and breeze in the summer  
|                       | • The interior has colder, mountainous temperatures |
| Precipitation         | • Along the coast, precipitation is limited, concentrated in spring and autumn  
|                       | • In the interior, where altitude is higher, rain is more abundant and snow persists in the winter |
| Wind                  | • Prevailing wind direction tends to blow pollutants away from the city of Genoa to the sea |
| Territory             | • Slim strip of land along the coast of the Gulf of Genoa  
|                       | • The territory is primarily hilly and mountainous (75% of the Liguria Region is forest)  
|                       | • 90% of the dwellings concentrated on the coast on 5% of the entire regional area  
|                       | • In Genoa main roads go through the city; there is road traffic congestion  
|                       | • The Port of Genoa extends 22-kilometres along the coastline and is extremely close to dwellings |

2.2 Economy

The sea and harbour play a critical role in Liguria’s economy. Today Genoa ranks as the first port in Italy in terms of total movement of goods (over 51 million tons), and the 15th port in Europe.\(^{11}\) The employment breakdown by sector in 2015 shows that services account for almost 80% of total employment, followed by industry at 20% (of which 12.7% was manufacturing)\(^{12}\). In Liguria particularly, tourism-related services are predominant\(^{13}\). The traditional production specialisations (“Made in Italy”) that characterise the majority of Northern and Central Italian regions are less present, albeit there is a significant share of SMEs working in specific sectors such as ship-building. Liguria has the largest share of harbour activity in the country (industrial and recreational i.e. cruise-ships) and it is second when it comes to naval ship-building and ship fleet.\(^{14}\) Agricultural production at the regional level is marginal to the GDP and the sector is in decline, with a slow but constant process of concentration of agricultural land and a contraction in the number of farms. However, a few

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\(^{12}\) EURES (2017) The European Job Mobility Portal. Labour market information. Italy – Liguria
\(^{14}\) European Commission (2015) POR Liguria FESR
signature products such as the Pesto Genovese (Genoa’s Pesto) and olive oil remain relevant for the region. In the past, steel production and coal fired power plants were also important to the regional and local economy (shut down of these is further explained in Chapter 4.3).

Per capita GDP was approximately €31,000 in 2015, above the Italian (€27,800) and European (28,900) averages. The unemployment rate increased considerably in recent years, from 5.4% in 2008 to 9.8% in 2016, below the national trend (from 6.1% to 11.7%) and close to the European one (from 7% to 8.6%). Unemployment is particularly affecting young people.

Table 2-2 Economic facts of the Liguria Region

<table>
<thead>
<tr>
<th>Economy</th>
<th>Facts &amp; characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main economic sectors</td>
<td>• 80% services (mainly tourism)</td>
</tr>
<tr>
<td></td>
<td>• 20% industry (SMEs in ship-building &amp; manufacturing)</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>€29,026</td>
</tr>
<tr>
<td>Unemployment (%)</td>
<td>10.8%</td>
</tr>
</tbody>
</table>
| Other negative & positive aspects | (-) Increasing unemployment  
(-) Youth unemployment  
(+ ) GDP per capita above Italian & European averages  
(+ ) Unemployment rate lower than in Italy & the EU |

2.3 Demographics

The population of Liguria on 1 January 2017 was 1,565,307 people, almost 2.6% of the national population. The population density is 289 inhabitants per km², above the Italian average (197) and European (EU-27) average (114). Genoa is the largest city in the region, home to over 54% of the Liguria population.

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16 European Commission (2017) EURES, Labour market information, Liguria
17 Istat (2017) Popolazione residente al 1° gennaio, Italia, regioni, province
18 European Commission (2015) POR Liguria FESR
Table 2-3 Population distribution in Liguria\textsuperscript{19}

<table>
<thead>
<tr>
<th>Province</th>
<th>Number of inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperia</td>
<td>215,130</td>
</tr>
<tr>
<td>Savona</td>
<td>279,408</td>
</tr>
<tr>
<td>Genova</td>
<td>850,071</td>
</tr>
<tr>
<td>La Spezia</td>
<td>220,698</td>
</tr>
<tr>
<td>Liguria Region (total)</td>
<td>1,565,307</td>
</tr>
</tbody>
</table>

Liguria is a region with low generational turnover. As of 1 January 2016, Italy's population counted 161.4 elderly for every 100 young people and this percentage is growing.\textsuperscript{20} In Europe only Germany has a more elderly population. Data from 2014 showed in fact that Liguria is the region in Europe with the highest percentage of elderly (238.2 elderly per 100 young people)\textsuperscript{21}

The migrant population in the Liguria Region counts 138,324 inhabitants (8.8%), of which more than half (71,556) are in Genoa.\textsuperscript{22} The migratory balance is far below the national figure and is not enough to contain the natural contraction (the total population growth rate in Liguria is negative).\textsuperscript{23} Most foreigners living in the region are Albanian, Romanian, Ecuadorian or Moroccan.

Table 2-4 Migrant population, resident on 1 January 2017\textsuperscript{24}

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Liguria Region</th>
<th>Genoa Province</th>
<th>Genoa Municipality</th>
<th>% of the total Ligurian population (1,565,307 people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>21,814</td>
<td>9,180</td>
<td>5,991</td>
<td>1.4%</td>
</tr>
<tr>
<td>Romania</td>
<td>20,124</td>
<td>8,300</td>
<td>5,176</td>
<td>1.3%</td>
</tr>
<tr>
<td>Ecuador</td>
<td>18,826</td>
<td>16,159</td>
<td>14,248</td>
<td>1.2%</td>
</tr>
<tr>
<td>Morocco</td>
<td>13,624</td>
<td>5,788</td>
<td>4,213</td>
<td>0.9%</td>
</tr>
<tr>
<td>Ukraine</td>
<td>5,028</td>
<td>2,844</td>
<td>2,016</td>
<td>0.3%</td>
</tr>
<tr>
<td>Total</td>
<td>79,416</td>
<td>42,271</td>
<td>31,644</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

\textsuperscript{19} Istat (2017) \textit{Popolazione residente al 1\textsuperscript{o} gennaio di ogni anno, per sesso, provincia e anno}

\textsuperscript{20} Istat (2017) \textit{Noi Italia, 100 statistiche per capire il Paese in cui viviamo. Edizione 2017}

\textsuperscript{21} European Commission (2015) \textit{POR Liguria FESR}

\textsuperscript{22} Istat (2017) \textit{Stranieri residenti al 1\textsuperscript{o} gennaio}

\textsuperscript{23} European Commission (2015) \textit{POR Liguria FESR}

\textsuperscript{24} Istat (2017) \textit{Stranieri residenti al 1\textsuperscript{o} gennaio - Cittadinanza, Regione e comuni, Liguria}
### Table 2-5 Main findings demographics in Liguria

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inhabitants (%) of national</td>
<td>1,565,307 (2.6%)</td>
</tr>
<tr>
<td>Density</td>
<td>289 inhabitants / km²</td>
</tr>
<tr>
<td>Age distribution</td>
<td>• Low generational turnover</td>
</tr>
<tr>
<td></td>
<td>• Very high rate of elderly (238.2 elderly per 100 young people)</td>
</tr>
<tr>
<td>Foreign population</td>
<td>• 91.2% Italian</td>
</tr>
<tr>
<td></td>
<td>• 8.8% Foreigner (mainly Albanian, Romanian, Ecuadorian or Moroccan)</td>
</tr>
<tr>
<td>Other</td>
<td>• Population density above the Italian average (197) and European average (114)</td>
</tr>
<tr>
<td></td>
<td>• Over 54% of the Liguria population live in Genoa</td>
</tr>
</tbody>
</table>

### 2.4 Governance

Liguria is a region of the Republic of Italy and Genoa is its capital city. From the administrative point of view, the territory is divided into 235 municipalities, three provinces and the metropolitan city of Genoa that includes the capital of the region which, almost in the centre of the region, divides it into two parts, the west (Savona and Imperia) and east coast (La Spezia).

The city of Genoa is embedded in a multi-tiered governance structure by the metropolitan city of Genoa, the Liguria Region, the Italian State and the European Commission.

The organs of the Region are: The Council, the Regional Government (“Giunta”), and its President. The municipal organs are: The Major, the Municipal Government (“Giunta”) and the City Council. The governance level in between is corresponding to the Metropolitan City of Genoa, a large area territory created for the first time by the reform of local authorities (Law 142/1990) and then established by the Law 56/2014 (“Delrio Law”), which dictates new provisions on Metropolitan Cities, Provinces, Union and Mergers of Municipalities. The Major of Genoa is also the Major of the Metropolitan City.

The governance of air quality and climate governance in Italy and the Liguria Region are explained in detail in Chapter 3.3 and Chapter 4.2 respectively.

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25 Regione Liguria (2016) Piano di risanamento e tutela della qualità dell’aria e per la riduzione dei gas serra
2.4.1 Political Structure

Whilst the Regional Council has, traditionally, been dominated by the Democratic Party (PD), it is currently (2015-2020) governed by a new coalition centre-right consisting of Forza Italia, Lega Nord, Fratelli d’Italia and Alleanza Popolare. The Municipal Council of Genoa since June 2017 is also led by a centre-right wing majority (an alliance composed of Forza Italia, Lega Nord, Fratelli d’Italia and other minor parties) with Marco Bucci as the elected Mayor. This Council has taken over from the centre-left Council of Mayor Marco Doria. What this change will entail the budget allocation for air quality and CO₂ emission reduction, and action in the City, is not known yet.

2.4.2 Regional budget for air quality and climate related spending

National law envisages the Regional Economic and Financial Document (DEFR) as a tool to predefine the room for manoeuvre and forecasts of the regional budget. The Strategic Goal 9.8.2 on "Gradual Improvement of Air Quality" provides insight on the measures (planning actions attributed to the Region) aimed to be implemented in the three-year period 2018-2020. The Strategic Goal 17.1.1 regards the energy field and diversification of the sources, the Region’s objective is to identify multi-sectoral and coordinated strategic actions across the region aimed at stimulating the production of energy from renewable sources, energy saving and at supporting energy efficiency, and the development of energy related infrastructures and works. Ultimately the objective of Strategic Goal 17.1.1 is to contribute to the reduction of energy consumption and emissions.

At the Regional Council meeting on Tuesday 6 March, a budget change was approved for the financial years 2018-2020 which includes, among other measures, 1.5 million euro for the Strategic Objective 9.8.2 on "Gradual improvement of air quality".

Table 2-6: Main findings governance in Liguria

<table>
<thead>
<tr>
<th>Governance aspects</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Levels of governance        | - Liguria consists of three provinces and metropolitan city of Genoa with a total of 235 municipalities  
- Genoa’s governance is dependent on the metropolitan city of Genoa, the Liguria Region, the Italian State and the European Commission |
| Political structure         | - The Regional Council is governed by a centre-right coalition consisting of Forza Italia, Lega Nord, Fratelli d'Italia and Alleanza Popolare (2015-2020).  
- The Municipal Council of Genoa is governed by a centre-right coalition consisting of Forza Italia, Lega Nord, Fratelli d'Italia          |

Governance aspects | Characteristics
---|---
and other minor parties. |  
Regional budget | For 2018-2020: 1.5 million euro the Strategic Objective 9.8.2 on "Gradual improvement of air quality"

2.5 Other characteristics

2.5.1 Energy

In Italy, according to the National Energy Balance of 2015\(^{28}\), the residential and commercial buildings absorb almost 41% of the final energy consumption. The remaining share of final energy consumption is attributable to services (34%), industry (22%), and agriculture (3%).

The Italian electricity consumption can be broken down as follows:\(^{29}\) Approximately 27% is accrued to electricity obtained from renewable sources (of which 15% hydro, 7% photovoltaic, 5% wind, 28% solid biomass, 7% biogas, 2% geothermal), 14% from net import, and 59% from fossil fuels (36% gases, 14% coal, 3.5% oil, 1.5% waste referring to transformation input). This is slightly below the EU-28 average (29.6%).\(^{30}\) For final energy consumption oil is the main fuel for transport, and gas for the residential and services consumption.

In Liguria, according to the Regional Energy Balance of 2011 (last available)\(^{31}\), the residential and commercial buildings absorbed almost 48% of the final energy consumption. This stems from the important weight of the tertiary sector in the Ligurian economy as well as from the poor energy efficiency (high annual energy consumption per square meter of surface area used) of the building stock in Liguria.\(^{32}\) The remaining share of final energy consumption is attributable to services (36%), industry (14%), and agriculture (2%).\(^{33}\)

2.5.2 Renewable energy

In terms of renewable energy, 7.6% of total energy consumption was powered by renewable energy sources (RES) in 2015.\(^{34}\) Liguria is lagging behind the rest of the country where the average is 16.5%. The table below summarises energy produced from renewable sources (RES) in Liguria. It shows that the most important renewable energy sources in Liguria (in 2015) were biomass for heating and hydro energy for electricity.

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\(^{32}\) European Commission (2015) POR Liguria FESR
\(^{34}\) GSE (2017) Monitoraggio statistico degli obiettivi nazionali e regionali sulle fonti rinnovabili di energia 2012-2015
Table 2-7 State of renewable energy in the Liguria Region in 2012 and 2015 (production)\textsuperscript{35}

<table>
<thead>
<tr>
<th>RES typology</th>
<th>RES production 2012 [Ktoe]</th>
<th>RES production 2015 [Ktoe]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photovoltaic</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Wind</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Hydroelectric</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Biogas</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Heating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td>130</td>
<td>127</td>
</tr>
<tr>
<td>Solar-thermal</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Heat pump</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Biogas and biomethane</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>194</strong></td>
<td><strong>198</strong></td>
</tr>
</tbody>
</table>

2.5.3 Energy Service Companies (ESCOs)\textsuperscript{36}

Italy’s ESCO market is among the biggest and most developed in Europe.\textsuperscript{37} The Italian ESCO market is mostly focused on the industrial sector, argued to be due to the difficulties related to public sector projects. Furthermore, it is because of the high yields delivered by the White Certificates programme, when applied to medium or large size energy recovery projects in manufacturing plants.\textsuperscript{38} Cogeneration and RES are the most supplied solutions. In 31 October 2017, there are 337 certified ESCOs in Italy\textsuperscript{39} certified in accordance with Italian technical standard UNI/CEI 11352, which means that each of these has signed at least one energy performance contract. As of end January 2018, there are only 15 ESCOs in Liguria in the list of ESCOs with ACCREDIA certification\textsuperscript{40}.  

\textsuperscript{35} GSE (2017) Monitoraggio statistico degli obiettivi nazionali e regionali sulle fonti rinnovabili di energia 2012-2015
\textsuperscript{36} An Energy Service Company (ESCO) is a company that offers integrated services and implements interventions aimed at energy saving and efficiency.
\textsuperscript{37} JRC (2017) Energy Service Companies in the EU
\textsuperscript{38} Ibid.
\textsuperscript{39} Federazione Italiana per l’Ise Razionale dell’Energia (2017) Elenco delle ESCO certificate UNI CEI 11352
\textsuperscript{40} ACCREDIA, Elenco delle Organizzazioni In Possesso di Certificazione Accreditata Accredia che Forniscono Servizi Energetici (Esco)
Table 2-8: Main findings on energy in Liguria

<table>
<thead>
<tr>
<th>Energy consumption (final)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential and commercial buildings (48%)</td>
<td>• Services (36%)</td>
</tr>
<tr>
<td>• Industry (14%)</td>
<td>• Agriculture (2%)</td>
</tr>
<tr>
<td>• Services (36%)</td>
<td>• renewable energy sources</td>
</tr>
<tr>
<td>• Industry (14%)</td>
<td>• Lagging behind Italy and the EU: RES in Liguria %7.6 of the total energy consumption (Italian average = %16.5)</td>
</tr>
<tr>
<td>• Agriculture (2%)</td>
<td>• For electricity: Hydroelectric energy, followed by wind and biogas.</td>
</tr>
<tr>
<td>• For heating: Predominantly biomass; then heat pumps.</td>
<td></td>
</tr>
</tbody>
</table>

2.5.4 Transport

When analysing transport in the Liguria Region, it is particularly interesting to focus on the situation in the capital city of Genoa where geographical constraints, population density, business activities and urban development decisions have resulted in a transport infrastructure network which is very close to living areas. The causes of this heavy traffic around the node of Genoa are: (1) The harbour, which generates a considerable volume of freight (cargo in heavy trucks) that is transported by road and rail; (2) Liguria is a transit corridor (for goods) from north to south, and east to west (to and from Spain and France); and (3) Daily commuting and tourist influx.

