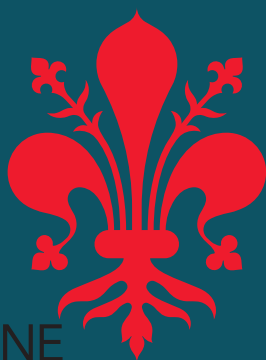




Climate City Contract

2030 Climate Neutrality Action Plan

2030 Climate Neutrality Action Plan of Florence



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Summary

This document is the result of the first iterative consultation analysis aimed at accelerating the municipal targets towards climate neutrality in 2030. Based on the recent SECAP, adapted to the requirements of the mission and improved with business-as-usual & co-benefits evaluation to support a deeper financial analysis (reported in the Investment Plan and closely linked to the actions), it outlines the pathways identified in the existing planning framework that have been enriched and improved in a first roundtable with stakeholders and doublechecked to assess the potential impacts (environmental, economic, external) and the feasibility of the target with different methodologies supported also by Net Zero Cities experts' consortium.

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Abbreviations and acronyms

Abbreviations and acronyms	Definition
BEI	Baseline Emissions Inventory
CCC	Climate City Contract
CDP	Carbon Disclosure Project
CoM	Covenant of Mayors
EEA	European Energy Award / Comune Clima
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre
MEI	Monitoring Emissions Inventory
NEEFEE	National Electricity Emission Factor
NZC	Net Zero Cities
SECAP	Sustainable Energy and Climate Action Plan
ToC	Net Zero Cities Theory of Change
UN SDGs	Sustainable Development Goals of the United Nations



1 Introduction

The quality of life of citizens and the conservation of the territory have always been at the centre of the policies of the Administration which pursues the EU objectives with sustainable and smart policies.

Florence is a very complex territory but also historically an extremely dynamic city, open to innovation.

The urgency of climate change and the new needs/sensitivity of citizens on the issues of sustainable and innovative territorial and social development have convinced the municipality to accept the challenge of the zero-impact smart city mission, capitalizing on what has already been activated in terms of structure, systemic approach, collaborations and participation, programs and initiatives,

The Sustainable Energy Action Plan (SEAP) and the subsequent plan also extended to the climate issue (SECAP) elaborated on the basis of a Total Quality Management System and with the support of European partners lead us to 60% savings on emissions climate-altering with the projects already planned and financed.

With the present document we intend to start a process in rapid and continuous evolution which, thanks to new funding opportunities, a wider audience of adhesions, including extra-territorial ones, the support of research and technological innovation aims to realize an extremely ambitious already strategically budgeted for the long term, but which technologically or financially had not yet been defined. We start from the effective panorama, outlined by the SECAP and by all the current plans correlated with the various measures and collaborations activated, expanding the lines of action already in place thanks to the new programming (NRP, NP Metro plus, ...) and new or increased commitments by the stakeholders. Given the objective limits of a territory like that of Florence, it will be essential to continue with a large set of differentiated interventions that can be adapted to the different needs and limits and that can add up to every possible contribution. It will be necessary to intervene on efficiency and energy saving together with the sustainability of energy vectors, accelerating wide-ranging electrification in various sectors, with massive use of self-produced or purchased green energy and new generation biofuels. To cover the inevitable "last mile", the green plan for the maintenance and increase of the arboreal heritage will certainly be of support, with broad effects of absorption, mitigation and adaptation. In addition, Florence as the leading city of the metro city, together with its subsidiaries, will be able to extend good sustainability practices to neighbouring municipalities by offsetting the remaining emissions that its particular condition as an UNESCO city, capital and destination for significant tourist flows does not allow to zero.

Currently the only area of exclusion, in line with the Covenant of Mayors, is air traffic for reasons of competence and availability of specific data history. However, the city airport is an integral part of logistics and mobility as well as urban services and will be able, thanks to the usual collaboration, in the following phases to provide insights into the evolution of the impacts that technological improvement and above all the use of new fuels (SAF) have had and they will be able to contribute.

In the drafting of the SECAP, with a view to linking this strategy and the complete decarbonisation of the activities under the municipal jurisdiction, the water and waste management services referring to the share of municipal use/contribution have already been added compared to the previous plan.

The participatory processes with stakeholders (starting from those already involved in the smart city plan and in the SECAP and from the existing working groups like the one of mobility managers, logistics companies, large companies, etc) and citizens (starting from the pilot climate assembly and the dedicated campaigns - www.firenzeperilclima.it) will be strengthened, as a necessary precondition for achieving the goal.

Thanks to the numerous European cooperation projects, a SWOT analysis has been in progress and continues to evolve with respect to the objective of climate neutrality schematized as follows.



Figure 1 - SWOT Analysis "climate neutrality in Florence"

As city are complex and living organism, also the action plan, as the other chapters/sections of the Climate City Contract, are «living documents» to be continuously improved, adapting to evolving framework, to monitoring results and to a wider involvement of stakeholders; the documents have been developed following the Net Zero Cities templates and guidelines (<https://netzerocities.eu>).

2 Work Process

Florence is a cultural heritage city, its historic centre was named a UNESCO site in 1982 and it is known worldwide as a tourist destination; it is a unique social and urban achievement which includes the greatest concentration in the world of museums, churches, buildings and artworks. The development of the city is strongly constrained by the need of preserving the rich historical and monumental heritage that very often represents a concrete obstacle to the most ambitious projects, avoiding any impact on the landscape. The interventions for energy efficiency and emissions saving must be

done in compliance with the landscape constraints and boundaries thus adapting the technology and set of opportunities to the urban context. Nevertheless, the city is fully engaged in urban transformations in the name of sustainability and innovation in a path that started in 1998 with the Aalborg Charter commitment and saw the active participation in almost all EU initiatives concerning sustainable, green and smart cities.



Figure 2 – Florence path towards sustainability

The Smart City Plan (2015) offered a systemic and coordinated vision of urban life from an integrated planning perspective in terms of infrastructures and mobility, energy efficiency and environmental sustainability, focusing on social dimensions and citizens' well-being. A powerful tool for achieving concrete goals for the city and the community, thanks to solutions for improving everyone's life quality.

The city aims at facing the major challenges related to climate change, which are amplified by the intense number of city users and activity while preserving its priceless heritage. The UNESCO Management Plan is another valuable example of how the city is approaching and implementing a holistic management system combining cross-sectoral competences for the protection and enhancement of the social and biocultural assets of the city as smart destination.

Since 2010, the urban planning has focused on refurbishment and reuse of dismissed buildings to prevent soil consumption (Zero Volume) and the new Plan highlights the link with the SEAP/SECAP and the related actions and targets.



Figure 3 – The integration of sectorial plans and programs

The present strategy will be fully integrated with the existing framework, based on existing facilities (internal structure, systemic approach, participatory processes and cooperation with relevant stakeholders...) boosting the transition targets foreseen for 2040-2050 enabling new synergies, focussing next investment programs on climate issue, engaging more and more stakeholders and testing innovative solutions in terms of technology and management/financing.

Referring to the NCZ climate transition Map, the city of Florence has already set up a similar iterative process for the energy & climate strategies thanks to the involvement in different initiatives which have modified the city's approach and procedures:

- the European Energy Award (Comune Clima in Italy www.european-energy-award.org and <https://www.agenziacasaclima.it/it/comuneclima-1559.html>) a Total Quality Management System for municipalities focussed on the energy & climate as transversal theme throughout all municipal competences;
- the system thinking approach which has been acquired during FP7STEEP and has been tested in the development of the co-created Smart City Plan (2015) where Florence has committed for the first time to the zero-emission target set for 2040-2050 decade.

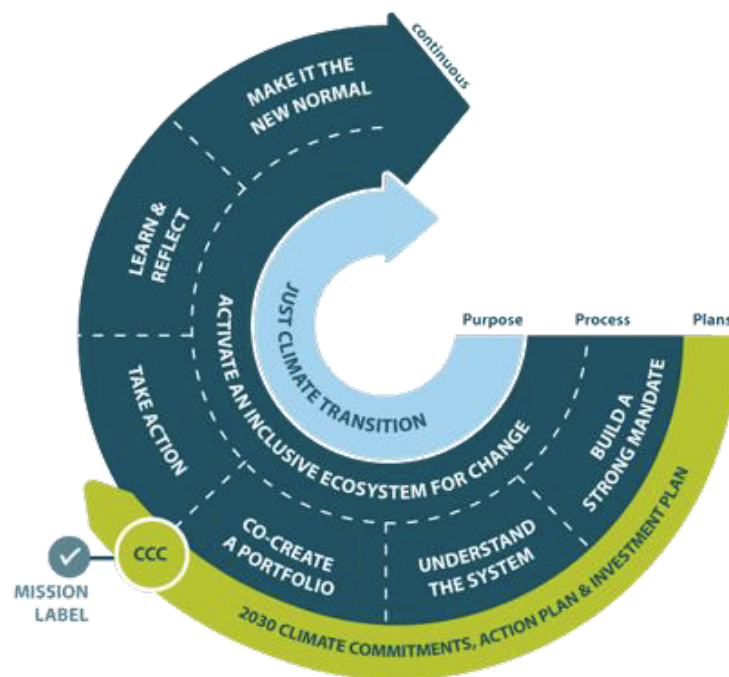


Figure 4 – The NZC Climate Transition Map

1. Build a strong mandate: the political commitment has been set long ago and continuously confirmed and improved; a « Climate task force » has been created within the local government since 2010 in the framework of the CoM. The structure is interdepartmental and flexible to cover any possible upcoming need or issue: it is structured into several « habitat teams » that are interacting with relevant stakeholders. The local city ecosystem has thus adopted a collaborative governance model that is already implementing the previous plans and testing innovative collaboration schemes for example with the creation of the Smart City Control Room for an advanced urban management and monitoring. *The concept will*

be extended to other government levels, strengthen buy-in and mutual commitments starting from the metropolitan and regional area. The city is also very active in networking at national as well as at international level to be in touch with innovative ideas and to find solutions to common needs as in case of the 9 Italian mission cities. Together with them Florence intends to engage the national stakeholders who could facilitate the regulatory and technical framework for the transition.

2. Understand the system: Florence has been monitoring its impacts regularly through qualitative and quantitative methods since the adherence to the Covenant of Mayors, to the EEA program and to the CDP initiative for steering and controlling the achievements (it's an EEA Gold city and rated A for 3 consecutive years in CDP).

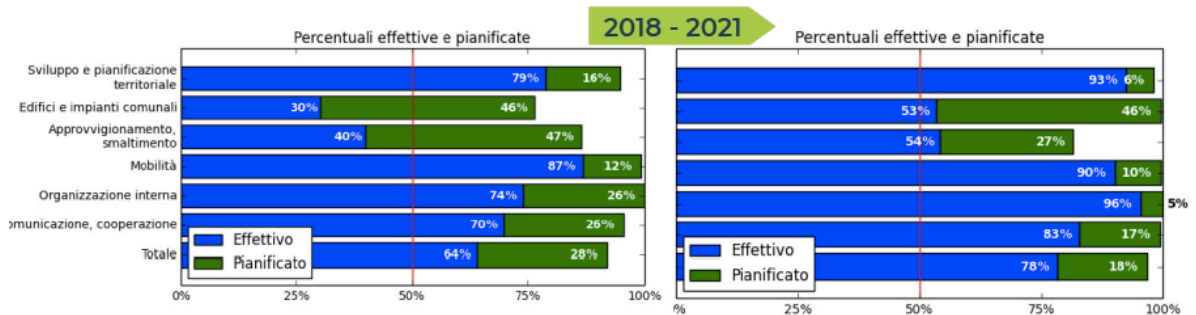


Figure 5 – The progress 2018-2021 assessed by EEA

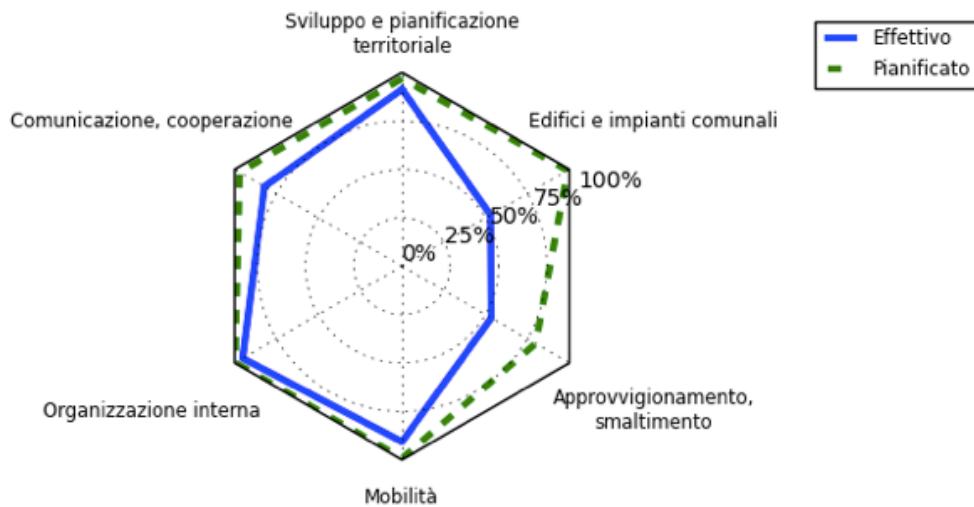
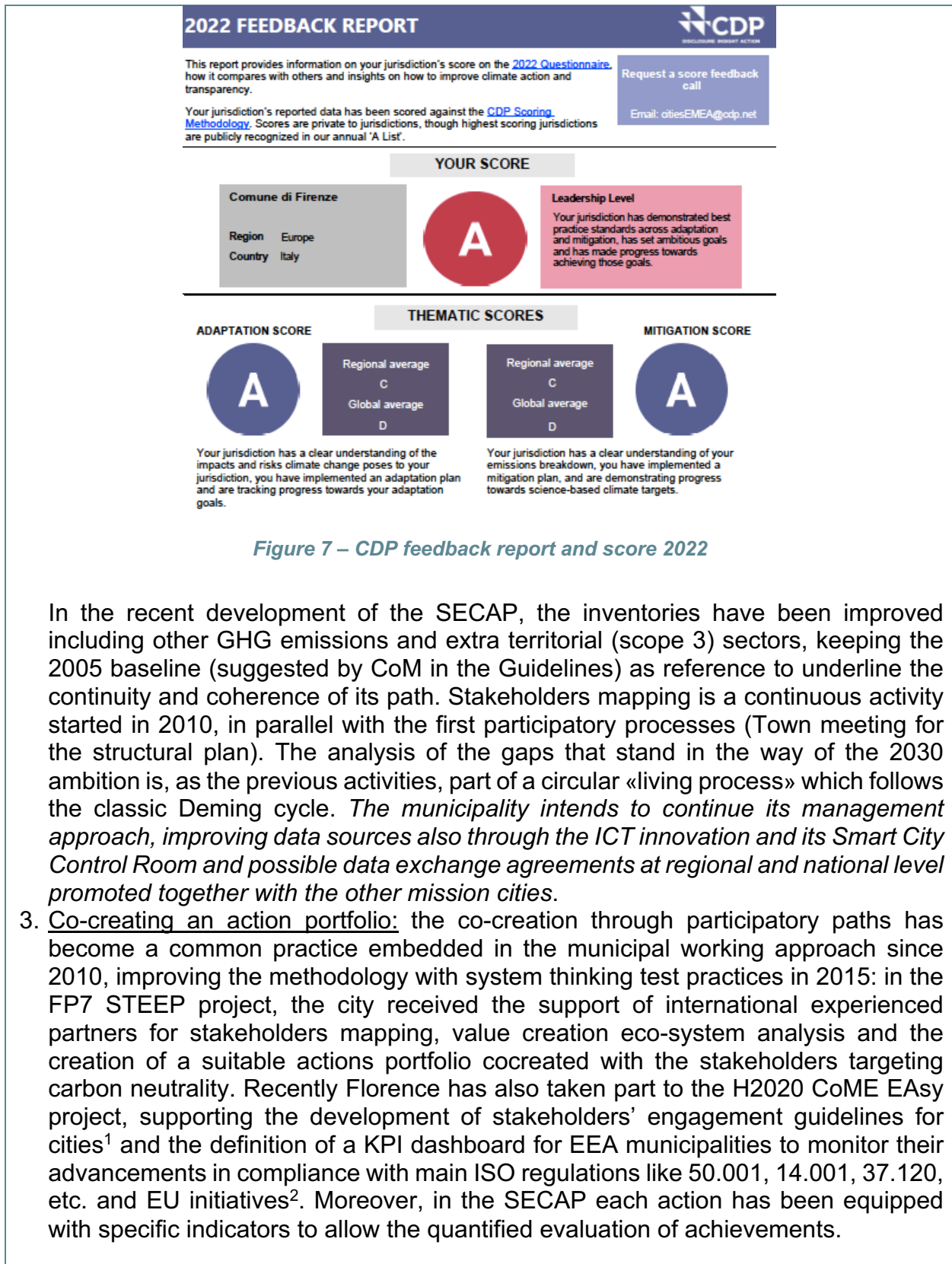


Figure 6 – Evaluation of the six main areas of competence (EEA – EMT tool): effective (blue) and planned (green) measures



¹ <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5c3b26429&appId=PPGMS>

² <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5c8d8b1c7&appId=PPGMS>

As already mentioned, the planning process has been approached as a continuous optimisation activity based on quantified evidence that could adapt to evolving framework: Florence intends to use all the know-how gathered so far and set up a co-design program to optimise the first proposed portfolio. The milestones have been set as follows:

Timeline

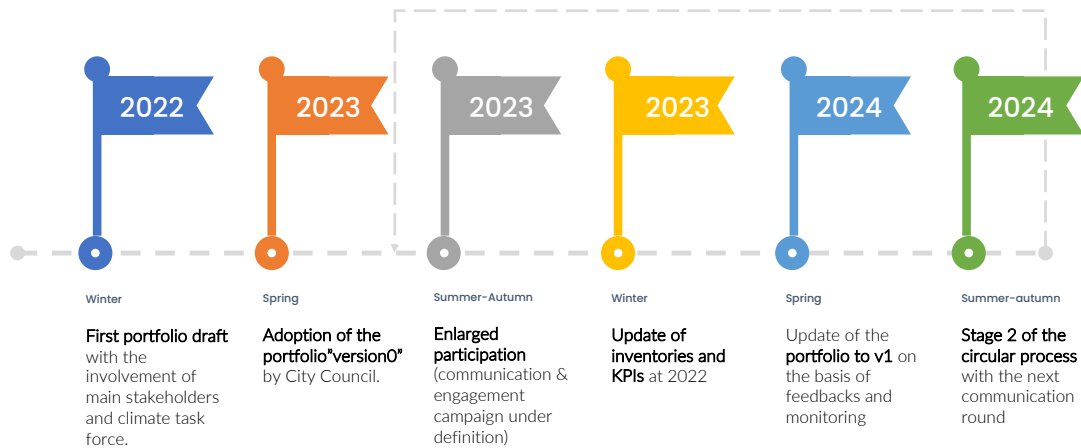


Figure 8 – The transition iterative timeline for the city of Florence

3 Part A – Current State of Climate Action

3.1 Module A-1 Greenhouse Gas Emissions Baseline Inventory

The city of Florence started to assess its consumption and emissions with the Covenant of Mayors baseline for the year 2005 to be aligned with the Provincial Energy Plan. Several monitoring inventories have been calculated regularly to assess trends and steer climate sustainable policies. The last monitoring consumption inventory 2019 developed for the recently adopted SECAP is reported in the following table.

A-1.1: Final energy use by source sectors				
year 2019				
	[MWh/year]			
	Scope 1	Scope 2	Scope 3	Total
Buildings				
Gas, Electricity, Biomass	2.001.064	1.755.424	-	3.756.489
Transport				
Gasoline, Diesel, LPG, Biofuels, Electricity	1.922.484	3.150	-	1.925.634
Waste & water				
Gas, Electricity, RES	Incl. in build. & transp.	Incl. in build. & transp.	39.020	39.020
Industrial Process and Product Use (IPPU)				
CHP, Gas, Oil	413.309	Incl. in build. & transp.	-	413.309
Agricultural, Forestry & Land Use (AFOLU)	not relevant	not relevant	-	-
Electricity, Diesel, Gasoline	Incl. in build. & transport	Incl. in build. & transport	-	-
TOTAL	4.336.857	1.758.574	39.020	6.134.452

Table 1 – Consumption inventory 2019

A-1.2: Emission factors applied

Florence is using standard emission factors for GHG gasses, that are calculated following the IPCC 2007 Fourth Assessment report methodology³ (GWPC₄ = 25; GWPN₂₀ = 298), which include the three CO₂, CH₄ and N₂O gases, as these are the ones currently recommended for the national inventory reporting, in the frame of the United Nations Framework Convention on Climate Change.

It is worth noting that they are characteristic of stationary sources. The CO_{2-eq} emission factors are up to 3% higher than the CO₂ values for the transport sector (e.g., for gasoline), because of higher non-CO₂ emissions compared to stationary sources.

In the context of EU and Global Covenant of Mayors for Climate and Energy, the JRC provides the emission factors for calculating GHG emissions attributed to the electricity consumption. The National Electricity Emission Factor is taken by JRC NEEFE 2010-2020.

³ <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html>

The National and European Emission Factors for Electricity consumption (NEEFE) are calculated by dividing the total national CO₂ emissions from electricity production from all input energy carriers by the total final electricity consumption⁴. According to the methodological approach followed by the local authorities⁵, the NEEFE have been calculated by applying the IPCC “standard” approach to the energy carriers consumed to produce electricity. Eurostat’s energy balances have been used for the European countries. The NEEFE factors in use are including CO₂, CH₄ and N₂O emissions expressed in tCO₂ eq/MWh taken from the FAR (IPCC Fourth Assessment Report). In the CoM framework, the MEIs have been calculated following the initiative specific requirements with the 2005 baseline NEEFE, improved with local actions: the 2019 inventory provided here (“CCC 2019 inventory”) has been calculated with the 2019 NEEFE (source JRC) not taking into account any green electricity purchase by the local authority or local production to avoid double-counting.

Primary energy/ energy source	Carbon Dioxide (CO ₂)	Methane (CH ₄)	Nitrous Oxide (N ₂ O)	F-gases	Sulphur hexafluoride (SF ₆)	Nitrogen trifluoride (NF ₃)
Methan gas	0,2019438	0,000018	0,0000004	-	-	-
Diesel	0,2667387	0,000036	0,0000022	-	-	-
Gasoline	0,24946	0,000036	0,0000022	-	-	-
LPG	0,2271418	0,000018	0,0000004	-	-	-
Biomasses	0	0,000252	0,0000054	-	-	-
Biodiesel	0	0,000036	0,0000022	-	-	-
Neefe 2019	0,282			-	-	-
Neefe 2005	0,483			-	-	-

Table 2 – Emission factors in use for main energy sources

The result has been double checked using a different methodology and the following emission factors have been used for the control calculation:

A-1.2: Emission factors applied (from economic model data inputs)		
Base year 2019	<i>For calculation in t or MWh of primary energy Methodology of the IPCC and the CoM</i>	
Sector	Primary energy/ energy source	Carbon Dioxide (CO₂)
Transport	Passenger cars + motorcycles (g/km)	197
	Buses (g/km)	1082
	Light duty trucks (<3.5 t) (g/km)	235
	Heavy duty trucks (>3.5 t) (g/km)	965
Buildings & Heating	Heat production (local heating) (g/kWh)	202
Electricity	Electricity generation (g/kWh)	282

Table 3 – Emission factor for the economic model methodology

⁴ Lo Vullo et. al, 2022

⁵ Bertoldi et. al, 2018

A-1.3: Activity by source sector (from economic model data inputs and Florence KPIs dashboard)			
Base year	2019		
	Scope 1	Scope 2	Scope 3
Transport			
Transport need - passenger cars + motorcycles [M km/year]	1.632		
Transport need - buses [M km/year]	9		
Transport need - trains/metro [M km/year]	11		
Transport need - light duty trucks (<3.5 t) [M km/year]	158		
Transport need - heavy duty trucks (>3.5 t) [M km/year]	257		
Total consumption for transport	44,3%	2%	
Consumption of gasoline (% on total trasport consumption) (% on total consumption)	24% 10%		
Consumption of Diesel (% on total trasport consumption) (% on total consumption)	59% 26%		
Consumption of Biofuels (% on total trasport consumption) (% on total consumption)	6% 2,7%		
Buildings & Heating			
Heating demand (space heating + domestic hot water residential and tertiary sectors)[GWh/year]	2.000		
Consumption of methane gas (% on total heating consumption) (% on total consumption)	94% 43%		
Electricity			
Electricity demand within city boundaries [GWh/year]		1.758	
Local production of electricity from RES [GWh/year]		7	
Waste			
Collected waste within city boundaries [tonnes]			247.659
Other			
Industry [GWh/y]	413	Incl. In electr.	
AFOLU: change of green areas (% of the overall city surface) from 2016 to 2021	+14%		
Water:			
losses in pipes	33%		
Domestic usage (drinking water) [litres per capita per day]	143		
Total usage (drinking water) [litres per capita per day]	193		
Total design capacity of WWTP [Population Equivalent – PE]	600.000		
Total load received by UWWTP [PE]	580.000		
Connection rate [%]	100%		
Treatment level which is applied in each UWWTP:	secondary or more stringent;		

Table 4 – Activity by source sectors

In the following tables, the results for 2019 from two different models are reported to confirm their substantial consistency (total difference <1% mostly due to *other sector*).

