POCACITO

european post-carbon cities of tomorrow

Turin Strategy Paper

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STRATEGY PAPER OF TURIN TOWARDS A POST-CARBON CITY

POLITECNICO DI TORINO, Turin, June 2016

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CHALLENGES FACING THE CITY

The present economic crisis has hit the city of Turin and its metropolitan area very hard, mainly because of the persistent strong specialisation in the industrial sector: since 2008 GDP has decreased and unemployment has increased; at the same time, Piedmont is the Italian region which invests the largest share of its GDP in R&D. Social inclusion must deal with severe problems: the stock of debt is high (with consequent difficulties in granting services for population), 20 people out of 100 being at risk of poverty. From the environmental point of view, the city offers a relevant share of green areas, some of them are natural reserves; but air quality is still very poor, and it is improving too slowly, and energy efficiency of buildings must be enhanced.

Table 1 summarises the global trends for each key performance indicator (KPI) analysed by the project in the *initial assessment document* (Nov. 2015) using statistics from the city and wider region. In red are the indicators in which Turin records a negative trend, green for positive; overall Turin's trends are all in line with a post-carbon city trend.

Table 1: Summary of KPI's global trends

Dimension	*Sub-dimension*	*INDICATOR*	*Year*	*Trend*
SOCIAL	*Social Inclusion*	Variation rate of unemployment level by gender	*2004-2013*	↗
		Variation rate of poverty level	*2004-2012*	↗
		Variation rate of tertiary education level by gender	*2004-2013*	↗
		Variation rate of average life expectancy	*2003-2012*	↗
	Public services and infrastructures	Variation rate of green space availability	*2000-2009*	↗
	Governance effectiveness	Existence of monitoring system for emissions reductions	*N/A*	*yes*
ENVIRONMENT AND CLIMATE	*Biodiversity*	Variation rate of ecosystem protected areas	*2008-2011*	=
	Energy	Energy intensity variation rate	*2002-2011*	↘
		Variation rate of energy consumption by sectors	*2003-2011*	↘
	Climate and Air Quality	Variation rate of carbon emissions intensity	*2002-2011*	↘

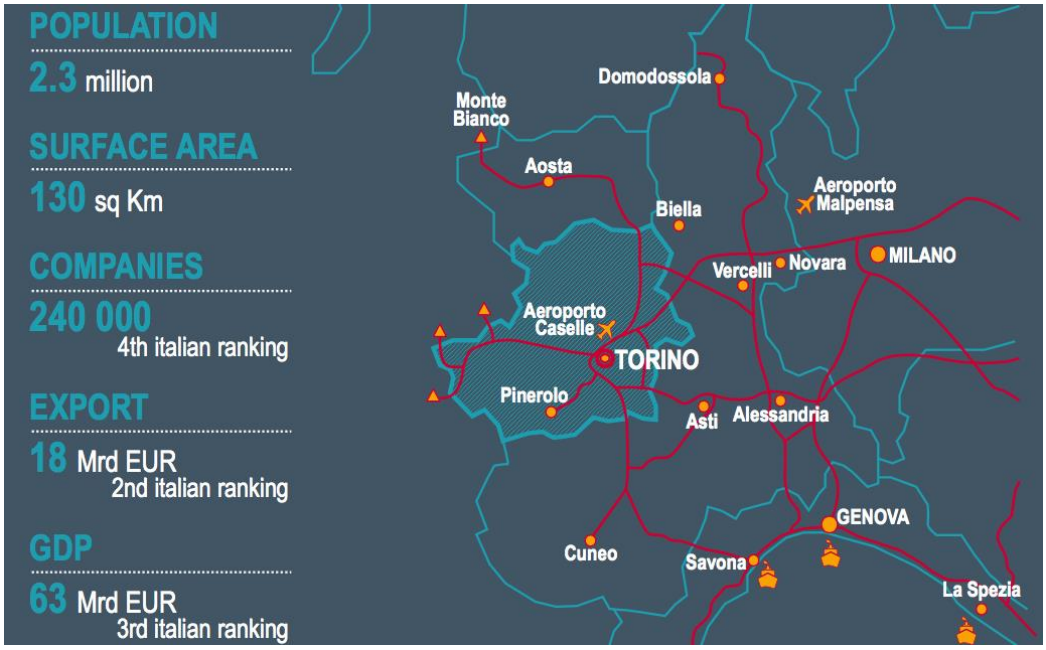
Dimension	Sub-dimension	INDICATOR	Year	Trend
		Variation rate of carbon emissions by sector	2002-2011	↘
		Exceedance rate of air quality limit values	2004-2013	↘
	Transport and mobility	Variation share of sustainable transportation	1998-2013	=
	Waste	Variation rate of urban waste generation	2002-2012	↘
		Variation rate of urban waste recovery	2002-2012	↗
	Water	Water losses variation rate	2003-2012	↘
	Buildings and Land Use	Energy-efficient buildings variation rate	2014	n/a
		Urban building density variation rate	2001-2011	↘
ECONOMY	Sustainable economic growth	Level of wealth variation rate	2002-2011	↗
	Public Finances	Indebtedness level variation rate	2007-2013	↘
	R & I dynamics	R&D intensity variation rate	2003-2011	↗