In 2010 public transport had a share of 37% of the transport sector in Genoa. The general breakdown of this sector was: 63% private vehicles, 21% metro/bus/trolleybus, and 16% train. Currently the share of collective public transport is probably slightly higher (and of private cars slightly lower) but no official data is available.

Below we explore the different means of transport and their availability and use in the Liguria Region. We do this on the one hand providing context of the national situation and on the other hand zooming in to the local situation to provide the reader with a comprehensive overview.

2.5.5 Road Transport

Italy is one of the Member States with the highest numbers of vehicle registrations per capita (together with France, Germany, Spain and the United Kingdom). However in Genoa

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43 EEA (2016) Monitoring CO2 emissions from new passenger cars and vans in 2015
(around 47 vehicles per 100 inhabitants) it’s below the national (58.5 vehicles per 100 inhabitants) and European ones (49.8 vehicles per 100 inhabitants)\textsuperscript{44}.

The share of electric vehicles is low in Italy but increasing as can be seen from the tables below:

\textbf{Table 2-9 Evolution of electric and hybrid vehicles per typology in the period 2013-2016}

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>2016</th>
<th>% of the total in 2016</th>
<th>2015</th>
<th>2014</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buses</td>
<td>464</td>
<td>0.47</td>
<td>495</td>
<td>488</td>
<td>495</td>
</tr>
<tr>
<td>Trucks</td>
<td>4,065</td>
<td>0.10</td>
<td>3,626</td>
<td>3,238</td>
<td>3,120</td>
</tr>
<tr>
<td>Special vehicles</td>
<td>674</td>
<td>0.10</td>
<td>644</td>
<td>652</td>
<td>667</td>
</tr>
<tr>
<td>Cars</td>
<td>126,508</td>
<td>0.33</td>
<td>89,932</td>
<td>65,840</td>
<td>45,404</td>
</tr>
<tr>
<td>Commercial motorcycles and quadricycles</td>
<td>967</td>
<td>0.37</td>
<td>811</td>
<td>696</td>
<td>640</td>
</tr>
<tr>
<td>Motorcycles</td>
<td>2356</td>
<td>0.04</td>
<td>2,160</td>
<td>1,997</td>
<td>1,840</td>
</tr>
<tr>
<td>Special motorcycles and quadriciles</td>
<td>5,810</td>
<td>7.00</td>
<td>4,517</td>
<td>3,660</td>
<td>3,257</td>
</tr>
<tr>
<td>Road tractors</td>
<td>21</td>
<td>0.01</td>
<td>20</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>TOTAL</td>
<td>140,865</td>
<td>8.42</td>
<td>102,205</td>
<td>76,587</td>
<td>55,437</td>
</tr>
</tbody>
</table>

However, Italy has a relatively lower average of CO\textsubscript{2} specific emissions than the others for a combination of reasons:

- Smaller cars: Cars registered in Italy have on average the fourth lowest mass among the EU Member States and on average the second lowest engine power;
- Italy has a high proportion of small diesel cars (56\% of the vehicles are diesel cars and these have an average mass of 1.441 kg and average emissions of 115.5 g CO\textsubscript{2}/km. These produce less CO\textsubscript{2} than petrol cars but are worse for human health as they result in more air quality related emissions.
- Italy has the highest proportion of alternative fuel vehicles (AFVs) (12\%) in the EU, especially hybrids with LPG or CNG as (second) fuel.

The Ligurian highway network, consists of six highways; four of these converge in Genoa, forming the so-called Genoa Node:

- A10 Genoa - Ventimiglia, the East-West connection to Ponente, that in Genoa area is essentially an urban infrastructure, intrinsically integrated with the city;

\textsuperscript{44} Euromobility (2017) \textit{Osservatorio mobilità sostenibile in Italia, Indagine sulle principali 50 città, edizione 2017}
• A7 Milano - Genoa, which ensures the connection along the North-South direction, towards Milan and originates at the junction of Genoa Sampierdarena - Porto;
• A12 Genoa - Livorno, which guarantees the connection east-west towards the Levante;
• A26 Genoa - Gravellona Toce, linking the Genoese area along the North-South route, with Switzerland and the North-West.

Next to that, Genoa has twice as many motorcycles than the national average in Italy. At a national level in 2015 there were 6,543,612 motorcycles and 2,421,947 mopeds. This means over 100 motorcycles and around 40 mopeds per 1000 inhabitants. In Genoa alone, there were 137,837 motorcycles, the equivalent of over 230 motorcycles per 1000 inhabitants, making it the city in Europe with the highest concentration of motorcycles. The Vespa, developed as a cheap mode of transportation after the Second World War, is an icon of Italian industrial design and an institution in Italian society - particularly in Genoa, its birthplace.

Figure 2-3 Piazza Dante motorcycle parking in Genoa

2.5.6 Public Transport

The regional network of local public transport services consists of a regional rail network an urban and suburban bus service network, and networks related to other modes of transport (maritime transport, funicular, lifts). There are 5 companies operating the public transport

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46 Calculation based on a total of 60,795,612 inhabitants in Italy in 2015; data from the official Statistics office Istat
48 Calculation based on a total of 586,655 in Genoa in 2015; data from the Municipality of Genoa
49 ClairCity project original photo
system for roads, through service contracts with the administrative authorities: provinces, municipalities and the metropolitan city of Genoa.\textsuperscript{50}

\textbf{2.5.7 Rail}

The rail network in Liguria is changing over time to meet the changing needs of the users, namely passengers and freight.\textsuperscript{51} The Ligurian rail network has to deal with the hilly morphology of the territory that leads to railways characterised by twists and tunnels with some trajectories that are single track.\textsuperscript{52} Regional, interregional and long-distance passenger rail traffic coexists with freight traffic, leading to busy rail traffic that has adverse effects on local traffic. In addition, almost all rail traffic converges on the node of Genoa, which causes high congestion in the city area.

For decades, rail transport is used by the Genovese for 16\% of the inner-city commuting (for example to go from the outer neighbourhoods into the city centre)\textsuperscript{53}. Today those journeys are being covered increasingly by the urban metro services, which is around 7 km long, has eight stops, and takes 11 million passengers a year\textsuperscript{54}.

\textbf{2.5.8 Bus, metro, funiculars, lifts, cog railways}

The bus network is mainly managed at provincial level. In the province of Genoa a joint stock company that holds the concession for public transport in the Italian city of Genoa called AMT manages a network and offers different modes of transport in the Genoa provincial area: 139 bus lines, one subway line, two funiculars, 16 lifts, a cog railway, the Genoa-Casella railway, four areas served by call bus, 24 additional services for the hilly areas, the service for the Volabus airport and the Navebus service by sea. AMT offers a network that is a total of 972.17 km long, of which 14.3 on the trolley network, 25.3 on rails and 7.2 on the underground. In 2016, AMT produced around 26.9 million kilometres and transported 133.6 million passengers.\textsuperscript{55}

In La Spezia\textsuperscript{56} the publicly controlled company ATC Esercizio manages local public transport. In 2016 the network consists of 980.4 km, 2,971 stops, 124 call services with 1 number of lines operated, 17,624,827 passengers transported, 9,306,068 km travelled, 923,832 scheduled runs, 251 vehicles including 22 trolley buses, 10 hybrid electric diesel vehicles, 24 EEV (Enhanced Environmental Vehicle).

In Savona\textsuperscript{57} TPL Linea Srl (Transport Ponente Ligure) holds the service contract of the public transport basin of the province of Savona with 250 vehicles supplied, about 9.5 million passengers transported per year, 8.395.529 km / year by contract of service.

\textsuperscript{51} Regione Ligure (2016) Mobilità e trasporti. La rete ferroviaria in Liguria
\textsuperscript{52} Comune di Genova (2010) Piano Urbano della Mobilità’ Genovese
\textsuperscript{53} AMT Genova, \textit{I numeri della metropolitana}
\textsuperscript{54} AMT Genova (2018), \textit{Carta della mobilità}
\textsuperscript{55} ATC Esercizio La Spezia (2017), \textit{Carta della mobilità}
\textsuperscript{56} TPL Linea Srl (2018), \textit{Nomini e numeri}
Finally in Imperia Riviera Trasporti has 239 buses and 19 trolleybuses that travel, every year, 8,250,000 kilometres (of which 900,000 buses), transporting approximately 10,000,000 passengers.

2.5.9 Cycling

Cycling in the Liguria Region is mostly recreational. Cycling lanes connect touristic coastal cities or develop along the rivers. In Liguria and Genoa, the use of bicycles for sporting or recreational purposes is spreading on secondary roads and on mountain bike routes. Associations such as FIAB organise mountain bike courses for children just outside Genoa.

Recent initiatives are aimed at regional, recreational cycling (rather than urban cycling). As part of the Par Fsc 2007-2013 project, funding was unlocked for the completion of the Ligurian cycling network. The starting point was the proposal of FIAB (Italian Bicycle Friends Association) for the creation of five networked cycle routes crossing the Liguria and allowing them to be included in the Italian bicycle and European (Eurovelo) cycling routes.

Figure 2-4 The Ligurian Cycling network

These are partly dedicated routes in low traffic areas or pedestrian paths. The underlying philosophy is to build only what's necessary and to recover and use what already exists. Against this backdrop, former train railways no longer in use have been turned into cycling paths.

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58 Riviera Trasporti (2018). Attività
59 Regione Liguria (2016) Mobilita e transporti. La rete ciclabile Ligure - RCL
Urban cycling is unpopular and the number of cyclists biking as a way to commute is negligible, particularly in Genoa. According to many locals, this is because of the steep hills in the city, even if along the coast the circulation is easier. This is not aided by bike infrastructure in the city, which is poor. Genoa for instance has no cycling network as such, and one of the few streets that has a bike lane is only one directional.

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In some other Ligurian cities however (e.g. Albenga, Sestri Levante, Sarzana, Varazze, Cogoletto, Arenzano, Sanremo, Levanto) urban cycling and inter-city cycling are somewhat more common. This stems partly from the shorter distances, flatter geography, and partly from the availability of infrastructure, i.e. cycling lanes. These cycle lanes were easier to create (than in Genoa) thanks to the flat geography, and ground and space availability.

Table 2-10: Main findings transport in Liguria and Genoa

<table>
<thead>
<tr>
<th>Transport</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport modes region</td>
<td>The regional network of local public transport services consists of a regional rail network, an urban and suburban bus service network, and includes maritime transport, funicular, lifts.</td>
</tr>
</tbody>
</table>
| Transport share Genoa (2010)   | • 63% road traffic (private)  
• 21% metro/bus/trolleybus  
• 16% train  
• Urban cycling is negligible. |
| Other characteristics          | • Transport infrastructure network very close to living areas  
• Regional, interregional and long-distance passenger rail traffic coexists with freight traffic  
• The Ligurian highway network (four highways) converges in Genoa  
• Rail traffic converges on the node of Genoa  
• Genoa’s vehicle registrations is below the national and European  
• Low share of electric vehicles  
• Genoa, has twice as many motorcycles than the national average in Italy and is the city in Europe with the highest concentration of motorcycles |

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61 Screenshot from Google Maps adapted
2.6 Discussion and conclusion

Several typical characteristics of the Liguria Region set the scene for air pollution and climate policies in the Liguria region. These are summarised in Table 2-11.

Table 2-11: Main contextual characteristics of the Liguria Region

<table>
<thead>
<tr>
<th>Main Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Geography and Climate</strong></td>
</tr>
<tr>
<td>- Coastal location, large forest area, hilly</td>
</tr>
<tr>
<td>- Mediterranean climate (except in the mountainous area)</td>
</tr>
<tr>
<td>- Population concentrated in the coastal and flat areas</td>
</tr>
<tr>
<td>- Potential climate change impact: on flood risk, forest fires In Genoa: little room for spatial planning; railway &amp; highway networks converge in the city. The Port is adjacent to the city.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Economy</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Economic sectors: Services (mainly tourism), industry (SMEs in ship-building &amp; manufacturing), the Port of Genoa</td>
</tr>
<tr>
<td>- Unemployment: lower than in Italy &amp; the EU, but high youth unemployment</td>
</tr>
<tr>
<td>- GDP per capita: above Italian &amp; European</td>
</tr>
<tr>
<td>- Economic activity concentrated along the coast</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Demographics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- High proportion of elderly</td>
</tr>
<tr>
<td>- Population predominantly Italian (over 90%)</td>
</tr>
<tr>
<td>- Population density above the Italian and European average</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Governance</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Liguria consists of three provinces and the metropolitan city of Genoa with a total of 235 municipalities</td>
</tr>
<tr>
<td>- The objectives of the regional budget plan are defined in the Regional Economic and Financial Document</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Other characteristics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Energy consumed mostly by buildings and then services</td>
</tr>
<tr>
<td>- Renewable energy: Lagging behind Italy and the EU; main sources hydroelectric, wind and biogas (for electricity) and predominantly biomass (for heating)</td>
</tr>
<tr>
<td>- Transport modes: regional rail network, urban &amp; suburban bus network, maritime transport, funicular, lifts.</td>
</tr>
<tr>
<td>- Transport share: Private vehicles predominant mode; Genoa has the highest amount of motorbikes in Europe</td>
</tr>
</tbody>
</table>

The Liguria Region is a slim strip of land along the coast of the Gulf of Genoa. The territory is predominantly forest, overall hilly, and enjoys primarily a Mediterranean climate (except in the mountainous area).

The population in the region is heavily concentrated on the coast, mainly in Genoa. The generational turnover is low and the share of elderly is very high.

- The strongest economic sectors are services (mainly tourism), and then industry (SMEs in ship-building & manufacturing). The Port of Genoa is also a key local and regional source of income. The unemployment rate (albeit increasing) is lower than in Italy & the EU, and
remains particularly an issue for the youth. However, GDP per capita is above Italian & European levels.

Almost half of the final energy consumption is accrued to residential and commercial buildings, followed mainly by services. The share of industry is rather small. The renewable energy production in the region is way below the national average. The main sources of renewable energy in Liguria are hydroelectric energy and biogas (for electricity) and biomass and heat pumps (for heating).

There is a regional network of local public transport, which is wide and diverse consisting of road, rail (including subway), maritime transport, and other miscellaneous modes (e.g. lifts connecting higher and lower parts of Genoa). Transport is particularly dense in Genoa, presumably due to the geographic characteristics of the city and region. Currently about a third of the transport share in Genoa is public transport. Urban cycling is negligible. The local transport infrastructure network is very close to living areas and the pressure from traffic is high. Both the highway node as well as the rail network (which supports regional, interregional and long-distance passenger rail traffic as well as freight traffic) converge in Genoa. This results in high congestion of road and rail traffic respectively. In addition, the city can be further characterised by a very high share of motorbikes and scooters.

For understanding the policies that will be analysed later on in this report, it is important to understand that Genoa is embedded in a multi-layered governance system as the city is part of the metropolitan city of Genoa, the Liguria Region, the Italian State, and the European Commission Political structure. The Regional Council and the municipal council are both governed by a centre-right coalition.

Together, these characteristics provide the context for Ligurian air quality and carbon policies, together with the international and national policy context that is discussed in the next chapter.
3 International and national air quality and climate change policies relevant for the Liguria Region

This chapter describes and analyses the international and national policies on air quality and climate change. The chapter first considers international and European legislation, relevant since this determines the context for Italian and Ligurian policy making in these areas (Section 3.1). It then provides an overview of emission trends and sources in Italy (3.2), of the governance of air quality and climate (3.3) and of its most relevant policies in these areas (3.4).

3.1 International and European policy context

For air quality as well as for climate change, several important international regulatory agreements, policies and frameworks exist that – directly or indirectly – have an impact on national and city level policies.

Air quality legislation

Air pollution has been regulated for many years at an international level by United Nations bodies as well as by the European Union. On a global level, the United Nations Economic Commission for Europe’s (UNECE) Convention on Long-Range Transboundary Air Pollution (CLRTAP) and the World Health Organisation’s (WHO) Guidelines are important regulatory frameworks.

CLRTAP was established in 1979. Under this Convention parties are obligated to report air quality related emission data to the Conventions’ Executive Body. These include sulphur dioxide (SO₂), nitrogen oxides (NOx), non-methane volatile organic compound (NMVOC), carbon oxide (CO), ammonia (NH₃), particulate matter (PM), various heavy metals and persistent organic pollutants (POP). The PM targets were only added in recent years, the 1999 ‘Gothenburg Protocol’ being adapted in 2012 to also include PM and black carbon targets for 2020. The values adopted under the Convention form the basis for the European norms.