A-1.4: GHG emissions by source sectors (Florence model)				
Year	2019			
Unit	CO ₂ equivalent/year			
	Scope 1	Scope 2	Scope 3	Total
Buildings	404.077	495.030		899.107
Transport	464.884	888		465.772
Waste and waste-water	Included elsewhere	Included elsewhere	47.219 72.039	119.258
Industrial Process and Product Use (IPPU)	85.793	Included in buildings	-	85.793
Agricultural, Forestry and Land Use (AFOLU)	not relevant	not relevant	-	-
Total	954.755	495.916	119.258	1.569.930

Table 5 – GHG emissions 2019 by source sector (Florence model)

A-1.4b: GHG emissions by source sector (from economic model inputs)					
Base year	2019				
Unit	t CO ₂ equivalent/year				
	Scope 1	Scope 2	Scope 3	Total	% of Total
Transport	515115			515115	33%
Buildings & Heating	403248			403248	25%
Electricity		498443		498443	31%
Waste*			35192	35192	2%
Other	132447			132447	8%
Total	1050810	498443	35192	1584444	100%

*only waste, no waste-water management. Includes Scope 1 Waste emissions (produced and processed in the city) and Scope 3 (produced in the city but processed outside the city border)

Table 6 – GHG emissions 2019 by source sector (economic model)

A business-as-usual forecast at 2030 results in an overall reduction of about the 10% as follows with natural technological update and population trends impacting on transport sector and buildings (natural replacement of old equipment (cars, buses, boilers, etc.):

A-1.4b: GHG emissions by source sector (from economic case)					
Base year	BAU 2030 (Business as Usual 2030)				
Unit	t CO ₂ equivalent/year				
	Scope 1	Scope 2	Scope 3	Total	% of Total
Transport	384881			384881	27%
Buildings & Heating	369360			369360	26%
Electricity		493416		493416	35%
Waste*			27827	27827	2%
Other	132447			132447	9%
Total	886688	493416	27827	1407930	100%

Table 7 – GHG emission BAU 2030 (economic model)

A-1.5: Graphics and charts

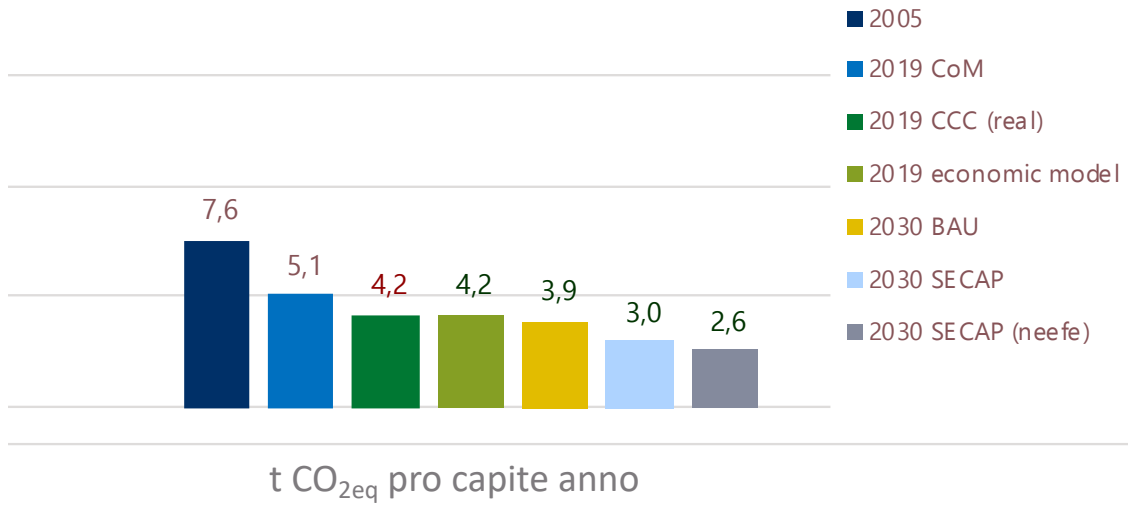


Figure 9 – Emissions calculations comparison from 2005

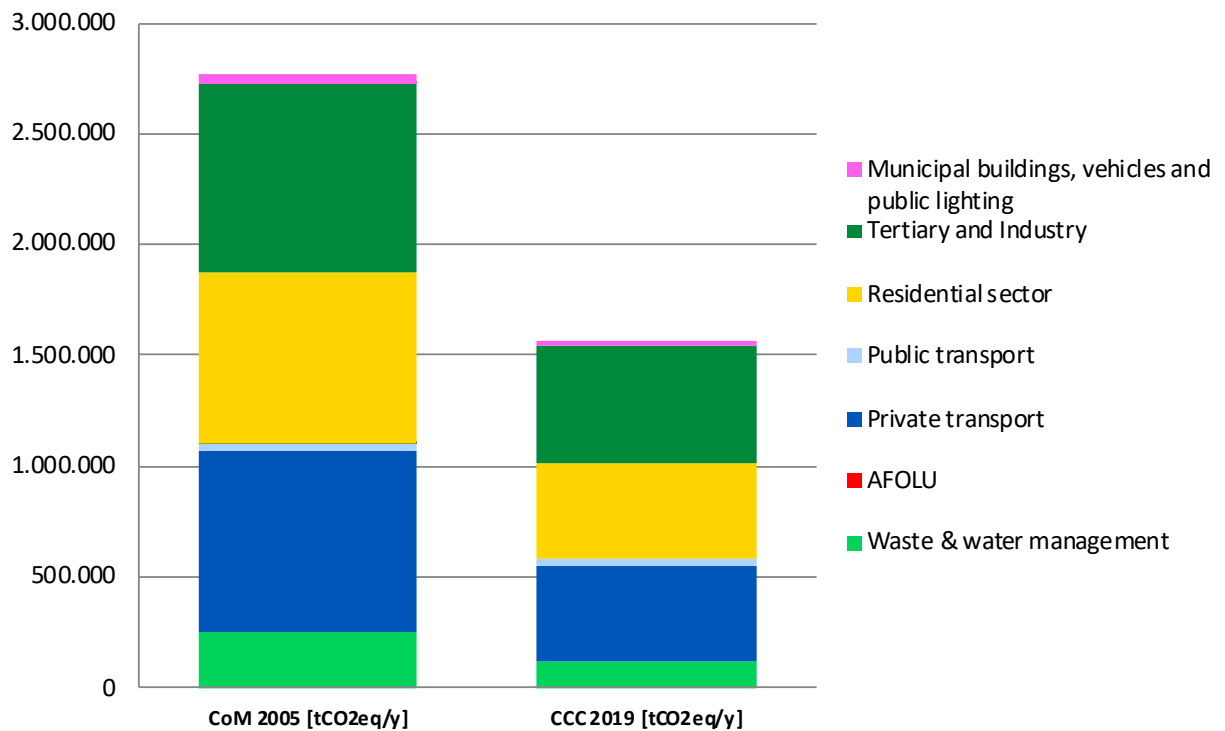


Figure 10 – CO_{2eq} emissions comparison per sector [t/y] 2005 Vs. 2019

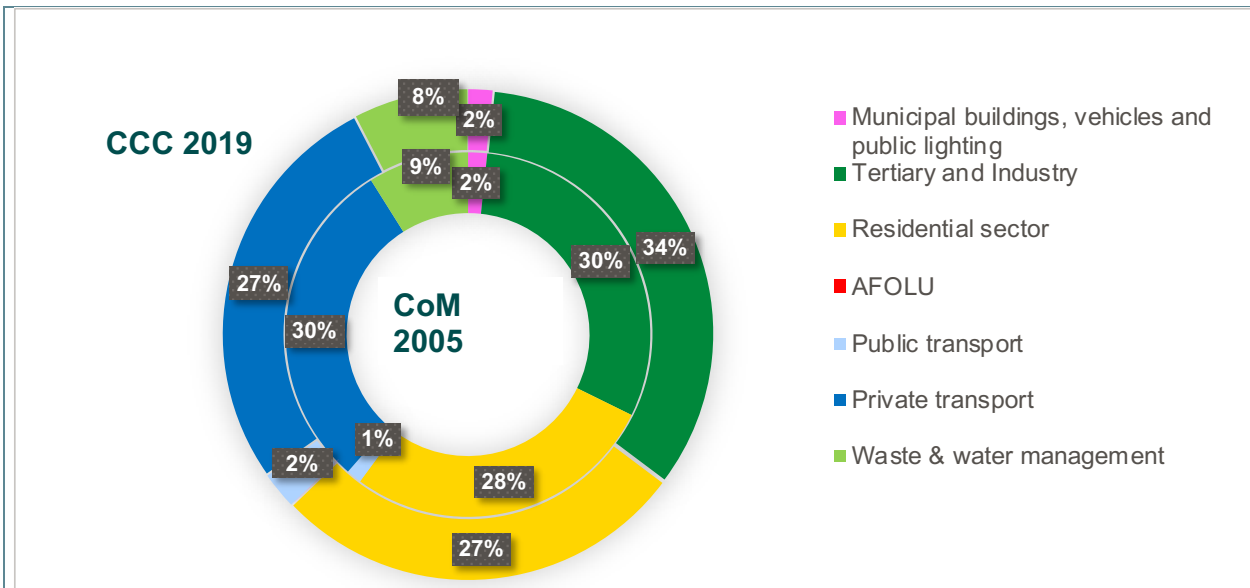


Figure 11 - CO_{2eq} emissions comparison per sector [%] 2005 Vs. 2019

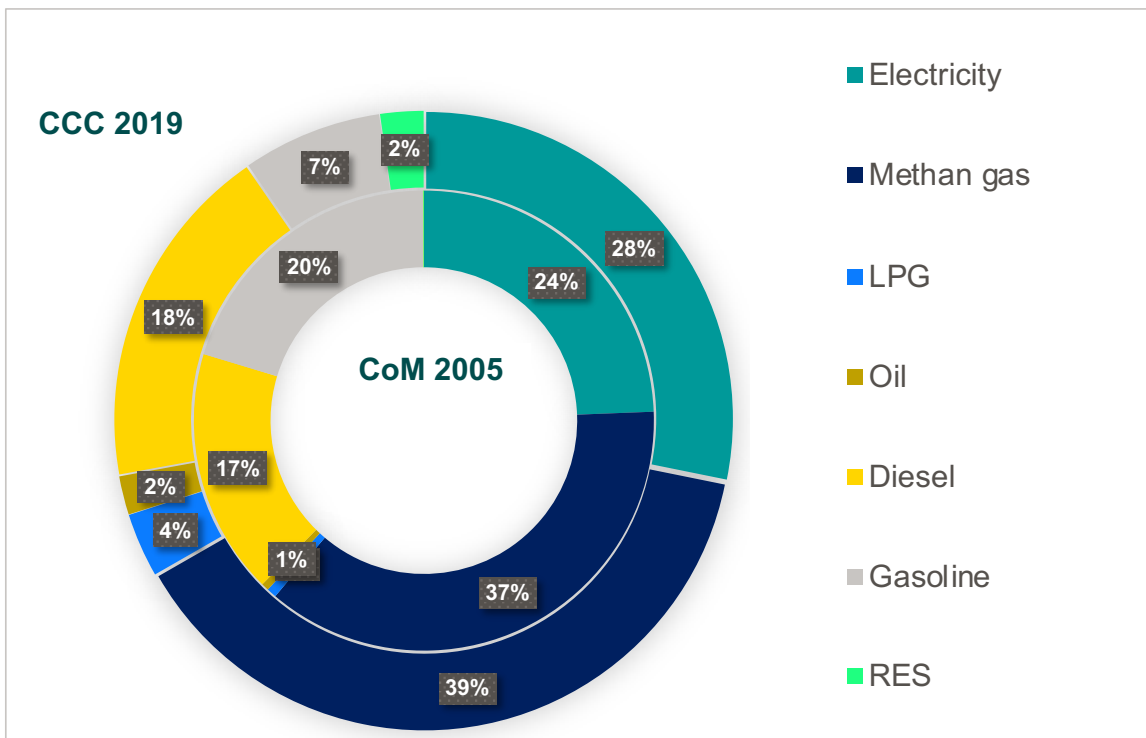


Figure 12 – Consumption comparison 2005-2019 per energy source

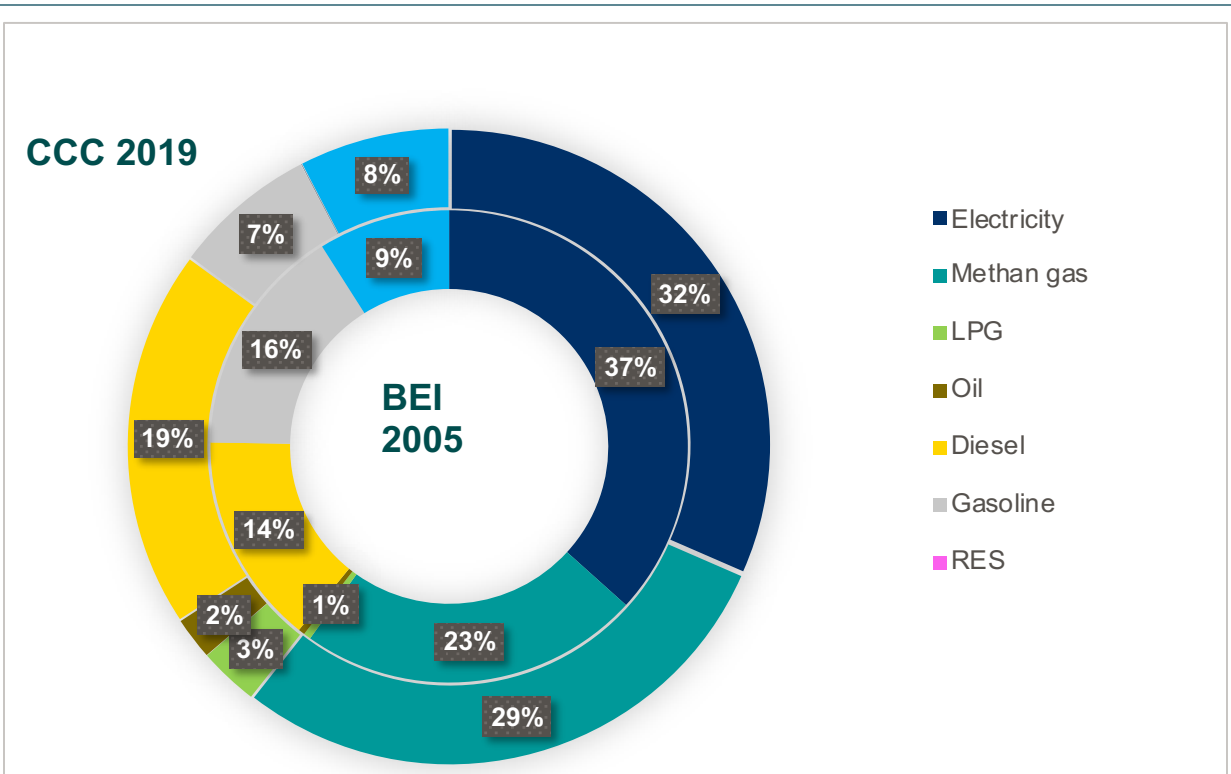


Figure 13 – Emissions comparison 2005-2019 per energy source

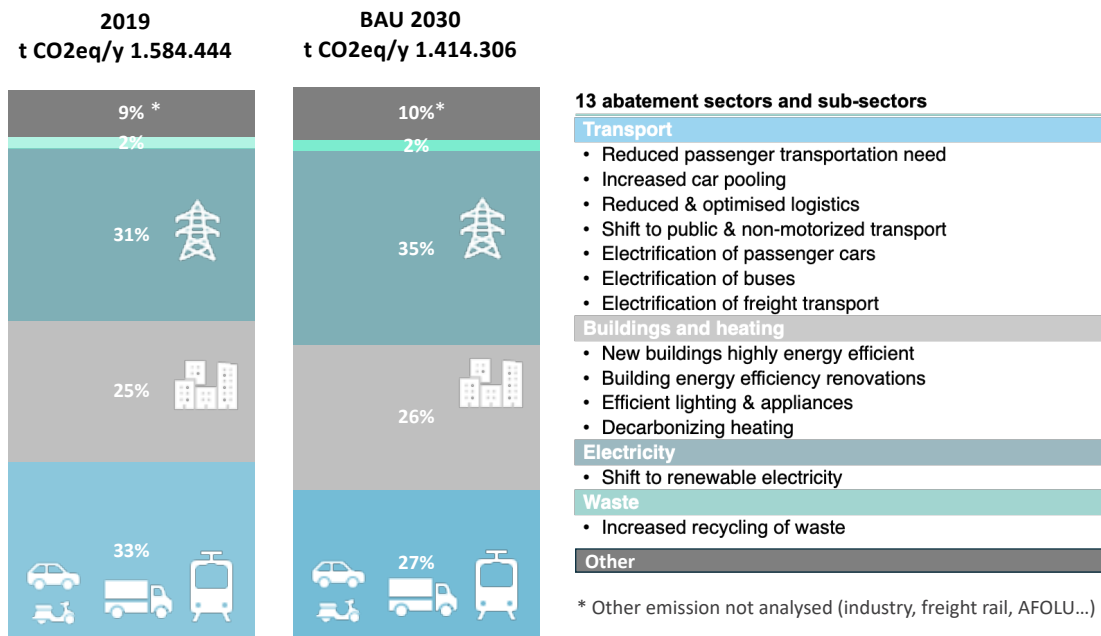
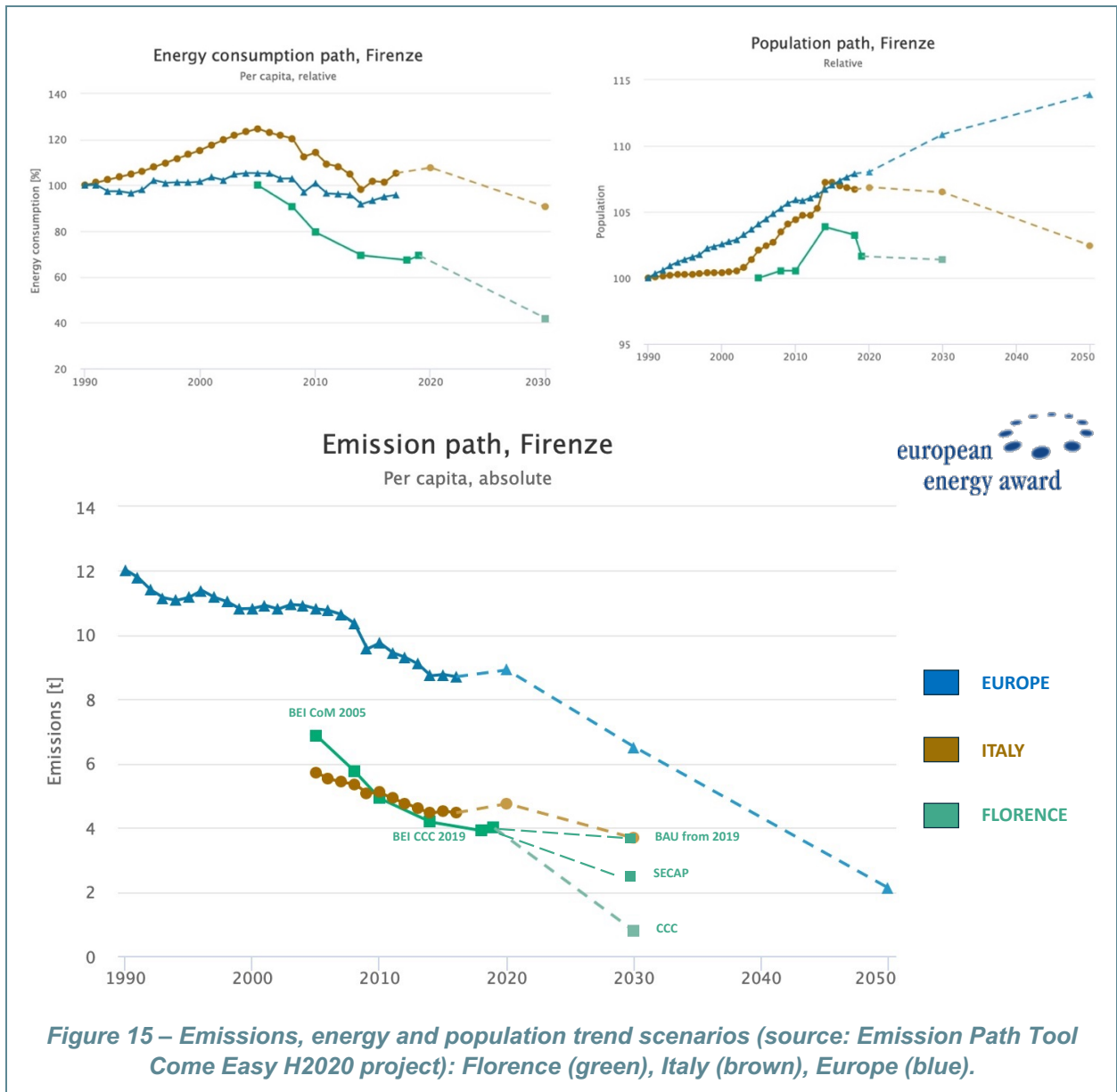


Figure 14 – Emissions 2019 (CCC inventory) and BAU 2030 composition





A-1.6: Description and assessment of GHG baseline inventory

The year 2019 has been chosen as the last year fully operational before the pandemic; the inventory developed, with the same data sources of the CoM baseline at 2005 (mainly DSOs for local fuel/electricity data, bottom up info for urban services⁶ and PA consumption and regional/national institutional databases) have been used, with different calculation methodologies compliant with the requirements of the initiatives⁷, in the CoM to assess the achievement at 2020 and in the Mission to identify the gap to be filled by 2030.

Compared to the reference year 2005, the targets have been largely achieved and the energy profile demonstrates a significant evolution as shown in the previous graphs: from 2005 to 2019 CO_{2eq} emissions in the municipal area decreased overall by 44,8% in per capita value, 43,3% in absolute value.

The comparison by consumption sector shows a clear improvement between 2005 and 2019 in the impact of mobility, services and the residential sector, while the tertiary sector and industry record less significant reductions.

Compared to the sources and energy vectors in use, there has been a substantial reduction in less sustainable fossil sources to the advantage of RES and the electrification of consumption.

The NCZ economic model confirm the overall results at 2019 as well as the sectors and fuels dependency; it provides also a business-as-usual inventory at 2030 which foresees a small decrease in buildings and transport due to the natural technological development and the trend of the population.

In synthesis, the 2019 inventory taken as reference baseline to measure the CCC improvements shows the following emission composition:

- The Scope 1 emissions are due to heating and transport and refer to fossil fuels (methane gas, diesel and gasoline) except for the biofuels quote in the transport sector and a small amount of biomass and solar thermal for heating.
- The scope 2 is the electricity distributed by the grid (which shows an increasing trend from 2005 in term of consumption but not in the emissions due to the improvement of the energy mix)
- The scope 3 is related to waste and water management belonging to the urban area but consumed/emitted elsewhere.

The inventory includes the geographical administrative boundaries with the only area of exclusion, in line with the Covenant of Mayors, is air traffic for reasons of competence and availability of specific data history. However, the city airport is an integral part of logistics and mobility as well as urban services and will be able, thanks to the usual collaboration, in the following phases to provide insights into the evolution of the impacts that technological improvement and above all the use of new fuels (SAF) have had and they will be able to contribute. AFOLU are not evaluated since not relevant in terms of quantities (no significant changes in the use of soil, no farming) while energy consumption for agricultural vehicles or buildings are included in transport and buildings sector.

⁶ Publiacqua (<https://www.publiacqua.it/chi-siamo/bilanci/publiacqua-sostenibile>),

Alia (<https://www.aliaserviziambientali.it/azienda/bilanci/>)

Silfi (www.firenzsmart.it and www.firenzecambialuce.it)

Autolinee toscane (<https://www.at-bus.it/it>)

⁷ The main difference consists in the National Electricity Emission Factor in use (source JRC for the value for the CCC inventory, while in the CoM MEI 2019 the emission factor is the NEEFE in use for the BEI 2005 taking into account local electricity production by CHP and PV)

Municipal waste collection, managed by Alia Servizi Ambientali spa (a public utility of which the Municipality of Florence is the major shareholder) is considered with impact on scope 1 and 2 (vehicles and buildings in use within the city boundaries) included in the buildings and transport sector, while emissions for waste treatments outside city boundaries is included in scope 3. The following table shows the composition of urban waste (more than 625 kg/inh. per year):

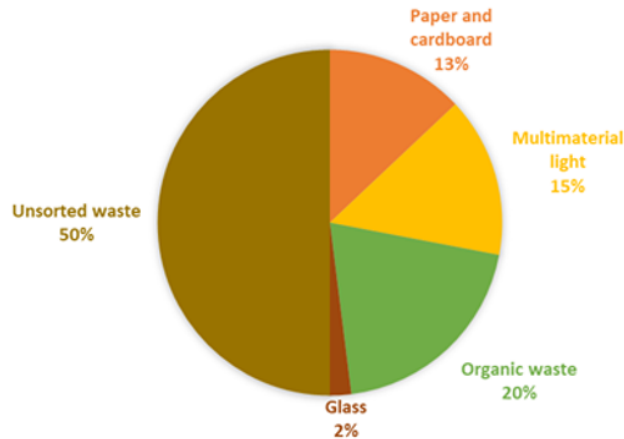


Figure 16 – urban waste fraction

The 53% of the waste is collected separately, the 78% recycled, the amount sent to incineration is the 9,5% and to landfill 24,8%.

Water distribution and wastewater treatment is also included in the inventory with the same approach. The integrated water cycle management (aqueduct and sewage) is entrusted to Publiacqua Spa, with a public capital holding (60% of which 21.67%, owned by the City of Florence). The aqueduct system of Florence presents a remarkable complexity, deriving from the presence of a quite large historical core, which makes it difficult to adapt structures to the technological innovations and to the growth in demand due to the strong tourist presence. As for many Italian cities, the origin of the aqueduct system dates back to Roman times when, in the case of Florence, water descended from Monte Morello through the gentle slopes of the hills. Over the centuries, the growing demand for water resources has prompted the construction of other underground supply sources (wells) as well as other sources; it was also necessary to access the area’s most important water resource, the river Arno.

All the drinkable water consumers (domestic, public and non-domestic) are provided with a meter for the measurement of water consumption. These currently operate on a mechanical system, with some interesting trials of smart metering (automatic and in proximity).

The water losses registered in Florence in 2019 are equal to 37%, intended as the ratio between the overall volume entering the network and the sales volume.

The total drinking water consumption is 193 litres per capita per day.