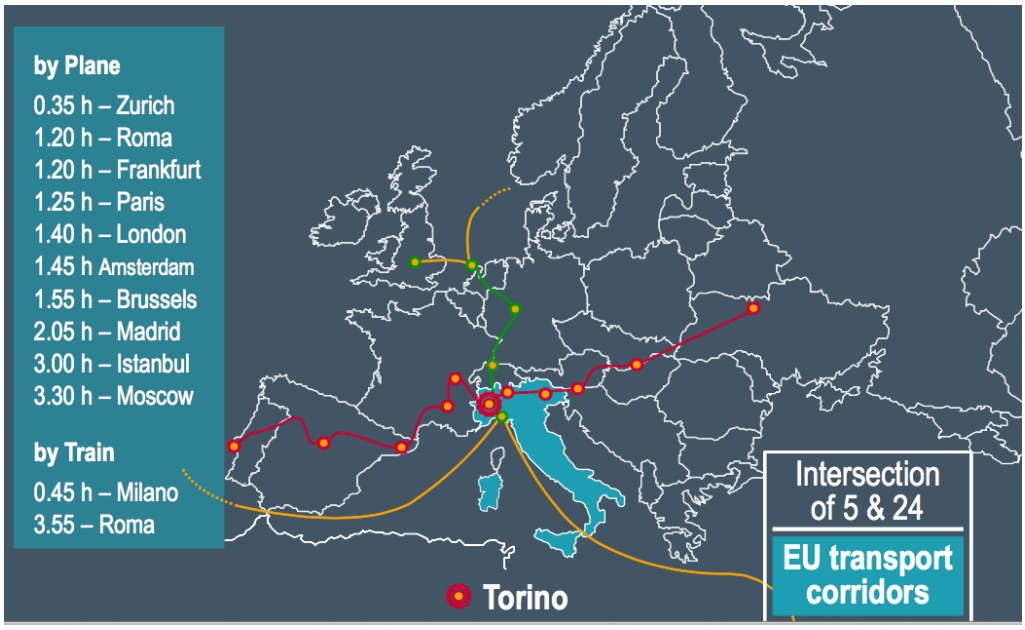
Source: Turin Initial Assessment (D.3.2).

The population of Turin fell between 1970 and 2000 from 1.2 million inhabitants to about 900,000 inhabitants. In the last 15 years it has been stable despite a negative birth rate, thanks to the migration rate: foreign-born immigrants are now 15% of the whole population (most of them come from Romania, 39%, and Morocco, 14%), and their integration represents a significant goal. Inhabitants aged 65 or older are 25% of the total population, while only 13% of the whole population is aged 15 or less: ageing is another key challenge for this area.

Formerly a typical 'one-company town' focused on the automotive sector, in the last 20 years Turin has greatly diversified its economy; it has maintained its industrial specialisation, but at the same time it has increased its role as a cultural and tourist attraction in Italy. The industrial sector contribution decreased between 2000 and 2011 from 30% to 25%, but it is still the most relevant in Italy. The city has hosted the Winter Olympic Games in 2006, valorised its artistic heritage (in particular baroque monuments, and XIX century urban buildings when Turin was the first administrative capital of the unified Italian Kingdom), increased its centrality as an international pole in contemporary arts. It hosts several fairs and events on food, books, arts. Moreover, Piedmont is the region with the largest percentage of GDP used to finance R&D in Italy, namely 1.88 in 2011. Despite these efforts, the metropolitan area has suffered the severe impacts of the global crisis of 2008. The weight of the province of Turin's GDP on the national GDP is now 4.3%, it was 4.7% in 1996. The 'new' economic specialisation of the city is not yet sufficient to compensate the decreasing role of industry: for example, considering the European 'premier league' cities in the *Benchmarking report 2013-14* by the European cities marketing (i.e. 44 major European cities, having at least 1.5 million bednights per year), Turin shows the greatest growth index of

international visitors in the period 2009-13, but in terms of density (tourists per inhabitants) the city is still in the last position of the ranking.