Whilst not legally binding, the Air Quality Guidelines of the WHO play an increasingly important role in global policy discussions. Based on the health impacts of air quality, the WHO has published more restrictive guidelines (see table 3.1) for several air pollutants and supports extensive research into the effects of air pollution.

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Table 3-1 Air Quality Standards comparison for selected main air pollutants: WHO and EU standards (maximum number of annual exceedances in brackets)

<table>
<thead>
<tr>
<th></th>
<th>WHO(^{63})</th>
<th>EU(^{64})</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM(_{10})</td>
<td>20 µg/m(^3) annual mean</td>
<td>40 µg/m(^3) annual mean</td>
</tr>
<tr>
<td></td>
<td>50 µg/m(^3) 24-hour mean</td>
<td>50 µg/m(^3) 24-hour mean (35)</td>
</tr>
<tr>
<td>PM(_{2.5})</td>
<td>10 µg/m(^3) annual mean</td>
<td>25 µg/m(^3) annual mean</td>
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<tr>
<td></td>
<td>25 µg/m(^3) 24-hour mean</td>
<td></td>
</tr>
<tr>
<td>NO(_2)</td>
<td>40 µg/m(^3) annual mean</td>
<td>40 µg/m(^3) annual mean</td>
</tr>
<tr>
<td></td>
<td>200 µg/m(^3) 1-hour mean</td>
<td>200 µg/m(^3) 1-hour mean (18)</td>
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<tr>
<td>SO(_2)</td>
<td>20 µg/m(^3) 24-hour mean</td>
<td>125 µg/m(^3) 24-hour mean (3)</td>
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<tr>
<td></td>
<td></td>
<td>350 µg/m(^3) 1-hour mean (24)</td>
</tr>
<tr>
<td>O(_3)</td>
<td>100 µg/m(^3) day maximum 8-hour mean</td>
<td>120 µg/m(^3) day maximum 8-hour mean (25 days averaged over 3 years)</td>
</tr>
</tbody>
</table>

The WHO also promotes ‘successful air quality policies’ internationally.

### Successful air quality policies according to the WHO\(^{65}\)

According to the WHO, successful air quality policies comprise:

- **For industry**: clean technologies that reduce industrial smokestack emissions; improved management of urban and agricultural waste, including capture of methane gas emitted from waste sites as an alternative to incineration (for use as biogas);
- **For transport**: prioritising rapid urban transit, walking and cycling networks in cities as well as rail inter-urban freight and passenger travel; shifting to cleaner heavy-duty diesel vehicles and low-emissions vehicles and fuels, including fuels with reduced sulphur content; shifting to clean modes of power generation (for electric transit and vehicles);
- **For urban planning**: improving the energy efficiency of buildings and making cities more compact, and thus energy efficient;
- **For power generation**: increased use of low-emissions fuels and renewable combustion-free power sources (like solar, wind or hydropower); co-generation of heat and power; and distributed energy generation (e.g. mini-grids and rooftop solar power generation);
- **For municipal and agricultural waste management**: strategies for waste reduction, waste separation, recycling and reuse or waste reprocessing; as well as improved methods of biological waste management such as anaerobic waste digestion to produce biogas, are feasible, low cost alternatives to the open incineration of solid waste. Where incineration is unavoidable, then combustion technologies with strict emission controls are critical.

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\(^{63}\) WHO (2016) Media center. Ambient (outdoor) air quality and health


At EU level, the **Ambient Air Quality Directive (2008/50/EC)**, adopted on 21 May 2008, sets ambient air quality concentration limits and target values for several substances that Member States need to comply with. Some of the key articles of this Directive are:

- **Establishment of zones and agglomerations** (Article 4)
  Member States shall establish zones and agglomerations throughout their territory to carry out air quality assessment and air quality management.

- **Limit values and alert thresholds for the protection of human health** (Article 13)
  Member States shall ensure that throughout their zones and agglomerations, levels of sulphur dioxide, PM$_{10}$, lead and carbon monoxide in ambient air do not exceed the limit values laid down in the Directive.

- **Air quality plans** (Article 23) and **short-term action plans** (Article 24)
  Member States shall ensure that air quality plans are established for those zones and agglomerations where the levels of pollutants in ambient air exceed limit values.

These were introduced in the context of an overall trend for significant declines in EU emissions over the last 10-20 years, as shown below in Figure 3.1. This was particularly the case for SO$_2$ levels, as PM$_{10}$ and NO$_2$ levels are declining much more slowly, and this is part of what the Directive was introduced to address.

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**Figure 3-1 Trends in EU air pollutant averages until 2013, PM$_{10}$, SO$_2$, NO$_2$**

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The Ambient Air Quality Directive air quality concentration limits and target values are generally less strict than the WHO guidelines (Table 3-1). In order to achieve these concentration levels, for air quality related emissions the National Emissions Ceiling Directive (2001/81/EC), agreed in 2001 and amended in 2009 and 2016, sets national emission ceilings (NECs) for the EU Member States. Rules were also set for measuring air quality by Directive 2004/107/EC on Reference methods, data validation and location of sampling points for the assessment of ambient air quality, which was adapted in 2005 and 2015.

In 2013 a third of EU's urban zones still exceeded the limit values for particulate matter (PM$_{10}$) and a quarter for nitrogen dioxide (NO$_{2}$) annual mean. At that moment, 17 Member States were subject to infringement proceedings for PM$_{10}$ non-compliance$^{67}$. In December 2013, the Commission adopted a Clean Air Policy Package, consisting of a new Clean Air Programme for Europe with new air quality objectives for the period up to 2030, a revised National Emission Ceilings Directive with stricter national emission ceilings for the six main pollutants (see Figure 3-2), and a proposal for a new Directive to reduce pollution from medium-sized combustion plant installations. In the light of this policy package, the NEC proposal was adopted in 2016$^{68}$.

Figure 3-2 Reductions of emissions in air pollutants covered by the National Emission Ceilings Directive as of 2016$^{69}$

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$^{69}$ European Commission (2016). EU approves new rules for Member States to drastically cut air pollution, 14 December 2016
Apart from these directives, there are a variety of regulations and directives in the fields of energy and transport relevant for regulation of sources of air pollution. These are for instance the **Large Combustion Plants Directive (2001/80/EC)** and the **Regulation on light passenger and commercial vehicles (459/2012)** setting the so-called ‘Euro-6’ emission standards for cars.

Figure 3-3 provides an overview of how the Euro emissions standards for petrol and diesel cars have reduced nitrogen oxide emissions of new cars. The figure also highlights the difference between testing and real-world emissions and particularly in the case of diesels how test and real-world performance has been diverging over time.

**Figure 3-3 Comparison of nitrogen oxides emissions for different car Euro standards, by emission limit and real-world performance (grams/kilometre)**

The European Union has **infringement procedures** in place so that the Commission can challenge violations of European law by a Member State. The Commission identifies possible infringements on its own initiative or following complaints from citizens, businesses or stakeholders on the basis of Article 258 of the Treaty on the Functioning of the European Union (TFUE).

Table 3-1 gives an overview of all relevant EU and international legislation in place concerning air quality.

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Table 3-2 International and EU legislation regulating emissions and ambient concentrations of air pollutants

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>PM</th>
<th>O₃</th>
<th>NO₂</th>
<th>NOₓ</th>
<th>SO₂</th>
<th>CO</th>
<th>Pb</th>
<th>BnP</th>
<th>PAH</th>
<th>VOCs</th>
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<td><strong>Directives regulating ambient air quality</strong></td>
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<td>2008/50/EC (EU, 2008)</td>
<td>PM</td>
<td>O₃</td>
<td>NO₂</td>
<td>NOₓ</td>
<td>SO₂</td>
<td>CO</td>
<td>Pb</td>
<td>Benzene</td>
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<td>2004/107/EC (EU, 2004)</td>
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<td></td>
<td>At, Cd, Hg, Ni</td>
<td>BaP</td>
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<td>2015/123/EC (EU, 2015)</td>
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<td>VOCs</td>
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<td><strong>Directives regulating emissions of air pollutants</strong></td>
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<td>EU 2001/81/EC (EU, 2001)</td>
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<td></td>
<td>NNVOC</td>
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<td>EU 2010/75/EU (EU, 2010)</td>
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<td>VOCs</td>
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<td><strong>European standards on road vehicle emissions</strong></td>
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<td>VOCs</td>
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<tr>
<td>EU 2012/66/EU (EU, 2012)</td>
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<td>VOCs</td>
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<td>EU 2009/126/EC (EU, 2009)</td>
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<td>VOCs</td>
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<td>EU 1999/13/EC (EU, 1999)</td>
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<tr>
<td>EU 1991/67/EUC (EU, 1991)</td>
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<td><strong>Directives regulating fuel quality</strong></td>
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<td>VOCs</td>
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<tr>
<td>EU 1999/52/EC (EU, 1999)</td>
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<td>VOCs</td>
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<tr>
<td>EU 1999/97/EC (EU, 1999)</td>
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<td>VOCs</td>
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<tr>
<td><strong>International conventions</strong></td>
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<td>VOCs</td>
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<tr>
<td>MARPOL 73/78 (IMO, 1978)</td>
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<td>VOCs</td>
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<tr>
<td>CLRTAP (UNISE, 1979)</td>
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<td>VOCs</td>
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</tbody>
</table>

Notes: 
(1) Directives and conventions limiting emissions of PM precursors, such as SO₂, NOₓ, NH₃, and VOCs, indirectly aim to reduce PM ambient air concentrations.
(2) Directives and conventions limiting emissions of O₃ precursors, such as NOₓ, VOCs, and CO, indirectly aim to reduce tropospheric O₃ concentrations.

3.1.1.1 Climate Change legislation

The current framework for international climate policies is provided by the 2015 Paris Climate Agreement. This legally binding agreement was signed by 195 countries and sets out a long-term goal of keeping the increase in global average temperature to well below 2°C above pre-industrial levels. The agreement also expresses the ambition to limit the increase to 1.5°C, since this would significantly reduce both the risks and the impacts of climate change.

The European Union has long been active in promoting ambitious climate policies at home and internationally, being a key force in the UNFCCC, signatory to the original Kyoto Protocol and a pioneer in the use of market-based mechanisms for emissions trading (EU-ETS). The current EU climate (and energy) policy framework is based on targets for 2020 and 2030.

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For 2020, the EU Climate and Energy Package set out the ‘20-20-20 targets’ (20% cut in greenhouse gas (GHG) emissions from 1990 levels, 20% of EU energy from renewables and 20% improvement in energy efficiency). These were followed by the ‘2030 Climate and Energy Framework’ adopted in 2014 and consisting of the following main targets of at least:

- 40% cuts in GHG emissions from 1990 levels;
- 27% share for renewable energy; and,
- 27% improvement in energy efficiency.

The energy efficiency target has since been increased to 30% following significant controversy over the (perceived very low) ambition, costs and benefits of the 27% target.

The European Union also aims to unite local initiatives on a European scale in the Covenant of Mayors, in which now 583 signatories (uniting some 224 million inhabitants) of local municipalities have committed to implementing EU climate and energy objectives in their territory. The City of Genoa, is since 2009 signatory to this Covenant.

### 3.2 Emission and concentration trends and sources in Italy

Air pollutant emissions in Italy overall have followed a downward trend since 1990. Especially the Po Region in Northern Italy remains one of Europe’s areas most affected by air pollution. GHG emissions have also decreased in the same period. Below, we elaborate on the situation and sources of emissions and on the policies that have helped tackle these.

#### 3.2.1 Trends and sources for Air Pollutants

The latest available Italian Informative Inventory Report (IIR) 2017 by ISPRA contains information on the Italian inventory up to the year 2015. This includes an analysis of emission trends and a description of key pollutant categories. Overall there is a downward trend of air pollutant emissions from a 1990 baseline, and reductions are especially relevant for the main pollutants (SO\textsubscript{x} minus 93%; NO\textsubscript{x} minus 62%; CO minus 67%; NMVOC minus 56% and lead minus 94%)\textsuperscript{73}. Although there has been an overall improvement in air quality, at present in Italy, particularly problematic are PM\textsubscript{10} and NO\textsubscript{2}, whose levels in urban areas are regularly breaching EU limit values. In fact, Italy (along with e.g. the UK, France, Germany and Spain) has been subject to infringement proceedings by the EU due to its regular breaches in air quality requirements for these pollutants\textsuperscript{74}. In 2015 an infringement procedure (2015/2043) with the European Commission was going on for overcoming the annual average NO\textsubscript{2} limits set by Directive 2008/50/EC.\textsuperscript{75} More recently in April 2017, the European Commission gave the country a “final warning” to take appropriate actions against

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\textsuperscript{72} Covenant of Mayors for Climate & Energy website: http://www.covenantofmayors.eu/index_en.html

\textsuperscript{73} ISPRA (2017). Italy Emission Inventory 1990-2015. Informal Inventory Report 2017


airborne particles (PM$_{10}$) as daily limit values of this pollutant have been exceeded in 30 air quality zones across Italy.\textsuperscript{76}

More detailed data (from 2013) shows that over 60\% of Italy’s urban population resided in areas exposed to PM$_{10}$ concentrations over the daily limit of 50 µg/m$^3$, on more than 35 days in a year (while the EU average is 16.3\%).\textsuperscript{77} The metropolitan cities have the highest number of days when daily limit values for PM are exceeded (56.1 on average) compared to medium-sized cities (43.1 on average)\textsuperscript{78}. By the end of 2015, such high concentrations led to the closure of traffic to the cities of Milan and Rome\textsuperscript{79}. For several air quality zones, the long-term target values for O$_3$ concentrations are not being met.

In addition, it is well known that the Po-valley located in northern Italy, at the footstep of the Alps, is a hot spot in terms of air pollution. The area, due to its particular morphology together with the fact that it is densely populated and heavily industrialised, is characterised by climatic conditions that favour the high concentrations of pollutants in the air.

The European Environment Agency (EEA) estimated that in 2013 in Italy alone about 66,630 premature deaths were attributable to PM$_{2.5}$ fine particle concentrations, 3,380 to O$_3$ concentration and 21,040 to NO$_2$ concentrations\textsuperscript{80}. This makes Italy the most affected of all Member States in terms of PM-related mortality\textsuperscript{81}. It is estimated that the health-related external costs from air pollution are above EUR 47 billion/year (income adjusted, 2010). This includes not only the intrinsic value of living a full healthy life but also direct costs to the economy\textsuperscript{82}. These direct economic costs relate to 17 million workdays lost each year due to sickness related to air pollution, and with associated costs for employers of EUR 2,400 million/year (income adjusted, 2010). Additionally there are direct costs for healthcare of above EUR 185 million/year (income adjusted, 2010), and for agriculture (crop losses) of EUR 418 million/year (2010).

**Main air pollution sources and factors contributing to the trend**

Overall for all pollutants, the **energy sector (including transport)** is the primary emitter of many air polluting substances (90\% SO$_x$; 96\% NO$_x$; 95\% CO; 91\%; PM$_{2.5}$; 91\%; PM$_{10}$ 85\%; BC 95\%; Cd 83\%; PAH 82\%).\textsuperscript{83} **Industry**, particularly through iron and steel production, is an important source of emissions for PM, heavy metals and Persistent Organic Pollutants (POPs), and the cement industry is an influential source for SO$_x$. The **agriculture** sector is the main source of NH$_3$ emissions in Italy with a share of 96\% of the national total.

\textsuperscript{76} European Commission (2017) Press Release Database. Air quality: Commission urges Italy to take action against small particulate matter (PM10) to safeguard public health
\textsuperscript{78} European Commission (2014). Partnership Agreement 2014-20, section 1A, pp.141
\textsuperscript{80} European Environment Agency (2016). Air quality in Europe — 2016 report
\textsuperscript{81} European Commission (2017) Press Release Database. Air quality: Commission urges Italy to take action against small particulate matter (PM10) to safeguard public health
\textsuperscript{83} ISPRA (2017) Italy Emission Inventory 1990-2015, Informal Inventory Report 2017
The waste sector, specifically waste incineration, is a relevant source for Hexachlorobenzene (HCB) emissions (68%).