Since 2014 Florence is entirely connected to the San Colombano water treatment plant. Therefore, all the city’s liquid waste is sanitised. The facility collects the sewage deriving from both shores of the river, to respond to a necessity for treatment evaluated at 600,000 PE (The steady-state situation foresees an annual wastewater flow of approximately 42,600,000 m³, or the equivalent of about 1.36 m³/s for a total of 583,275 PE and the City of Florence contributes to about 70% of the total).

For several years Publiacqua has prepared a yearly Energy Efficiency Plan, identifying

the programme of interventions aimed at recovering the efficiency of the systems (for both the installations and management standpoints). In a four-year period (from 2018 to 2021), the energetic consumptions went from 116,0 GWh to 106,3 GWh, with a reduction of over 8,5%. The evolution of the energetic consumptions is illustrated in the following graph:

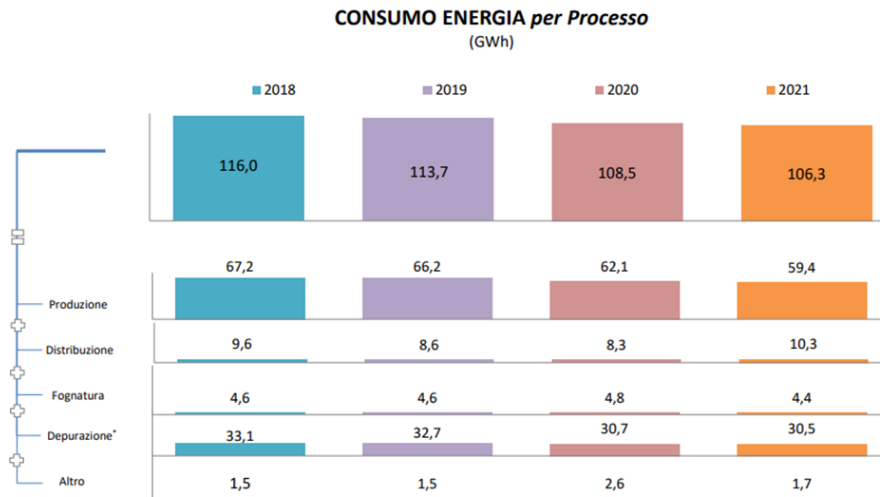


Figure 17 – Annual consumption for water management process 2018-2021 [MWh]

The year 2019 represents a milestone for the CoM path (CoM scenario) and the baseline for the most ambitious one (CCC scenario) towards climate neutrality developed by the city of Florence.

3.2 Module A-2 Current Policies and Strategies Assessment

The following table summarises the main policies, strategies, initiatives or regulation from local, regional and national level, relevant to the city's climate neutrality transition.

A-2.1: List of relevant policies, strategies & regulations					
Type	Level	Name & Title	Description	Relevance	Need for action
Action plan	Local	SECAP	Sustainable Energy and Climate Action Plan	The plan assesses the achievements at 2020 and sets targets at 2030 to fulfil the 55-fit EU strategy and following the CoM rules in buildings, mobility and services sectors	Continuous monitoring. Alignment with new boosted targets
Action plan	Metro city	SUMP	Sustainable urban mobility plan	The plan has been defined at metropolitan level to extend impacts of sustainable mobility policies (e-mobility, public transport & tramlines, bike paths, multi-modality...)	To be accelerated to fulfil new timeline for targets
Action plan	Local	SCP	Smart City Plan	The Smart City Plan defined in 2015 the carbon neutrality path to 2050	
Action plan	Local	Green Plan	Green plan for the maintenance and the improvement of green areas in the urban context	It foresees the development of green areas within Florence's boundaries, giving value to the existing green heritage and planning for huge number of new plants for mitigation and adaptation purposes	Possible extension to the metro area and to further territories for compensation
Strategy	Metro city	Waste strategy	Waste management plan	The waste management plan defines targets (>75%) for recycled urban waste and actions to promote sustainable collection and circular economy	
Strategy	Metro city	Water safety Plan	Water management plan	The plan sets performance targets for the water management service including environmental impacts and energy savings	
Regulation	Local	Structural and operative plans,	Urban plans and regulations for buildings and services	These plans rule the building sector with a "zero volumes" concept and sustainable standards	



		buildings regulation			
Action plan	Local	SULP	Sustainable Urban logistic plan	This strategy has been developed to decrease the impact of logistic sector on urban mobility	It will be tested and further improved in the framework of H2020 Unchain in the next 3 years
Action Plan	Regional & Local	PRQA & PAC	Regional Air Quality Plan/ City air quality action plan	The two plans, in accordance with the Energy and Environmental Regional Plan, pursues a holistic and integrated strategy for enhancing air quality and reducing greenhouse emissions.	Accelerate measures (in accordance with other plans for energy and mobility) linked to new targets
Action plan (Pon+, Pnrr...)	National	National programs (Pon+, Pnrr...)	Investment programs PON METRO+ and PNRR	The projects submitted by the municipality are strongly linked with its climate neutrality path and do add impacts to the SECAP where the PON METRO was included	
Action plan	National	PNIEC, PNACC	Integrated National Plan for Energy and Climate and for Climate Adaptation	Setting goals in different sectors at 2030	A first feedback has been sent together with the 9 Italian mission cities and some suggestions included. Further interactions are possible
Strategy	Internat.	UN SDGs	UN sustainable development Goals	The municipality is evaluating impacts of its strategies on UN SDGs to be in line with the Agenda 2030	

A-2.2: Description & assessment of policies

Florence set a first target for 2030 (-40%) and 2050 (-70%) in its SEAP (2011) and updated its ambitions, following monitoring results and action plan, in the Smart City Plan (2015). Targets are regularly monitored and further improved in the European Energy Award activity program (Gold audit 2021) and officially included in the SECAP (-60% at 2030 and net zero before 2050, planned at 2040).

Under the umbrella of its Smart City Plan which has been acting as the Master Plan on sustainable policies since 2015 when it was adopted after a long participatory co-design process following the system thinking methodology, every following urban strategy/plan is linked as “puzzle piece” to the others to reach the overall targets regarding citizens’ wellbeing and environmental sustainability including carbon neutrality.



In the SCP all sectors have been included and local stakeholders involved to coordinate and facilitate the transition, using ICT as enabler. The action plan transferring the SCP into action is the SECAP actually under adoption which follows the SEAP for the 2020-30 decade.

Several sectorial plans have been developed recently to detail specific targets:

> **the city's air quality plan (PAC)**, to be updated every 3 years, setting goals for the reduction of air pollutants including stationary and non-stationary sources. The actions included in the City Action Plan (PAC) for the rehabilitation and maintenance of air quality are compliant with the guidelines of the Regional Air Quality Plan (PRQA) whose objective is protecting public health, and the measures established in the sectorial plans are consistent and concurrent to reduce the emissions from the main sources.

> **the sustainable mobility plan (SUMP)**, regarding the public transport system and the sustainable mobility policies for the whole metropolitan area, to coordinate efforts, share infrastructures and facilitate common approaches. It was approved in 2021 after a participatory process with the active involvement of citizens and stakeholders from the very beginning. The SUMP approved in 2021 draws up a solid strategy based on four pillars:

① a high-capacity and efficient public transport system, through the extension of the tramway network, the enhancement of rail services, the construction of new BRT systems and the reorganisation of road services

② mobility hubs, to maximise the use of the tramway and public transport fleet, avoiding the use of private vehicles

③ the Green Shield, an environmental LTZ covering most of the city and controlled by a telematic control system

④ promotion of soft mobility, through a continuous and widespread system of bicycle connections, integrated with sharing, micro-mobility.

Autolinee Toscane manages the local public road transport, with 730 km of lines, 85 bus lines, 2.319 stops, and a fleet of 350 urban buses equipped with an AVM System, allowing to know their position in real time; since 2014, an e-ticketing service is active. The city is committed to decarbonise the bus fleet in urban LPT road service: the funds of the NRRP and PN Metro plus will be used to renew the vehicle fleet, providing over EUR 48 million for the purchase of new electric buses for LPT (objective of purchasing at least 30 buses by 2024 and 80 buses in total by 2026). Once this investment has been completed, the urban service will be carried out by the latest generation of Euro 5 buses (20%), Euro 6 buses (around 55%) and electric vehicles (around 25%).

A significant contribution to zero emission shifting is represented by the tramway lines (line 1, operating since 2010, lines 2 and 3 operating since 2018-19, line 4 expected by march 2024 and further extensions already planned), capable of attracting substantial mobility flows directed to the city centre. As capital city region and well-known all over the world, Florence reveals to be a city-users city: besides its 365,000 official residents, the city counts 15Mil tourist/year (pre COVID19) plus 150,000/200,000/day users (workers, students...).


> **the green plan (GP)**, to protect the existing green heritage and improve the number of trees and green areas in the city, following the post-pandemic approaches and the upcoming adaptation requirements, mainly contributing to counteract the "Heat Island" effect (hot points mapped and studied by CNR & DUVRI). The municipal territory




includes a widespread green system consisting of parks, some with high historic-cultural value, and green areas, allowing almost all the resident population to be in reach of a green space from their home at just a 300-metre distance (following the 10 minutes principle). During the pandemic, it clearly emerged how green areas are fundamental asset for well-being as strongly expressed by citizens also during the participatory process started in 2020 for the new City Operational Plan (POC) and the Green Plan (GP). As first answer to the need, a special Urban Forestry project has been planned with short and medium impact: by 2030 Florence along with the Metropolitan City will provide for the planting of one million trees. Moreover, the Municipality of Florence is planning to go from the current 24 m² of usable green areas per capita to 30 m², thanks to the construction of new parks and the regeneration of green areas.

These measures are mainly funded by NextGenerationEU (NRP and REACT-EU) and 2021-2027 programming period and have already enabled a first package of interventions in green areas for € 18 million which will end in 2023, thus allowing the continuation of what has been implemented also regarding the use of green roofs or walls that the characteristics of built heritage encourage mainly out the historical centre or in specific pilots (as schools).

> the **waste and water management plans** which analyse the specific service and set ambitious performance KPIs for the next years.

 **Water:** the integrated water cycle management (aqueduct and sewage) is entrusted to Publiacqua Spa with a public capital holding (60% of which 21.67%, owned by the City of Florence). The aqueduct system of Florence presents a remarkable complexity, deriving from the presence of a quite large historical core. The management vision aims at overcoming the segmented territorial logic to establish an interconnected aqueduct network of the 2 areas Florence-Chianti and Prato-Pistoia. For several years Publiacqua has prepared a yearly Energy Efficiency Plan, identifying the programme of interventions aimed at recovering the efficiency of the systems (for both the installations and management standpoints). Publiacqua Spa has planned significant replacement investments to renew the pipes infrastructures aimed at achieving two main environmental objectives related to water losses reduction and to water quality improvement.

 **Waste collection:** it is managed by Alia Servizi Ambientali spa, a public utility (of which the Municipality of Florence is the major shareholder). The waste collected in the city of Florence in road and door-to-door mode in 2019 amounted to 235 kg per capita. The 2019 data is the baseline for the five-year plan «Firenze Città Circolare», the Waste Plan approved in 2020 aimed at improving the quality and quantity of differentiated waste through innovations in the collection system and stimulating greater awareness and responsibility of people. The project includes the industrial strategy of Alia in relation to the availability and strengthening of the plants for the most important recycling chains: Paper; Glass; biomethane; plastic granule; biofuels; bulky waste. The objectives of the project were analysed in terms of the environmental impacts and benefits generated by the management of urban waste collected in the city of Florence, comparing the starting state (year 2019) with the future scenario (2024 fully operational), through the application of the LCA (Life Cycle Assessment) method.

> the **Structural Plan (SP)** which contains the vision and the guidelines until 2030 and represented an innovation in terms of approach for the transformation of abandoned

buildings/surfaces for the city’s development. Its leading principle is to rehabilitate, thus preventing the land consumption (so-called “Zero Volumes”). Thanks to the empty spaces and brownfields mapped by the **Urban Plan**, in a co-created process, the areas needing attention and accomplishment of public and private actions-infrastructures-services were identified. Through the Urban Planning Rules 2015-2020 (updated together with the operative plan) over 40% of the transformational urban area provisions have been implemented (thus having 900.000 sqm gross usable area redeveloped and relocated with 0,7 BLN of investment and 7.500 jobs).

> the **City Operational Plan (COP)** that, following the “zero volumes” vision, rules the urban development facilitating retrofitting and RES.

All these tools will be constantly monitored and updated to enhance coordination and synergies or detailed to cover specific issues, as it is programmed for the Sulp integrating the Sump for the logistic sector.

The alignment with regional and national strategies is always under analysis also to exploit synergies with existing supporting investment possibilities, like those foreseen in the PON-Metro + or PNRR programs, infrastructural programs, like PNIEC for e-mobility or incentives and regulatory evolutions like the ones enabling energy communities.

To be consistent with its transition path, Florence has evaluated as first step the gap existing in the actual strategies to reach net-zero emission target keeping as reference the 2005 baseline in use since the first sustainable energy plan.

The following table summarises the results of the analysis: the recent SECAP together with the integrated local planning framework (Sump, Sulp, Green Plan, Operative plan...) is already targeting the 66% of reduction at 2030⁸ with a remaining gap of about the 14% to be addressed. This scenario, not too far from the SECAP impact and investment plan, hasn’t been considered in the following analysis which are referred to a more ambitious target calculated on the basis of the business-as-usual at 2030.

Emissions gap in existing strategies (baseline CoM 2005 scenario)										
	Baseline emissions 2005		Residual emissions / offsetting ¹		Baseline emissions reduction target ²		Emissions reductions in existing strategies ³		Emissions gap (to be addressed by action plan) ⁴	
	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)
Buildings	1.497.590	54	300.000	10,8	1.200.000	43,3	967.693	35	232.307	8,4
Transport	861.765	31	175.000	6,3	700.000	25,3	606.818	22	93.182	3,4
Waste	247.624	9	40.000	1,4	195.000	7	39.054	6	27.736	1
IPPU	164.234	6	30.000	1,1	130.000	4,7	78.441	3	51.599	1,9
Total	2.771.214	100	545.000	19,7		80,3	1.820.215	66		14,3

¹ Residual emission consist of those emissions which can't be reduced through climate action and are being offset. Residual emission may amount to a maximum of 20 % as stated by the Mission Info Kit.
² Baseline reduction target = Baseline emissions – residual emissions.
³ Emission reductions planned for in existing action planning and strategies should be quantified per sector.
⁴ Emissions gap = Baseline emission reduction target – Emissions reduction in existing strategies.

Table 8 - Emissions gap in existing strategies (baseline CoM 2005 scenario)

In the SECAP monitoring process, the achievements calculated vs BEI 2005 will be reported.

⁸ Real values with neefe updates

Climate Neutrality Target At 2030



Figure 18 – the two scenarios for the net-zero target at 2030

Starting from the 2019 inventory, the result is the following:

A-2.3: Emissions gap at 2019											
	Baseline emissions 2019		Residual emissions offsetting		Baseline emissions reduction target		Emissions reductions in existing strategies		Emissions gap to be addressed by action plan		
	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	
Buildings	899.107	54	127.012	14,1%	772.095	85,9%	362.403	40%	409.692	45,6%	
Transport	465.772	31	98.529	21,2%	367.243	78,8%	211.029	45%	156.214	33,5%	
Waste	119.258	9	18.168	15,2%	101.090	84,8%	38.949	33%	62.141	52,1%	
IPPU	85.793	6	36.200	42,2%	49.593	57,8%	32.026	37%	17.567	20,5%	
AFOLU	-										
Total	1.569.930	100	279.909	17,8%	1.290.021	82,2%	644.407	41,0%	645.614	41,1%	

Table 9 - Emissions gap 2019 scenario

For the present action plan, the baseline taken as reference is the business-as-usual inventory at 2030, worst scenario, while the emission reduction target is the total impact of the strategic pathways re-targeted with the support of the stakeholders.

A-2.3: Emissions gap (kt CO2eq)							
	Baseline emissions (BAU 2030)	Residual emissions offsetting ¹		Emissions reduction target		Emissions gap (amount necessary to achieve net-zero)	
	(Absolute value)	(Absolute value)	(% of BAU 2030)	(Absolute value)	(% of BAU 2030)	(Absolute value)	(% of BAU 2030)
Transport	385	84	22%	301	78%	0	0%
Buildings & Heating	369	53	14%	316	86%	0	0%
Electricity	493	99	20%	395	80%	0	0%
Waste	28	18	65%	10	35%	0	0%
Other²	132	26	20%	106	80%	0	0%
Total	1408	280	20%	1128	80%	0	0%

¹ Residual emissions consist of those emissions which can't be reduced through climate action and are being offset. Residual emission may amount to a maximum of 20 % as stated by the Mission Info Kit.

² Emissions reduction target percentage for "Other" sector is assumed to be the same as for the other 4 main sectors unless updated by city. Activities and commitments to reduce these emissions are documented in the Climate Neutrality Action Plan.

Table 10 - Emissions gap CCC scenario

3.3 Module A-3 Systemic Barriers and Opportunities to 2030 Climate Neutrality

The following table summarises the main systems and related stakeholder groups. As described in the following paragraphs, the list is a living database that is evolving together with the co-production activity.

A-3.1: Systems & stakeholder mapping				
System description	Stakeholders involved	Networks	Influence	Interest
Governance	<ul style="list-style-type: none"> - Local Administration (any department and/or third party related to the city council) - Metropolitan city - Regional and - National Administration 	<p>Association and networks of municipalities</p> <p>9 Italian mission cities partners in the pilot project Let's Gov</p>	<ul style="list-style-type: none"> - Regulatory role - Facilitator role - Data exchange / management - Incentives provision 	<ul style="list-style-type: none"> - Coordination (multi-level governance model) - Integration of policies - Synergies exploitation - Investment programs management - Emergency management - Research and innovation
Public transport and sustainable mobility	<ol style="list-style-type: none"> 1- Region 2- Metro City 3- Public transport companies (Autolinee Toscane, Ferrovie dello Stato,...) 4- Infrastructures managers (Aeroporto, SILFI...) 5 – PON Metro governance authority 	<p>Organizations, companies, clusters, etc. related to the Transport field:</p> <ul style="list-style-type: none"> -Mobility managers -Mobility operators (logistics, sharing services, taxi drivers...) -Tourism operators, hotels... -NGOs, Etc 	<ol style="list-style-type: none"> 1- Selection of operator for PT 1- air quality measurements 2- SUMP & SULP definition 3 & 4- service providers All - promotion of sustainable mobility 	<ul style="list-style-type: none"> - Innovations & Best practices extension - services requirements - traffic management - parking and access policies
Buildings	<ol style="list-style-type: none"> 1-National Heritage authority (Sovrintendenza) 2-Municipality (and third-party Casa spa) 3-Financial organisations 	<ul style="list-style-type: none"> - builders - designers - owners and tenants 	<ol style="list-style-type: none"> 1 & 2- definition of prescriptions 2- energy poverty mitigation 2 & 3 - facilitations All - market support 	<ul style="list-style-type: none"> - retrofitted building stock - improved indoor quality of life - improved air quality - energy costs savings



			All -promotion of best practices	- improved investments
Energy production & distribution	Electricity and gas operators (DSO, any company related to power generation including Energy Services Companies).	-Environmental Organizations (private or public, working to foster sustainability through any type of actions) - Energy Organizations (companies, clusters, etc. related to the Energy field).	All of them play an important role directly linked to the reduction of emissions by reducing consumption and costs by providing and using data better managed	- grid improvement -market increase - national and EU targets achievement - data share / management - authorisation processes facilitation
Water and waste management	Water operator Publiacqua Waste operator ALIA	Metropolitan (ATO) municipalities Circular economy companies	- Improvement of services - communication campaigns - tariffs	- tariffs regulation - national / municipal investment programs - works coordination
Research and innovation	- Academic organisations (Universities like UNIFI) - research Centres (national research centres like CNR) - innovative SME	- Big companies WG - national and international networks of cities	- research - innovation pilot tests - roll-out analysis	- cooperation and networking - EU / national programs enhanced access - availability of testbeds and pilot locations
Education and communication	- Academic organisations - schools of any level - media - environmental associations	- living labs - sectorial associations (mobility, buildings, sport...) - End users' associations and citizens organisations	- awareness improvers - behavioural change promoters - best practices multipliers	- promotion of information about common intents/targets - networking - inclusion in the decision-making processes

Table 11 – Systems and stakeholders mapping

A-3.2: Description of systemic barriers

The path towards climate neutrality and sustainability in general is a big challenge for any city because energy and climate are complex problems that have to be tackled in complex urban systems.

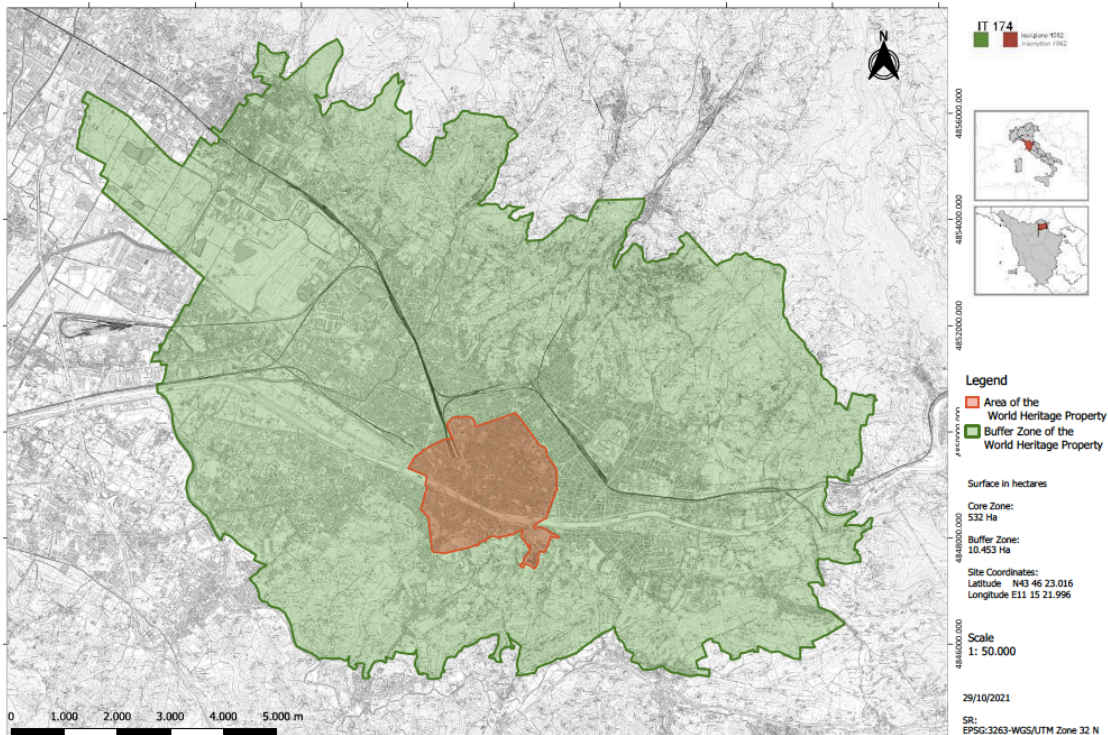


Figure 19 – UNESCO area (core and buffer zones)

Florence urban context is even more problematic because of the widespread presence of **cultural heritage and UNESCO boundaries** (“core” and “buffer” zone⁹ for about 11.000 ha) that are making authorization processes more complex and longer, are slowing down the installation of RES (solar potential can’t be fully exploited because of landscape restrictions) and the retrofitting of the building stock.

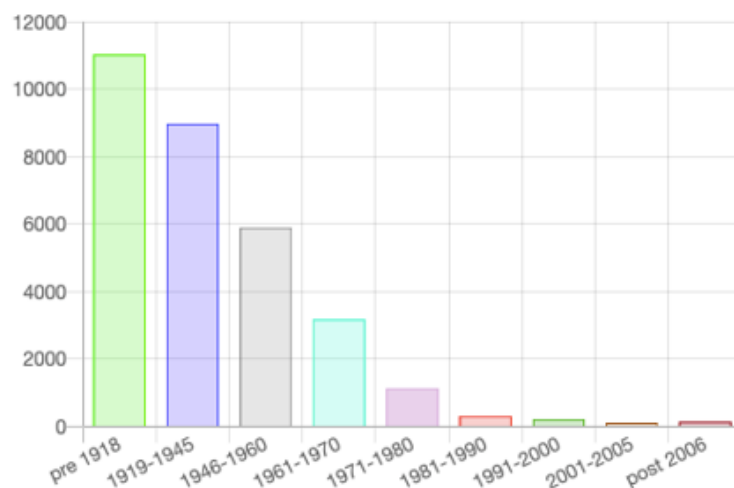


Figure 20 – age of the buildings stock in Florence (source ISTAT)

⁹ <https://www.firenzepatrimoniomondiale.it/il-perimetro-del-sito/>



Additional issues related to finance and investment could be:

- the stability of the supporting framework: national incentives schemes are regularly subjected to articulated changes which involves maximum subsidies thresholds, non-accumulative, and changes in the supported technologies. National programs like "Conto termico" or "EcoBonus 110%" providing support for energy efficiency are unstable and very complicated to access. Forecasts on fuel prices are often difficult and could affect significantly the business models, especially those with longer paybacks.
- Externalities and co-benefits are not considered reliable business model inputs by financial Players.
- A long administrative process is necessary due to the new national rules on public tendering (published in 2016 and modified in 2017) which are affecting all the phases of the tendering procedure (validation of the design with the public selection of the validator, most cost-efficient bid evaluation with a technical judging board, cash flow for the tendering procedure, lower possibility of "testing" solutions outside the market, ...).
- Unforeseen issues, like pandemic period, have impacted on timing and final costs of works.
- Extraordinary incentives for green actions led to an over-demand which resulted in the unavailability of materials, an unexpected increase in costs, thus involving more than a benefit, a damage to the execution with delay effecting the realization of the interventions and therefore the possible return of the incentives going beyond the foreseen times of use, affecting cost/effectiveness of the project plan.
- Local infrastructures could not be ready for an accelerated transition: the distribution grids and the charging networks, as already started in Florence, should be continuously improved to enable innovation spread on the whole territory.