From a social point of view, the unemployment rate in Turin slightly decreased from 2004 to 2006, then gradually increased to 11.1% for males and 11.7% for females: these are very high values, similar to those of most cities in southern Italy. The gender gap dropped from 2.3 percentage points in 2004 to 0.6 points in 2013. Among young people, the unemployment rate reaches almost 50%. Between 2008 and 2012, the average income decreased by 15.7%. The level of poverty in Piedmont was quite stable from 2004 to 2009, then increased over 20%: in 2012 21% of people were at risk of poverty.

As regards energy consumption, between 2002 and 2011 it declined in the province of Turin by 13%, while GDP increased by 20%. The decreasing weight of the industrial sector in the local economy is the main cause of the increasing efficiency in energy consumption: energy consumption increased in agriculture (+18%) and in the tertiary sector (+14%), remained stable for the residential sector and decreased in industry (-32%) and transport (-16%). The declining trend in energy intensity is reflected in a declining trend in carbon intensity: between 2002 and 2011, emissions were reduced by 21%, but because of the contemporary growth of GDP, carbon intensity in the same years decreased by one third. One major challenge is atmospheric pollution, also because of Turin's position in the Po valleys, where air stagnates because of the Alps and pollution concentrates at a high level. Air quality is generally improving, but the situation is still critical: during 2013, 126 days (instead of 35) were detected in which the concentration of PM10 exceeded the threshold limits established by the Directive 2008/50/CE; the days were 31 (instead of 18) for N02 and 38 (instead of 25) for O3 (in this case, calculated as the average of the last three years). According to the European Airbase, Turin is one of the most polluted great cities in Europe; according to Ecosistema Urbano, Turin ranks 81 out of 83 cities considered with regards to the concentration of PM 10, 81 out of 82 for NO2, and 69 out of 86 for O3.

Finally, probably the most difficult challenge for the city, and for its ability to solve the above-mentioned problems, is its indebtedness level: the stock of debt of the municipality of Turin is the highest in Italy per person (over 3.500 euros per inhabitant) and the second after Milan in absolute terms, nearly €3.500 million.

DESCRIPTION OF THE STAKEHOLDER CONSULTATION WORK

According to the general methodology defined in the project, four workshops were organised to involve local stakeholders in drawing up a roadmap toward a post-carbon Turin.

The first workshop included both the presentation of the initial assessment results, and the definition of the 2050 post-carbon vision for Turin (in its relations with Milan). The results of the Initial assessment for Milan and Turin were illustrated through a Powerpoint and participants' feedback was gathered. Data were agreed; some stakeholders suggested to integrate them with further indicators about demographic trends (as they can have major impacts on carbon consumption patterns), presence and investments of multination companies, and passenger journeys between Milan and Turin. The vision-building exercise was implemented according to the three envisaged phases: 1) drawing, 2) identifying key words describing drawings, 3) structuring them in mental maps. Participants were split into three groups; each group was asked to turn around three tables to interact with other groups' work. Afterwards, each group tried to interpret and describe the three final drawings through key words; these key words were then structured in mental maps, according to main themes (described in the next paragraph) that were chosen by each group autonomously. One member of each group orally illustrated to the others the vision schematised through the mental map, and the three visions were collectively discussed. Finally, the FEEM member illustrated the vision that emerged in the previous workshop 1 held in Milan. In term of results, it should be noted that the final vision is mainly focused on socioeconomic issues, while environmental aspects have been quite neglected; in particular, energy themes were not considered as fundamental by the workshop participants in building the vision of a *post-carbon* city. A short-

medium term vision was predominant, and stakeholders seemed to have a hard time imagining how the city should be in 35 years' time.

The second workshop aimed to identify obstacles, milestones and actions in the road towards the vision, as the normative desired end point. SSP scenarios were illustrated, with a main focus on the 'middle of the road' SSP2 (which was chosen as the background reference scenario) and the two alternative scenarios (the 'sustainability' SSP1 and the 'fragmentation' SSP3) for the sensitivity analysis. Participants were split into two groups, and asked to make a list of obstacles and opportunities until 2050 in achieving the vision. The members of the groups discussed their ideas and wrote them down on post-its; then, one member from each group described to the other the proposed obstacles and opportunities, and placed them on a drawn timeline. The same approach was used for milestones and actions: participants discussed them, wrote them down on post-its, then pinned them on a timeline. The final step was the robustness check: stakeholders were asked to assess if the proposed pathway would work – or need changes – also under the two alternative scenarios.