If we look at the most problematic pollutants in the country, the main source of emissions of NOx is **road transport** (accounting up to 52% in 2015) although **non-industrial combustion** also results in this pollutant. The main source of PM$_{10}$ emissions is non-industrial combustion (62% of total PM$_{10}$ emissions in 2015), which is the only source increasing its emissions, due to the increase of wood combustion units for residential heating, which is an emerging issue in Italy, mainly outside urban centres.$^{84}$ Road transport, industry and agriculture are also sources of PM$_{10}$.$^{85}$

There are various reasons that explain the downward trend in emissions overall: SO$_2$ reductions have been the result of a continuing shift to natural gas (replacing oil) in energy combustion processes as well as obligatory SO$_2$ filters due to the European Large Combustion Plants Directive (Directive 2001/80/EC). NOx emission reductions have been made possible thanks to various transport policies - including Euro norms, incentives to renew the public and private fleet and for the purchase of electric vehicles, and the integration and expansion of rail, maritime, and urban transport systems. The trajectory of measures dates back to 1998, when Italy adopted a Decree (D.P.R. 203/1988) which imposed emission limits and prescriptions for industries and for civil thermal plants, and limits and prescriptions for the use of fuels. The Presidential Decree was then modified by extending its scope and was later replaced by Legislative Decree 152/06, which regulates emissions concerning large combustion plants, VOC, and limits on the use of fuels for ships. Recently, the standards already applied in Italy for combustion plants have been adapted to the European Directive on medium combustion plants.

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$^{84}$ ISPRA (2017) *Italy Emission Inventory 1990-2015, Informal Inventory Report 2017*

$^{85}$ European Commission (2017) *Press Release Database. Air quality: Commission urges Italy to take action against small particulate matter (PM10) to safeguard public health*
Table 3-3: Main findings national air polluting substances evolution

<table>
<thead>
<tr>
<th>Air pollution</th>
<th>Main facts</th>
</tr>
</thead>
</table>
| **Situation & trend** | • Air pollutant emissions in Italy overall have followed a downward trend since 1990.  
• However especially the Po Region in Northern Italy remains one of Europe’s most polluted areas.  
• Particularly problematic are NO$_2$ and PM$_{10}$, whose levels in urban areas persistently exceed EU limit values (infringement procedures launched for these in 2015 and 2017 respectively)  
• For several air quality zones, O$_3$ objectives are neither met. |
| **Main sources** | • NOx emissions are due to road transport (53% in 2015) followed by industry (12%), shipping (10%) residential (6%) and commercial (5%) combustion.  
• The main source of PM$_{10}$ emissions is non-industrial combustion (57% in 2015) followed by road transport (13% in 2015). |
| **Past policies with positive effect** | • NOx reductions are result of transport policies: Euro norms, incentives to renew the public and private fleet, incentives for electric vehicles, public transport development.  
• SOx reductions are the result of a continuing shift to natural gas and mandatory filters required by the LCP Directive |

### 3.2.2 Greenhouse gas emission trends and sources

In 2015, Italy emitted 442.8 Mt CO$_2$e (including international aviation and indirect CO$_2$, excluding LULUCF) The equivalent of 7.28 t CO$_2$e per capita (based on the 60,795,612 inhabitants counted in Italy in 2015).

As in most EU countries, the trend is downward: total GHG emissions decreased by 16.7% between 1990 and 2015 (from 520 to 433 million tonnes CO$_2$ equivalent excl. LULUCF) although increased by 2.3% from 2014-2015 (the largest increase in GHG together with the Netherlands and Spain). Those values follow the overall trend in the EU but are more negative than for the EU-28 average, where GHG emissions were reduced by 23.7%.

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86 Eurostat (2017). Statistic explained. File: Total greenhouse gas emissions by countries (including international aviation and indirect CO$_2$, excluding LULUCF), 1990 - 2015 (million tonnes of CO$_2$ equivalents) updated  
87 Istat (2017) Popolazione residente al 1° gennaio. Italia, regioni, province  
88 The last year for which data has been reported so far  
between 1990 and 2015, and where the increase in emissions from 2014-2015 was ‘only’ 0.5%.

The most prominent GHG in Italy is CO\textsubscript{2}, accounting for 82.5% of total GHG emissions in 2015. CO\textsubscript{2} showed a decrease by 17.9% between 1990 and 2015, from 435 to 357 million tonnes.\textsuperscript{30} CH\textsubscript{4} and N\textsubscript{2}O emissions were 10.0% and 4.2% of total GHG emissions in 2015 respectively. Both gases showed a decrease of 20.3% and 32.5% respectively for the same period. The contributions to the total emissions of other greenhouse gases i.e. HFCs, PFCs, SF\textsubscript{6} and NF\textsubscript{3}, was minimum, ranging from 0.01% to 2.1% of the total emissions.

**Figure 3-4 National GHG emissions 1990-2015 (without LULUCF) (Mt CO\textsubscript{2} eq.)\textsuperscript{91}**

*Main sources and the reasons for increases and reductions of GHG emissions*

Based on the Inventory data from 2015\textsuperscript{92}, the energy sector is the largest contributor to national total GHG emissions with a share of 81.8% (this includes transport, which is responsible for 29.9% of the sectoral emissions total) followed by industrial processes and agriculture (6.9% of total emissions each), and then waste (4.3% of total emissions).

Emissions from the energy sector decreased by 15.8% from 1990 to 2015 (but increased again in 2015), particularly for CO\textsubscript{2}, which accounts for 96.5% of the total emissions in the energy sector. Emissions of CH\textsubscript{4} were also reduced in this sector by 30.1% but this did not have much impact as CH\textsubscript{4} make up a mere 2.2% of energy sector emissions. Emissions from transport increased (by 3.2%) on the other hand.

In a similar vein, emissions from industry are also in decline. Industrial processes sector emissions (in which CO\textsubscript{2} emissions accounts for 49.9% and CH\textsubscript{4} for 0.1%) decreased by 25.7% from 1990 to 2015. Specifically, CO\textsubscript{2} emissions decreased by 49.0% and CH\textsubscript{4} emissions decreased by 67.1%. The decrease in emissions can be partly explained due to a

\textsuperscript{90} Ispra (2017) *Italian Greenhouse Gas Inventory 1990-2015, National Inventory Report 2017*

\textsuperscript{91} Ispra (2017) *Italian Greenhouse Gas Inventory 1990-2015, National Inventory Report 2017*

\textsuperscript{92} Ispra (2017) *Italian Greenhouse Gas Inventory 1990-2015, National Inventory Report 2017*
decrease in emissions from the chemical industry (due to the fully operational abatement technology in the adipic acid industry) and mineral and metal production emissions in this period. Next to that, the lower industrial activity in most industries due to the economic recession has also contributed to these downward emissions trend of the last years. A considerable increase was observed in F-gases emissions (about 283.4%), whose level on total sectoral emissions is 48%. This increase is presumably due to the replacement of ozone depleting CFCs (phased out in the 1990s) by HFCs, which are used in refrigeration and air conditioning equipment.

Overall, CO₂ emissions have essentially mirrored energy consumption. A decoupling is observed in recent years though, mainly as a result of the substitution of fuels with high carbon contents by methane gas in the production of electric energy and in industry. Moreover in the most recent years it can be seen as a result of the increase in the use of renewable energy sources (RES).

**Agricultural** emissions (61.6% CH₄, 37.0% N₂O and just 1.4% CO₂) of the total decreased (-15.9%) mostly due to the decrease of CH₄ emissions from enteric fermentation as consequence of the reduced cattle population (heads) and to the decrease of N₂O from agricultural soils.

Finally, emissions from the **waste sector** decreased by 19.3% from 1990 to 2015, mainly due to a decrease in the emissions from solid waste disposal on land (-22.3%), which account for 75.1% of waste emissions. The most important GHG in the waste sector, CH₄ (89.3% of the sectoral emissions) decreased 21.7%, from 1990 to 2015. N₂O emission levels increased by 43.0%, whereas CO₂ decreased by 78.1% (these gases account for 10.1% and 0.6% in the sector, respectively).
Table 3-4: Main findings national greenhouse gas emissions evolution

<table>
<thead>
<tr>
<th>GHG emissions</th>
<th>Main facts</th>
</tr>
</thead>
</table>
| **Situation & trend** | • GHG emissions decreased by 16.7% between 1990 and 2015  
• Currently GHGs emitted = 7.28 tCO₂e per capita  
• CO₂ accounts for 82.5% of total GHG emissions (2015) |
| **Main sources** | • The energy sector is responsible for 50% of GHG emissions  
• Transport is responsible for almost 25% of GHG emissions  
• Industry (almost 7%)  
• Agriculture (almost 7%)  
• Waste (around 4%) |
| **Past policies with positive and negative effect** | • Decrease in emissions from the chemical industry due to abatement technology in the adipic acid industry (+)  
• Decrease in emissions from industry due to the economic recession - slowdown of industrial activity (+)  
• Increase in F-gases emissions due to the replacement of ozone depleting CFCs by HFCs in refrigeration and air conditioning equipment (-) |

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93 Ispra (2017) [Italian Greenhouse Gas Inventory 1990-2015, National Inventory Report 2017](https://www.isprambiente.it/it/)
3.3 Governance of air quality and climate change in Italy

This section discusses structural features of national air quality and climate change policymaking.

3.3.1 Air quality governance


Previous to the entry into force of the European Directives, state regulation had given the regions the competence for air quality planning. With the national legislative Decree of 13 August 2010 (number 155)\textsuperscript{95}, which implemented the European directives on air quality, the competence of the Regions was corroborated. The regions assess air quality and implement measures to improve air quality, comply with limit values and preserve the quality of the air where it is good. The Regions also ensure the participation of local authorities in planning to ensure that these contribute to the implementation of the measures.

In Italy, the Ministry of the Environment is responsible for enacting environmental standards and identifying in this case air quality limits and standards. The Institute for Environmental Protection and Research (ISPRA) of Italy in turn has the overall responsibility for the emission inventory compilation and reporting to the Convention on Long Range Transboundary Air Pollution\textsuperscript{96}, and the United Nations Framework Convention on Climate Change (UNFCCC).\textsuperscript{97} ISPRA is also responsible for the monitoring and reporting of pollutants under the European NEC Directive. Jointly with the Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), ISPRA develops of emission scenarios (as established by the Legislative Decree n. 171 of 21st May 2004). The Ministry for the Environment, Land and Sea is responsible for the endorsement and for the communication of the inventory to the Secretariat of the different conventions.

3.3.2 Climate change governance

The national legislation about GHG emission reduction in Italy is the Decree of 15 March 2012 on Burden Sharing.\textsuperscript{98} This Decree determines the emissions of the regional administrations based on the national allocation laid down in European Member States’

\textsuperscript{94} Decreto del Presidente della Repubblica 24 maggio 1988, n. 203, Attuazione delle direttive CEE numeri 80/779, 82/884, 84/360 e 85/203 concernenti norme in materia di qualità dell’aria, relativamente a specifici agenti inquinanti, e di inquinamento prodotto dagli impianti industriali, ai sensi dell’art. 15 della L. 16

\textsuperscript{95} Decreto Legislativo 13 agosto 2010, n. 155, Attuazione della direttiva 2008/50/CE relativa alla qualità dell’aria ambiente e per un’aria più pulita in Europa.

\textsuperscript{96} Same as the rest of the EU countries

\textsuperscript{97} ISPRA (2017) Italy Emission Inventory 1990-2015, Informal Inventory Report 2017

\textsuperscript{98} Gazzetta Ufficiale (2012) DECRETO 15 marzo 2012, Definizione e qualificazione degli obiettivi regionali in materia di fonti rinnovabili e definizione della modalità di gestione dei casi di mancato raggiungimento degli obiettivi da parte delle regioni e delle province autonome (c.d. Burden Sharing)
annual emission allocations\textsuperscript{99} for the period from 2013 to 2020. As a Party to the Convention and the Kyoto Protocol, Italy is committed to develop, publish and regularly update national emission inventories of greenhouse gases (GHGs) as well as formulate and implement programmes to reduce these emissions.\textsuperscript{100} The national GHG emission inventory is compiled and communicated annually by the Institute for Environmental Protection and Research (ISPRA) to the competent institutions, after endorsement by the Ministry for the Environment, Land and Sea.

\textbf{3.4 Air quality and climate change policies in Italy}

As explained in Chapter 3.3, past national legislation and policies aimed at transport and industry for instance have contributed to the reduction of emissions of air pollutants and GHG emissions. Below we elaborate on recent ongoing policies. We categorise them in sectors, not distinguishing whether they are directed at improving air quality or reducing carbon, since most of the policies have a twofold impact reducing both air pollutants as well as GHG emissions.

On the 19\textsuperscript{th} of December 2013, the Ministry of the Environment, the Ministry of Economy, the Ministry of Transport, the Ministry of Agriculture, and the Ministry of Health signed a program agreement with the regions in the Po Valley, where exceedances of PM\textsubscript{10} limits are a persistent problem. The Protocol is to stimulate a coordinated implementation of measures in the areas of transport, energy, agriculture and industry. The measures apply to the whole of Italy. For example, a regulation has been issued to limit emissions from biomass plants, for extended application of the Best Available Technologies (BAT), guidelines for urban plans for sustainable mobility have been issued, etc.

Afterwards, on the 30\textsuperscript{th} of December 2015, the Ministry of the Environment and the Protection of the Territory and of the Sea signed a Memorandum of Understanding with the Conference of Regions (Regions) and ANCI (Nacional Association of Italian Municipalities): The \textit{Anti-smog Protocol of 31/12/2015}.\textsuperscript{101} The aim is to ensure coordination of the parties to be able to take urgent measures in case of repeated exceedances of the PM\textsubscript{10} limits to promote measures to improve air quality and reduce GHG emissions in several areas, to coordinate existing regulatory and financial instruments and to harmonise existing activities of the Regions. The Protocol includes emergency measures (e.g. lowering speed limits to 20 km/h in urban areas, incentives for the use of local public transport and shared mobility, reduction (2°C) of the maximum heating temperatures of buildings, and the limitation of biomass use for civil heating). In addition to these, it includes structural measures (e.g. increasing energy efficiency and facilitating the transition to less polluting


\textsuperscript{100} Ispra (2017) \textit{Italian Greenhouse Gas Inventory 1990-2015, National Inventory Report 2017}

\textsuperscript{101} Ministero dell'Ambiente e della Tutela del Territorio e del Mare, Conferenza delle Regioni e Province autonome, Associazione Nazionale dei Comuni Italiani (2015) \textit{Protocollo d'intesa per migliorare la qualità dell'aria, incoraggiare il passaggio a modalità di trasporto pubblico a basse emissioni, disincentivare l’utilizzo del mezzo privato, abattere le emissioni, favorire misure intese a aumentare l’efficienza energetica}
fuels of large users, the transition to low-emission public transport modes, and the promotion of electric vehicle charging network, to name but a few).

Besides these cross-cutting policies, there are more specific sectoral policy measures. We elaborate on these below.

3.4.1 Energy policies

National Energy Strategy (SEN) 2017

In 2013 the Economic Development Ministry set the new National Energy Strategy for 2030. Despite the fact that the Strategy is heavily focused on the competitiveness of the Italian energy market (particularly reducing the energy cost gap for consumers and businesses, also energy supply security), it includes specific targets for decarbonisation which read:  

- **Energy Consumption:** Reduction of 24% in primary consumption below 1990 levels by 2020 (4% compared to 2010), exceeding the European target of 20%, mainly thanks to energy efficiency measures.
- **Renewable energy:** The share of renewable energy in gross final consumption would be 19-20% by 2020 (compared to about 10% in 2010). The share of renewables on primary energy consumption will be 23%, with a reduction from 86 to 76% of fossil fuels. The penetration of renewable energy should reach at least 60% of gross final consumption by 2050, and higher in the electricity sector.
- **Energy efficiency:** Primary consumption will have to fall in the range of 17-26% by 2050 compared to 2010, by decoupling economic growth from energy consumption.

Recently, the Ministry of Economic Development of Italy has unveiled its draft new National Energy Strategy 2017 which aims to:  

- Phase out coal-fired power generation by 2030 at the latest. Gas will be the key in the energy transition, in the power sector and in maritime transport.
- Raise the share of renewable energies to:
  o 48-50% of electricity consumption by 2030 (from 33.5% in 2015)
  o 28-30% in heat consumption (from 19% in 2015)
  o 17-19% in transports (from 6.4% in 2015).
- Upgrade energy efficiency for buildings in residential, tertiary and public sectors,
- Strengthen local mobility measures to reduce urban traffic and support intermodal public transport.

‘Conto Energia V’

This feed-in tariff program that encouraged the production of electricity from photovoltaic systems connected to the grid, was the major renewable energy support scheme in Italy. The scheme stopped since it reached its total cumulative expenditure of €6.7 billion in June 2013, and since then no new installations can access the scheme. The result of the programme by the end of 2014 was that 550,588 systems were financed with the scheme.
leading to a cumulative power of 17.7 GW.\textsuperscript{105} After the scrapping of the program the power and production of solar PV energy stabilised in Italy as shown in the figure below\textsuperscript{106}.