The main internal risk is that the municipal structure could result undersized to follow the additional work needed for the implementations. "Silos" are prevented by the internal inter-departmental working group organization and the total quality management system in place which must go on over time. Manage huge amount of funds, responsibilities and performance target within few years needs an internal review of the organizations investing in building capacity and reinforcing the administrative and technical staff of the departments involved, include the management staff, thus guaranteeing the correct use of the funds on time, capitalising experience.

A-3.3: Description or visualisation of participatory model for the city climate neutrality

After several years of experience and exchange with other fellow cities, it resulted clear the "Smart and Sustainable City" needs to be a "liquid" concept with no rigid and static definition linked to the use of technologies: it is more related to a continuous process or an approach embedded into the municipal organization which must respond to new challenges for its citizens' wellbeing and its own resilience.

The model developed by the city thanks to different EU innovation projects, is based on the following elements: behind innovative technologies that are evolving faster and faster and, in few years, can also become cheaper changing completely their actual business models, the supporting factors for the diffusion of the Smart and Sustainable approach in use in Florence to pursue climate neutrality resulted in a supporting local

legal framework, a renewed internal organisation, the creation of portfolio of actions with the evaluation of all the external impacts and a structured co-productive approach.

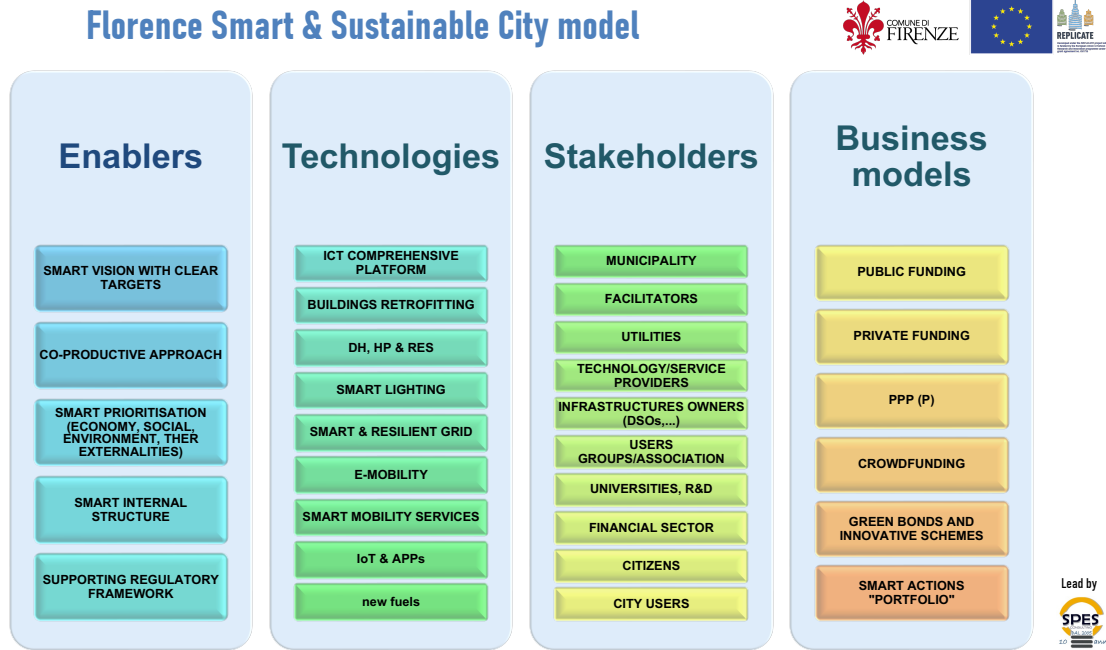


Figure 22 – Florence Smart & Sustainable City model (REPLICATE project)

Empowering stakeholders and citizens can multiply ideas, create consensus and increase participation and awareness: the city has been adopting co-productive methodologies for complex problem-solving, including stakeholders in the decision-making process.

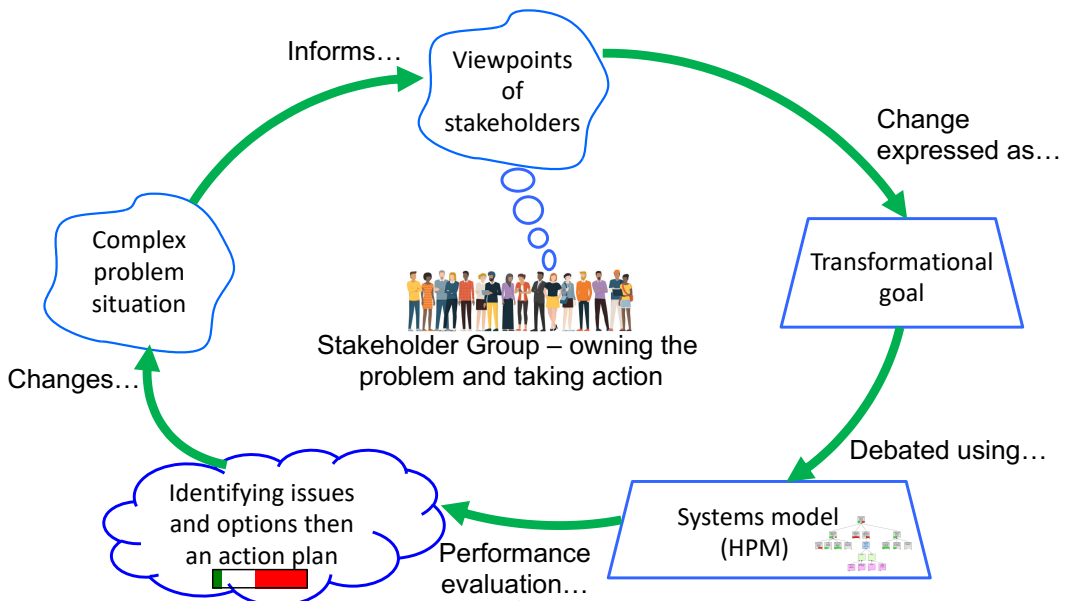


Figure 23 – FP7 STEEP methodology tested by Florence (Prof. Mike Yearworth)

The stakeholders' group is quite wide, and it is based on previous experiences and on-going cooperation activities on climate issues.

The engagement strategy for the net-zero at 2030, in accordance with the first communication campaign started in 2023, foresees the active participation of stakeholders with progressive steps of involvement, from institutional bodies to civil society, organizations and businesses with also a pilot "Climate Assembly of citizens".

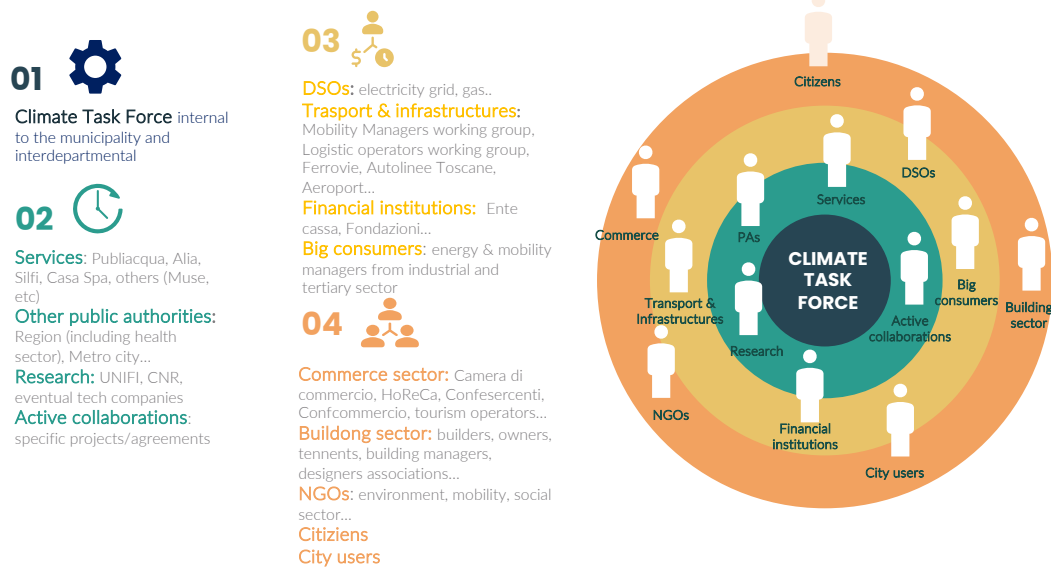


Figure 24 – Stakeholders' engagement steps in Florence CCC development

Beside the internal involvement, three consequent engagement steps are foreseen:

- ❖ this first version of the contract, as well as the "model 0" of the pathways, is developed in close cooperation with local public framework and active collaborations including regional and metropolitan authorities, urban services operators, university and research centres and other collaborations activated in the last years on innovation and climate projects.
- ❖ The second step includes main infrastructures owners/managers (DSOs, transport...), financial institutions, energy & mobility managers of big consumers from industrial and tertiary sector and feedbacks on "model 0" from a pilot "Climate Assembly".
- ❖ In following stages, the engagement activity will become more and more capillary and from main stakeholders' associations will proceed targeting all citizens and city users to collate all possible feedbacks for the first update of the CCC in one year, starting an iterative optimisation process, intended as <living document>

Among all the players listed in the model figure and involved in the process, the "facilitator" role has resulted very useful for the successful transition: supporting agencies, third parties and technical external expertise are crucial for the target realisation.

To ensure that all the recipients of the implemented and planned interventions are involved, the construction of a detailed local mapping of the stakeholders and a reference database has been envisaged. The mapping includes in particular: stakeholders already active on the issue of ecological and digital transition, civic and third sector organizations, professional and trade associations, unions and cooperative federations, service centres and intermediate bodies of an informal nature (e.g.



business networks, hybrid spaces), incubation, acceleration and co-working spaces and other organizations such as banking foundations.

The elaborated database also includes all subjects of civil society, such as purchasing groups, neighbourhood associations and committees, etc. capable of involving and representing citizens in various forms. In drawing up the list of local actors, particular attention was paid to those subjects already active on the issues of environmental and social sustainability.

The mapping of the stakeholders allows to effectively achieve the involvement of limited targets for particular actions, using ad hoc communications and invitations, starting from a preliminary subdivision of the subjects mapped into categories. These categories are identified in the executive project as follows:

- **doer**, actors willing to implement small concrete actions to reduce emissions that contribute to the achievement of climate neutrality
- **tellers**, actors willing to propose events and/or dissemination contents on the topics of climate change and carbon neutrality
- **funders**, actors willing to finance activities in support of the implementation of the Municipality's projects aimed at mitigating climate change and resilient urban development
- **advisors**, natural persons who will form a support group able to provide expertise in various thematic areas and who will enter into relations with the Assembly both in the moments of information and in the moments of debate to provide technical-scientific support
- **testimonials**, people known to the citizens called to act as testimonials for the participation process.

The database produced and the related subdivision into stakeholder categories will in any case remain an open and evolving document, undergoing modifications, additions and integrations as a result of the co-creation process.

The experience showed a big gap between the business as usual (technologies, stakeholders and management/financing models involved) and the implementation of the Smart & Sustainable City concept: the pilot action in Replicate H2020 project developed in the last years tried to overcome this mismatch adopting project management mechanisms that allow to realign the interests of the various subjects in the field; the successful realization models are resulting from a different approach, which could enable the replication and the large-scale dissemination.

Meeting cities' smart and sustainable commitments requires investment in a portfolio of projects of different sizes, involving many stakeholders: interdepartmental work and co-creating planning are part to establish the dynamic network of stakeholders which characterises smart cities.

Smart & Sustainable city structure resulted to be a network of links and relations not as rigid as a crystal lattice but highly adaptable like a liquid and always evolving: in a smart city the stakeholders' group has no fixed boundaries and membership is related to the degree of interest about a specific topic in a specific moment.

Systemic vision and networking are the pillars of Florence experience: a wide and well-connected smart structure at every level, as liquids do, naturally tends to adapt and extend itself.

4 Part B – Pathways towards Climate Neutrality by 2030

4.1 Module B-1 Climate Neutrality Scenarios and Impact Pathways

Hereafter, the pathways developed for the city of Florence to reach the climate neutrality at 2030 are illustrated: the NZC Theory of Change methodology has been matched with the one adopted for the SECAP (STEEP approach – Annex 1) integrating and adapting the strategy to align pathways and portfolio of actions in a unique model which could be easily compared with the NZC economic model for monitoring and control and used in the next steps of the co-creation process.

The starting point for mapping the TOC were the key emission domains, here “field of action”, critical for climate-neutrality: those identified by NZC in cooperation with the EU Joint Research Centre comprise – energy generation, stationary energy (including built environment), mobility & transport, circular economy, nature-based solutions, green industry. Florence is addressing all the six domains with a specific pathway for energy systems, buildings, mobility & transport, waste & circular economy, green & nature-based solutions. Industry has been considered transversal and embedded in all the other domains while two additional sub-fields have been highlighted (water management as relevant part of the green domain and communication as transversal strategy of all domains).

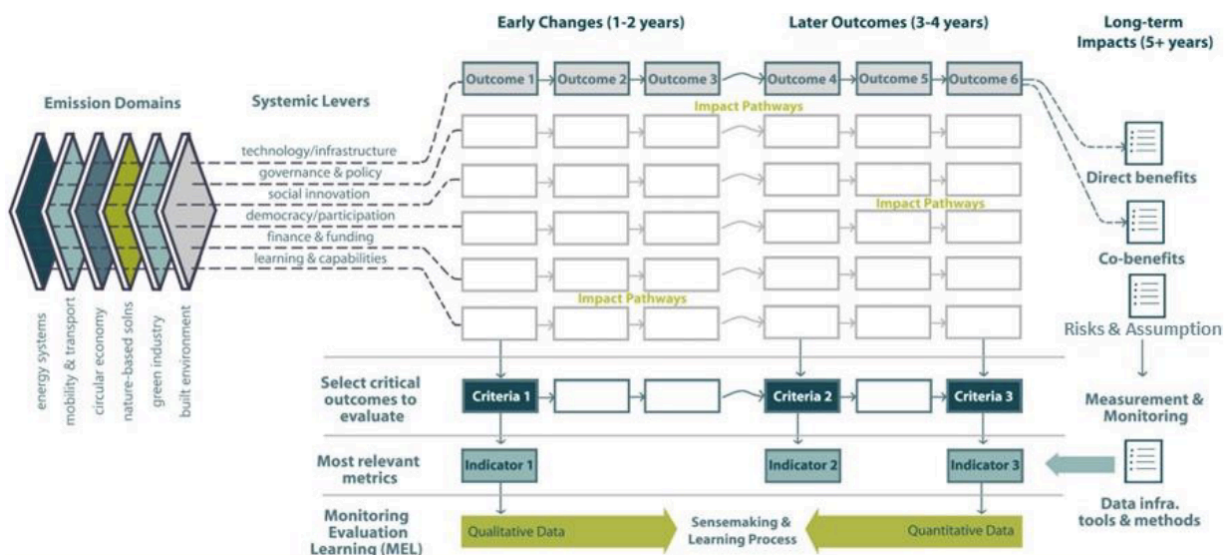


Figure 25 - NZC TOC's overall structure and its essential elements

Consistent with other NZC support and service design, there are six levers identified for the NZC TOC, namely:

- 1) Technological innovation and infrastructure,
- 2) finance and funding,
- 3) Social innovation,



- 4) Democracy and participation,
- 5) Governance innovation, and
- 6) Learning, capacity and capability building.

Within NCZ TOC, these systemic levers link the emission domains as a coherent portfolio, act as entry points into larger systems-wide transformations and support the design and implementation of a city's actions. The levers amplify and enable early and later-stage outcomes and long-term impacts, as well as lend structure to the city's impact pathways. These transition pathways progress across short-term, medium term and long-term timelines towards 2030 net-zero targets, including direct impacts (like sectoral GHG reduction), as well as a wide range of co-benefits and risks.

The impacts reported are those resulted from the CCC scenario based on 2030 BAU inventory (projection of 2019) which is more ambitious than the SECAP scenario with the baseline at 2005 (not analysed in this context but included in the SECAP-CCC monitoring activity in the next years).

The co-benefits due to the indirect impacts (other pollutants avoided, road accidents, hot spots avoided but also jobs created, energy poverty mitigation....) on several fields like human health, biodiversity, cultural heritage preservation, economy, etc. are part of the financial analysis included in the investment plan (see part 3 of the CCC, closely linked with this action plan).

B-1.1: Impact Pathways							
Fields of action	Transformation / challenge	strategy	Systemic levers	Early changes (1-2 years)	Late outcomes (3-4 years)	Direct impacts (Emission reductions)	Indirect impacts (co-benefits)
Energy systems	Greener City	Decarbonisation of heating	Capacities & capabilities	Designers and installers informed and engaged	Decrease of fossil fuel boilers (HPs, solar...)	- 170.000 tCO _{2eq}	- Flexibility of the provisions - Local supply chain activated - New skills/jobs - Air quality increase (impacts on health, preservation of cultural heritage, biodiversity....)
			Technology and infrastr.	New options tested	Availability of new options on local market		
				Distribution grids analysis	Optimisation of the grid and distribution of mixed fuels		
		Decarbonisation of electricity	All	<ul style="list-style-type: none"> - Increased awareness about energy market & RES - First "100% green electricity" use in companies (starting from public entities and tourism) - Mini hydro plant installed in Arno 	<ul style="list-style-type: none"> - Increased purchase / use of certified green electricity - Further decrease of local emission factor Vs national provisions (65% res at 2030 in the national energy plan PNIEC) 	- 397.000 tCO _{2eq}	<ul style="list-style-type: none"> - Flexibility of the provisions - Local supply chain activated - New skills/jobs - Air quality increase (health, preservation of cultural heritage, biodiversity....) - Awareness rising - Energy poverty contrast
		Renewable energy communities and PV promotion	Democracy and participation + Governance + Finance and funding	<ul style="list-style-type: none"> - More information about RES exploitation options - Map of the available areas - Analysis of the consumption profiles - First business models 	<ul style="list-style-type: none"> - Reduced boundary regulations in urban context - Implementation of pilot projects - Decrease of local electricity emission factor and of heating systems impact 		



	Smarter city	<ul style="list-style-type: none"> - smart grid (high automation and performance levels, smart metering...) - SCCR 	Technology and infrastructures	<ul style="list-style-type: none"> -Emergency and faults management - data gathering and analysis - enabled services (e-mobility, PV and energy communities....) 	<ul style="list-style-type: none"> - enhanced awareness - active management and control (predictive functions) of some systems included in the urban context (digital twin) -exploitation of synergies among systems 	<ul style="list-style-type: none"> -Decreased emissions for energy demand / production / transmission and emergency management. -Increased exploitation of RES and picks management 	<ul style="list-style-type: none"> - increased safety of citizens - decreased costs for urban management
Mobility & transport	Connected City	<ul style="list-style-type: none"> - public transport improvement (infrastructure & fleets) - improvement of pedestrian areas and bike lanes - electrification of fleets - Public charging network update - efficient logistics 	<p>Technology and infrastr.</p> <hr/> <p>Governance & policy and social innovation</p>	<ul style="list-style-type: none"> -public transport improvement (optimised service and options, increased number of users, financial support...) - regulatory evolution (limited access for private transport to city centre) - test of new solutions for logistics 	<p>Change of mobility habits for all city users (residents, commuters, tourists, logistic operators...) in favour of e-mobility, public transport and soft mobility modes</p>	<ul style="list-style-type: none"> - 250.000 tCO₂eq Other emission reduction (CO₂, NOx, PMx...) 	<ul style="list-style-type: none"> - liveability of city centre - time saved - health improvements...



	Smarter City	<ul style="list-style-type: none"> - Information technology evolution - eco-road pricing 	<p>Technology and infrastr.</p> <p>Governance & policy and social innovation</p>	<ul style="list-style-type: none"> - enhanced smart city control room and traffic management system - activation of the Green Shield - further institutional users in the SCCR - more users of the optimised information services for citizens 	<p>Reduced motorized passenger transportation need</p> <p>Reduced accesses of pollutant vehicles</p> <p>Reduced congestion</p> <p>Modal shift</p>	<p>- 51.000 t CO₂eq</p> <p>Other emission reduction (CO₂, NO_x, PM_x...)</p>	
	Greener city	<ul style="list-style-type: none"> - increased amount of alternative fuels (bio fuels, hydrogen...) 	<p>Technology and infrastr.</p>	<ul style="list-style-type: none"> - Increased % of biofuels in the distribution network (from 7 to 10%) - New options (hydrogen) 	<ul style="list-style-type: none"> - Increased % of biofuels in the distribution network (up to 20%) - Increase of the low emission vehicles number 	<p>t CO₂ eq NOT EVALUATED YET (Compensation)</p> <p>Other emission reduction (CO₂, NO_x, PM_x...)</p>	<p>new supply chains and jobs</p>
Mobility & transport	Social focussed city	<ul style="list-style-type: none"> - mobility as a service - vulnerable people services - incentives for PT or upgraded vehicles 	<p>Gov & policy, social innovation</p>	<p>Increased accessibility to mobility services for vulnerable people</p> <p>Increased use of PT</p> <p>Contrast to energy poverty</p>		<p>For MaaS: - 19.000 t CO₂eq</p> <p>And other emission reduction (NO_x, PM_x...)</p> <p>The other impacts are Included in the previous mobility measures</p>	<p>inclusion</p> <p>mitigation of energy poverty</p>



Waste management & circular economy	Smarter city	<ul style="list-style-type: none"> Improve differentiated collection and selection Decrease plants and vehicles impacts 	<ul style="list-style-type: none"> Technology and infrastructures and social innovation 	<ul style="list-style-type: none"> - improved % of differentiated waste - reuse of rough materials - involvement of tourism sector 	<ul style="list-style-type: none"> - optimal use of resources - circular economy development - production of alternative fuels (biogas, biodiesel...) - improved efficiency of waste management system 	- 10.000 t CO ₂ eq	- new jobs / opportunities in circular economy
Green infrastructure & nature-based solutions: "Water management"	Greener city	<ul style="list-style-type: none"> -distribution network optimisation -citizens' awareness 	<ul style="list-style-type: none"> Technology and infrastructures and social innovation 	<ul style="list-style-type: none"> - water savings (decrease in water losses and use) - energy savings 	<ul style="list-style-type: none"> - optimal use of resources - production of alternative fuels (biogas) - improved efficiency of water management system 	- 21.000 t CO ₂ eq (other)	- water savings
Green infrastructure & nature-based solutions	<ul style="list-style-type: none"> Greener city and Social focussed city 	<ul style="list-style-type: none"> - green areas improvement (also through crowdfunding) - new trees - urban vegetable gardens - green roofs and walls 	<ul style="list-style-type: none"> Technology and infrastructures + Finance and funding + Social innovation 	<ul style="list-style-type: none"> - heat islands mitigation - increased availability/accessibility of green areas 	<ul style="list-style-type: none"> - green roofs diffusion - increased sense of belonging - urban forest therapy solutions 	<ul style="list-style-type: none"> - energy savings for heat decrease at soil/roof level - CO₂ increased absorption t CO₂ eq NOT EVALUATED YET (Compensation) 	<ul style="list-style-type: none"> - fragile population safe from heat islands effects or drought - support to biodiversity
Buildings	<ul style="list-style-type: none"> Greener city and Social focussed city 	<ul style="list-style-type: none"> - energy efficiency prioritization - high DNSH standards in urban regeneration 	<ul style="list-style-type: none"> Technology and infrastructures + Finance and funding + 	<ul style="list-style-type: none"> - improvement of smart retrofitting measures - analysis of new financial tools and incentives framework 	<ul style="list-style-type: none"> - decrease of energy demand in buildings - exemplary projects 	- 127.000 t CO ₂ eq	Energy poverty mitigation (energy communities and high standards for social housing)



		and new buildings - efficient industrial sector	Social innovation	- activation of the big industrial WG also on climate issues			
	Smarter and Social focussed city	Lighting & appliances efficiency	Technology and infrastructures + Social innovation	- lighting systems efficient retrofitting (very high LED coverage) - appliances update		- 83.000 t _{CO2 eq}	safeness availability of other services
All domains:	Social focussed city	Information, communication and education	Social innovation,	- pilot “climate assembly” (special focus on youth and vulnerable citizens) - Integration of stakeholders’ communication strategies	- Education programs with academic and school organisations - Citizens Assembly	t _{CO2 eq} NOT EVALUATED (influence on other measures, possible double counting)	-Awareness rising -Energy poverty mitigation -Higher resilience and adaptation of population

B-1.2: Description of impact pathways

The Climate Neutrality target has been assumed as the transformation of a complex system owned by all stakeholders and driven/facilitated by the municipality. Implementing the STEEP methodology described in Annex 1 in co-design iterative sessions, the municipality has drafted the very first model showing the pathways and portfolio of actions towards the NZC vision starting from what has been done for the SECAP and enhancing its targets.

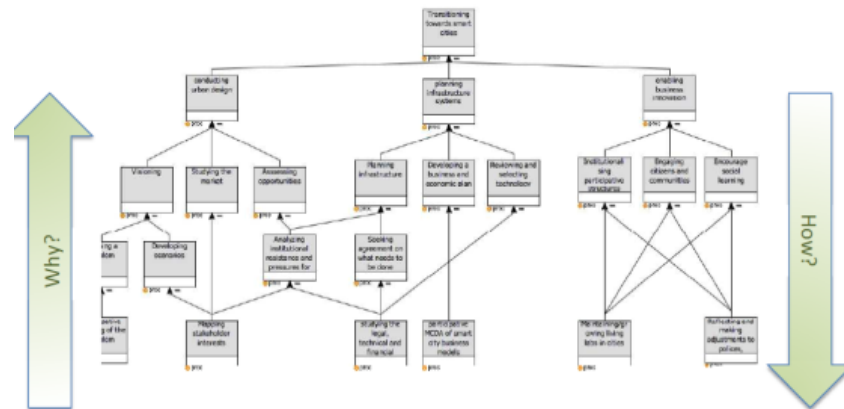


Figure 26 – FP7 STEEP model for smart & climate neutral city in use

The 2030 strategy of the Municipality of Florence is aligned with the main European strategic objectives/challenges, also adopted by the Metropolitan City of Florence, namely:

- **A smarter city** through innovation and digitization, which promotes and implements actions in the sustainable management of waste, regeneration and research in support of the circular economy and which makes innovation and digitization available to the various sectors.
- **A greener and lower-carbon city** thanks to investments in the energy transition, renewable energies and the fight against climate change. A city that enhances biodiversity and the network of its protected areas, with particular attention to the protection of natural resources (such as water) and landscape, aware that policies for environmental protection and adaptation to climate change make the territory safer and more resilient even in the face of hydrogeological risks.
- **A connected city** through investments in mobility and strategic transport and digital networks. A city that aims at the development of sustainable mobility and information and communication technologies, as tools for territorial inclusion and cohesion and as strategic infrastructures for an environmentally friendly, integrated, internationally connected territorial development supported by research and innovation.
- **A city with a strong focus on the social aspect**, which implements interventions against poverty and in favour of social inclusion and **close to citizens** through the sustainable and integrated development of urban, rural and mountain areas.