The third workshop was aimed to apply the POCACITO Critical Influences Assessment (PCIA) sensitivity model to understand the influence that different factors/variables have on each other in the cities development, and to identify specific important factors for the evolution toward a post-carbon status. It was organised as an 'integrated' Turin-Milan workshop: it was held in Turin but stakeholders were invited from both Turin and Milan, so to have a 'mutual learning process' in defining the Impact Matrix. The PCIA methodology was described to the participants. Then the preliminary variable set built by the city case study coordinators in the pre-workshop phase was illustrated; participants were randomly split into three groups and asked to discuss this set and to select the ten variables they considered most important to describe the integrated case study. One member of each group presented the ten selected variables; the ten most quoted variables by the three groups were introduced in a new Impact Matrix. Participants were then divided again into three groups; this time, the division was organised to have one group composed only of stakeholders from Milan, one only from Turin, and one mixed of stakeholders from both Milan and Turin. This approach was meant to compare different views for the two cities. Each group filled in the Impact matrix, performed the analysis of the systemic role of the variables and then showed the results to the other groups. Finally, the PCIA tool and methodology, the output of the exercise and the implications for the two cities were discussed in a plenary session. In general, the most active variables were 'Policies and incentives for resource efficiency', 'R&D, funding and policies for innovation', 'Soil consumption'. 'Strategic planning and measures for energy efficiency' turned out to be very active for Turin, less so for Milan; the opposite was true for 'Economic specialisation'. 'Accessibility of urban services', 'Valorisation of cultural heritage and landscape, rehabilitation of derelict areas' and 'Policies and infrastructures for no-fossil fuel mobility' turned out to be the most passive variables.

Finally, the fourth workshop was aimed at revising the visions, the milestones and the actions identified in the previous workshop, according to the results of the GAP analysis, which allowed the recognition of which measures were not sufficient to reach the 2050 post carbon vision. Also this workshop was organised in common for the two cities: it was held in Milan, but stakeholders both from Turin and Milan were invited, in order to search together for new solutions to improve the consistency and robustness of supporting actions to the desired post-carbon state.

INSIGHTS FROM THE GAP ANALYSIS FOR THE CITY

The business as usual (BAU) and post-carbon (PC 2050) scenarios for Turin were modelled and compared.

Under the BAU scenario Turin in 2050 has recovered from a three-decade decline to one of rising economic growth. Despite an increase in population to 1.1 million the energy use of the city has the business as usual (BAU) and post-carbon (PC 2050) scenarios for Istanbul and quantifying the impacts declined. Car use is still high and represents a larger modal share than public transport. However, electric vehicle use is increasing. Many buildings have undergone energy efficiency renovations and solar cells are common, resulting in lower energy use in the residential sector, despite a population increase.

In the PC2050 scenario, Turin has expanded to 1,215,000 people whilst total energy use has been reduced by 30%. However, progress in local renewable energy has been slow and this only accounts for 25% of the energy. Fossil fuel transport still accounts for 50% of the transport energy, and combustible fuels still provide 45% of Turin's total energy.

More specifically, the basic efficiency assumptions were applied to the sectors as shown in the following tables (the structure is in line with the structure of the Turin Action Plan for Energy, where the best available data was obtained). The energy use calculations were obtained by applying these efficiency improvements, and a population factor to the projected emissions for 2020 of the Turin Action Plan for Energy efficiency.

PC2050

1.1 Municipal	25% efficiency improvement
1.2 Tertiary	50% efficiency improvement
1.3 Residential	60% efficiency improvement
1.4 Lighting public	25% efficiency improvement
2. Industry	20% efficiency improvement
3. Transport.	40% efficiency improvement

Table 2 summarises the current trends of the KPI and provides a projection of the likely outcome and performance under each of the scenarios (where possible and applicable). The qualitative assessment is indicated by both a colour and simple scoring system with green and "++" indicating a very likely positive performance and improvement. Whilst red and "--" indicate a very poor or negative performance, as shown in the table below.