**Figure 3-6 Evolution of the installed capacity [yellow bar] and number of photovoltaic systems [grey bar]**

![Figure 3-6](image)

**White Certificates (Certificati Bianchi)\textsuperscript{107}**

The Italian White Certificates also known as "Energy Efficiency Titles" (TEEs), are tradable securities that certify the achievement of energy savings in end-use energy, through interventions and projects to increase energy efficiency. The White Certificates system was introduced in Italian legislation in 2004 and revised in 2012. A certificate is equivalent to saving one tonne of oil equivalent (TEP). Eligible to submit projects for the issue of white certificates are: electricity and gas distribution companies with more than 50,000 final customers and their subsidiaries; non-obliged distributors; companies operating in the energy services sector; and from 2012, all companies and organisations that have an energy manager or an energy management system. White Certificates scheme has acted as incentive to increase the ESCO market (especially through increasing the revenues from projects).\textsuperscript{108}

**Energy Service Companies (ESCOs)\textsuperscript{109}**

In Italy, several policies and measures have come in place to support Energy Service Companies (ESCOs). The EU Energy Efficiency Directive is being transposed in Italy through Legislative Decree 102/14, which provides some important innovations and obligations about energy efficiency promoting, in particular the role of ESCOs. The status of ESCOs is gradually moving from a voluntary system to a mandatory one. Legislative Decree 102/2014 requires, from July 19th 2016, ESCO statements in the form of energy audits for large companies and public buildings of the state and imposes White Certificates.

\textsuperscript{105} GSE (2017) *Totale dei risultati del conto energia*


\textsuperscript{107} GSE (2017) *Certificati Bianchi*

\textsuperscript{108} guarantEE (2017) *D2.2 Market Report on the Italian EPC Market*

\textsuperscript{109} An Energy Service Company (ESCO) is a company that offers integrated services and implements interventions aimed at energy saving and efficiency.
3.4.2 Heating policies

Conto Termico\footnote{GSE (2017) \textit{Conto Termico}}

This is the main support scheme in Italy for renewable heating. Introduced in 2012 and revised in 2016, the scheme provides subsidies for the installation of renewable heating and cooling systems, as well as for energy efficiency refurbishments in public entities buildings. The cap of the incentive scheme was set at €200 million for public entities and at €700 for companies and individuals. The incentives -varying from 40% (e.g. wall and ceiling insulation) to 65% (e.g. for nZEB renovations, heat pumps, biomass appliances) of energy renovation measures taken depending on the types of measures.

District heating & cooling\footnote{RES-Legal (2017) \textit{Italy: Summary}}

District heating plants produce less than 0.1% of non-electric national final energy consumption (only 89 Ktoe vs 91,725 Ktoe)\footnote{Ministero dello sviluppo economico (2017) \textit{Bilanocio Energetico Nazionale 2015}}. Although district heating and cooling networks are managed at a local level in Italy, national legislation provides the framework legislation for this. In this context, since 2011 there is an obligation to establish development plans for district heating and cooling networks for all municipalities above 50,000 inhabitants. This should be done in cooperation with provincial authorities and coherently with the regional energy plans. Municipalities below 50,000 inhabitants can also develop such plans, however there is no obligation for them in place.

Biomass combustion

The Italian Ministry of Environment on the 9th of June 2017 signed, with the Regions which had the most limit exceedences, a new program agreement for the coordinated and joint adoption of measures to improve air quality\footnote{Ministero dell'Ambiente e della Tutela del Territorio e del Mare, \textit{Nuovo accordo di programma per l'adozione coordinata e congiunta di misure per il miglioramento della qualità dell'aria - 9 giugno 2017}}. This agreement integrates the program for co-financing urgent interventions for the management of critical air quality situations\footnote{Ministero dell'Ambiente e della Tutela del Territorio e del Mare, \textit{Decreto Ministeriale 316 del 10/11/2016 recante Programma di cofinanziamento degli interventi urgenti per la gestione delle situazioni critiche di qualità dell'aria}} particularly as consequence of PM$_{10}$ (for which the country had recieved a warning)\footnote{Ministero dell'Ambiente e della Tutela del Territorio e del Mare, \textit{Decreto Direttoriale RIN-DEC 125 del 22/11/2016 recante Programma di cofinanziamento degli interventi urgenti finalizzati a gestire le situazioni critiche caratterizzate da superamenti continui di PM$_{10}$}.

Some of the provisions in the cofinance program agreement concern biomass combustion.

3.4.3 Transport policies

The objectives and strategies of the national transport infrastructure policy as outlined by the Ministry of Infrastructure and Transport (MIT) are to create Useful, Slim and Shared Infrastructures, promote Modal Integration and Intermodality (to reduce road traffic and improve maritime and rail transport), Enhancement of Existing Infrastructures, and
Sustainable Urban Development (accessibility, quality)\textsuperscript{116}. Preserving air quality is also an explicit goal in transport policies.

Concrete transport measures were considered as well in the aforementioned new co-finance program agreement between the national government and the Regions\textsuperscript{117}. The interventions included measures to increase the use of local public transport and shared mobility through discounted rates for the rental and use of electric cars, promotion of shared taxi, creation of additional reserved lanes and expansion of lines for public transport, promotion of pedestrian mobility and shuttles for home-school and home-work trips, free or discounted fare for bike sharing, and car sharing.

Next to this, under the framework of the Anti-Smog Protocol of 31/12/2015, the Regions - in case of exceedances of the daily limit of PM\textsubscript{10}, or if exceedances are foreseen - can apply emergency measures to prohibit traffic for the most polluting cars.

Below we elaborate on two examples of recently established road transport and railway policies.

\textit{Low emissions mobility}

During the three-year period 2013-2015, a scheme for incentives for low emission vehicles (LEVs) was implemented in Italy. The incentives varied depending on the range of CO\textsubscript{2} emissions of the purchased vehicle. The incentives, up to a maximum of €5,000, were distributed equally between the state contribution and a discount applied by the seller. The results indicate a total of 2,653 vehicles in 2013 and 13,102 in 2014 used these incentives. Of these, 11,652 were in the range of emissions between 50 and 95 gCO\textsubscript{2} / km and 1,681 were electric (cars and quadricycles)\textsuperscript{118}. Next to this, based on the European Directive on the development of an alternative fuels infrastructure (Directive 2014/94/EU), the national government allocates funds to the Regions for the implementation of the National Infrastructure Renewal Plan for Electric Power Vehicles, to increase the amount of charging points.

As of January 2017, there are 1700 public charging points in Italy, aiming for 2400 by the end of 2017, and about 2000 private points (of which about 20 are in Genoa)\textsuperscript{119}.

\textit{Terzo Valico}

At the national level the "Terzo Valico" project is probably one of the most important measures concerning transport. It consists of a new high capacity / high-speed train line that connects the Ligurian port system with the main railway lines of Northern Italy and the

\begin{footnotesize}
\textsuperscript{116} Ministero dell'economia e delle finanze (2017), \textit{Documento di economia e finanza, 2017 - Allegato Connettere l'Italia: fabbisogni e progetti di infrastrutture.}

\textsuperscript{117} Ministero dell'Ambiente e della Tutela del Territorio e del Mare, \textit{Decreto Ministeriale 316 del 10/11/2016 recante Programma di cofinanziamento degli interventi urgenti per la gestione delle situazioni critiche di qualità dell'aria.}

\textsuperscript{118} Ministero dell'Ambiente e della tutela del territorio e del mare (2017) \textit{Elementi per una roadmap della mobilità sostenibile.}

\textsuperscript{119} Ermeto Realacci: \textit{Sullo sviluppo della mobilità elettrica.} Camera dei deputati, Commissione VIII (Ambiente, territorio e lavori pubblici), Giovedì 26 gennaio 2017 pag. 66.
\end{footnotesize}
rest of Europe.\textsuperscript{120} This new train line is expected to divert substantial freight traffic from the roads to the rail, with benefits for the environment and society.

3.4.4 Industrial policies

Since 1988, Italy has had a stricter industrial policy for reducing industrial emissions than the Community legislation\textsuperscript{121}. The subsequent regulations on fuels, introduced specific limitations and prohibitions for the use of the most polluting fuels in the industrial sector. For instance, it is forbidden to use coal and fuel oil for plants that do not have adequate emission abatement techniques available (normally the small plants). In 2006 Italy reorganised all the environmental legislation\textsuperscript{122} and introduced for industrial emissions new national regulations and EU legislation (on Large Combustion plants and more recently also on medium combustion plants). As a result, (in particular) the electricity generation sector has undergone a radical technological change. Between 1998 and 2007 electricity

\textsuperscript{120} Terzo Valico (2013). Progetto

\textsuperscript{121} Through the Decree of President of the Italian Republic, DPR n° 203 of 24 May 1988, a Decree that regulated the emissions into the atmosphere until the entry into force of Legislative Decree 152/2006

\textsuperscript{122} Decreto Legislativo 3 aprile 2006, n. 152 Norme in materia ambientale, Parte quinta, Norme in materia di tutela dell’aria e di riduzione delle emissioni in atmosfera, Titolo I, Prevenzione e limitazione delle emissioni in atmosfera di impianti e attività
generation from natural gas grew from 25.7% to 47.4% of the total national amount while, during the same period, oil production fell by 42.5% to 12%.  

Table 3-5: Main findings national air quality and climate related governance and recent policies in Italy

<table>
<thead>
<tr>
<th>Key facts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Governance of air quality</strong></td>
</tr>
<tr>
<td>• Air quality planning is a regional competence – including assessment and implementation of measures.</td>
</tr>
<tr>
<td>• The Regions also ensure the participation of local authorities in air quality plans.</td>
</tr>
<tr>
<td>• The Ministry of the Environment is responsible for enacting air quality limits and standards.</td>
</tr>
<tr>
<td>• The Institute for Environmental Protection and Research (ISPRA) of Italy is responsible for the emission inventory compilation and reporting to the different conventions.</td>
</tr>
<tr>
<td>• ISPRA is also responsible of the monitoring and reporting of the pollutants under the NEC Directive.</td>
</tr>
<tr>
<td><strong>Governance of climate</strong></td>
</tr>
<tr>
<td>• GHG emissions reduction in Italy is regulated by the Decree of 15 March 2012 on Burden Sharing that determines the emissions of the regional administrations based in the national allocation by the EU for the period 2013-2020.</td>
</tr>
<tr>
<td>• The national GHG emission inventory is compiled and reported by ISPRA after endorsement by the Ministry for the Environment, Land and Sea.</td>
</tr>
<tr>
<td><strong>Recent air quality and climate related targets and policies</strong></td>
</tr>
<tr>
<td>Energy:</td>
</tr>
<tr>
<td>• Targets in the National Energy Strategy (SEN) 2017:</td>
</tr>
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<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>• Financial support schemes for energy efficiency and RES: White Certificates, Conto Termico, Conto Energia</td>
</tr>
<tr>
<td>• Incentives for efficient, clean renewable energy generators and limitations to (incentives for) biomass</td>
</tr>
</tbody>
</table>

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### Key facts

**Policy that fosters ESCOs**

**Transport:**
- Anti-smog protocol for emergency action
- Financial incentives & charging infrastructure for electric vehicles
- Terzo Valico: high-speed train connecting the Ligurian port with Northern Italy aiming to divert freight traffic.

**Industry:**
- Italy had from 1988 a stricter industrial policy (for reducing industrial emissions) than the EU.
- Between 1998 and 2007 electricity generation from natural gas grew from 25.7% to 47.4%.

### 3.5 Discussion and conclusion

particularly European policies form an important point of departure for national policies in Italy. The main conclusions regarding national emission and concentration trends, governance and policies in Italy are summarised in Table 3-6

**Table 3-6: National AQ and CC emission and concentration trends in Italy**

<table>
<thead>
<tr>
<th>National emission and concentration trends</th>
<th>Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Downward trend for air pollutant emissions since 1990 aided by policies in the areas of transport and industry</td>
<td></td>
</tr>
<tr>
<td>• Air quality is still a problem in the Po Region in Northern Italy</td>
<td></td>
</tr>
<tr>
<td>• Particularly problematic are NO\textsubscript{2} and PM\textsubscript{10} (and in turn O\textsubscript{3}) – EU limits exceeded persistently in urban areas.</td>
<td></td>
</tr>
<tr>
<td>• Primary emissions sources of these are road transport and non-industrial combustion for heating</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Air quality and climate change governance</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Governance of air quality and climate change are a national responsibility of the Ministry of the Environment and Protection of Land and Sea.</td>
<td></td>
</tr>
<tr>
<td>• Targets for air quality and GHG emissions are set at a national level</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Policies</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Heating: Several policies to tackle solid fuel burning</td>
<td></td>
</tr>
<tr>
<td>• Transport: Local public transport improvement, shared mobility, financing schemes for electric mobility, high-speed train project to divert freight traffic.</td>
<td></td>
</tr>
<tr>
<td>• Industry: continuing with the current considerably strict industrial policy</td>
<td></td>
</tr>
</tbody>
</table>
Governance of air quality and climate related issues are both a national responsibility of the Ministry of the Environment and Protection of Land and Sea. Targets for air quality and GHG emissions are set at a national level.

Air pollutant emissions in Italy overall have followed a downward trend since 1990, which were aided by policies in the areas of transport and industry – and prompted by EU regulation. However, air quality is still a problem in Italy at present, especially the Po Region in Northern Italy. Particularly problematic are NO₂ and PM₁₀ (and in turn O₃), of which the levels in urban areas persistently exceed EU limits. As in some other MSs, the EU started infringement procedures against Italy to improve the situation. Both these types of emissions are to a large extent the result of road transport, and non-industrial combustion for heating.

In a similar vein, GHG emissions - most of which from CO₂ – decreased by 16.7% between 1990 and 2015. The energy sector is predominantly responsible for the emissions, followed by transport (industry emissions are a very small part of the total). EU-prompted industrial and transport policies have contributed to this trend.

The report also looked at recent air quality and climate related targets and policies. These are often sectoral policies and targets in sectors that impact air quality and GHG emissions - energy, transport and industry require most attention in this case. Italian energy targets concerning energy consumption and renewables are slightly higher than the EU benchmark. Several financial schemes are at the disposal of the public, with public authorities responsible to finance the transition. Many policies have been identified to tackle the emerging solid fuel burning by households. These include incentives for the replacement of renewable energy generators by energy efficient ones, and the limitation to (incentives for) residential biomass burning for heating. In the area of transport, policies revolve around supporting local public transport as well as shared mobility and financing schemes for electric mobility. A very recent project that requires attention is the Terzo Valico high-speed train, which will connect the Ligurian port with Northern Italy and the rest of Europe. It aims to divert freight traffic substantially from road to rail. As for industrial policy, Italy has since 1988 a stricter industrial policy for reducing industrial emissions than the Community legislation.

Having analysed the national air pollutants and GHG emissions situation, as well as past and present policies, the next chapter will focus on the particular situation and policies in the Liguria Region.
4 Air quality and climate change policies in the Liguria Region

This chapter analyses policymaking and policies in the fields of air quality and carbon reduction in the Liguria Region. The chapter starts by describing air quality and GHG emission trends in Liguria (Section 4.1), then discusses the governance structure of air quality and carbon reduction policies in the region (4.2). Subsequently, the main Ligurian air quality and carbon reduction policies are examined (4.3), as well as the role of initiatives taken by citizens and other relevant citizens interest organisations (4.4). Finally, the findings are put in context in the discussion section (4.5).

4.1 Emission and concentration trends in the Liguria Region

4.1.1 Air quality concentration trends

The trend in air pollution concentrations in the Liguria Region is similar to the national trend, where an overall decrease is observed. Policies across all areas from harbour to industry to transport have contributed to this trend. This is particularly observable from: the standards relating to sulphur content in marine fuels, the standards for diesel cars and other measures relating to mobility and traffic, and the (progressive) decommissioning of some industry plants (e.g. the integrated ILVA steel plant, the ENEL thermoelectric power plant in Genoa)\(^\text{124}\). Moreover, this trend was influenced by the local application of European legislation\(^\text{125}\) (Directive 2008/01/EU relating to plants subject to integrated environmental authorization, Directive 2015/2193/EU relating to medium combustion plants, and Directive 2010/75/EC relating to large combustion), and national legislation (Legislative Decree 152/06 on industrial emissions and combustion plants). Finally, the management of atmospheric emissions permits, which in Liguria mostly issued in the province and the Metropolitan city of Genoa, have also helped the downward trend.