The fields of action analysed are:

- **Energy systems** with the decarbonisation of heating and electricity, promotion of RES and the smart grids.
- **Mobility** with improvements in public transport, soft mobility, electrification of fleets and charging infrastructure, efficient logistics, accessibility and inclusion.
- **Buildings** with higher performances in new and retrofitted buildings both public (municipal or belonging to other public authorities) and private.
- **Waste management** with the increase in differentiated collection and recycling.
- **Water management** with higher performances of the distribution network and the awareness rising for water saving.
- **Green infrastructures** to increase public spaces liveability, buildings comfort and pollutants absorption.
- **Communication and education** to support and multiply the effect of the other measures.

Impacts have been quantified based on the actual KPIs values, SECAP forecasts, the economic model outcomes and the target values from existing plans. National forecasts and objectives have been combined with influencing local framework and policies to calculate specific target values.

The overall impacts of the designed pathways are the following:

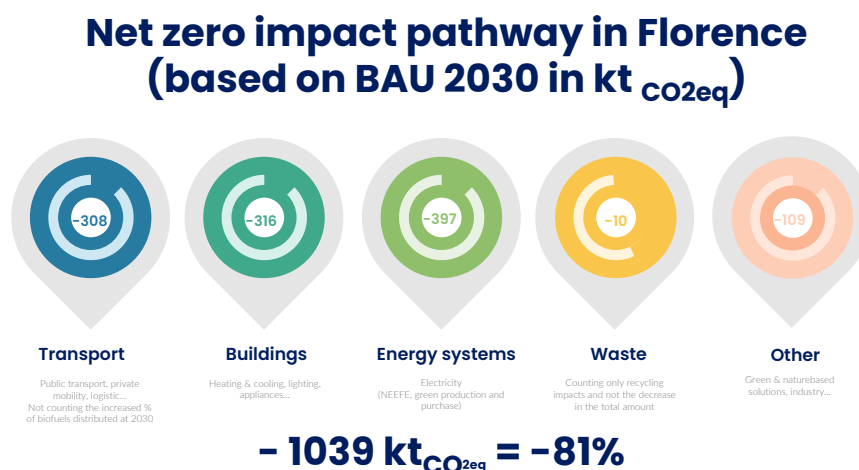


Figure 27 – net zero impact pathway in Florence (based on BAU 2030)

4.2 Module B-2 Climate Neutrality Portfolio Design

The numerous mitigation activities included in the plan can be divided by competence, including measures on directly managed municipal properties, the efficiency of urban public services under concession or the properties of other public administrations present in the area, the mobility sector, the urban development and territorial planning, governance and cooperation at different levels to finish with the communication and animation activities that will accompany the entire implementation of the plan.

The transitional model 0 aimed at “Pursuing climate neutrality and future citizens’ wellbeing” consists in more than 80 actions and sub-measures belonging hierarchically to the six competence portfolios as shown in the following figure.

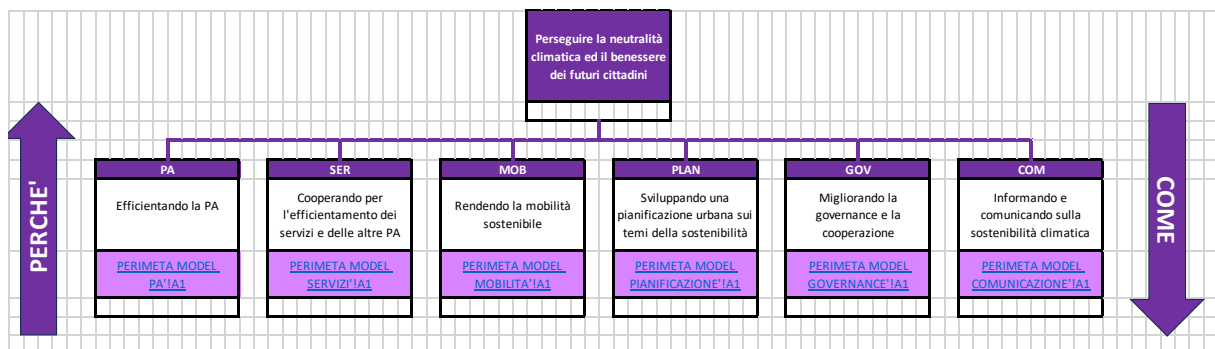


Figure 28 – First level of model 0 “pursuing climate neutrality and future citizens’ wellbeing”

A portfolio is not merely a list of actions connected to each-other, it is a collective effort unified by common direction. Portfolio actions are targeted at the same vision, building the pathways towards it by aligning to defined learning intents or goals. These goals act as frames to keep generating new actions, supporting the iteration process.

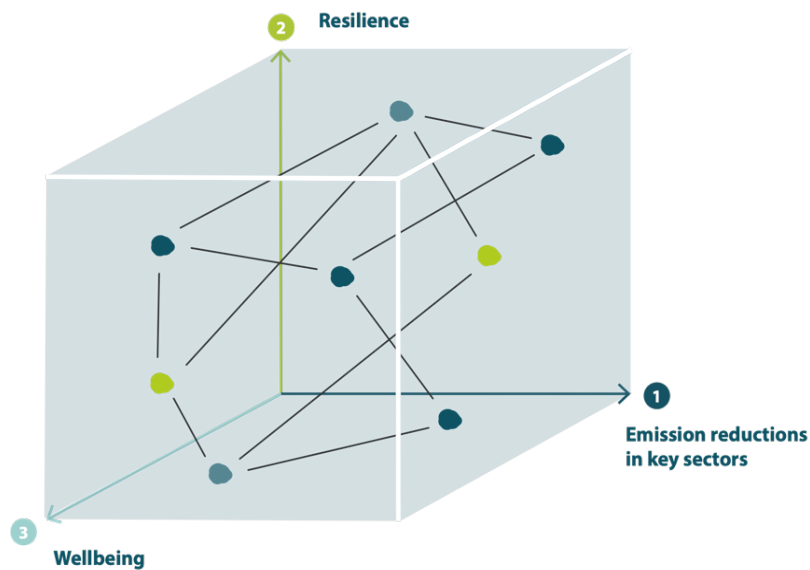


Figure 29 - NZC portfolio illustration



B-2.1: Description of action portfolios			
Fields of action	Portfolio title	Portfolio description	
		List of actions	Descriptions
Buildings Mobility Energy systems (decarbonisation of heating and electricity) Education (capacity building)	Efficient municipality	PA01 Buildings PA02 Public Lighting PA03 Sport facilities PA04 Vehicles PA05 GPP PA06 training & tech assistance	<p>Municipal consumption is not relevant (<2% of the total) but public authority efficiency can play an exemplar role for citizens. The city will act on every sector of competence to improve its performances, capacities and be able to disseminate best practices.</p> <p>Municipal building stock includes different use (offices, schools, markets, museums, theatres...).</p> <p>Public lighting systems will be continuously updated to improve performances as well as municipal fleet.</p> <p>Training courses and technical assistance are provided to employees on climate issues, GPP & financing, etc.</p>
Buildings Mobility Waste Water Energy Systems	Efficient Public authorities and urban services	SER01 Water management SER02 Waste Management SER03 Cooperation with other public authorities SER 04 green electricity promotion	<p>The water management efficiency will be boosted both for mitigation and adaptation impacts: pipelines retrofitting to decrease leaks, ICT and innovative technologies implementation to detect losses and save consumption for water treatments and distribution, RES implementation and communication campaigns are some of the measures.</p> <p>The impact of waste management will be optimised while promoting circular economy growth and exploiting biofuels production.</p>

Figure 30 – Efficient municipality sub-model



Tourism will be strongly involved in the promotion of sustainable habits and CO₂ compensation.
 As capital city, Florence hosts several other institutional entities (Ministries, Regional authority, Metropolitan city...) and academic & research organisations (University of Florence, CNR...) which have influence on buildings, mobility of employees and users and promotion of behavioural changes.

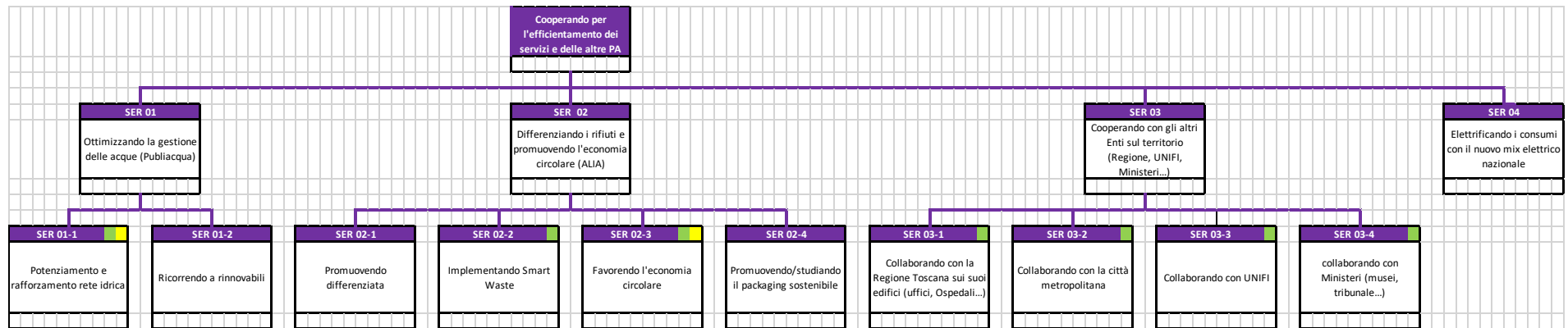


Figure 31 - Efficient Public authorities and urban services sub-model

Mobility

Sustainable mobility

- MOB01 improving public transport
- MOB02 Promoting soft mobility
- MOB03 Implementing advanced mobility management
- MOB04 Making private transport more efficient

Mobility sector will boost and improve the SUMP strategy based on the following pillars:

- accessible, sustainable and optimised public transport
- eco-road pricing and continuous extension/optimisation of access limits
- facilitation of multimodal transport
- improved sustainability of logistics (SULP)
- close cooperation with the metropolitan area

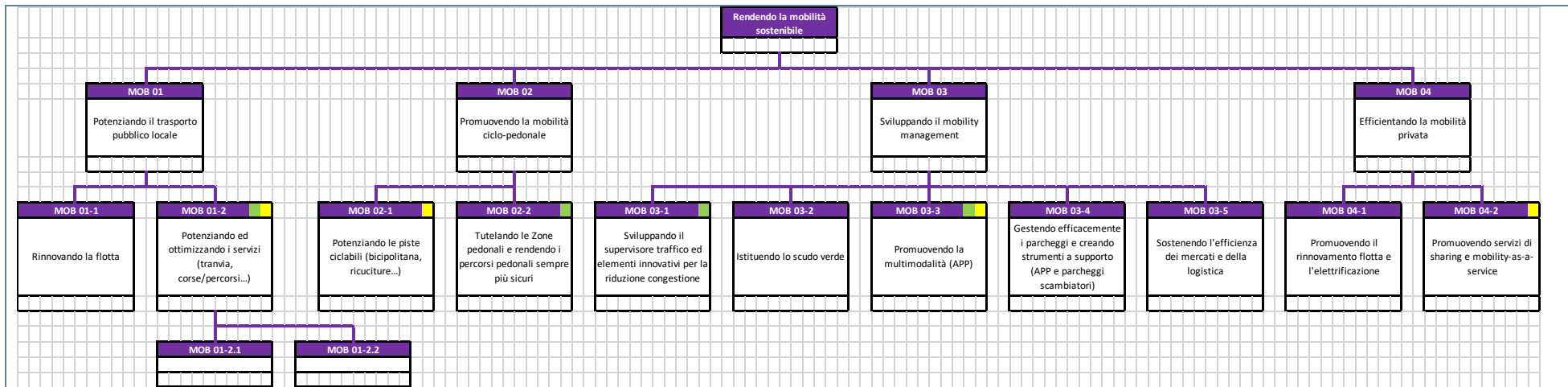


Figure 32 – Sustainable mobility sub-model

<p>Buildings Energy systems Green infrastructure & nature-based solutions</p>	<p>Planning for a better built environment</p>	<p>PLAN01 Acting of residential sector PLAN02 Acting on tertiary sector PLAN03 Sustainable urban regenerations PLAN04 Promoting RES PLAN05 Differentiating energy production/fuels ADAPT10 Green plan implementation</p>	<p>In the last years, the building sector has already started to become more and more efficient thanks to the national incentives framework and the local regulations / programs. The “zero volumes” and “energy efficiency first” concepts are the basis of local strategy and embedded in regulations. Electrification of consumption, as started in mobility sector, will favour efficiency matched with flexibility in the use of resources and integration with RES (renewable energy communities and mini hydro). Research and development of storages and e-fuels (including hydrogen) will support the optimisation of the generation system for buildings. Urban regeneration projects will exploit the opportunity of becoming best practices for the implementation of sustainable policies testing and integrating different technologies and aspects for citizens’ well-being, climate mitigation and adaptation. The heating system will undergo into a deep renovation aimed at improving efficiency, advanced control and diversifying technologies</p>
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and resources tailored to better fit the specific needs of an UNESCO city.

Other biofuels will be analysed and tested, also mixed with gas, with their full supply chain.

Smart ancillary measures, regarding smart grids, smart metering (already 100% coverage) and the smart city control room, are included to introduce more and more innovation in the energy management and to support awareness and data driven decision making.

The implementation of the recently adopted green plan will support the hot spots and high temperature control while improving the compensation through absorption.

Communication measures (campaigns, dedicated helpdesk...) will support the action and multiply results.

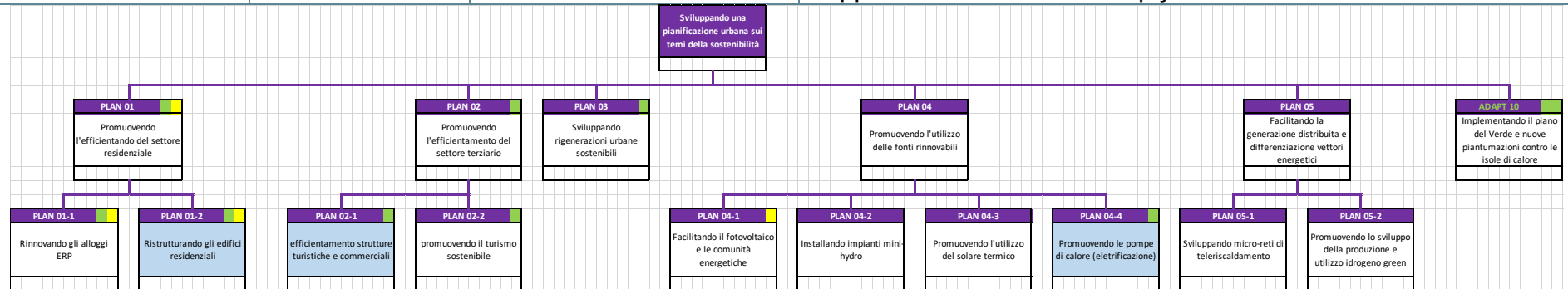


Figure 33 – Planning for a better built environment sub-model

<p>ALL</p>	<p>Enhanced governance and cooperation</p>	<p>GOV01 Promoting a multi-level coordination GOV02 Implementing the digital agenda GOV03 Supporting research & innovation</p>	<p>Integrated governance at any level is the key for the implementation and steering of the net-zero strategy: from the internal task force to the national cooperation with Ministries, the integration of policies, exploitation of synergies and alignment of regulatory frameworks will be pursued.</p>
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Another fundamental support for a data driven decision making and an optimal management of the territory is the implementation of ICT technologies, with the digital agenda and the Smart City Platform. New challenges and opportunities will be faced during the process: continuous research and test of innovative solutions will be possible also thanks to the cooperation with research at EU, national and local level.

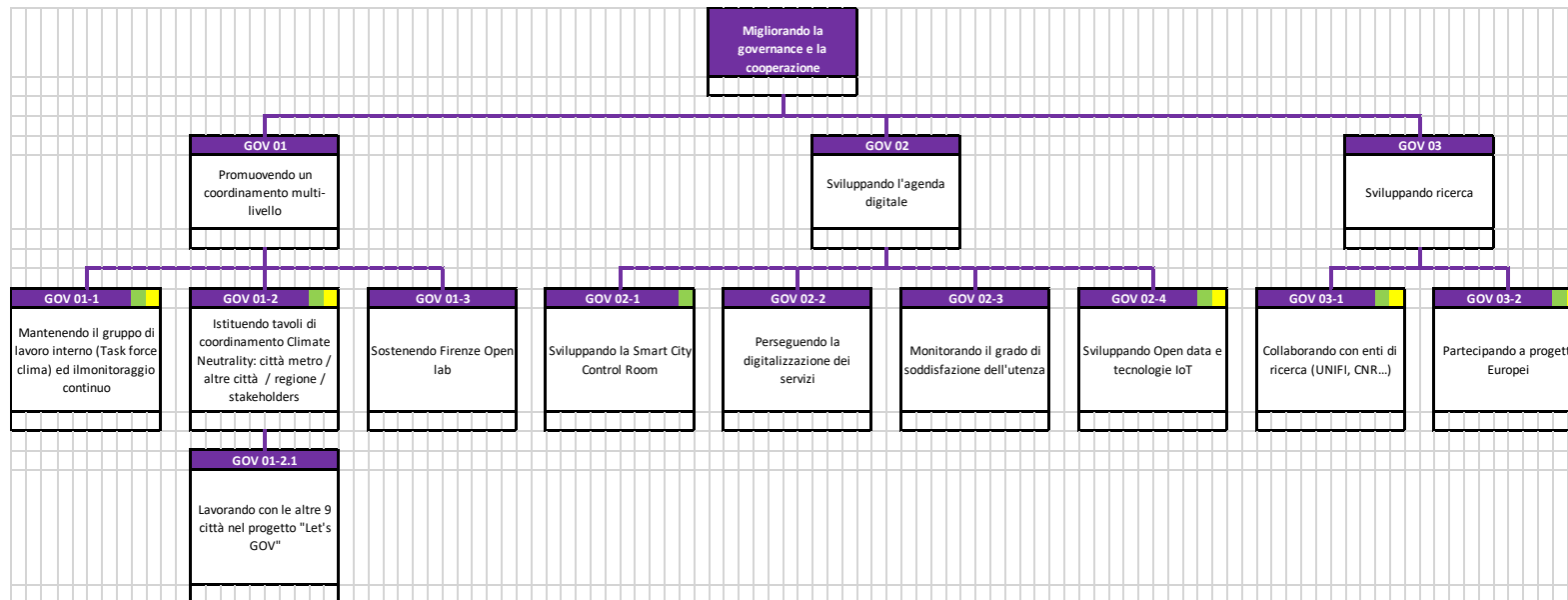


Figure 34 – Enhancing governance and cooperation sub-model

Communication and education

Information and communication

COM01 Cooperating with schools and universities
 COM02 Informing city-users
 COM03 Supporting with the help-desk

Communication and education about climate issues can multiply the results of all the previous measures. To reach “future citizens” and families, an information action with schools and universities is foreseen. Thematic campaigns and different media channels are planned to reach all city-users. A pilot “Climate Assembly” is going to be tested

to involve citizens and focus on vulnerable people and youth. Coordination among stakeholders' communication activities will multiply effects and create networking.

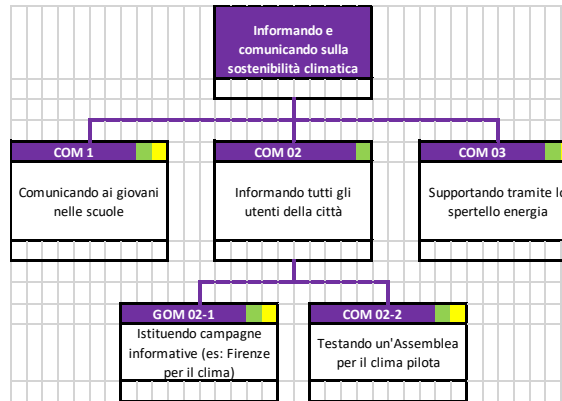


Figure 35 – Information and communication sub-model 0

In the following sheets, some of the main actions/sub-actions included in the portfolio are reported. For more details, please refer to the SECAP (and its monitoring reports) and to each single stakeholder's annex.

B-2.2: Main action outlines		
Action outline	Action name	Efficient municipality PA 01 - Buildings PA 03 – Sport facilities PA04 – Vehicles fleet
	Action type	Buildings refurbishment
	Action description	The city will retrofit its real estate (including offices, schools, markets, historical buildings and museums, theatres and cinemas, other buildings and sport facilities) to become more and more efficient. The measure includes: <ul style="list-style-type: none"> · building shell insulation · energy plants improved efficiency · Renewable integration · installation of advanced control systems · services relocation · management contracts updates
Reference to impact pathway	Field of action	Buildings: efficiency, lighting, Energy systems: decarbonisation of heating and electricity
	Systemic lever	Technology,
	Outcome (par. B-1.1)	Lower consumption and emissions, electrification, RES exploitation, awareness
Implementation	Responsible body for implementation	Internal departments for technical services, municipal properties, culture (Servizi tecnici, patrimonio, cultura, sport)
	Action scale	Municipal scale.
	Involved stakeholders	Buildings managers and users
	Comments on implementation	Many projects already programmed in the framework of NOP Metro, NP Metro plus and NRRP KPIs: kWh/m ² *y for each building, MWh consumptions, MWh of green electricity produced/purchased
Impact & cost	Generated renewable energy (if applicable)	Expected energy consumption covered by RES/RECS: 2.500 MWht, 5.000MWhe
	Removed/substituted energy	Expected energy savings: -46.000 MWh
	emissions reduction estimate (total)	14.600 tCO _{2eq}
	Total costs	Investments already appointed: 30.232.741€

Action outline	Action name	Smart public lighting PA 02 Public lighting and indoor lighting in public buildings
	Action type	Lighting efficiency
	Action description	<p>The <i>Firenze Cambia Luce</i> programme, cofinanced by NOP Metro for over 8.5 million €, has already achieved important results and will be completed throughout the municipal area.</p> <p>The design of the intervention combined energy efficiency criteria with the optimization of the service and the road safety. The additional services installed on the infrastructure (video surveillance, environmental sensors, wi-fi...), with savings in terms of costs and landscape impacts, new technologies will be extended and tested to make the network increasingly resilient and efficient.</p> <p>The action concerns public lighting, as a whole, including traffic and votive lights. Also indoor lighting of municipal buildings is included.</p>
Reference to impact pathway	Field of action	Buildings (lighting)
	Systemic lever	Technology
	Outcome (par. B-1.1)	Reduced consumption of buildings
Implementation	Responsible body for implementation	Technical services department and third party Silfi spa
	Action scale	Municipal scale
	Involved stakeholders	Buildings users and managers, public lighting manager (SILFI)
	Comments on implementation	www.firenzecambialuce.it Projects already financed: Firenze cambia luce, PON 2.1.1a KPIs: MWh/y consumption, number of public lighting lamps, % of LED bulbs
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy	3.000 MWhe
	emissions reduction estimate (total)	1.400 t _{CO2eq}
	Total costs	8,5 M€ since 2017

Action outline	Action name	Water management (SER 01)
	Action type	Efficiency of the infrastructure
	Action description	The collaboration with Publiacqua, whose sustainability report is drawn up annually, is working on the issues of water saving, use of RES and the efficiency of distribution net and



wastewater treatment plants. The partnership generated the best practice related to the drinking water fountains to reduce the use of plastic and transport of drinking water (455,000 l/y). In 2019, the Water Safety Plan was drawn up and detailed analyses were carried out to introduce energy efficiency into the distribution systems and measures were activated to influence the company's consumption trends (-4,5% per year), as it can be seen from the following table:

Water Treatment Plant	2019			2020			2021		
	Energy (kWh)	Water production (mc)	kWh/mc	Energy (kWh)	Water production (mc)	kWh/mc	Energy (kWh)	Water production (mc)	kWh/mc
ANCONELLA	20.358.730	70.929.765	0,287	19.759.749	67.200.634	0,294	18.700.694	65.605.308	0,285
MANTIGNANO	3.894.008	10.024.109	0,388	2.516.506	7.485.146	0,336	2.615.651	7.146.175	0,366
TOTAL	24.252.738	80.953.874	0,300	22.276.256	74.685.780	0,298	21.316.345	72.751.483	0,293

The table shows the water volume production and the energy consumption of the two main water treatment plants (Anconella e Mantignano) in the period 2019-2021. The optimization of energy consumption led to a reduction of the specific energy consumption of (from 0,3 kWh/mc in 2019 to 0,293kWh/mc in 2021) with a significant decrease of water production (from 80,9 Mm3/year to 72,7Mm3/year).

A 2.4 MW hydroelectric plant was installed on the Bilancino dam (3,5 GWh/y).

Publiacqua Spa has planned significant replacement investments to renew the pipes infrastructures aimed at achieving two main environmental objectives related to water losses reduction and to water quality improvement.

The water loss management is based on:

- pressure management
- active leakage control
- speed and quality of repairs
- maintenance plan.

A series of strategic objectives have been defined, the main ones are listed below:

- improvement of technical quality in service management in order to align to the requirements of the future Eu-directive
- Improved commercial quality through increased response performance to the user
- security for its employees and for the company's information and real estate assets;
- environmental sustainability;
- increased efficiency and productivity;
- added value through innovative services and processes.