Legend	Explanation for scenario projection compared to current situation
++	Likely very positive

+	Likely progress
0	Likely neutral or similar to current situation
-	Likely negative
--	Likely very negative

Table 2: Semi-quantitative assessment of the POCACITO KPI's under BAU and PC2050 for Turin

	SUB-DIMENSION	INDICATOR	UNIT/INFO	BAU 2050	PC 2050
ENVIRONMENT	*Biodiversity*	Variation rate of ecosystem protected areas	*2008 2012*	*0*	*0*
	Energy	Energy intensity variation rate	*Toe/Meuro 2001-2011 Toe (000)*	+	++
		Variation rate of energy consumption by sectors	*Percentage Total 2005-2010= 4861-4294 KToe (11.7% decrease)*	*N/A*	*N/A*
	Climate and Air Quality	Variation rate of carbon emissions intensity	*2002-2011 KTon CO_2 KTon CO_2/M euro*	+	+
		Carbon intensity per person	*Population (Province) : 2002: 2,171,000 2013: 2,294,000*	+	+
		Variation rate of carbon emissions by sector	*Ton CO_2 Total 2005-2010 14945-11852 kton (20.7% decrease)*	+	+
		Exceedance rate of air quality limit values	*Nº of days 2004-2013 PM10 NO2 O3*	++	++
	Transport and mobility	Variation share of sustainable transportation	*Percentage (2000-2010)*	-	+
	Waste	Variation rate of urban waste generation	*Kg/person/year*	+	+
		Variation rate of urban waste recovery	*Percentage*	++	++
	Water	Water losses variation rate	*m^3/person/year*	+	+
	Buildings and	Energy-efficient buildings variation rate	*Percentage*	+	+

	SUB-DIMENSION	INDICATOR	UNIT/INFO	BAU 2050	PC 2050
	Land Use	Urban density variation rate (population)	*Buildings/ km² (2001-2011)*		+
ECONOMY	*Sustainable economic growth*	Level of wealth variation rate	*eur/person*	+	+
		Variation rate of GDP by sectors	*Percentage 2000-2011*	*N/A*	*N/A*
		Employment by sectors variation rate	*Percentage 2000-2011*	*N/A*	*N/A*
		Business survival variation rate	*Percentage*	+	+
	Public Finances	Budget deficit variation rate	*Percentage of city's GDP*	*ND*	*ND*
		Indebtedness level variation rate	*Percentage of city's GDP*	*0*	*0*
	Research & Innovation dynamics	R&D intensity variation rate	*Percentage*	++	++
SOCIAL	*Social Inclusion*	Variation rate of unemployment level by gender	*Percentage 2004-2013*	-	*0*
		Variation rate of poverty level	*Percentage*	-	-
		Variation rate of tertiary education level by gender	*Percentage (2004-2013)*	+	+
		Variation rate of average life expectancy	*Average Nº (2003-2012)*	++	++
	Public services and Infrastructures	Variation rate of green space availability	*Percentage*	+	++
	Governance effectiveness	Existence of monitoring system for emissions reductions	*Yes/No Description*	*N/A*	*N/A*

The most prominent gaps for Turin under the current PC2050 scenario are as follows:

Energy

Currently the PC2050 still has high (although reduced) GHG emissions of 2.7 MTCO2e or 2.26 tCO2e per capita. This is due to the interpretation of the limited actions and milestones that addressed these aspects in the first set of stakeholder workshops.

Hence the current energy mix of 30% grid electricity, 45% combustible fossil and 25% renewable energy sources can be greatly improved through increased actions. This essentially means that there is a gap of almost 10,000 GWh in renewable energy if the combustible fuels and grid electricity are to be replaced by renewable energy (in addition to the 3251 GWh assumed under PC2050 currently).

Social

There is some concern about the poverty level, which has increased to 21% which is very high. This indicates a high level of inequality that has not been addressed in either scenario.

Urban sprawl

Under BAU urban sprawl will increase by 32.6 km^2 despite a reduction in population of 29,000 (for the Province area). Currently the potential for urban sprawl and increased densification is not adequately addressed within the PC2050 scenario. With a projected increase of 203,300 people by 2050 under PC2050, there is a need for the strategic paper to develop a clear series of milestones and strategies to ensure urban sprawl is contained. This obviously also has ramifications for energy use, infrastructure investment and transport.

Circular economy and lifestyles

The potential for improvements in the impact of consumption are currently not well addressed in the PC2050 scenario. Options include increase the facilities for reuse (e.g. through provision of locations to leave unwanted goods for reuse) and repair (such as repair cafes), but also to support businesses and innovation in this area.

Biodiversity

The level of biodiversity protected areas in Turin is relatively low and how to improve the increase of green spaces and green corridors (for wildlife) could be addressed in the strategic document.