\(^{124}\) Liguria Region (2016), *Emissioni regionali per uno o più Inquinanti (Dettaglio socioeconomico: Macrosettore)*; Liguria Region (2015) *Sintesi risultati delle Proiezione delle emissioni Scenario di riferimento*.

\(^{125}\) Smaller plants are municipal competence while the larger plants (thermoelectric power plants and refineries) are of national competence.
The latest available annual assessment of air quality monitoring from 2016 and concluded that air quality in Liguria has not improved significantly, in comparison to 2015 and 2014. In 2015 it was slightly worse than in 2016. One of the reasons for this variation can be partly weather conditions - a very rainy 2014, and a rather dry 2015, especially in the autumn months.\textsuperscript{127}

Exceedances are observed mainly for NO\textsubscript{2}, PM\textsubscript{10}, and O\textsubscript{3}\textsuperscript{128}. The situation is critical particularly for NO\textsubscript{2}, for which EU limitation values are not met. The average annual concentration limit value (40 μg/m\textsuperscript{3}) was exceeded in several traffic monitoring stations in the Genoa agglomerate (5 out of the 8 monitoring stations that the zone has in total) and in one traffic station in La Spezia (out of the 10 monitoring stations in the Spezzino zone). The NO\textsubscript{2} hourly average limit value (200 μg/m\textsuperscript{3} not to be exceeded more than 18 times/year) was met in every zone.
Figure 4-2 NO\textsubscript{2} average annual mean in various measuring stations in Genoa in 2010-2016\textsuperscript{129}

![NO\textsubscript{2} concentration chart]

Genoa also exceeded PM\textsubscript{10} limit values (day-mean) in one station in 2015 for the first time since 2010 (all locations complied with the annual mean).\textsuperscript{130} In 2016, however, EU limit values were met. The daily average PM\textsubscript{10} limit value (50 μg/m\textsuperscript{3} not to be exceeded more than 35 times/year) was respected throughout the regional territory, an improvement compared to the previous year. However, PM\textsubscript{10} remains a pollutant to be monitored closely, given the high values and number of exceedances in several stations. It should be noted however that the average annual limit values (40 μg/m\textsuperscript{3}). PM\textsubscript{2.5} average annual concentrations (25 μg/m\textsuperscript{3}) were also met everywhere.

\textsuperscript{129} Liguria Region (2017). Relazione sullo stato dell’ambiente della Liguria anno 2017
\textsuperscript{130} Regione Liguria, Arpal (2017) Valutazione annuale della qualità dell’aria – Anno 2015
Exceedances of the long-term objective values of O₃ for the protection of health persist in most of the Liguria Region as evidenced by exceedances in many of its measuring stations. In 2016, the EU’s maximum daily 8-hour mean limit value (120 μg/m³ as the maximum daily average of 8 hours, not to be exceeded for more than 25 times/year, and as an average of the last 3 years) was exceeded in the two zones where O₃ is measured. In 2016, and for the first time since 2007, two days were registered in which the hourly average was above the alarm threshold (240 μg/m³ for 3 consecutive hours), in the Genoa agglomeration zone.

131 Liguria Region (2017). Relazione sullo stato dell’ambiente della Liguria anno 2017
In addition, the Benzo (a) pyrene (BaP) average annual limit value (1.0 ng / m³) is not being met. In three industrial monitoring stations located in the inland Bormida industrial area, values up to 1.3 ng/m³ have been registered in 2016 worsening the situation in the area regarding this pollutant compared to previous years. The rest of the territory in the region meets the standards.

SO₂ does not present critical issues in any area of Liguria. The highest concentrations, albeit within the EU’s permitted limits, are recorded in stations affected by industrial and port activities. SO₂ EU limit values in terms of hourly average (350 μg/m³, not to be exceeded more than 24 times/year) were complied with in every zone in the Region.

CO is not a problematic pollutant in Liguria, however occasionally, some stations register high values. In 2016 this is the case for the traffic stations Corso Europa and Via Buozzi in Genoa (in the Genoa agglomeration zone). The highest values are recorded in stations aimed at monitoring vehicle traffic. The limit values are respected.

Overall, national, regional and local policies and measures adopted in recent years for various sources (industry, energy, transport, and maritime activities) have helped bring down PM₁₀ concentrations in Liguria to the limit values required by the EU (exceedances recorded in one station in Genoa in 2015). Such measures also helped bring down NO₂ concentrations, albeit not enough to comply with the EU limit values at all the Liguria traffic stations. For this reason, the agglomeration of Genoa is one of those zones affected by the aforementioned infringement procedure No. 2015/2043 (see Chapter 3.3). This is a direct cause for exceeding the annual average NO₂ limits set by Directive 2008/50/EC, which have been registered in Italy during the years 2010-2013.
4.1.2 Air pollutant emission sources

A statistical analysis of the regional inventory of 2011 shows that the sources that emit most NO\(_x\) in the atmosphere are road transport (37%) and maritime activities (33%), primarily the hoteling of ships in the port\(^{132}\). Industry also played a role in NO\(_x\) emissions - including energy production - (22% of the total) and domestic and commercial heating (4%). To date, the contribution to NO\(_x\) emissions from energy production has decreased as a result of the closure of the coal groups of 2 thermoelectric power plants.

The same analysis for the Genoa agglomerate shows that the sources that emit most NO\(_x\) in the atmosphere are maritime activities (62%), primarily the hoteling of ships in the port, followed by road transport (26%)\(^{133}\). For road transport, 88% of the NO\(_x\) emission originate from diesel vehicles and 45% from heavy duty vehicles (including freight and buses). The inventory also distinguishes between the contributions of different transport categories to pollution:

- automobiles, motorcycles and light duty vehicles traffic on urban roads represent 8.5% of the total municipality emissions;
- buses and heavy vehicles traffic on urban roads (in particular trucks transporting goods to and from the port) contribute about 7% of the total municipality emissions;
- traffic emissions from nearby highways (8% total municipality emissions) and extra-urban roads (2.6%).

Industry - including energy production - also plays a role in NO\(_x\) emissions (6% of the total) and domestic and commercial heating (5%).

There is a clear link between local road traffic and air pollutant concentrations of NO\(_2\). The average hourly concentrations of all primary pollutants recorded by monitoring stations throughout the day shows concentration peaks in hours of increased road traffic. Exposure of the population to NO\(_2\) concentrations is in particular problematic in narrow and congested streets. The port further adds to the traffic emissions in the neighbourhoods in its vicinity, something which was confirmed by an apportionment study funded by the EU a few years ago\(^{134}\). However, road transport emissions are considered by experts the main source of ground level air pollution (NO\(_2\)) and on the exposure of the population\(^ {135}\).

Since O\(_3\) is a photochemical secondary pollutant, the levels are determined by the meteorological characteristics and precursor emissions, such as NO\(_2\) and volatile organic compounds. Concentrations are higher on hot summer and spring days (and away from the sources of emissions) in background stations.

\(^{132}\) Liguria Region (2017). Emissioni Annue Ossidi di Azoto (NO\(_x\)) per Macrosettore; Regione Liguria (2018) SIRAL - Inventario emissioni E\(_2\)Gov 2 2011\(^{133}\)


\(^{134}\) APICE project (2012) Source Contribution Analysis Report

\(^{135}\) ClairCity project internal knowledge from partners; inputs from interviews with air quality experts from the Region, conducted in November 2017.
Table 4-1: Main findings air polluting substances evolution in Liguria

<table>
<thead>
<tr>
<th>Air pollution</th>
<th>Main facts</th>
</tr>
</thead>
</table>
| **Situation & trend** | • The trend for air pollution is downward.  
  • Exceedances are observed mainly for NO₂, PM₁₀ and O₃.  
  • The situation is critical particularly for NO₂, where the annual limit value was surpassed in Genoa and in La Spezia. The hour mean was complied with everywhere. |
| **Emission Sources** | • NOx emissions in Liguria are due to road traffic (37%), primarily diesel vehicles; maritime activities (36%); industry (22%) and heating (4%).  
  • In Genoa the presence of the port is evident;  
    o NOx emissions in Genoa is due to maritime activities (62%), primarily the hoteling of ships in the port; road transport (26%) primarily diesel vehicles; industry (6%); and domestic and commercial heating (5%).  
    o Road transport emissions, occurring at ground level, have a main impact on air quality and on exposure of the population. |
| **Justification of the trend** | • Industry: Local application of European legislation and national legislation, decommissioning of plants, emission permits.  
  • Harbour: standards relating to sulphur content in marine fuels  
  • Traffic: standards for diesel cars, mobility / traffic measures |

4.1.3 *Greenhouse gas emission trends*

Overall there has been a significant GHG emissions reduction (for all CH₄, N₂O and CO₂) in Liguria, in the period 2005-2011. The most important GHG i.e. CO₂ emissions (accounting for over 95% of total emissions in Liguria) have also decreased in this period, mainly due to a reduction in emissions from industry, as seen in the graph below.

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136 Liguria Region (2016) *Relazione sullo stato dell’ambiente in Liguria. Indicatore: Emissioni annue totali gas serra*
137 Liguria Region (2016) *Relazione sullo stato dell’ambiente in Liguria. Indicatore: Emissioni di CO₂ dovute ai consumo finali di energia*
Figure 4-5 CO$_2$ emissions from final energy consumption in various sectors in Liguria

This may be due to the recession of the sector, accompanied by the increase in renewable energy share in that period\textsuperscript{138}.

Table 4-2: Main findings greenhouse gas emissions evolution in Liguria

<table>
<thead>
<tr>
<th>GHG emissions</th>
<th>Main facts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Situation &amp; trend</strong></td>
<td>• GHG emissions decline from 2005 to 2011.</td>
</tr>
<tr>
<td></td>
<td>• CO$_2$ accounts for 95% of the total GHG emissions.</td>
</tr>
<tr>
<td><strong>Sources</strong></td>
<td>• Transport, domestic heating, tertiary buildings heating, industry, and agriculture.</td>
</tr>
<tr>
<td></td>
<td>• The downward trend is mainly due to GHG reductions in industry, may be due to the economic recession and increase of RES use.</td>
</tr>
</tbody>
</table>

\textsuperscript{138} Liguria Region (2016) Relazione sullo stato dell’ambiente in Liguria, Indicatore: Energia prodotta da fonti rinnovabili (in termini di fonte primaria fossile sostituita)
4.2 Governance of air quality and climate change in the Liguria Region

The national legislative Decree 2010/155\textsuperscript{139} transfers to regional administrations the tasks laid down in Articles 4, 13, and 23 of the European 2008/50/EC Directive on ambient air quality and cleaner air for Europe (see Chapter 3.2).

The Liguria Region, with the support of ARPAL (l’Agenzia Regionale per la Protezione dell’Ambiente Ligure), evaluates the concentrations of pollutants in the air at the end of each year to verify compliance with the limit values and to define the air quality management policy. The evaluation is carried out on the basis of the values recorded by the monitoring network whose management is assigned to ARPAL under regional law.

The establishment of zones and agglomerations in force in the current measuring network were approved by the Regional Council resolution No. 44 of 24 January 2014 and subsequently reviewed with regional executive deliberation. The zoning divides the Liguria region into homogeneous areas identified in view of the predominant features in assessing ambient air quality (emission characteristics, climate, topography, geography, etc.).\textsuperscript{140} Currently there are three zoning definitions: (1) main pollutants and benzene, (2) benzo(a)pyrene and ozone, and (3) heavy metals. Zoning definition (1) includes the Genoa agglomeration and 5 zones consisting of various municipalities each (see Figure 4-1 above); zoning definition (2) includes the Genoa agglomeration, and all other municipalities as a separate zone (see Figure 4-6); and zoning definition (3) includes the Genoa agglomeration, La Spezia, Savona, and Bormida zone, and all the other municipalities zone (see Figure 4-7).\textsuperscript{141} The classification of zones regarding the air quality standards are periodically revised following legislation.

\textsuperscript{139} Decreto Legislativo 13 agosto 2010, n. 155. Attuazione della direttiva 2008/50/CE relativa alla qualità dell’aria ambiente e per un’aria più pulita in Europa.

\textsuperscript{140} Ambiente in Liguria (2017) Aria / qualità dell’aria / zonizzazione

Figure 4-6 Zoning for BaP ed O3 and monitoring stations (year 2016) [Types of station: green dots (from dark to light) – rural background, suburban background, urban background; blue triangle – suburban industrial; purple triangle – urban industrial; red dots - traffic; orange dots - traffic/industrial]

Figure 4-7 Zoning for Pb, As, Cd, Ni and monitoring stations (year 2016) [Types of station: green dots - background; blue triangle - industrial; red dots - traffic; orange dots - traffic/industrial]
The Regional Air Quality Plan defines air quality management strategies and provides guidance on the range of measures that can be taken to ensure compliance with the limits set by the legislation across the entire territory. The most recent Plan in the Liguria Region is that of 2006.

To support the planning of air quality and the preparation of the regional environmental energy plan, the Liguria Region has an Information System (observatory) for the management and processing of statistical data. The system was created in 1997 to prepare the first regional inventory of air polluting emissions. Today its data covers: energy consumption and production, energy and non-energy related GHG emissions, and air quality emission factors and statistics which allows for the preparation of the Emission Inventory (to evaluate the trends into the air of the GHG and other pollutants emissions); and energy and CO$_2$ balances necessary for the Air Quality Plan, energy environmental plan, and for environmental information.\textsuperscript{142}

The energy targets established by Decree of the Ministry of Economic Development 15/03/2012 (c.d. Burden Sharing) are pursued through the Regional Environmental Energy Plan 2014-2020 (PEAR). The PEAR lays the foundations for energy planning by 2030 and 2050.

Next to all this, it is also interesting to look at the governance of sectors which have a direct effect on air quality, for example industry. The authorisation of the most important plants, such as refineries and thermal power plants, are of national competence, the others are provincial. Authorisations related to smaller plants for paint production, metal processing using oil and degreasing, furniture production etc. are regulated by national legislation (not European legislation) and are of the competence of the municipalities\textsuperscript{143}. Control activities including inspections and sampling of chimneys are carried out by ARPAL. The ordinary checks are designed on the basis of an operational program approved and funded by the Region; to these are added the extraordinary checks, including those carried out during emergencies.

### 4.3 Air quality and climate change policies and measures in the Liguria Region

The latest Air Quality Plan in the Liguria Region (2006) included provisions and concrete actions for the implementation of the regional plan for restoration and protection of air quality, and for the reduction of greenhouse gases to be carried out by the region. The Plan also defined the measures to be adopted by local governments, for instance the Municipal Administration of Genoa. The measures adopted at the various institutional levels included actions in the fields of transport, industry, energy and the port.

\textsuperscript{142} FEDAREN\textsuperscript{E} (2017) \textit{Energy and Environmental Observatory of the Region of Liguria}

\textsuperscript{143} Decreto Legislativo 3 aprile 2006, n. 152 Norme in materia ambientale, Parte quinta, Norme in materia di tutela dell'aria e di riduzione delle emissioni in atmosfera, Titolo I, Prevenzione e limitazione delle emissioni in atmosfera di impianti e attività
• Transport – This concerns mostly Genoa where measures related to improving the railway, the metro, the bus fleet, and fostering electric mobility - e.g. tax exemption for electric cars and LPG fuelled vehicles - were taken.

• Port - The Region, the Ministry of the Environment and Port System Authority provided funding for the electrification on the docks in the area of ships repairs.

• Energy - Incentives for energy efficiency and energy saving measures in residential and commercial buildings, and a ban on the use of fuel oil for smaller boilers.

• Industry – The management of atmospheric emissions permits (which in Liguria are mostly accrued in the province's and Metropolitan city of Genoa); the local application of European legislation (in particular Directive 2008/01/EU relating to plants subject to integrated environmental authorisation, Directive 2015/2193/EU relating to medium combustion plants recently implemented in Italy and Directive 2010/75/EC relating to large combustion); and national legislation (Legislative Decree 152/06 on industrial emissions and combustion plants, as well as the progressive decommissioning of some plants - e.g. the thermoelectric power plant in Genoa).

These measures have contributed to the reduction in PM$_{10}$ concentrations to the value limits required by the EU (with the exception of 2015 when the EU limit values were exceeded in a station in Genoa). In addition, they brought down NO$_{2}$ concentrations, albeit not enough to comply with the EU limit values, set by Directive 2008/50/EC, at all the Liguria traffic stations. For this reason, the agglomeration of Genoa is under the infringement procedure No. 2015/2043, which was registered in Italy in the period 2010–2013. Pending the approval of the update of the Regional Air Quality Plan, the region intends to adopt an action plan aimed at reducing Genoa's traffic emissions in the short term, by supporting local action in traffic limitation measures. Below we provide an overview of the ongoing and upcoming most relevant policy measures and targets set.