One of the main means of achieving these objectives is represented by the continuous technological and organizational evolution thanks

		to the introduction of ICT services and solutions to support the Line of Business.
Reference to impact pathway	Field of action	Green and nature based solutions
	Systemic lever	Technology and infrastructures, governance and policy, social innovation
	Outcome (par. B-1.1)	Reduced water and energy consumption, biogas production, reduced emission from water and waste water management
Implementation	Responsible body for implementation	Publiacqua
	Action scale	Wider than municipal level (ATO)
	Involved stakeholders	Metro-city, Tuscany region, Authority “bacino dell’appennino settentrionale”, city users
	Comments on implementation	NRRP projects. Effects also on adaptation KPIs: MWh/y of consumption, MWh/y produced by RES, annual drinking water consumption pro capite, % water leaks in the distribution network
Impact & cost	Generated renewable energy (if applicable)	14.500 MWh
	Removed/substituted energy	3.700 MWh
	emissions reduction estimate (total)	21.000 t _{CO2eq}
	Total costs	Most of the budget (79.501.374€ out of 106.341.374€) is dedicated to replacing and adapting aqueduct infrastructure and a massive water meter fleet renovation to ensure the accuracy of the measurement. More than 5M€/tCO _{2eq}

Action outline	Action name	(SER 02) Firenze circular city
	Action type	Waste management
	Action description	<i>Firenze Città Circolare</i> is the Waste Plan approved in 2020 aimed at improving the quality and quantity of differentiated waste through innovations in the collection system and stimulating greater awareness and responsibility of people. In this way, the City aims at achieving the targets set by the EU in the Circular Economy Package (Directive 2018/851). Based on urban characteristics, population density and attendance (tourists, city users, etc.), the territory of the city of Florence has thus been divided into zones, each of which has been associated with the most appropriate type of collection. The main objectives of the project are the spread of the 5R (Reduce, Reuse, Repair, Rot, Recycle) through the value chain, offering advanced services, the reduction of management costs while saving energy.

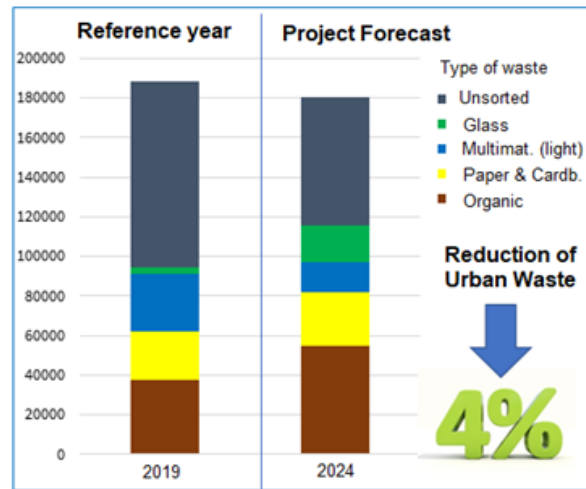


Figure 36 – Reduction of urban waste and improvement of separated collection

The project includes the industrial strategy of Alia in relation to the availability and strengthening of the plants for the most important recycling chains: Paper; Glass; biomethane; plastic granule; biofuels; bulky waste. The discard will decrease to 5% for paper and 2% for glass.

Further measures are:

- Implementation of electronics installed on waste containers, with the extension of volumetric sensors.
- Digitization of production processes, implementation of on demand services and optimization of resources, routes, consumption, and emissions.
- Enhancement of the virtuous behaviour of users, as an incentive system for recycling and a substantial contribution to the reduction of emissions and climate mitigation.

Florence is deeply committed in the path towards circularity, it signed the City Declaration on Plastic Free (2019), the Circular City Declaration (2020) and the Green City Accord (2021).

In addition, the City approved the Florence Plastic Free Plan (2020) aimed at reducing plastic in public offices, in school canteens, during happenings and events, also stimulating private companies to follow this way.

Florence promoted also the Circular Economy Pact (2021) with local stakeholder with the aim of networking the actors of the territory, enhancing and exchange experiences in the field of circular economy, to create the conditions for common projects (public / private partnership).

	Field of action	waste
	Systemic lever	Technology and infrastructure, social innovation

Reference to impact pathway	Outcome (according to module B-1.1)	Decrease in waste production and discard during the selection, increase of recycled fraction
Implementation	Responsible body for implementation	ALIA (waste manager) Environmental department of the municipality
	Action scale & addressed entities	Municipal scale
	Involved stakeholders	Citizens, tertiary sector
	Comments on implementation	KPIs: kg/y waste produced per capita, % differentiated waste, % recycled waste per each material, % discard during selection...
Impact & cost	Generated renewable energy (if applicable)	-
	Removed/substituted energy	-
	emissions reduction estimate (total)	Scope 3: >10t _{CO2eq} depending on BAU forecasts. Scope 1 and 2 8t _{CO2eq} to be included under building, mobility and decarbonisation of electricity measures
	Total costs	6,3 M€ already programmed

Action outline	Action name	(SER 03) Efficiency in other public authorities
	Action type	Buildings refurbishment, efficient fleets
	Action description	Florence as the capital of the region and of the metropolitan city is home to numerous buildings under the responsibility of other public bodies. The education and culture sector can also count on numerous properties belonging to other entities such as high schools, universities, museums, as well as the health sector. As part of the climate neutrality objective, a consultation table is envisaged with the energy managers responsible for sharing the targets of each institution for 2030. Over the years, various interventions have already been carried out, while further measures can be designed by contextualizing them in the surrounding urban fabric to exploit synergies and possible synergies.
Reference to impact pathway	Field of action	Buildings, mobility
	Systemic lever	Technology and infrastructures
	Outcome (according to module B-1.1)	Savings in building sector and in mobility
Implementation	Responsible bodies/person for implementation	University of Florence, Tuscany region, Metropolitan city, Ministries and other public bodies
	Action scale & addressed entities	municipal



	Involved stakeholders	Building managers, mobility managers, employees
	Comments on implementation	Savings and specific actions are detailed in the annex to the CCC of each signatory. KPIs: MWh consumption for buildings and fleet
Impact & cost	Generated renewable energy	TBD
	Removed/substituted energy	TBD
	emissions reduction estimate (total)	TBD
	Total costs	TBD

Action outline	Action name	Green plan: Botanical invasions (ADAPT 10)
	Action type	Greening the urban spaces
	Action description	<p>Florence has always had a strong sensitivity towards gardens and green areas, so much so that it can count on 8km² of urban greenery. The objective of the new green plan is to further increase green spaces through a five-year program of recovery and unused areas (+6% of urban green compared to 2018).</p> <p>In 2019-2024, an "urban forestation" program is underway, planting at least 15000 new trees, thanks also to crowd-funding initiatives. At the same time, management activities continue for the control, maintenance and progressive replacement of the tree population.</p> <p>The city is promoting also urban vegetable gardens to both improve green and food culture. Furthermore, for mitigation Florence is taking steps to green the walls/roofs of buildings and use greenery to reduce heat island (mapped with the technical support of the National Research Centre CNR).</p>
Reference to impact pathway	Field of action	Green & nature-based solutions
	Systemic lever	Technology and infrastructures, Finance and funding, Social innovation
	Outcome (according to module B-1.1)	<ul style="list-style-type: none"> - energy savings for heat decrease at soil/roof level (t_{CO2 eq} NOT EVALUATED YET - Compensation) - fragile population safe from heat islands effects or drought - support to biodiversity - increase adaptation
Implementation	Responsible body for implementation	Municipal department for environment
	Action scale & addressed entities	Municipal scale

	Involved stakeholders	Citizens' associations, schools, university and CNR
	Comments on implementation	m ² of green areas, number of trees, hot spots / heat islands affected areas
Impact & cost	Generated renewable energy	-
	Removed/substituted energy	-
	emissions reduction estimate (total)	TBD
	Total costs	18 M€ already programmed

Action outline	Action name	Shift to public and not motorised transport and reduction of mobility needs <ul style="list-style-type: none"> - MOB01 Public transport - MOB 02 Soft mobility - GOV02 Digital agenda
	Action type	Optimisation of public transport, promotion of soft mobility (pedestrian areas and paths, bike lanes and sharing)
	Action description	<p>Local public transport will continue its optimization to be able to meet the needs of citizens in a sustainable way and to contribute to the decrease in private transport.</p> <p>Pursuing the goal of sustainable and intermodal mobility, focusing on electric mobility, Florence has designed a large network of tram-lines nearing completion to increase the offer of local public transport (+20%).</p> <p>The road share can count on a fleet of 350 city buses in continuous modernization towards the decarbonization and electrification.</p> <p>The fleet of e-taxis has been supported by the city and is expanding rapidly. Subsidized taxi services for vulnerable citizens have been activated through an agreement with the municipality.</p> <p>Much has already been done on cycle paths, park and ride parking, sharing and pedestrian mobility and the planning of sustainable mobility provides for the continuation of soft mobility policies with various improvement actions for the completion of connections (internal and also towards neighbouring municipalities), safety and the promotion of intermodality.</p> <p>The "Bicipolitana" is a planned network of 8 cycle paths crossing the city.</p> <p>Bike sharing was activated with over 3,500 traditional and pedal assisted vehicles.</p> <p>A Florence bike app with route map is available.</p> <p>For pedestrian mobility, numerous safety measures have been carried out and a pedibus has been introduced for schools.</p>

		The Smart City Control Room and the ICT services (app IF, parking info...) together with the digitalisation of services and the policies for the 15' city, are going to reduce the mobility needs and travels.
Reference to impact pathway	Field of action	Transport
	Systemic lever	Technology and infrastructure, social innovation
	Outcome (module B-1.1)	reduced km by private vehicles, reduced consumption of fossil fuels, reduced emissions (CO ₂ , NO _x , PM _x ...), reduced traffic congestion and time spent in traffic
Implementation	Responsible body for implementation	Municipality, Department mobility and viability
	Action scale & addressed entities	municipal and metro-city scale
	Involved stakeholders	Regional authority, metro-city, Autolinee Toscana, Taxi associations....
	Comments on implementation	https://mobilita.comune.fi.it/index.html https://youtu.be/f-z4Rl6FxD0 https://mobilita.comune.fi.it/mobilita_sostenibile/mobilita_sostenibile/mobilita_ciclistica.html
Impact & cost	Generated renewable energy	-
	Removed/substituted energy	400 GWh of fossil fuels consumption
	emissions reduction estimate (total)	109 kt CO ₂ eq
	Total costs	564 M€

Action outline	Action name	Eco-road pricing, electrification of fleets and sustainable logistic MOB 03 Mobility management MOB 04 Private mobility
	Action type	mobility regulation, incentives and infrastructures
	Action description	Florence has focused on e-mobility for the private sector by equipping itself with a widespread public charging infrastructure of over 500 recharging points which will be further strengthened and modernized to respond to technological developments. The composition of the private fleet ought to continue to update, supported by discounts for LEV vehicles and other measures. Logistic system is playing a crucial role and it has been recently addressed by a new SULP which foresees a close cooperation with operators for a systemic change. The Horizon project UNCHAIN will support a pilot action in the city centre to test new approaches and technologies. The action includes the promotion of sharing services, of the concept of "Mobility As A Service"

		and of discussion tables with companies' mobility managers and logistic operators.
Reference to impact pathway	Field of action	Transport
	Systemic lever	technology & infrastructure
	Outcome (module B-1.1)	- regulatory evolution (limited access for private transport to city centre) - change of mobility habits for all city users (residents, commuters, tourists, logistic operators...) - test of new solutions for logistics
Implementation	Responsible body for implementation	Municipality, Department mobility and viability
	Action scale & addressed entities	municipal scale
	Involved stakeholders	mobility managers, SILFI (charging infrastructure manager), Regional and national authorities (for regulations and incentives), logistic operators, sharing services providers
Impact & cost	Generated renewable energy	-
	Removed/substituted energy	>700 GWh by fossil fuels
	emissions reduction estimate (total)	199 kt _{CO2eq}
	Total costs	221 M€

Action outline	Action name	Buildings renovation PLAN 01 Residential sector PLAN 02 Tertiary and industrial sector PLAN 03 Urban regeneration
	Action type	buildings regulation, retrofitting, incentives
	Action description	The Structural Plan contains the vision up to 2030, preventing land consumption: it represents a complete innovation in terms of approach to planning, since it does not foresee the exclusive reuse of abandoned buildings/surfaces, but only their transformation for the city's development. The principle of planning is to rehabilitate, limiting as far as possible the consumption of new ground (so-called "zero volume") and improving the amount of the existing ecological network. For the first time, the Structural Plan granted equal importance to the system of ecological allocations as to that of mobility and collective facility systems, for the planning and management of the territory. Hence the definition and identification of ecological allocations, consisting of nodes and corridors making up the main network, formed by green elements of the urban fabric and connected to the metropolitan one.



		<p>The operational plan, together with the green plan, contains the guidelines aligned with the new climate sustainability objectives.</p> <p>In recent years, the availability of subsidies has favoured interventions aimed at promoting the improvement of the energy performance of buildings. Energy consultancy is carried out through the renewed desk in cooperation with Legambiente and the one-stop shop for construction, in particular on state incentives available for homes.</p> <p>The intention is to proceed with an ERP housing redevelopment program by adopting high energy standards (NZEB).</p> <p>The evolution of the building stock in the tertiary and productive sector is also regulated by the structural plan with precise guidelines regarding the redevelopment and limitation of new buildings. The implementation of the new Municipal Operational Plan foresees specific exchange tables and programmatic agreements for the development of a green tourism/productive system.</p> <p>The municipality has encouraged the replacement of the boilers and also promoted the renovation of the facades with energy efficiency, increasing the national incentive (+10%).</p> <p>In addition, advanced management and control systems, intelligent lighting and efficient appliances, the use of RES and the purchase of green energy is promoted (the last two measures are part of the action about decarbonisation of electricity).</p>
Reference to impact pathway	Field of action	buildings & heating
	Systemic lever	Technology and infrastructures, Finance and funding, Social innovation
	Outcome (module B-1.1)	<ul style="list-style-type: none"> - improvement of smart retrofitting measures - analysis of new financial tools and incentives framework - activation of the big industrial WG also on climate issues - decrease of energy demand in buildings - exemplary projects
Implementation	Responsible body for implementation	Municipality, Urban development department
	Action scale	municipal level
	Involved stakeholders	Casa Spa, designers, builders, owners/tenants associations
	Comments on implementation	<p>The projects already started in the framework of PON Metro (9M€) and PNRR (52M€) on residential buildings are:</p> <ul style="list-style-type: none"> • Pon 4.1.1a retrofitting of ex Meyer stock • Pon 4.1.1b Smart Liveability

		<ul style="list-style-type: none"> • Pon 6.1.3b Energy poverty • PNRR Urban regeneration • PNRR social housing (128 houses in Florence, 357 in the metro city) Other projects have been submitted for more than 60 M€
Impact & cost	Generated renewable energy	-
	Removed/substituted energy	about 700 GWh of fossil fuels (gas, oil) and more than 250 GWh _{el} .
	emissions reduction estimate (total)	210kt _{CO2eq}
	Total costs	1.038 M€

Action outline	Action name	Decarbonisation of electricity & smart grid
	Action type	RES and green electricity market promotion, grid update
	Action description	<p>The potential of renewables has been the subject of various studies and was also clarified for hydroelectric power during the drafting of the PAES (PV and mini hydro). The landscape constraints have considerably limited the development potential of solar plants, while the air quality requirements have not allowed the promotion of biomass power plants and cogeneration. Significant growth is expected following the launch of local energy communities that can facilitate, also thanks to the support of the municipality, the constraint and investment obstacle in the future by allowing access to many citizens.</p> <p>Two hydro plants are being installed in the Arno river within the Florentine area by the Region, as part of the eight plants programmed for a total cost of 80 M€ and a production of 55GWh/y.</p> <p>Among the measures dependent on Other Entities there is also the improvement of the national electricity mix (NEEFE) strictly connected to local policies for the electrification of consumption, mainly in the mobility sector but also in the building sector, in synergy with the purchase and local production of renewable energy.</p> <p>The national emission factor target at 2030 has been set at 65% in the last update of the PNIECC. The municipality intends to</p> <ul style="list-style-type: none"> - actively participate at national WG (also through Let's Gov project) to increase the targets - boost the local market for certified green electricity purchase by promoting green & sustainable tourism



		<ul style="list-style-type: none"> - support the implementation of RES private plants by facilitating the urban regulation and the creation of energy communities with pilot implementations and technical support - install public plants (hydro and PV)
Reference to impact pathway	Field of action	buildings & heating
	Systemic lever	Democracy and participation, Governance, Finance and funding, technologies & infrastructures
	Outcome (module B-1.1)	<ul style="list-style-type: none"> - Increased awareness about energy market & RES - First “100% green electricity” use in companies (starting from public entities and tourism) - Mini hydro plant installed in Arno - Increased purchase / use of certified green electricity - Further decrease of local emission factor Vs national provisions (65% res at 2030 in the national energy plan PNIEC) - More information about RES exploitation options - Map of the available areas - Analysis of the consumption profiles - First business models - Reduced boundary regulations in urban context - Implementation of pilot projects - Decrease of local electricity emission factor and of heating systems impact
Implementation	Responsible body for implementation	Municipal environmental department, Regional Authority, national Government
	Action scale & addressed entities	local and national
	Involved stakeholders	Sovrintendenza, ESCOs and energy market players
Impact & cost	Generated renewable energy	more than 80% of electricity in use produced by RES
	Removed/substituted energy	-
	emissions reduction estimate (total)	395 kt _{CO2eq}
	Total costs	240 M€

Action outline	Action name	Decarbonisation of heating generation
	Action type	RES and efficient technologies promotion
	Action description	the municipality will promote the use of efficient technologies (like micro district heating and heat pumps) and renewable plants for heating generation following the pilot test of the seasonal TES (H2020 SCC1 Replicate). The use of biofuels for heating will be analysed together with DSO and stakeholders’ associations.
	Field of action	buildings & heating

Reference to impact pathway	Systemic lever	Technology & infrastr., capabilities
	Outcome (module B-1.1)	increased use of heat pumps and renewables for heating (solar thermal, biofuels)
Implementation	Responsible body for implementation	Municipal departments (environment, urban development, economic development)
	Action scale	municipal scale
	Involved stakeholders	designers, builders, owners/tenants associations, building managers, DSOs, national Government
Impact & cost	Generated renewable energy	TBD
	Removed/substituted energy	85 GWh of gas
	emissions reduction estimate (total)	170 kt _{CO2eq}
	Total costs	170 M€

B-2.3: Summary strategy for residual emissions

The offset of the remaining emissions will be pursued through a compensation strategy based on the following options:

- green absorption management within the city boundaries
- improved green absorption outside Florence administrative boundaries (green projects from the metro city up to other nations)
- support to the implementation of efficiency projects in the metro city or at regional level by third parties.

The actions not yet quantified or not included (like the increased use of biofuels, hydrogen, etc.- see section B1.1 Impact pathways) may contribute to decrease the offset needs, boosting the savings in mobility and buildings sector.

4.3 Module B-3 Indicators for Monitoring, Evaluation and Learning

As part of its Total Quality Management System EEA and the monitoring program of the local planning framework (SUMP, Sulp, Secap...), Florence has adopted a comprehensive dashboard of indicators which is embedded in the Smart City Control Room concept.

In the CoME EAsy project Florence, as ambassador city, shared its experience to create a common KPIs list to be implemented by municipalities participating in different initiatives (ISO 50.001, 14.001, 37.120, Green capital/leaf, CoM, EEA, CDP...)¹⁰.

The Smart City Control Room and the Open data portal with about 2000 data sets (<https://opendata.comune.fi.it>), are collecting a huge quantity of data about mobility (traffic supervisor system), urban and infrastructural info, environmental data, etc.

Thanks to the involvement of urban service providers like Publiacqua, Silfi and ALIA, all data about public lighting and electric vehicles charging stations, water and waste management are available.

¹⁰ <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5c8d8b1c7&appId=PPGMS>

In the SECAP as in this action plan, for each measure a set of KPI has been defined to monitor the achievements. It must be underlined that single project KPIs are often only measuring the advancement of the specific action and can't be added to evaluate the overall results because of the interactions and influences among actions.

Only a more complex model and the complete emission inventories can regularly monitor the real situation.

Hereafter a list of some KPIs included in the SECAP and SUMP actually included in the monitoring strategy.

	2017	2018	2019	2020
<i>Resident inhabitants</i>	377.635	374.160	376.451	372.566
<i>Average yearly concentration of PM 10</i>	26,00	22,75	21,00	20,33
<i>Number of public charging stations for e-vehicles every 100.000 inhabitants</i>			127,65	145,18
<i>Water losses in the distribution network [%]</i>		40,00	38,00	33,00
<i>Public transport use (trips per capita per year)</i>	161,94	187,41	221,00	161,90
<i>Number of fossil fuel vehicles per capita</i>	0,71	0,71	0,73	0,71
<i>% of electric or hybrid vehicles</i>	El.0.07 Tot.0.83	El.0.08 Tot.1.05	El.0.12 Tot.1.47	El. 0.21 Tot. 2.80
<i>Voters at last elections [%]</i>			69,00	69.75%
<i>% of public areas with free WIFI access</i>				33,00
<i>Municipal area [Km²]</i>	102,40	102,40	102,40	102,40
<i>Unemployment rate [%]</i>	6,80	5,70 5.80	6,80 6.20	5,70 6.00
<i>Access to sharing solutions: number of available vehicles every 100.000 inh.</i>	188,74	315,97	320,99	325,73
<i>% of inhabitants with easy access to public transport (< 500m)</i>		81,04	83,00	86,00
<i>% of low emission busses</i>				83.3
<i>% of busses with alternative fuels (electric, hybrid, hydrogen...)</i>				16.7 (4.3 electric)
<i>Sharing vehicles</i>				Euro 6: 148, e-car: 62, LPG/gas natural: 9, e-bikes: 1000, Bikes: 2000, e-Moto: 600, e-scooters: 900
<i>Bike lanes (km every 100.000 inhabitants)</i>	22,84	23,49	24,64	29.93
<i>Final green electricity consumption of municipal buildings</i>	3.050,00	3.112,00	3112,00	3112,00
<i>Urban waste yearly production per capita [t/inh]</i>	0,63	0,65	0,66	0,59
<i>% of differentiated urban waste collected</i>	50,85	53,51	53,95	53.48
<i>% of public green areas</i>				high density area:12.58 low density area:7.89
<i>% of private green areas</i>				high density:8.06 low density:46.8
<i>% of inhabitants living near green areas (<300 m)</i>				98,23 high density 94.4 low density
<i>% of inhabitants living near green areas (<300 m) bigger than 5000m²</i>				45.33 high density 68.01 low density
<i>Tourism intensity: Total number of overnights per year/ (total population/100.000)</i>	2.646.67 9	2.831.050	2.962.877	2.824.465

Table 12 – SECAP general KPIs

Tabella 8.1 Indicatori di valutazione

Obiettivi di sostenibilità		
Mobilità e trasporto	Garantire a tutti i cittadini modi di spostamento che permettano loro di accedere alle destinazioni ed ai servizi chiave (LG_PUMS)	Domanda di mobilità stradale riferita alla CM (veicoli/giorno) Lunghezza della rete stradale riferita alla CM (km) Percorrenze totali giornaliere sulla rete stradale della CM (auto*km/hp) Tempo totale di viaggio giornaliero sulla rete stradale della CM (auto*ore/hp) Velocità media sulla rete stradale – Auto (km/h) Passeggeri trasportati nell'ora di punta del giorno di riferimento sulla rete Tpb– (numero passeggeri/hp), Passeggeri saliti nell'ora di punta del giorno di riferimento sulla rete Tpb – (numero saliti/hp)
	Realizzare un passaggio equilibrato a modi di trasporto ecocompatibili ai fini di un sistema sostenibile di trasporto e di mobilità (SSS)	Ripartizione modale (% di spostamenti per mezzo utilizzato) Percorrenze totali giornaliere sulla rete stradale della CM (auto*km/hp) Percorrenze totali giornaliere sulla rete stradale dell'Agglomerato urbano (auto*km/hp)
	Aumentare la mobilità sostenibile di persone e merci, garantendo a tutti, entro il 2030, l'accesso a un sistema di trasporti sicuro, conveniente, accessibile e sostenibile, in particolar modo potenziando i trasporti pubblici (SNSvS)	Tratti di rete stradale in congestione – (km) Tratti di rete stradale in precongessione – (km) Passeggeri trasportati nell'ora di punta del giorno di riferimento sulla rete Tpb– (numero passeggeri/hp), Passeggeri saliti nell'ora di punta del giorno di riferimento sulla rete Tpb – (numero saliti/hp)
	Migliorare i servizi di trasporto pubblico di passeggeri per incoraggiare a una maggiore efficienza e a prestazioni migliori (SSS)	Ripartizione modale (% di spostamenti per mezzo utilizzato) Passeggeri trasportati nell'ora di punta del giorno di riferimento sulla rete Tpb– (numero passeggeri/hp), Passeggeri saliti nell'ora di punta del giorno di riferimento sulla rete Tpb – (numero saliti/hp)
	Migliorare l'accessibilità di persone e merci (LG_PUMS)	Ripartizione modale (% di spostamenti per mezzo utilizzato) Percorrenze totali giornaliere sulla rete stradale della CM (auto*km/hp) Tempo totale di viaggio giornaliero sulla rete stradale della CM (auto*ore/hp) Tratti di rete stradale in congestione – (km) Tratti di rete stradale in precongessione – (km)Velocità media sulla rete stradale – Auto (km/h) Tratti di rete stradale in congestione – (km) Tratti di rete stradale in precongessione – (km) Passeggeri trasportati nell'ora di punta del giorno di riferimento sulla rete Tpb– (numero passeggeri/hp), Passeggeri saliti nell'ora di punta del giorno di riferimento sulla rete Tpb – (numero saliti/hp)
	Riduzione della congestione stradale (LG_PUMS)	Tempo totale di viaggio giornaliero sulla rete stradale della CM (auto*ore/hp) Velocità media sulla rete stradale – Auto (km/h) Tratti di rete stradale in congestione – (km) Tratti di rete stradale in precongessione – (km)
Qualità dell'aria	Minimizzare le emissioni e abbattere le concentrazioni inquinanti in atmosfera (SNSS)	NOX (kg/giorno) PM10 (kg/giorno) PM2,5 (kg/giorno)
Cambiamenti climatici	Ridurre i consumi energetici (SEN/PNIEC e PERFER)	Consumi (Tep/ora)
	Ridurre le emissioni di gas climalteranti (SEN/PNIEC e PAESC)	Emissioni gas serra CO2 (kg/ora)
Inquinamento acustico	Evitare e ridurre il rumore ambientale laddove necessario e, in particolare, allorché i livelli di esposizione possono avere effetti nocivi per la salute umana, nonché di conservare la qualità acustica dell'ambiente quando questa è buona (2002/49/CE)	Popolazione esposta al rumore
Salute	Diminuire l'esposizione della popolazione ai fattori di rischio ambientale e antropico (SNSvS)	Emissioni centri abitati (agglomerato e città metropolitana di NOX (kg/giorno) PM10 (kg/giorno) PM2,5 (kg/giorno) Popolazione esposta al rumore