A STAKEHOLDER VISION FOR THE CITY

The 2050 post-carbon vision for Turin that emerged in the participatory workshops is built around the following three key concepts:

DIFFERENTIATION

- The economic base is structured in a few specialised sectors (for example, automotive, tourism, ICT etc.); they represent the strengths that make the city competitive and more resilient to economic crisis;
- The mobility system at metropolitan level is organised to be multimodal; people (residents, tourists, businessmen) are less dependent on private motorisation and can easily move by more sustainable modes. Emissions from transport are reduced by introducing a congestion charge, fostering telecommuting, and cutting the use of private cars by promoting more sustainable mode of transport.

IDENTITY

- Even if deeply differentiated, Turin will keep and enhance its identity thanks to strong social integration, high quality of life, promotion of young people's initiatives and start-ups. Ageing

problems are faced by enhancing social housing, developing user-friendly technologies, and improving welfare through ICT;

- Spatial resources, cultural heritage and landscape are recognised and developed as a crucial value. Soil consumption is reduced by preserving natural and agricultural soils, re-naturalising abandoned built areas, promoting instruments for moving and concentrating building rights in the empty spaces inside the existing city.

SMARTNESS

- Technology is systematically developed to connect people, both inside the city and between the city and the global world. New green tech jobs are created, thanks to cooperation between universities and local companies, innovative financial tools for R&D and start-ups, the promotion of renewable energy sources, enhancement of tertiary education in scientific issues. Emissions from buildings are reduced through spread adoption of certifications of energy performance and incentives to building renovation;
- Sharing is a new key paradigm, for granting services (first of all, mobility) but also as an opportunity for economic innovation and new business. New models of education and training are defined, as well as innovative tools and resources for welfare.

ACHIEVING THE VISION

The milestones and actions proposed in the second workshop, and revised in the fourth one, are summarised in the following **Table 3**.

Table 3: Milestones and actions towards the 2050 post-carbon vision for Turin

MILESTONE	STARTEGY TOWARDS MILESONE
Reduction of soil consumption (2020)	Preserve natural and agricultural soils Re-naturalise abandoned built areas Promote instruments for moving and concentrating building rights in the empty spaces inside the existing city
Facing the ageing society (2020)	Enhance social housing Develop user-friendly technologies Improve welfare through ICT
Turin as a touristic city (2020)	Create innovative offers and holiday packages for tourists
20% reduction of emissions from buildings (2025)	Adopt certifications of energy performance Adopt incentives to building renovation
New jobs from green tech (2030)	Increase cooperation between universities and

	local companies Innovate financial tools for R&D and start-ups Promote renewable energy sources Enhance tertiary education in scientific issues
50% reduction of emissions from transport (2035)	Introduce congestion charge Foster telecommuting Halve use of private cars through promotion of more sustainable mode of transport
Turin as an inclusive and "shared" city (2040)	Define new models of education and training Innovate tools and resources for welfare

ASSESSMENT OF NEEDS

In the fourth workshop, the discussion about the results of the GAP analysis led the stakeholder to propose further actions, to integrate the set identified in the second workshop.

At the local level, the main measures proposed were:

- improve access to new technologies, reduce the digital divide and generational and social gaps, through open data, digital platforms, networks, etc.;
- increase the role of the third sector for circular economy, creating physical and logistic spaces for new economic activities;
- promote new programmes of urban regeneration, whose impacts should at the same time reduce social inequalities, increase building energy efficiency and avoid further consumption of soil;
- simplify the creation of new start-ups in sectors of the sharing economy;
- reduce food and water waste;
- guarantee the presence of the monitoring-assessing-reporting chain, in order to keep under control the effectiveness of the post-carbon strategy in the long term.

In the workshop, not all the actors seemed to be fully aware that a post-carbon strategy has to be interdisciplinary and integrated in environmental, social and economic terms. In particular, it was conceived by some stakeholders as a mainly energetic/environmental strategy, while its economic opportunities and social benefits had been overlooked. A greater dissemination of the complexity and multi-faceted characterisation of the post-carbon approach could broaden the audience of potential stakeholders interested to post-carbon measures.

As regards the national and EU level, an issue that emerged in the last Turin-Milan integrated workshop is that local actors often believe not to have the requested skill and knowledge to define and implement a complex and interdisciplinary strategy, such as the post-carbon roadmap. Support from the EU and national levels could offer training opportunities and life-long learning to urban and metropolitan public administrators.

Another issue is clarity in national strategy. For example, in the case of Turin and Milan stakeholders put in evidence that the effective 'post-carbon' evolution of the cities in energetic terms will significantly depend on the weight of renewable sources that will be used to produce electricity at the national level: it is then important that national policies and strategies are as clear as possible in defining their targets and impacts.