4.3.1 Transport policies in the Liguria Region (of relevance for the City of Genoa)

The Liguria Region recognises the fundamental role of public transport (rail, road or maritime) and aims to continuously improve and stimulate its use, whilst at the same time to discourage the use of private vehicles. It does so by directing and coordinating actions of the public transport government bodies and transport management companies, issuing local public transport reform laws. The aim is to improve the quality and efficiency of the service, promoting the integration of transport systems and the purchase of new transport facilities.

Rail transport

Rail transport has a particular strategic value as it connects the different urban areas of the region and covers local transport in Genova metropolitan area. Large works are underway in particular to develop the Genoese node (6.2 billion euros) with the aim to separate the traffic flows of the metropolitan and local railway system from those of medium-long distance (both travellers and goods), in particular along the coastal axis of the city.

Next to that, in the area of freight traffic is the aforementioned Terzo Valico railway network, which is a local and EU-level priority. Ongoing works, planned to be finalised by 2022, will allow the rapid connection between the Ligurian capital and the main railway lines
of northern Italy. This will offer the port of Genoa an alternate access route for the transfer of goods to the Po Valley area and northern Italy, in substitute of road transport. Future scenarios foresee transferring 40% of freight traffic originating in the port of Genoa from road to rail.

Road transport

After a serious slowdown in the renewal of resources for the local public transport as a result of the cuts in state resources, the renewal of the bus fleet in the region has now been ambitiously relaunched. The renewal is from old diesel buses like "Euro 0" and "Euro 1" for Euro 6. 115 Euro 6 buses are already in circulation, and a second phase launched will add an additional 150-160 buses to that. This is financed with over 25 million euros for the first phase and over 21 million euros for the second phase. Furthermore, the Municipality of Genoa has started an experimentation for electric buses.

Next to that, in the area of road transport, the Gronda project is an important ongoing link road project. It’s goal is to upgrade the current Genoan highway infrastructure, which is inadequate to deal with urban and extra-urban traffic. The planned interventions have been designed to move traffic towards a new part of the motorway, outside the inhabited city centre. The Gronda project is not embraced by all. Environmental organisation WWF campaigned against it arguing that more roads lead to more traffic. In September 2017 the final design and the expropriation were approved by the Ministry of Infrastructure and Transport. The works are estimated to last approximately 10 years.

At the municipal level in Genoa, the local strategy and measures related to mobility are encompassed in the 2010 Urban Mobility Plan. The objectives are to meet the needs of citizens in terms of mobility, reduce air pollution and noise, reduce fuel consumption, increase road safety, minimize the individual use of private cars, increase the percentage of collective modes of transport, reduce congestion, and encourage the use of alternative means of transport. Recently the Preliminary Strategic Framework of the new Urban Plan for sustainable mobility was presented\textsuperscript{144} which will be an important instrument of local policies for the improvement of air quality, as stated in the program of the European Commission "Clean air" for Europe COM (2013) 918 final. The strategies in the preliminary document aim for the phasing out of the thermal engine, which within a few decades should be replaced by the electric one, especially in public transport. However, the choice between trams on rails and electric buses on dedicated lanes is still in progress, and will be dependent on tests and technological evolution. The underlying ideas of the Preliminary Strategic Framework are based on a quality public transport and an efficient interconnection between underground, train and private traffic. The latter to be connected through a series of small and large interchange parking areas, which should arise near the motorway exits.

Further measures taken within the framework of sustainable mobility in Genoa are the car sharing system, the creation of pedestrian areas and areas with limited traffic, and the introduction of incentives for the purchase of electric vehicles and charging points in Genoa.

\textsuperscript{144} Comune di Genova (2018). \textit{Press release}
(financed by the Ministry of Infrastructure and Transport as part of the national infrastructure plan for the recharging of vehicles powered by electricity (PNire). Electric mobility is also incentivised by the Region and Municipality of Genoa through measures such as the exemption from the regional car tax and with discounts on parking and access to the areas of limited traffic (ZTL) (see box below).

**Box 4-1 Areas of limited traffic (ZTL) in Liguria Region**

<table>
<thead>
<tr>
<th>Area</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Genoa</strong></td>
<td>Access is allowed to all vehicles intended for the transport of goods, (max 3.5 t) as well as cars (maximum 8 seats plus the driver), mopeds and motorcycles owned by residents in the area who pay a fee for that dependent on the number of components of the resident family unit and the type of vehicle. Electric cars, motorcycles and mopeds can access the ZTL at all times without any fee.</td>
</tr>
<tr>
<td><strong>La Spezia</strong></td>
<td>Within the ZTL of La Spezia cars are not allowed (unless authorised), but mopeds and motorcycles are. Residents in the ZTL area, owners of a parking space within the ZTL, commercial vehicles for loading and unloading goods, and vehicles of craftsmen are allowed.</td>
</tr>
<tr>
<td><strong>Savona</strong></td>
<td>Only citizens resident in the ZTL area, commercial operators (according to the allowed time slots), and owners of a parking space within the ZTL are allowed.</td>
</tr>
</tbody>
</table>

In addition, there are active travel promotion measures, include the municipal bike sharing system. However there is not yet sufficient cycling infrastructure to support urban cycling, which has resulted in the interventions not bringing significant results in the urban centre of Genoa. E-cycling and e-scooters are not being considered due to the belief that these are not powerful enough for the hilly morphology of Genoa.

The above positive policies have nevertheless been accompanied by other somewhat contradictory policies such as the example in the box below.

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145 Gazzetta Ufficiale della Repubblica Italiana (2016) Piano Nazionale Infrastrutturale per la Ricarica dei veicoli alimentati ad energia Elettica – PNire
146 Comune di Genova, Disciplina dell’accesso alle zone a traffico limitato
147 Città de La Spezia, ZTL e zone interdette
148 Comune di Savona, Richiesta autorizzazione accesso ZTL
150 Various interviews conducted in October 2017.
Box 4-2 More and cheaper vehicle parking in Genoa

In 2017, the new Mayor of Genoa, Mr Bucci, cut by 48% the rates for car parking in the centre of Genoa for the first hour of stay from €2.50 to €1.30. Additionally, the second hour of stay was reduced to €1.70, and €2 for the third. These tariffs have been active since August 2017. This was the Mayor’s promise during the last election campaign which he believed would “favour the citizens and the commerce of the city”. During 2017, about 140 free parking spaces for motorcycles were created in the city center in order to reorganize the spaces dedicated to the 2 wheels that are parked outside the dedicated areas.

4.3.2 Energy and other environmental policies

Concrete energy targets, strategies and measures are laid out in the Regional Environmental Energy Plan 2014-2020 (PEAR) which aims to:

- Implement energy efficiency measures aiming at reducing gross final consumption by 276, Ktoe (60% from domestic energy consumption of the residential sector and 40% from non-residential buildings including public sector);
- Increase production of RES from 138 Ktoe to 373 Ktoe, in particular by increasing the share of renewable energy produced from biomass, and to a lesser extent from wind turbines, heat pumps, solar thermal, biogas and hydroelectric by 2020.

Regarding Energy efficiency, there are regional level financing initiatives which are promoted through ESCOs, measures of a regulatory nature, and measures which will be implemented through The Thematic Objective 4 of the Regional Operation Programme for Liguria (POR Liguria) funded by the European Regional Development Fund (ERDF). Measures on renewable energy will also be implemented through POR funding and regional rural development funding (PSR) alongside regulatory measures.

The Sustainable Energy Action Plan (SEAP) of municipality of Genoa

In 2010 Genoa submitted its SEAP, in accordance with the Covenant of Mayors, committing to a 23% CO₂ emissions reduction by 2020 compared to 2005. Since then, this has been the cornerstone of energy policy in Genoa. The SEAP is prepared by the Municipality of Genoa in collaboration with the Ligurian Regional Energy Agency and the CRUIE (Research Centre in Town planning and Ecological Engineering) of the University of Genoa.

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151 Comune di Genova (2017) Altri 77 nuovi parcheggi per le moto in centro; Comune di Genova (2017) Parcheggi, largo alle moto
152 Regione Liguria (2017), Piano Energetico Ambientale Regionale (PEAR 2014-2020)
The SEAP consisted of 78 actions (and currently 86 after a revision in 2014 in which new actions were added) across various sectors: in the built environment, to increase energy efficiency and RES; concerning transport, to extend local transport (underground, ferries, funiculars) and biking lanes; in the energy sector, to foster renewable energy production from different sources; and concerning the port, an Environmental Energy Plan was put in place.

4.3.3 Industrial policies relating to the atmospheric emissions of the industries

Industry emissions in the Liguria Region have decreased in recent years, probably due to the impact of the economic recession on local industrial activity. Moreover, more restrictive industrial emissions regulations have led to the adaptation or closure of various industrial plants. Among the latter there is the closure from the hot steel mill and coal power plants. In the past (until about over a decade ago) when the ILVA Steel plant was operating in Genoa there was a pollution problem in the Cornigliano area. An epidemiological study\(^\text{154}\) showed a relationship between breathable particles (diameter less than or equal to PM\(_{10}\)) emitted by iron and steel plants and the higher mortality rates of people in the area compared to the rest of Genoa. In 2002 the cocking plant switched off, and in July 2005 also one of the blast furnaces of the Cornigliano plant. In addition, two (of the three) smallest and oldest units that composed the Genovese coal-fired power station, located in the city, were shut down in 2012 and 2014. The third 155 MW unit, located in Genoa Sampierdarena, was shut down in 2017.

Other than this, emissions from industrial plants are controlled through **environmental impact assessments and emissions authorisations**. The most important chimneys are equipped with continuous control systems.

### 4.3.4 Harbour policies

Prompted by pressure from citizens and the local authorities, the port authority has launched important environmental improvement measures at the port of Genoa. The Triennial Operational Plan of the Port of Genoa 2017-2019 includes the following measures for the reduction of emissions as part of the Environmental Energy Plan:

- Realisation of "technological installations for the electrification of docks", both for the naval repair part (where completion of the works is due to take place during the first half of 2018) and the commercial part (cruise ships) where the installation is expected to be completed by 2020;
- Use of "alternative energies", with particular regard to the future use of LNG for ships. The execution phases of the project envisages completion within three years (2018-2020);
- Project "INES - Implementation of new environmental solutions in the port of Genoa", selected in 2015 for European co-financing (equal to 20% of eligible costs), concerning the electrification of the docks at the port terminal of Prà-Voltri.

### 4.4 Citizen and stakeholder initiatives in the Liguria Region

Current citizen activities aimed at improving air quality and GHG emission reductions are linked to other stakeholders’ activities, i.e. citizens interest groups and NGOs. Judging from the topics that citizens and citizen interest groups are active on, air quality does not seem a top priority. Nevertheless, it has led to some protests against the harbour and against the banning of the most polluting vehicles.

#### 4.4.1 Legambiente - Italian environmentalist association

Legambiente is the most important environmental association on the national territory, committed to the defence of the environment, the health of citizens, and the preservation of the natural, historical, artistic, and cultural heritage. They are involved in several initiatives, in collaboration with other likeminded organisations such as WWF (with whom they organise a national environmental movie festival) or Friends of the Bicycle (see below). Legambiente Liguria was founded in 1983 (after the birth of the National Legambiente in 1980) prompted by the publication of "The limits of development" (1972) commissioned to the Massachusetts Institute of Technology by the Club of Rome.\(^{155}\) Legambiente is regionally coordinated and their strength lies in the local groups. Its delegation in Genoa is concerned with initiatives on sustainable mobility, consumer protection, marine pollution, renewable energy, environmental education and parks. Air quality is not their major concern. Currently environmental challenges that are more pressing are waste management and flooding.

4.4.2 **Circolo Amici della Bicicletta di Genova (Circle of Friends of the Bike of Genoa)**

The Circle of Friends of the Bicycle in Genoa (who are a part of the national group - Federazione Italiana Amici della Bicicletta, or FIAB) aims to promote interventions and measures in favour of safe and comfortable cycling, with the ultimate goal of improving urban living. It was born in 1987, as result of a project of the New Ecology Club of the Legambiente in Genoa.\(^{156}\) In the wake of car traffic at the time, bikes were promoted as an alternative means of transport for daily travel in the city and for leisure. The Circle, since then, supports cycling as a way to commute in the city centre. The Commission of Urban Cyclists' was formed by urban cyclists to further promote the same concept. The Circle has also created a map portal\(^{157}\) where the routes that Genoese urban cyclists use daily are reported. This helps to make cycling easier and safer in the city.

4.4.3 **Citizen activism against attempts to ban most polluting vehicles**

By the end of 2016, the Mayor of Genoa at the time, Marco Doria, issued a Decree on December 31st to ban oldest and polluting vehicles from the streets of Genoa, in order to reduce air pollution. This was part of a nationwide campaign to reduce air pollution after weeks of unusual warm weather in which smog reached alarming levels, particularly in Rome, Naples, and Milan. The ban was due to come into force on February 1st, 2017 but was postponed until April 1st, 2017 under public pressure. The ban would affect also the 20,000 Vespa community (‘Vespisti’) who were against the Council’s Decree. This generated the social media reaction of the Twitter hashtag: #lamiavespanonsitocca (“Don’t touch my Vespa”). This, along with other reactions from citizens and associations of motorcyclists, managed to block the ban.

**Table 4-3 - Main findings air quality and climate change governance and policies in Liguria including citizen involvement**

<table>
<thead>
<tr>
<th>Governance</th>
<th>Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is a Regional competence to carry out the following:</td>
<td></td>
</tr>
<tr>
<td>The establishment of zones and agglomerations</td>
<td></td>
</tr>
<tr>
<td>The evaluation of air quality on the base of EU limit values and alert thresholds</td>
<td></td>
</tr>
<tr>
<td>Air quality plans and short-term action plans</td>
<td></td>
</tr>
<tr>
<td>The Regional Agency for the Protection of the Environment in the Region of Liguria (ARPAL) manages the monitoring network</td>
<td></td>
</tr>
<tr>
<td>The Liguria Region, with the support of ARPAL, evaluates the concentrations of pollutants in the air; ARPAL carries out activities to control emissions.</td>
<td></td>
</tr>
<tr>
<td>The Liguria Region is also in charge of the estimations of air pollutants and GHG emissions, and the regional energy balance calculations.</td>
<td></td>
</tr>
</tbody>
</table>

\(^{156}\) FIAB Genova (2011) *Chi Siamo*

\(^{157}\) GPSies (2017) *Tracks of Ciclomourbano*
The Regional Environmental Energy Plan 2014-2020 (PEAR) is based on the energy targets established by the Decree of the Ministry of Economic Development 15/03/2012 (c.d. Burden Sharing).

The PEAR lays the foundations for energy planning by 2030 and 2050.

### Policies

**Transport:**
- Improvement of Public transport (rail, road or maritime)
  - Extension of the railway
  - New bus fleet (from ‘Euro 0’ and ‘Euro 1’ to Euro 6)
  - Improvement of service quality
- Sustainable mobility
- More motorbike parking and cheaper vehicle parking in Genoa (which encourage the use of private vehicles).
- The Gronda project: link road project designed to divert traffic from Genoa city

**Energy:**
- Energy efficiency and increase in RES production, particularly from biomass;
- financing schemes.
- The Sustainable Energy Action Plan (SEAP) committing to a 23% CO₂ emissions reduction by 2020 which proposed actions on transport, energy, industry up to 2020.

**Industry:**
- Application of national and European legislation and control measures

**Harbour:**
- Electrification of docks in the period 2018-2020 for cruises and container docks.
- Projects to supply LNG to ships.