Table 13 – SUMP monitoring KPIs

Some target values for KPIs, calculated versus the business-as-usual forecast at 2030, are the following

B-3.1: Economic indicators by sector					
Sector	Indicator	Indicator Unit	Indicator baseline (BAU)	Indicator target 2030	
Transport	Reduced motorized passenger transportation need	% reduction by 2030		22%	
	Reduced passenger kilometres by car through shift to public & non-motorized transportation	% reduction in car passenger kilometres by 2030		40%	
	Car pooling	average passengers per car	1,3	1,5	
	Electrification of cars + motorcycles by 2040	% of fleet electrified	1%	80%	
	Electrification of buses	% of fleet electrified	2%	50%	
	Optimization of trucking logistics - light duty trucks (< 3.5 t)	average utilization of maximum load weight for light duty trucks (< 3.5t)	23%	55%	
	Optimization of trucking logistics - heavy duty trucks (> 3.5 t)	average utilization of maximum load weight for heavy duty trucks (< 3.5t)	45%	60%	
	Electrification of light duty trucks <3.5t by 2030	% of fleet electrified	0%	50%	
	Electrification of heavy duty trucks <3.5t by 2040	% of fleet electrified	0%	60%	
Buildings & Heating	Building renovation (envelope)	% annual renovation rate	1,0%	5,0%	
	New buildings built to top performing standard	% of buildings built to the top standard	25%	75%	
	Efficient lighting and appliances	% annual renovation rate	1,0%	7,0%	
	Heating technologies	share of heating as district heating		0%	1%
		share of DH by fossil fuels		20%	20%
		share of DH by electric heat pumps and solar		80%	80%
	Decarbonizing district heating	share of DH by bio-fuels		0%	0%
Heating technologies	share of heating as local heating		100%	99%	



	<i>Decarbonizing local heating</i>	<i>share of local heating produced using fossil fuels</i>	99%	40%
	<i>Decarbonizing local heating</i>	<i>share of local heating produced using electric heat pumps and solar</i>	0%	45%
	<i>Decarbonizing local heating</i>	<i>share of local heating produced using bio-fuels</i>	1%	15%
Electricity	<i>Renewable / fossil fuel electricity production</i>	<i>share of electricity produced using fossil fuels</i>	52%	10%
Waste	<i>Paper recycling</i>	<i>% recycling rate</i>	88%	90%
	<i>Metal recycling</i>	<i>% recycling rate</i>	88%	90%
	<i>Plastic recycling</i>	<i>% recycling rate</i>	68%	78%
	<i>Glass recycling</i>	<i>% recycling rate</i>	88%	90%
	<i>Organic recycling</i>	<i>% recycling rate</i>	80%	90%
	<i>Amount of municipal waste generated per capita</i>	<i>kg/capita/year</i>	625	590
	<i>Recycling rate of municipal waste</i>	<i>%</i>	78,5	90%
	<i>Municipal waste that is recycled (including through composting and anaerobic digestion of biowaste)</i>	<i>%</i>	78,5	90%
	<i>Municipal waste sent to incineration (R1 code)</i>	<i>%</i>	9,5	2%
	<i>Municipal waste sent to landfill (or other forms of disposal (D codes)</i>	<i>%</i>	24,8	14%
	<i>Municipal waste that is collected separately</i>	<i>%</i>	53,5	75%
	<i>Recycled packaging waste</i>	<i>%</i>	78,2	90%
Water	<i>water losses</i>	<i>%</i>	38	>30
	<i>water consumption</i>	<i>l/inh.* year</i>	193	>170
	<i>consumption covered by green energy</i>	<i>%</i>	3	>30

5 Part C – Enabling Climate Neutrality by 2030

5.1 Module C-1 Organisational and Governance Innovation Interventions

C.1.1: Enabling organisational and governance interventions					
Intervention name	Description	Responsible entity/ dept./ person	Involved stakeholder	Enabling impact	Co-benefits
Climate and environmental emergency and rights of next generations	Inclusion of environmental care and next generations' rights in Florence Statute	Florence Administration	City Council	Inclusion of climate topic in any activity and sector of competence of the administration	Awareness, legal framework coordination
Extended task force (Let's Gov)	The climate task force internal to the organisation will be extended for a multi-level organisational model	General direction department	Metro-city, region, ministries, DSOs, other NCZ cities...	Data exchange, Aligned regulations for a coordinated legal framework	Exploitation of synergies of funds and innovation opportunities
New innovation topic for the task force and round tables (industry, mobility managers, logistic operators...)	Enhanced exchange with research to test innovative technologies in R&D projects	EU projects and fund rising department	Research bodies, Industries and technological partners	Increase of R&D projects	Enhanced exchange with research networks and international best practices
Total Quality Management System (eea) update to NCZ target	The eea methodology adopted to steer and control climate achievements will be set on climate neutrality targets	Eea advisor and Team leader	Climate Task Force and all linked stakeholders (habitat teams)	Aligned monitoring procedures and targets	Coordination of different activities, sectors, initiatives and possible cross-fertilisation.
Pilot Climate Assembly	A pilot test with a citizens' assembly to discuss climate issues, impacts and roll out of on	Florence Administration	Technical support	Active citizens' participation in decision making process. Inclusion of vulnerable	Collection of feedbacks and needs. Awareness

	going and programmed projects and provide feedbacks to model 0			people and focus on youth	
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C-1.2: Description of organisation and governance interventions

In the Smart and Sustainable city model Florence has adopted, the main enablers consist in (see

Figure 22 – Florence Smart & Sustainable City model (REPLICATE project):

- Municipal internal organization: the “Climate Task Force” - the usual structure has been adapted to new challenges, able to manage an integrated vision and open to innovative schemes: Florence has formally established in 2010 a permanent « Climate task force » adapting the structure to cross-cutting topics related to climate, flexible and active to support the upcoming needs of the city. It holds regular meetings to monitor activities, tune other plans under development, benchmark and exchange with other cities and initiatives. The Climate Task Force interacts with the other “habitat teams” composed by specific stakeholders and citizens, managing an interactive and iterative exchanges. Each member of the internal steering group is responsible for one topic: the internal responsible coordinates the sub-groups and then reports the results to the steering group, following the “sense checking” method.

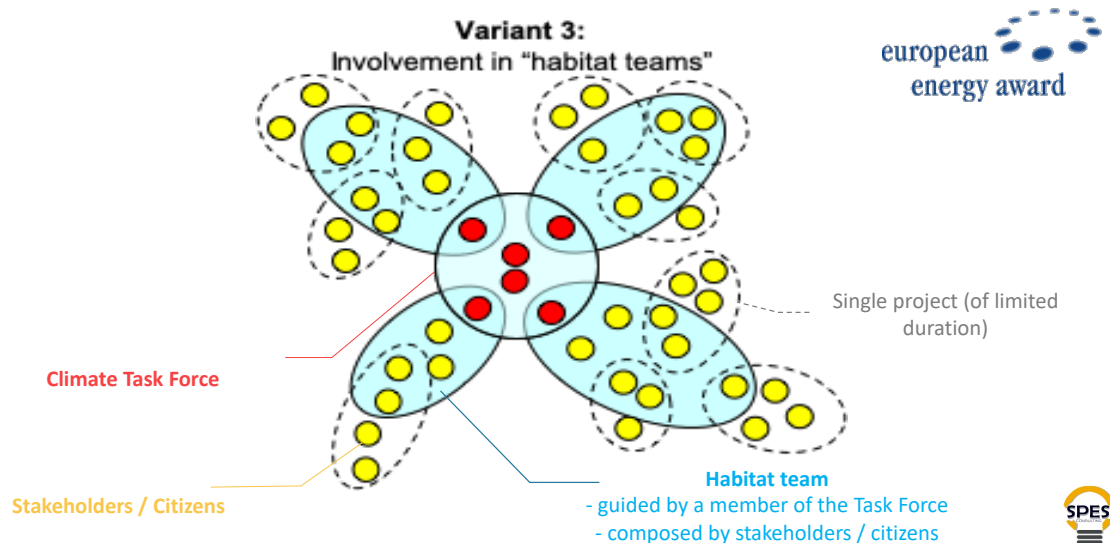


Figure 37 – the climate task force and the “habitat teams” (source EEA)

- the coordination of the legal framework at multiple level: this target will be pursued by extending the local task force and the coordination model at multiple-level as tested with the Digital Manifesto for the data exchange and the urban management and with the recent Memorandum of Understanding signed by the Region and Prato at regional level and by the participation in the pilot project Let’s Gov together with the other eight Italian cities selected in the mission.

- a strong vision with clear targets: the vision must be strongly supported and continuously steered following the evolution of the boundary conditions as it happened during the Covid pandemic or the Ukrainian crisis. The municipality intends to include in its statute the concept of the Climate and environmental



emergency and protection of rights of next generations; these adds to the fundamental chart of the city will ensure the future care and commitment.

- a smart prioritisation of interventions: as explained in the next paragraph, the decision-making process ought to take into account multiple aspects and both direct and indirect impacts as the analysis included in the present document and in the investment plan.

- a co-productive approach: this governance and social innovation is the most powerful tool to create and implement effective strategies that will result more coordinated, realistic, inclusive and impactful. For this purpose, involvement of stakeholders is one of the focuses of the present strategy (see Paragraph 3.3 and sheet 3.3) with a wide participation strategy including different tools and methodologies to reach all possible city user interested.

Stakeholder engagement methods are in continuous evolution and they can vary from a mono-directional information level to a participatory process. Their selection ought to be made taking into account the public involvement level targeted; the following table provides an example of the most appropriate options.

Methodology	Information (communication)	Consultation (long term processes)	Cooperation (specific projects)	Engagement (planning)
Media and socials	XXX	XXX	X	X
Interviews & Surveys		XX	XX	
Events/meetings		XX	XX	X
Climate Assembly		XX	XX	XXX
STEEP (Modelling)		X	X	XXX
EMT	X		XX	XXX
SWOT, USP, PESTEL	XX		XXX	X
KPIs and MAPs	X	X	XX	XXX

Table 14 - Example of methodology selection in the different public involvement options

In Autumn 2023 a pilot test for a Climate Assembly will be carried out, focussing on vulnerable people as the most affected citizens by climate impacts and transition costs and youth as future citizens of 2030.

5.2 Module C-2 Social and Other Innovation Interventions

C.2.1: Enabling social innovation interventions

Intervention name	Description	Responsible entity/ dept./ person	Involved stakeholder	Enabling impact	Co-benefits
System thinking approach to Net Zero target	Adaptation of the STEEP approach in use for the SECAP to net zero strategy	Administration	Stakeholders' database	Integration of sectors, exploitation of synergies, commitment, collection of needs and best	Awareness, consensus



				practices, empowerment	
Climate Assembly and new participatory models	Set up of the climate assembly to get citizens more and more involved in the decision-making process	Administration	citizens	Commitment, collection of needs	Awareness, consensus
Vulnerable people focus	Transition should be equal and Florence is supporting vulnerable people in the implementation of innovation and sustainable actions	Administration	Citizens with special needs (energy poverty, health disease, cultural obstacles...)	Participation of whole society to the energy transition	integration
Co-benefits highlight (Smart prioritisation)	In the decision-making processes, indirect impacts will be highlighted	Administration	Stakeholders involved in different actions	Advanced business models and integration of funds	promotion of benefits

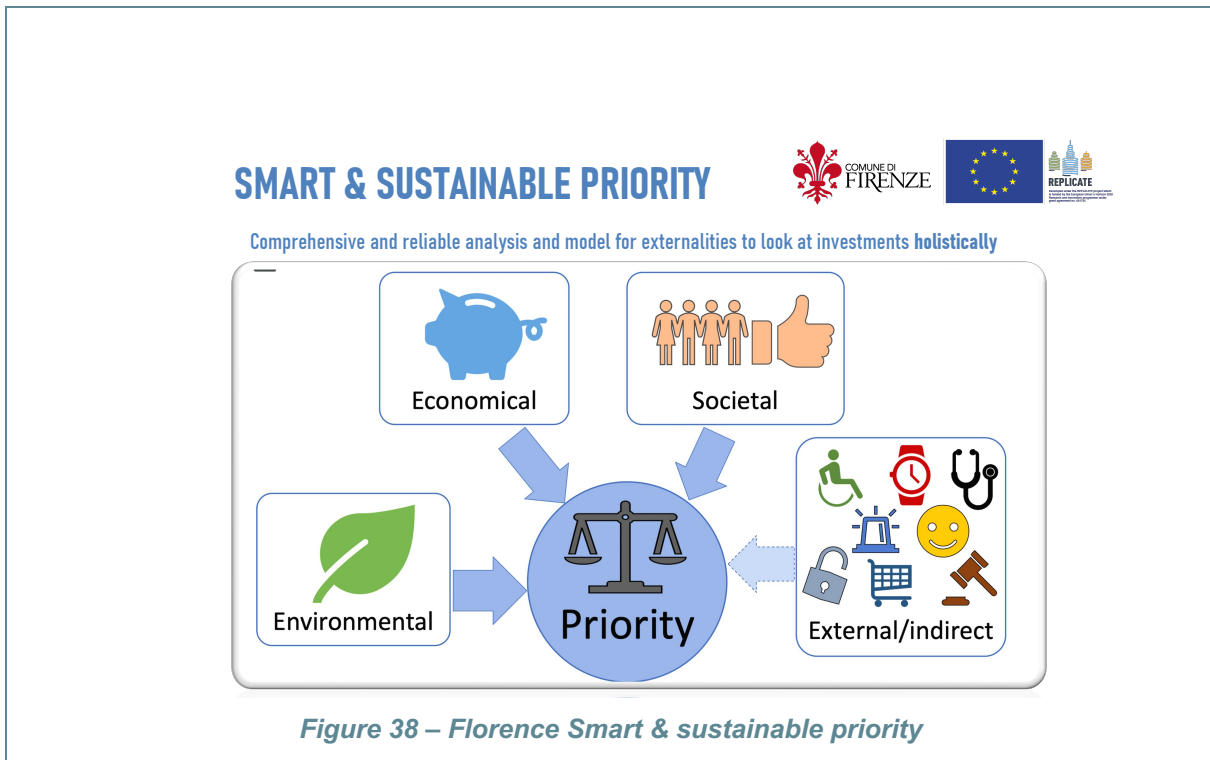
C-2.2: Description of social innovation interventions

The system thinking approach as well as the participatory strategy have been illustrated in the previous paragraphs and in Annex 1.

Another social innovation regards the introduction of “externalities” or “co-benefits” in the assessment of the strategies and in their prioritisation during co-productive sessions. All the different impacts (direct and indirect) and co-benefits should be clearly pointed out in the decision-making process (health, social inclusion, poverty...): since its definition in Replicate project and in line with the UN Sustainable Development Goals concept, the city is following the “Smart and Sustainable priority” concept as the sum of different aspects, at least economy-social-environment, in the evaluation of impacts and benefits.

The social and environmental impacts as well as the possible indirect externalities play a role also in the business model of the actions exploiting synergies from different funding opportunities and represent important added values for communication and engagement campaigns.

This approach is perfectly in line with the ISO (adopted also by EIP) definition of Smart City: “ a city that increases the pace at which it provides social, economic and environmental sustainability outcomes and responds to challenges such as climate change, rapid population growth, and political and economic instability by fundamentally improving how it engages society, applies collaborative leadership methods, works across disciplines and city systems, and uses data information and modern technologies to deliver better services and quality of life to those in the city (residents, businesses, visitors), now and for the foreseeable future, without unfair disadvantage of others or degradation of the natural environment.”



5.3 Module C-3 Financing of Action Portfolio

During the definition of the portfolio, a first analysis of impacts and costs has been carried out. This provision will be updated yearly to include changes in average costs, info from the annual balance of the municipality, feedbacks from CCC signatories and info from national and regional databases (Let's Gov project).

The total economic case shows an investment of 2,5 billion € for the decade 2020 - 2030 with a net recurring cost saving and co-benefits of about 3,6 M€ within 2050.

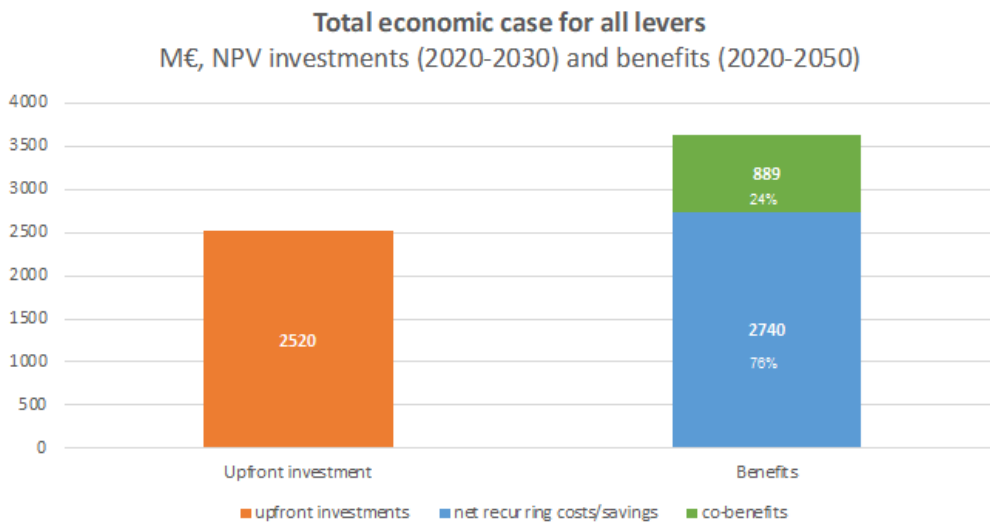


Figure 39 – Total economic case for the CCC scenario



C-3.1: Summary of interventions with related costs									
Actions	Actions & Results (2030 assumptions)		Responsible entity and person	Start / end date	Sector	Impact			Total investment cost (CAPEX)(MEUR - NPV 2020-2030)
						GHG reduction (kt CO2e)	Operational cost/savings (OPEX) (MEUR - NPV 2020-2050)	Co-benefits (MEUR - NPV 2020-2050)	
Shift to public & non-motorized transport	40%	reduction in car passenger kms	Municipality, other PAs,PT operators, mobility managers WG, other mobility stakeholders	2020-2030	Transport	57	€ 280	€ 354	€ (18)
Reduced motorized passenger transportation need, increased car pooling and Mobility as a service	22%	reduction	Municipality, other PAs, mobility managers WG, other mobility stakeholders	2020-2030	Transport	51	€ 611	€ 142	€ (521)
	20%	increase in average passengers per car	Municipality, other PAs,PT operators, mobility managers WG, other mobility stakeholders	2020-2030	Transport	19	€ 258	€ 69	
Electrification of cars + motorcycles	80%	electric cars + motorcycles by 2040	Municipality, mobility managers WG, private sector	2020-2040	Transport	48	€ 95	€ 19	€ (88)
Electrification of buses	50%	electric buses	Municipality, Region, Metro-city, PT operator	2020-2030	Transport	4	€ 7	€ 5	€ (12)
Optimized logistics	15%	reduction in total trucking kilometers	Municipality, Metro-city, logistic operators WG	2020-2030	Transport	91	€ 148	€ 172	€ -
Electrification of trucks	50%	Light duty trucks (<3.5t) by 2030	Municipality, Metro-city, logistic operators WG	2020-2030	Transport	30	€ 78	€ 32	€ (121)
	60%	heavy duty trucks (>3.5t) by 2040	Municipality, Metro-city, logistic operators WG	2020-2040	Transport				
Building renovations (envelope)	5.0%	annual light renovation rate	Municipality, Let's Gov multi-level WG	2020-2030	Buildings & Heating	80	€ 593	€ 47	€ (755)
New energy-efficient buildings	75%	share of new buildings built with high performing building standard	Municipality	2020-2030	Buildings & Heating	2	€ 20	€ 2	€ (24)
Efficient lighting & appliances	100%	share of lighting and appliances renovations producing ~40% efficiency improvement	Municipality, Sifli, private sector	2020-2030	Buildings & Heating	63	€ 488	€ 7	€ (260)
Decarbonizing heating generation	45%	share of local heating produced with high efficient plants (electric heat pumps) or solar pannels	Municipality, Let's Gov multi-level WG, private sector	2020-2030	Buildings & Heating	170	€ 171	€ 42	€ (147)
Decarbonizing electricity generation	80%	share of fossil fuel electricity production replaced with renewables (national minimum target value 65% from PNIEC)	Municipality, Let's Gov multi-level WG, private sector	2020-2030	Energy systems Electricity	395	€ (9)	€ -	€ (190)
Increased waste recycling	35%		Municipality, Region, ALIA	2020-2030	Waste	10	€ 2	€ 0	€ (4)
Other	80%	improving efficiency in water management and industrial sector	Publiacqua, Water managemnt Authority, Industries, etc.	2020-2031	Other	106			€ (100)
Total						1129	€ 2.740	€ 889	€ (2.239)

Table 15 – summary of the interventions with related costs

The financing possibilities are illustrated in detail in the investment plan and include EU and national programs and opportunities together with possible financing schemes.

6 Outlook and next steps

Plans for next CCC and Action Plan iteration

The climate city contract is going to be constantly monitored and reviewed following an iterative process in use also for the CoM and the TQMS: in this way the action plan will become a living document, flexible and adaptable to the evolving frameworks and needs, resilient to deviations and inclusive with new contributions/stakeholders.

The frequency of the quantitative monitoring will follow the data availability from DSOs and relevant sources but will not exceed the two years period.

As already reported, for the first period a timeline is foreseen targeting an update of the portfolio in 2024 (see *Figure 8 – The transition iterative timeline for the city of Florence*). Next steps will consist in taking action implementing measures and involving more and more stakeholders, analyse the impacts and make the process “the new normal”.

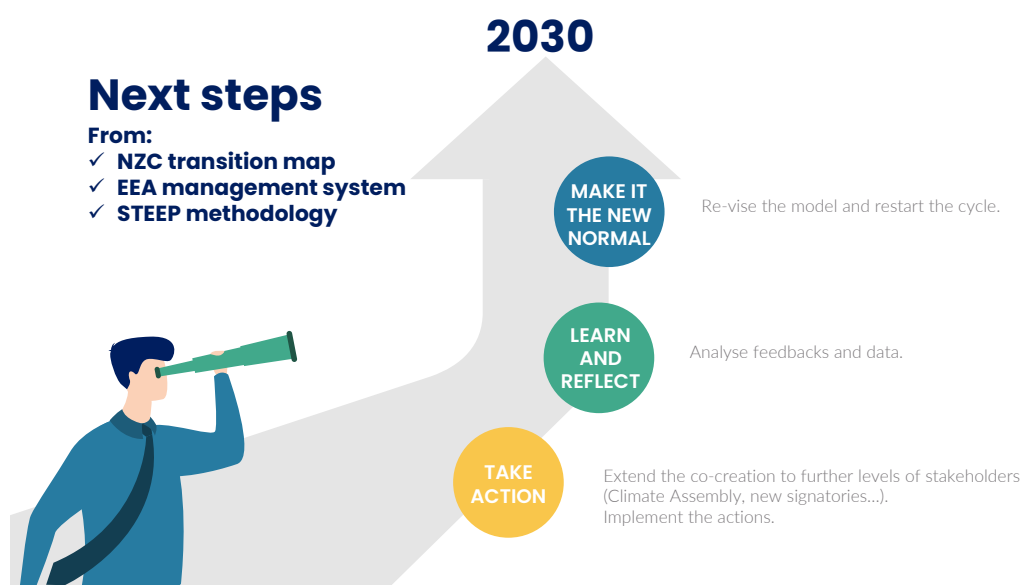


Figure 40 – Next steps in Florence transition path

7 Annexes

7.1 ANNEX 1: STEEP “System thinking” approach and methodology

By taking an integrated approach to strategic city planning where all systems and their interlinkages are considered would result in greater efficiency in terms of both carbon and cost and also provide other benefits such as greater stakeholder engagement and ownership of actions. The instrument for this endeavour should be a comprehensive plan which includes the whole set of necessary actions following a **holistic approach**.

Energy planning ought to be viewed as a **wicked problem**, because it has to deal with situations that are not well defined, because of many uncertainties and lack of reliable data, involving many interested parties with different perspectives. There is a general difficulty in agreeing objectives of interventions which requires creating consensus amongst parties involved to be successful (Yearworth, 2016).

The FP7 STEEP project identified the following key factors for its definition:

- ❖ It is necessary to have the *collaboration of all the stakeholders* across the value chain: public administrations, technology experts, companies, end users, etc.
- ❖ It is necessary to consider *the city as a complex system of processes*, where the different elements of the city are connected and one intervention in one process of the city influences the rest of the processes.



Figure 41 - Snapshots from STEEP modelling sessions

The STEEP Methodology is a **systemic Problem Structuring Method (PSM)** (Yearworth & White, 2014) designed for use by organisations such as municipalities for planning transformations in complex problem contexts such as energy and smart city planning. These are examples of what is known as messy or wicked problems¹¹.

The methodology is based on ideas from Soft Systems Methodology where a system model is considered as a conceptual device to describe the target transformation through the use of a root definition. For example:

“A city council owned system to transition the organisation to new forms of financing projects, by designing new smart city governance and project selection processes, in order to meet the capital investment required for the municipality’s smart city portfolio addressing citizen needs”.