Again at the national level, Italy lacks the legislation and fiscal security for the investments necessary for promoting post-carbon trends in the medium to long term, which are further hampered by frequent regulatory changes. A security system for the duration of depreciation period of the capital is needed, as the subsidies for photovoltaic systems.

Also benchmarking to other European (but also non-European) cities is considered useful to stay on track about best practices and measures to be adopted.

Finally, some consideration about the opportunity of interurban coordinated post-carbon policies, as emerged (or not) in the integrated Pocacito case study of Turin and Milan. During the workshops, although explicitly asked and stimulated to keep in mind the relation between the two cities, participants tended to focus on their own city as a separate territorial object. In particular, participants did not consider a major integration of the two cities as an opportunity for the vision, either for promoting post-carbon policies, or for improving local competitiveness.

Asked to think over the right territorial and institutional level to implement post-carbon policies and actions, stakeholders recognised that the city level is in general not sufficient (for example for policies against pollution, waste etc.) and policies have to be conceived at a wider level (for example to develop the area between Turin and Milan). But this wider level does not necessarily correspond to the two cities: according to stakeholders, most of the post-carbon policies that cannot be implemented at the city level have to be proposed at a metropolitan or even at a regional level (for example for the whole Piedmont region, or the whole north-west Italy), rather than through cooperation between Milan and Turin.

According to the stakeholders, this cooperation can only really be effective in the context of policies for R&D and tertiary education: Milan and Turin have universities which are important at the European level, but they have to cooperate to compete in the global context. Moreover, the two cities have different economic specialisations, which can be complementary for promoting technological research and development.

ANNEX. STAKEHOLDERS: TURIN

WORKSHOP 1

Institution	Name and Surname
Municipality – Department of Transport	Giuseppe Estivo
Torino Strategica	Riccardo Saraco
Fondazione Torino Wireless	Chiara Ferroni
Turin Action Plan for Energy	Gianfranco Presutti
Confindustria Piemonte	Cristina Manara
Collegio Costruttori Edili	Paolo Peris
SiTI	Chiara Casalino
Università Bocconi	Giuseppe Berta
Politecnico di Milano	Andrea Rolando
Alta Scuola Politecnica	Emilio Paolucci
Agenzia per la Mobilità Metropolitana	Andrea Stanghellini
RFI – Rete Ferroviaria Italiana	Natalia Picco
Car City Club	Tiziano Schiavon
FEEM	Andrea Bigano
Politecnico di Torino	Patrizia Lombardi
Politecnico di Torino	Stefania Guarini
Politecnico di Torino	Giulia Sonetti
Politecnico di Torino	Luca Staricco

WORKSHOP2

Institution	Name and Surname
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SiTI	Chiara Casalino
SiTI	Francesca Abastante
Alta Scuola Politecnica	Alberto Uberto
Agenzia per la Mobilità Metropolitana	Andrea Stanghellini
DIST - Politecnico di Torino	Luigi Buzzacchi
Associazione Dislivelli	Federica Corrado
FEEM	Cristina Cattaneo
Politecnico di Torino	Patrizia Lombardi
Politecnico di Torino	Stefania Guarini

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WORSHOP 3

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Turin Municipality – Environment Department	Enrico Bayma
Turin Municipality – Environment Department	Mirella Iacono
Torino Strategica	Riccardo Saraco
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Politecnico di Torino	Luigi Buzzacchi
Università Bocconi	Tania Molteni
INU Lombardia	Luca Imberti
Fondazione Lombardia per l'Ambiente	Mita Lapi
Finlombarda	Dino De Simone
A2A	Riccardo Fornaro
FEEM	Margaretha Breil
FEEM	Cristina Cattaneo
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WORSHOP 4

Institution	**Name and Surname**
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ARPA Piemonte	Maria Cuviello
Politecnico di Milano	Stefano Caserini
A2A	Riccardo Fornaro
INU Lombardia	Luca Imberti
Fondazione Lombardia per l'Ambiente	Mita Lapi
Università Bocconi	Tania Molteni
AMAT	Marta Papetti
Ordine Architetti Milano	Alessandro Trivelli
FEEM	Andrea Bigano

FEEM	Margaretha Breil
FEEM	Cristina Cattaneo
FEEM	Pasquale Alfierj
Politecnico di Torino	Stefania Guarini
Politecnico di Torino	Luca Staricco

ROSTOCK AS A POST-CARBON CITY 2050 - STRATEGY DOCUMENT, ENGLISH SUMMARY

ECOLOGIC INSTITUT, Berlin, August 2016

Susanne Langsdorf, Ecologic Institute

SUMMARY

This strategy paper aims to support the efforts undertaken by Rostock on its way to a post-carbon city in 2050. It presents the results of a participation process undertaken and the analyses of selected measures regarding their effectiveness to achieve a 2050 post-carbon city. Furthermore, in an excursus the measures that the EU and the national level – from the viewpoint of stakeholders in Rostock – can implement to support cities are summarised.