### Citizen and stakeholder initiatives

- Current citizen activities are rather scarce and linked to other stakeholders’ activities, i.e. citizens interest groups, and NGOs.
- Air quality is not a priority, but it has led to protests against the harbour and against the banning of the most polluting vehicles

#### 4.5 Discussion and conclusion

The main findings regarding local air quality and carbon policies in the Liguria Region are summarised in Table 4-4.
Main findings air quality and climate change policies in the Liguria Region

**Table 4-4: Main findings air quality and climate change policies in the Liguria Region**

<table>
<thead>
<tr>
<th>Main emission and concentration trends</th>
<th>Liguria Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Air quality in the Liguria region is improving</td>
<td></td>
</tr>
<tr>
<td>• However, exceedances for NO\textsubscript{2} and O\textsubscript{3} are observed, and high PM\textsubscript{10} concentrations are on the verge of exceeding limit values.</td>
<td></td>
</tr>
<tr>
<td>• The downward trend has been the result of the measures taken to reduce industry emissions (EU legislation, decommissioning of plants), harbour emissions (standards for fuels), and transport emissions (standards for diesel cars, and traffic and mobility measures).</td>
<td></td>
</tr>
<tr>
<td>• GHG emissions have also decreased in the past decade as result of similar transport and industry measures, in addition to the application of RES.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Governance</th>
<th>The evaluation of the concentrations of pollutants in the air and energy planning are regional responsibilities.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Policies</th>
<th>Transport:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• [Positive] improving regional public transport, extending the rail network, replacing the bus fleet; a large link-road project to push transit traffic outside of Genoa city</td>
<td></td>
</tr>
<tr>
<td>• [Negative] More parking for scooters, cheaper parking for cars (at the local level, in Genoa)</td>
<td></td>
</tr>
<tr>
<td>Energy: Actions for energy efficiency under the Sustainable Energy Action Plan (SEAP); Increase in RES particularly from biomass combustion</td>
<td></td>
</tr>
<tr>
<td>Industry: Application of national and European legislation and control measures</td>
<td></td>
</tr>
<tr>
<td>Port: Electrification of docks and infrastructure projects for supplying ships with LNG</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Citizen and stakeholder initiatives</th>
<th>Citizen activities scarce, mainly linked to NGO activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Some ambivalent citizen activities: Protests against port emissions and noise go hand in hand with protests against a ban on the most polluting vehicles</td>
<td></td>
</tr>
</tbody>
</table>

The regional characteristics described in Chapter 2, along with the international and national policies in Chapter 3, form an important point of departure for regional and local policies in the Liguria Region as well as for citizen activity that were described in this chapter.

Similar to the national trend, air quality in the Liguria region is improving, yet exceedances for NO\textsubscript{2} and O\textsubscript{3} are observed, and the region risks exceedances for PM\textsubscript{10}. The downward trend has been the result of the measures taken to reduce industry emissions (EU legislation, decommissioning of plants), harbour emissions (standards for fuels), and transport emissions (standards for diesel cars, and traffic and mobility measures). GHG emissions have also decreased in the past decade as result of similar transport and industry measures, in addition to the application of RES.

Evaluating the concentrations of pollutants in the air and the evaluation of GHG emissions for planning energy planning are regional responsibilities. Currently no long-term targets and policy plans exist for air pollution or climate change on a local level, but several policies in these areas are in place particularly affecting the area around Genoa.
In the transport field, improving public transport is a priority, primarily extending the rail network and replacing the bus fleet. At the same time more and cheaper vehicle parking is being introduced in Genoa. In the longer term, the Gronda link road project is being implemented to push part of the transit traffic (which now goes through the city) outside of Genoa.

Energy ambitions revolve around common energy efficiency and an increase in RES production pursued by EU Member States. It should be noted that RES targets aim to increase energy produced particularly from biomass combustion, which helps CO₂ targets, but in a city environment can have a negative impact on air quality.

In industry, the main policy measures have to do with the application of European and national legislation on authorizations and control measures. In some cases this has led to the closure of the most polluting plants.

As for the harbour, the electrification of certain docks and some infrastructural projects to be able to supply LNG to ships are in implementation. These measures stand against an expected growth of the port that might offset the positive results obtained.

Current citizen activities in the field of air quality and carbon emissions are rather scarce and are linked mainly to other stakeholders’ activities, i.e. citizens interest groups, and NGOs. The results of citizen actions are ambivalent: Protests against the harbour emissions go hand in hand with citizens uprising against a ban on the most polluting vehicles.
5 Conclusions

The previous chapters have shown that local air quality and carbon policies in Liguria take place within the context of specific local characteristics as well as within the conditions set by international and national policies.

This chapter presents and discusses the main findings of this report and links this to the rest of the elements of ClairCity. It does so by getting back to the main questions asked in Chapter 1 (depicted again on the table below).

<table>
<thead>
<tr>
<th>Leeway for local policy-making</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What are specific local conditions that determine the context of local air quality and carbon policymaking?</td>
</tr>
<tr>
<td>2. In what way are the ambitions of local policymakers in the field of air quality and climate change enhanced or hindered by international and national policy levels?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Roles of citizens in policy-making</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. What is the role of citizens in causing local air pollution and carbon emissions, next to that of other stakeholders?</td>
</tr>
<tr>
<td>4. What are local policy targets and instruments, in what ways do these policies affect citizens and how are these policies affected by political and financial preconditions?</td>
</tr>
<tr>
<td>5. What is the role of citizens in local policymaking: as voters, policy participants, protesters, and initiators of policy relevant activities and projects?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Success and fail factors of local Citizen-inclusive policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Which factors found in the city/region are most relevant to the success or failure of citizen-inclusive local air quality and carbon policymaking?</td>
</tr>
<tr>
<td>7. What lessons can be learned for other Work Packages in the ClairCity project?</td>
</tr>
</tbody>
</table>

In the Liguria Region air quality is a challenge but it is not considered a major problem by stakeholders for three reasons:

1) there are more pressing problems in public opinion such as floods, waste, forest fires, and water quality, to name a few;

2) the air in the region is cleaner than in other parts of Italy; and

3) the air is cleaner than it was in the past, due to industrial policy and an industrial decrease in activity.

Despite this, considerable improvements have been measured in the past decades. However, problems with NO₂ and O₃ persist (and PM₁₀ problems are still a risk), particularly in urban areas such as Genoa. The sources of pollutants (transport, and the port) are very close to where citizens live, resulting in undesirable exposure. Overall, citizens are probably mostly exposed to road traffic emissions. In some areas emissions from ships are added to
that. Although the partial electrification of the harbour is planned, it is unclear whether this will be offset by the expected growth of the port.

In the Liguria Region, the **Climate change** could threat the Liguria Region concerning floods, droughts, forest fires and heat waves. The problem is sometimes framed in relation to the potential impacts this may have in high quality agricultural products the region produces e.g. olive oil.

### 5.1 Leeway for local policymaking

**The geographical characteristics of the territory are a blessing and a problem at the same time**

- The forest-rich geography of Liguria results in good air quality overall in the region. This drives attention away from hotspots such as urbanised areas of Genoa, where there is an air quality problem.
- The main wind direction in the Liguria Region tends to blow pollution away from the city of Genoa to the sea.
- The hilly and compact territory places limitations on city planning, for instance in Genoa. Located in between the sea (harbour) and the steep hills, there is little room for spatial planning. Industry, the large port, traffic (with a highway that goes through the city and a very high number of motorbikes and scooters), and housing are all close together. The development of bike infrastructure is also hindered by these spatial features.

**Both finance and politics are hindering more ambitious policymaking**

- Air quality policies are partly hindered by budget limitations. Public transport improvement investments for instance compete in local and regional budgets with social care budgets.
- Air quality policies are partly also influenced by a lack of willingness by local policymakers to implement unpopular measures (judging from recent measures that encourages the use of private vehicles, e.g. cheaper car parking and more parking space for scooters).

**EU regulation drives national and local policies**

- The ambition level in the Liguria Region and Genoa is set at the national level: the aim of air quality and carbon emission reduction actions is to comply with EU requirements (and avoid sanctions stemming from non-compliance). More ambitious goals such as pursuing WHO guidelines for air quality are not a matter being considered at the moment.
5.2 Roles of citizens in policy-making

Citizens can help improve air quality in particular by driving less and by putting pressure on polluting actors such as the harbour

- Road transport and the harbour are the main air polluting sources in Liguria, while in Genoa the harbour is the biggest emitter of air pollutants. Exposure of citizens to road traffic is higher as it occurs at ground level.
- Also citizens could contribute more with the use of renewable energy sources, given that Liguria is lagging behind with renewables implementation compared to other regions in Italy. Furthermore the majority of renewable implementation consists of biomass burning – which has potentially negative consequences for air quality, even if its used mostly outside the major urban centres.
- The citizens’ contribution to local pollution concentration levels emanates from the use of private vehicles, i.e. cars and motorbikes. A change in behaviour in this regard, towards more sustainable modes of transport, should help improve air quality. Harbour policies are a national and international competence that citizens can do little about. Their main means of influence is through demanding cleaner and more energy efficient harbour policies, such as they achieved previously through protest action.
- Industrial pollution is currently not the main problem, prompted by years of national and EU regulation leading to cleaner industries. This was supplemented by the economic downturn, which has led to the closure of the main polluting past industries.

Regional policies trying to stimulate sustainable mobility are not facilitated by local policies that do not discourage air polluting behaviour of citizens

- The use of public transport is being fostered by the region through its continuous efforts to improve and expand public transport.
- Although at the local level (in Genoa) sustainable mobility is on the political agenda, certain practices are at odds with this. These include incentives such as more scooter parking and cheaper car parking, and the lack of a comprehensive plan for a suitable urban cycling infrastructure.

Citizens are not very concerned about air quality nor climate change, and prefer not to have to change their behaviour

- Citizens in Liguria are overall not active in the fields of air quality and climate. Environmental activism comes principally from NGOs, but air quality is not high up on their priority list. However cleaner transport and energy are topics they deal with to some extent (relating such work to carbon reduction rather than air pollution reduction).
- Air pollution protests from citizens exist and are directed to the harbour, rather than road traffic. But citizen action (some of which are owners of the historical Genoese Vespa) against the ban on most polluting vehicles shows that citizens are not willing to change their behaviour. It is unclear whether citizens are unaware of the impact of road traffic in air pollution and the health effects of this, or whether the rather long-
term health effects of air pollution are not perceived as important enough for one to have to change behaviour.

- There is no clear citizen activism fighting for better air quality or carbon emissions reductions. Whether citizens perceive that they are sometimes exposed to (very high) pollutant concentrations cannot be answered by this report (further ClairCity activities such as the Delphi Process are better suited for this).

### 5.3 General success and fail factors of local policies

#### Lack of citizens mobilisation concerning air quality and climate related issues lead to low political priority of air quality in particular

- Politicians react to citizens’ demands. The low priority and lack of ambition of air quality policies particularly in sustainable mobility is partly justified by the lack of the citizens’ will and demands (perhaps prompted by a lack of awareness), for better air quality and climate action. As long as citizens continue to be attached to their private vehicles - be it a car or a motorbike - development towards sustainable mobility will not be easy.

#### European legislation remains quintessential for EU air quality and carbon mission reduction

- Overall current air quality policies aim to comply with EU limit values. EU air quality legislation remains key in stimulating measures across the sectors that affect air quality and GHG emissions. It encourages sectoral legislation, policies and measures (in the transport, energy, port, and industry sectors) at various governance levels (local, regional, national).
- At the same time, European legislation and policies (e.g. Euro norms, incentives on electric mobility) have proven not enough to solve the problem, judging from recent exceedances. National, regional and local policies can make a different here.
- At the same time European legislation and possibly infringement procedures remain essential to preserve decent levels of air quality in the country.

### Lessons for ClairCity work

It is important to take onboard success and fail factors from the Liguria case into the study of other cities and into other elements of ClairCity. We therefore elaborate a separate section (Section 5.6) for it.

### 5.4 Recommendations for policymakers

Recommendations for policymakers are only planned in the final stage of the ClairCity project. Nevertheless, it is the aim of the policy status quo reports to keep in mind this intended final project result. This will allow the analysis to be geared towards practical guidelines and tips for policymakers.
Overall, the solution for air quality and CO₂ emissions in Liguria lies in reducing emissions in the Genoa area. Some aspects to highlight based on this report are the following:

- **Awareness raising as a means to empower citizens to take action**: If citizens are not aware of the problem and its causes, behaviour change is unlikely to happen. Currently it is unclear if citizens understand the sources of air pollution, their contribution and what the health effects of that are. This is important particularly in the area of mobility, which citizens can act upon. The dissemination of information and knowledge building in the area of electric mobility possibilities is deemed necessary in our view based on current public misconceptions (e.g. the fact that e-bikes and e-busses are not suitable (powerful enough) for a hilly city). Awareness raising for citizens is also essential to empower them to take action in other areas as well - for instance to demand the harbour undertakes environmental measures, and for cleaner fuels (next to citizen pressure, government pressure will be key to demand further measures).

- **Reducing traffic in the city**: If road traffic can be partly diverted outside the city centre (as planned for in the Gronda project) and partly replaced by rail traffic (as it is expected from the project of Terzo Valico) this would decrease air quality problems and improve the overall quality of life in the city (less noise, freeing up space for public and active transport, connecting the city to the sea again).

- **Quality public transport and Shifting to electric mobility**: Considering the private vehicle tradition of the population, a solution could come from electric mobility. Technical measures such as the improvement of public transport and electrical scooters in this case may be a way forward for improved air quality.

### 5.5 Lessons for further work in ClairCity

As outlined in Chapter 1, WP6 serves to feed into further ClairCity work. The potential consequences of the Liguria findings through this report for further work in the ClairCity project are discussed in the following paragraphs.

**Dissemination & Exploitation (WP2)**

Awareness raising of the problem and potential solutions: Awareness raising is key to understanding a problem which is in turn, key for citizens to act on a problem. When citizens understand their contribution to air pollution and the available solutions to tackle the problem, they are more likely to act on that. Once these reports obtain the status of ‘public’ and are thus open for distribution, we will announce these via the ClairCity external newsletter and ClairCity website – both of which are managed by the communications experts working on WP2.

Exchanging experiences to learn: Liguria could very much benefit from leading policy measure examples from the other ClairCity case studies. Such examples include: environmental zones for vehicles (e.g. in Ljubljana, Amsterdam); how to make what at first seem unpopular decisions, i.e. pedestrianising streets, work (e.g. Ljubljana); or arranging a wide cycling infrastructure network (e.g. Amsterdam). Due to the regional dimension, cross-learning is expected between Liguria and Aveiro. Liguria can potentially provide an example of regional public transport planning to the Aveiro Region. Citizens in Genoa - through the
Friends of the Bike association - could also be inspired by the small-scale cycling examples in Aveiro city, given that both cities deal with a lack of infrastructure and safety issues that hinder cycling.

**Behaviour, Activity & Practices (WP3)**

Road traffic is the typical problem resulting from citizens having to go to work, take children to school, visit relatives or get out in the weekend, in other words, daily practices of citizens. A conclusion of this report is that in general, citizens in the Liguria Region and more concretely in Genoa are not eager to change their behaviour and practices. Policies in these areas will need to take this into account.

**Citizens and Stakeholder Engagement activities (WP4)**

It will be very interesting to find out what the Delphi Process unveils about awareness on air pollution and carbon emissions, and about citizens motivations for their choices. Round 1 of the Delphi Process has enquired about how citizens in Liguria currently travel and heat their homes, and about how they would like to do that in the future. Along the process of writing this report the literature analysed and the interviews conducted lead towards the following hypotheses:

1) Awareness is low about the air pollution and carbon emissions situation, the sources contributing to those, as well as about the impacts of air pollution on citizens in Genoa. Awareness about the impacts of mobility is absent. The same goes for domestic heating – we presume that there is little awareness concerning CO₂ emissions and air pollution from heating.

2) People often use the car or motorbike for daily activities (going to work, taking children to school, grocery shopping, leisure). Their motivations for this are the lack of suitable public transport and price, particularly in the case of motorbikes. Citizens favour motorbikes over cars, as the latter are more expensive, take up too much parking space, and are much slower for commutes in the city due to traffic congestion. There is also a sense of the car being more polluting and thus the scooter being the “cleaner” alternative.

3) There seems to be no willingness to change. The reason for this is partly that motorbikes are the only alternative to walking for the shorter distances as steep hills and traffic safety are discouraging for cycling,. The long term negative effects on health are not known or discouraging enough to foster change.

This need for awareness raising can be tackled by the other ClairCity outputs aimed at engaging the public. Namely these are the Game, the App, the Schools competition, allowing citizens at different ages to learn about the (impacts of) different policy measures, their exposure, and how their behaviour contributes to the overall air pollution problem.

**Scenario Coordination & City Policy Package (WP7)**

The policy package is the key final product of the project and directly evolves from the results of WP6. The discussion chapters in this report give some indications for future policy recommendations. A cross-country comparison and a SWOT-like analysis that will follow the preparation of the reports will contribute to the final Policy Package.
For the report, 17 interviews with Ligurial stakeholders in October 2017 were used. Names of individual stakeholders interviewed were mentioned with their permission.

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