A key component of Rostock's climate protection activities is the so called 'Masterplan-process' (Masterplan 100% Klimaschutz), which was conducted in Rostock from 2012-16. The objective of the Masterplan is the reduction of energy demand by 50% by 2050 and of CO_2 emissions by 95% compared to 1990 levels. It includes measures in the public, private and household domain. The participation process conducted as part of the POCACITO process built on this masterplan process and on the goals and measures already set. In total four POCACITO workshops (WS) were held in Rostock between December 2014 and May 2016:

- **Visioning**: in the first WS a vision "Rostock 2050" was developed
- **Backcasting**: in the second WS the way to reach this vision was elaborated
- **Sensitivity**: in the third WS the measures to reach the vision were discussed in more depth
- **Next steps**: in the final WS the results of the POCACITO modelling exercise and the next steps of the Rostock post-carbon process were discussed.

The most important action fields identified were: economy/jobs, mobility, consumption and waste, quality of life for all, demographic change/old age poverty, affordable housing vs. public green space, energy sources/efficiency and connection to the surrounding region.

The main actors working towards these goals are the 'climate protection control centre' ('Klimaschutzsleitstelle') of the Agency for the Environment in Rostock and the energy alliance ('Energiebündnis'). In the alliance actors from the energy sector and energy consumers (e.g. the municipal utilities; WIRO, the biggest local residential building cooperative; RSAG, the local provider of public transport) cooperate to support the so called 'Energiewende' (energy transition).

The main tool for achieving the vision is the 'Masterplan 100%' which was further developed as part of the POCACITO participation process. Within the Masterplan almost 50 measures were set of which a number are already finalised, while the majority is ongoing. With regard to the action fields described above, broader goals have been set. The *economy/jobs* field shall be fostered with a focus on the assembly sector and on the already strong economic sectors fisheries and harbour, tourism and agriculture as well as research and development. In order to reduce energy consumption of the *mobility* sector Rostock will become more compact and a city of short distances. Regarding *consumption and waste* a change in diets will be supported. Also a number of milestones on the way to a post-carbon city have been set.

The existing and planned measures have been modelled in the POCACITO project, using two modelling approaches. One approach focused on the city level. The other included the footprint of the inhabitants of Rostock, i.e. the emissions produced and energy used outside Rostock through the consumption generated in Rostock. The latter was calculated using a multi-regional input output model.

Two scenarios were calculated: one *business-as-usual 2050 scenario* (BAU), in which the running and agreed upon measures were included, and the existing trends extrapolated. The second scenario was a *post-carbon 2050 scenario* (PC2050), in which the indicators that have been developed in the participation process and the measures of the 'ambitious version' of the Masterplan were included and projected into the future. The most important results include the following:

In the BAU scenario most indicators show a positive trajectory. Nevertheless, energy consumption declines only marginally, due to a rising population and increased electricity consumption. The biggest reductions are achieved in the transport sector. In the PC2050 scenario the development is significantly better, despite an even bigger increase in population. Energy consumption in the PC2050 scenario is 22.2% lower than in the BAU scenario, in both scenarios most energy is consumed in heating. Greenhouse gas emissions are 693,000 tCO_2e in the BAU2050 scenario and 346,700 CO_2e in the PC2050 scenario. This corresponds to 3.22 tCO_2e and 1.58 tCO_2e per capita respectively. While in the city limits of Rostock great reductions can be achieved in the PC2050 scenario, calculations of the 'footprint' show a very different picture. Already today a major part of Rostock's emissions don't materialise within Rostock, but outside through consumption. This share is to rise considerably in the future: if the consumption of private households and the public sector is taken together, the emissions of Rostock are even expected to rise!

Drawing on these results the paper closes with the most relevant action fields to achieve a post-carbon Rostock 2050. Within the city limits of Rostock these are: heating (efficiency, renewable heat), electricity, transport (consequences of e-mobility) and realising a compact city.

As 90% of the environmental effects of Rostock are expected to materialise outside Rostock, consumption needs to be a major focus to truly achieve a post-carbon city. Important measures include: fostering the local economy and a circular economy, reducing the environmental effects of e-mobility and changing diets, and lowering the impact of food consumption and production.

ANNEX. STAKEHOLDERS : ROSTOCK

WORKSHOP 1

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