The main benefit is that the methodology brings a system-thinking perspective to the transformation and manages the process of reconciling different stakeholder

¹¹ <https://www.grounded.systems/2017/03/wicked-problems/>



worldviews, providing a common operational picture and addressing issues of transparency. It can be used with participants in multi-organisation groups.

The methodology can be applied at any time and at any scale of transformation. This is entirely determined by the root definition, which defines *both* the scope of the transformation and the stakeholder group. These are therefore *co-dependent* and *co-created*.

7.1.1 The model and the co-production methodology

The STEEP Methodology uses a form of systems modelling known as a Hierarchical Process Model (HPM) to develop a shared understanding by the problem owners about how to achieve the transformation.

- *The vision and the transformation:*

Cities face the challenge of sustainable urban development: a city is something dynamic and mutating as quick as the needs of its society. To manage the inevitable changing process in a proper way there must be a **long-term driving concept** to be translated into policies which should overcome short term political cycles and technological development. Whilst the tools (i.e. technologies and methodologies) will evolve, with a clear vision, the city should be able to implement any innovative solution which helps to achieve the target. However, care should be taken that there is not a mis-match between transformational scope and stakeholder inclusion, disregarding their co-creational/co-dependent nature can lead to difficulties (Freeman & Yearworth, 2017).

The first step in the process is to define **purpose**. Consensus amongst stakeholders regarding a high-level objective for the planning has to be achieved: this is essential in the process for prioritising interventions, as it allows a specific focus on what can be plausibly achieved and who will own this process. The following points are crucial for the successful implementation of the STEEP methodology:

- There must be **clear ownership** of the process
- Deciding the **transformational goal** and defining the **stakeholder group** are **co-dependent** activities. It is not possible to define transformational goals independently from identifying *who* would be the Actors (A) responsible for achieving them, and the Owners (O) accountable for the actions¹². Likewise, a stakeholder group with no transformational goal in mind is a nonsensical construct, in *what* does this group have a stakeholding? The '*who*' and '*what*' of a transformational goal *must be defined simultaneously at the outset*, before any thought about the *how*, *when* and *why* can be discussed. The STEEP methodology as implemented by Yearworth, Schien, and Burger (2014) focuses particularly on the latter, and particularly the method of system modelling, but the learning from evaluation has shown that this preliminary step is absolutely critical to success.

Experience from STEEP project suggests the "purposeful transformation" should be

- sufficiently ambitious to catch the interest of stakeholders and to start the change
- realistic in scope not to waste time in fruitless discussions

¹² The Actors (A) and Owners (O) are two of the three stakeholder groups identified in the CATWOE formulation of Soft Systems Methodology (SSM), the third is Customers (C). The meaning of these roles is discussed in the STEEP methodology training course (<http://www.smartsteep.eu/resources/>)

- wide enough to touch every sector of influence but focussed on the topic
- dynamic and flexible in approach to be able to fit future evolution and re-calibration due to the monitoring feedbacks.

The last consideration implies logically an **ongoing planning process**. The transformation is unlikely to be met simply with an agreed solution but will require continuous effort to bring about alignment of stakeholders' views on the problem and possible interventions: the actions, which will be documented as plans, are not the end goal, but it is the transformational system that is important.

- **The model building and performances monitoring:**

The model can be developed by the owners of the transformation in a facilitated group model building workshop, or by a systems expert interviewing the owners, or a mixture of both. An example is shown in figure below.

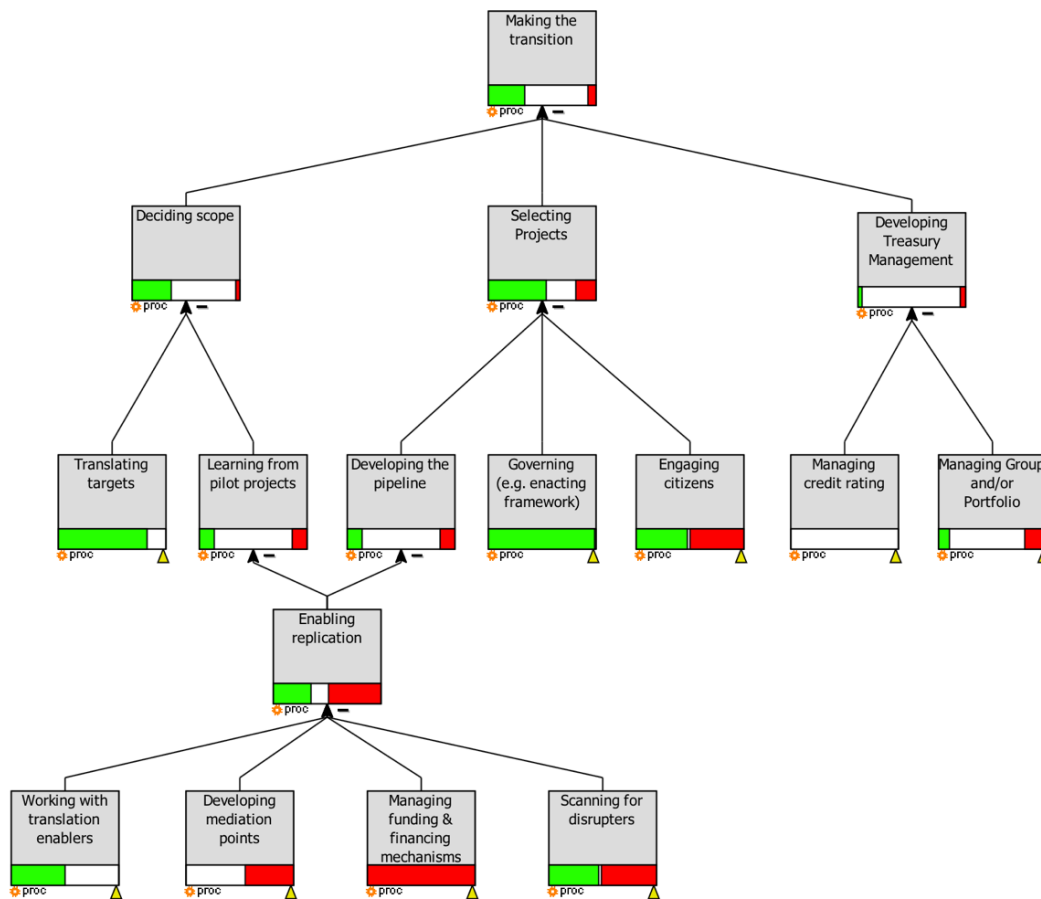


Figure 42 - System model and example of a performance evaluation produced in the REPLICATE project.

The one illustrated in the picture is a system designed to achieve the transformation described in the text. Each sub-process below the top-level process provides more detail about how to achieve the process. Two immediate actions are apparent from the Italian Flag scoring of processes i) the <Managing funding & financing mechanisms> process needs to be improved, and ii) the <Managing credit rating> process is completely uncertain and needs some work to research how to implement this process.

The systems model can be read **down the page**, where sub-processes provide



answers about **how** the high-level processes can be achieved. The model can also be read **up the page** as answers to **why** processes exist. Inferior processes are ‘part-of’ or contained within superior ones.

The system model is designed to help with decision making and therefore **the processes can be evaluated for performance** using evidence from stakeholders. A colour scheme is used; green for a process performing well, red for processes performing badly, and white where there is little or no information about performance. The arrangement of green, white and red leads to its colloquial label of an **Italian Flag**. For each process that is labelled mostly red there is a clear need to act to improve its performance. For processes that are labelled mostly white then there is a need to find out more about what is happening or what needs to be done. For these ‘issue’ processes options must be developed to address them in order to improve the overall performance of the system. The stakeholders can be debate arguments for and against each option, or vote on them, until a decision is made about which options to implement. Thus, a group is able to work through the process of deciding a transformation and how it might be achieved leading to an ‘action plan’.

The approach can be implemented using the conventional props of flipcharts and post-it notes in face-to-face workshops. An experimental online system is available for working groups to continue developing system models and action plans (so-called same-time/different-places workshops (Yearworth & White, 2019)). Expert systems’ modellers have access to modelling software that can produce systems models such as shown in the figure above. The latter can be used to calculate overall system performance metrics for monitoring.

Where there is some commonality of purpose across different municipalities and where there is a common facilitator (or facilitation team) that is operating across them, as is the case with CoME Easy, then there is an opportunity for exploiting some preliminary systems modelling prior to face-to-face workshops taking place. Experience from the expert facilitators themselves, as ‘qualified advisors’ in using the COM/SECAP and EEA processes, means that there is already an understanding of the transformational purpose that is *shared* or common by all municipalities. At the moment, this understanding is not shared between the qualified advisors, but is brought individually by them to each engagement. However, systems modelling of the sort used in the STEEP methodology could also be used to *capture* the knowledge of the qualified advisors to build a shared understanding of common elements (processes) of transformation that occur across all municipalities. It can be seen immediately that if these common elements (processes) of transformation need to (re-)discovered every time in a face-to-face workshop then a considerable amount of valuable time could be saved by initiating or seeding the workshop with this preliminary model¹³. Such techniques have been used successfully in the problem structuring field for many years (Rouwette & Vennix, 2006; Vennix, 1996). The precise details of operationalising this preliminary model building stage in CoME EAsy will be published in the forthcoming training materials for qualified advisors and municipalities.

¹³ Face-to-face workshops require a considerable investment of time and commitment from stakeholders to attend. This is good for engendering a sense of buy-in to the process, but also places considerable stress on the facilitator to ensure that the maximum benefit is gained from this investment in time. By removing from this process, the elicitation of a model that is generally known implicitly, but to date hasn’t been made explicit, then the benefits from the workshop can be enhanced – primarily from participants being focussed on the processes of transformation that are *specific* to the municipality.



It is expected that the STEEP methodology, enhanced with the preliminary modelling stage, is adopted as a continuous and ongoing process whilst the transformation is underway, rather than just used once at the start; the action plan being updated to reflect tasks completed, learning – which would lead to changes to the structure of the system model, and revised evidence about performance e.g. tasks completed should lead to processes becoming ‘green’. The key message from the STEEP project is that **it is the planning process that is important**; plans are inherently transitory and merely specific artefacts of the process.

The co-productive approach with stakeholders’ engagement is not going to end with the adoption of the action plan, but it should follow its monitoring and re-calibration over time.



Climate City Contract

2030 Climate Neutrality Commitments

Climate Neutrality Commitments of Florence



Disclaimer

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Abbreviations and acronyms

Abbreviations and acronyms	Definition
BEI	Baseline Emissions Inventory
CCC	Climate City Contract
CDP	Carbon Disclosure Project
CoM	Covenant of Mayors
EIP	European Innovation Partnership
EEA	European Energy Award / Comune Clima
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre
MEI	Monitoring Emissions Inventory
NEEFE	National Electricity Emission Factor
NZC	Net Zero Cities
SECAP	Sustainable Energy and Climate Action Plan
ToC	Net Zero Cities Theory of Change
UN SDGs	Sustainable Development Goals of the United Nations

1 Introduction

The city of Florence is driven by a strong commitment to address the challenge of climate change, recognizing the urgency of acting to mitigate the effects and to become more and more resilient to its impacts in order to preserve territory and improve wellbeing of citizens.

EU FRAMEWORK

The EU framework has been evolving, setting more and more ambitious targets for urban context that have been identified as crucial for the mitigation of climate change since the [“EU 2020 package”](#), which was a set of laws passed to ensure the EU meets its climate and energy targets for the year 2020 cutting its greenhouse gas emissions by 20% compared to 1990, energy consumption by 20% compared to the trend scenario, and raising the share of renewable energy up to 20%.

To support of the Climate and Energy package, the EU has produced several policy papers with direct implications for national, regional and local legislation as the renewable energy directive and the energy performance of buildings directive.

In March 2011 the EU took one step further presenting to the EU Commission [“a roadmap for moving to a competitive low carbon economy in 2050”](#) looking beyond these 2020 objectives and setting out a plan to meet the long-term target of reducing domestic emissions by 80 to 95% by mid-century as agreed by European Heads of State and governments.

The Paris Agreement, adopted by 197 Parties at the [UN Climate Change Conference \(COP21\)](#) on 12 December 2015, entered into force on 4 November 2016: its overarching goal is to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. To limit global warming to 1.5°C, greenhouse gas emissions must peak before 2025 at the latest and decline 43% by 2030.

Conclusions on 2030 Climate and Energy Policy Framework, the European Council endorsed four main targets: 40% less greenhouse gas emissions by 2030 compared to 1990, at least 27% renewable energy consumption, a 27% energy efficiency increase, the completion of the internal energy market. On energy security, the European Council endorsed further measures to reduce the EU's energy dependence and increase the security of its electricity and gas supplies.

On 30 November 2016, the European Commission presented a package of measures to keep the European Union competitive as the clean energy transition changes global energy markets.

The proposals have three main goals: putting energy efficiency first; achieving global leadership in renewable energies and providing a fair deal for consumers.

Among the legislative acts that make up the package, we note the [EU Regulation No. 2018/1999](#) of the European Parliament and of the Council, on the 11 December 2018, on the governance of the Energy Union and Climate Action ensuring that the Energy Union achieves its objectives, in particular the targets of the 2030 policy framework for climate and energy and the Paris Agreement on climate change.

The binding target is the reduction of the GHG by at least 40% compared to 1990 levels by 2030.

Concerning RES, the share of energy from renewable sources in the gross final consumption of energy in Italy should not be less than 17%, already reached and exceeded (in 2017 was 18.3% already).

As regards energy efficiency, EU has set binding targets of reducing our energy consumption through improvements in energy efficiency by 2030 by at least 32.5%.

The European Commission published on 11 December 2019 a Communication setting out its so-called *'European Green Deal'* (EGD), a roadmap aimed at resetting the Commission's commitment to tackling climate and environmental-related challenges. It aims to boost the efficient use of resources by moving to a clean, circular economy and stop climate change, revert biodiversity loss and cut pollution. The Green Deal is also an integral part of the European Commission's strategy to implement the *United Nations' 2030 Agenda and the Sustainable Development Goals (SDGs)*, and the other priorities announced in the political guidelines put forward by the President of the European Commission.

On 4 March 2020, the European Commission adopted a legislative proposal for a climate law, setting the objective for the EU to become climate-neutral by 2050. On 17 September 2020, the Commission amended the proposal to introduce the updated 2030 climate target of a net reduction of at least 55 % of the EU's greenhouse gas (GHG) emissions compared to 1990 levels, and it was approved by the Council on the 20 December 2020.

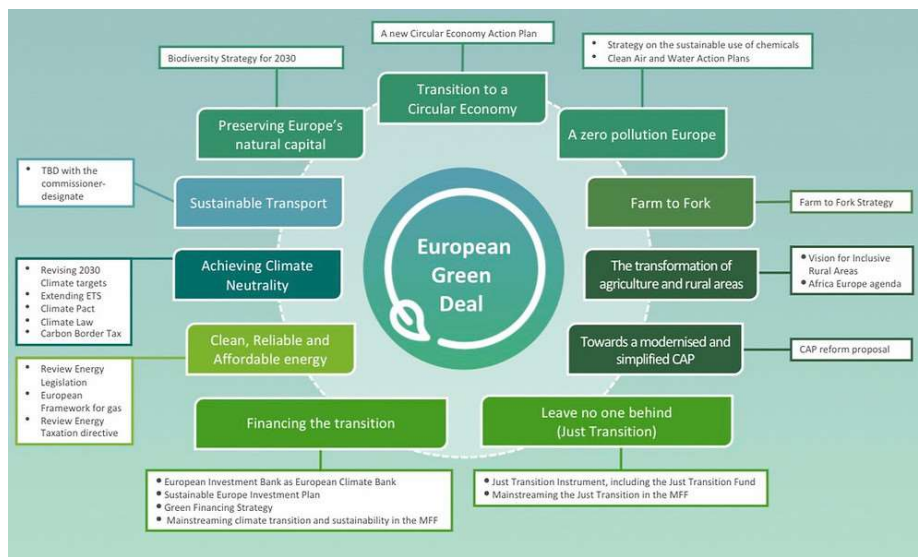


Figure 1 - The EU Green Deal

On 14 July 2021, the European Commission adopted *"Fit for 55"*, a set of policy proposals preparing the implementation of the EGD. In particular, Fit for 55 package aims to reduce greenhouse gas emissions (GHG) by at least 55 percent by 2030.

EU TARGETS BY 2030	EU TARGETS BY 2030 (Fit for 55)
GHG reduction by at least 55% compared to 1990 levels: European Climate Law	GHG reduction by at least 55% compared to 1990 levels: European Climate Law
The share of energy from renewable sources in the Union's gross final consumption of energy is at least 32 %: Directive EU 2018/2001	The share of energy from renewable sources in the Union's gross final consumption of energy is at least 40 %
Reduction of primary energy consumption of at least 32.5: Directive EU 2018/2002	Reduction of primary energy consumption of at least 36-39%

EU INITIATIVES FOR CITIES

Following the EU legislative framework, the *Covenant of Mayors* (CoM) was launched in 2008 in Europe with the ambition to gather local governments voluntarily committed to achieving and exceeding the EU climate and energy targets. In 2014, *Mayors Adapt* – the Covenant of Mayors Initiative on Climate Change Adaptation – was set up by the European Commission as one of the actions of the EU Adaptation Strategy to engage cities in taking action to adapt to climate change as

cities consume the vast majority of global energy and are therefore major contributors of greenhouse gas emissions.

In 2021, the EU launched the “*Missions*”, new ways to bring concrete solutions to some of the greatest challenges it’s facing to deliver concrete results on ambitious goals by 2030. Cities play a key role in achieving climate neutrality by 2050: they take up only 4% of the EU’s land area but host the 75% of the EU citizens. They also consume over 65% of the world’s energy and account more than 70% of global CO₂ emissions.

The so-called *Cities Mission* will involve local authorities, citizens, businesses, investors as well as regional and national authorities to deliver 100 climate-neutral and smart cities by 2030. Paving the way to climate neutrality by 2030, ensure that these cities act as experimentation and innovation hubs to enable all European cities to follow suit by 2050.

As foreseen in its implementation plan, the Cities Mission takes a cross-sectoral and demand-led approach, creating synergies between existing initiatives and basing its activities on the actual needs of cities.

The main tool of the Cities Mission is the «Climate City Contract » (CCC), which will help to define, through a participatory process with local stakeholder and the NZC support platform, the way to achieve climate neutrality by 2030 through actions and investments. Although it is not legally binding, the contract will set a clear strategy and a strong political commitment not only at EU level but also at local level engaging the citizens.

In April 2022 the 100 climate neutral forerunner cities have been selected: among them there are nine Italian municipalities including Florence (Bergamo, Bologna, Milano, Padova, Parma, Prato, Roma, Torino).

FLORENCE PATH AND STRATEGY

Florence’s path, aligned with EU evolving targets about climate and energy, can be summarised as follows:

- 2010 → with the resolution of the City Council n. 2010/C/00008, the municipality of *Florence joined the Covenant of Mayor* initiative, which involves European cities in order to implement significant mitigation activities to climate change by reducing the CO₂ emissions through energy efficiency and by increasing renewable energy sources at least 20% by 2020
- 2011 → with the resolution of the City Council n. 2011/C/00048, the municipality of Florence consequently *approved the Action Plan for Sustainable Energy (SEAP)*, the key document in which the signatories’ cities outlines how they intend to reach their commitment by 2020
- 2015 → with the resolution of the City Council n. 57/2015, the municipality of Florence *joined the Mayors Adapt and the Compact of Mayors initiatives*: the resulting “Global Covenant of Mayors for Climate and Energy” is the world’s largest movement for local climate and energy actions
- 2016 → with the resolution of the City Council n. 2017/C/00016, the municipality of Florence *joined the Covenant of Mayors for Climate & Energy* which aims to increase support for local activities, provide a platform for greater engagement and networking by cities, and raise public awareness about adaptation and mitigation and the measures needed
- 2018 → the municipality of Florence *joined the H2020 CoME EASY project as city ambassador*, in order to harmonize different existing initiatives such as the Covenant

- of Mayors, the European energy award, with the aim of facilitating their implementation at local level
- 2020 → since 2020, the city of Florence has gained the *A label in the CDP initiative* for its efforts in planning, implementing and monitoring adaptation and mitigation actions
 - 2021 → the municipality of Florence obtained the *European Energy Award Gold* recognition for the city's improvements in climate mitigation (after the silver one, in 2016)

the city approved the motion to update its Statute to include climate neutrality and the rights of new generations as guiding principle of its policies by establishing moreover a permanent climate assembly
 - 2022 → Florence has been selected among the 100 EU Climate Neutral Cities at 2030
 - 2023 → The city is selected as one of the 53 pilot cities as testbed for innovative approaches for climate neutrality



Figure 2 – Florence' path

The long history of Florence towards sustainability shows *a path which is not merely continuous, but it has also grown up together with the relation with its citizens which made it successful*: Florence has always had the ambition of playing an exemplar role for its territory, making, as forerunner, sustainable and innovative choices (about mobility, energy efficiency, social innovation and technology) and hoping to motivate the whole community and the neighbourhood. This synergic process together with the holistic and participated approach adopted in any strategic plan of the city, represented the motivation to candidate Florence experience in Europe as testbed with other fellow cities that are on the path to climate neutrality to bench-learn and grow together without reinventing the wheel. That's why Florence confirms its convinced participation to new EU targets, aware of the boundaries of a cultural heritage city.

Florence is then ethically committed to climate neutrality to save the planet, taking this issue as an opportunity to reshape its economy in a sort of New Green Renaissance.

Its targets are already in line with the Green Deal and based on the societal transformation started with the Smart City policies (prosperity, energy poverty, resilience, security and wellbeing) and extended to further topics (as adaptation, circular economy)

Integration of policies and actions has been relevant since the beginning to exploit synergies and resources. Florence strategy is based on cross-fertilization of actions and funds carrying out projects in different sectors with particular care to sustainability. The NextGenerationEU funding for example, recently boosted the green (and digital) transition: within 2023, the city has planned to invest more

than 100M€ within this “recovery plan” in a multi-fund approach (local, national and EU public and private funds).

The continuous pursuement of the city’s ambitious targets (through its SECAP deployment and improvement) is also linked to the EU programming period 2021-2027 and following, which will benefit from the present city contract fruitful implementation.

By joining the EU Mission, Florence aims to accelerate, anticipate and multiply its efforts towards becoming a climate-neutral and smart city by 2030. The city intends to achieve this ambitious goal, overcoming barriers and objective obstacles, through the implementation of a wide range of policies and initiatives in every relevant sector in close cooperation with stakeholders and always targeting citizens’ wellbeing putting people and its territory at the center with a holistic approach and vision in which no one (and no place) will be left behind.

2 Goal: Climate neutrality by 2030

Following its anthropocentric vision, Florence has adopted long ago an interdisciplinary, co-productive and integrated approach to strategic planning, convinced that only by capitalizing synergies between sectors, empowering stakeholders and engaging citizens, the city could really tackle the challenges.

Florence, as part of the 100 Mission Cities, is supporting and strengthening its strong climate commitment: the city approved the motion to update its Statute in 2021 by including climate neutrality and the rights of new generations as leading principle of its policies and by establishing a permanent climate assembly.

The systemic vision, the integrated planning as well as the social innovation have been crucial concepts since the elaboration of the Smart City Plan (“system thinking methodology” acquired during the FP7 STEEP project). This Master Plan acts as an “umbrella” and together with the SECAP are the guidelines for every planning tool.

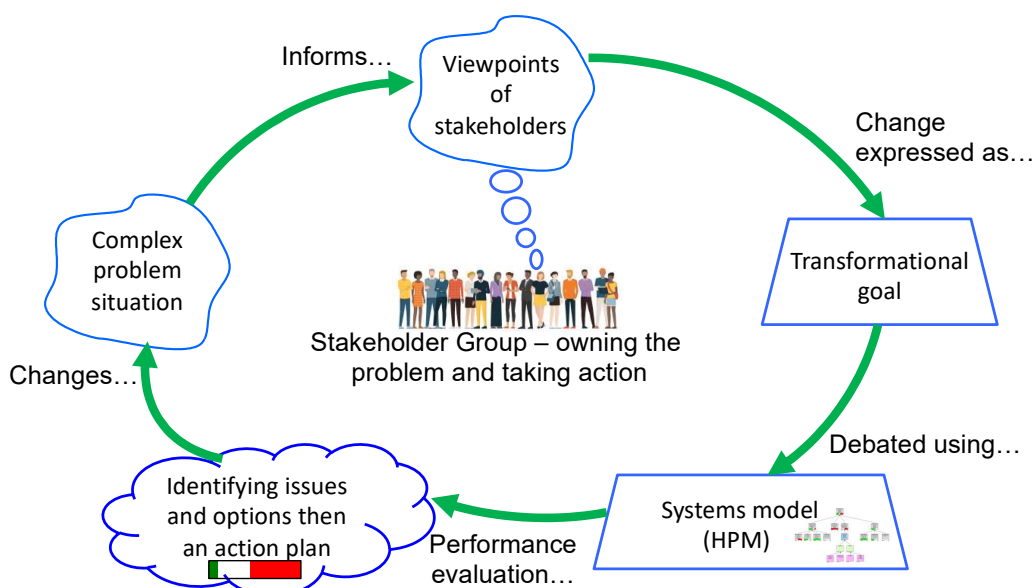


Figure 3 – The system thinking approach (STEAP project)

Florence's target vision is not merely related to innovation and technology, which are perceived as amazing "tools", but to a wider scope, in line with UN sustainable Goals, always focused on sustainability and wellbeing of citizens; this has been reflected in the decision making process, which is more and more co-created, and in the "smart prioritization" concept developed in H2020 – SCC1 REPLICATE project based on the assessment of all different direct impacts and indirect externalities (air quality and health, social inclusion, poverty, ...). The possible co-benefits play a role also in the business model of the actions exploiting synergies from different funding opportunities and represent important added values for communication and engagement campaigns.

This approach is perfectly in line with the ISO (adopted also by European Innovation Partnership) definition of Smart & Sustainable City: *"a city that increases the pace at which it provides social, economic and environmental sustainability outcomes and responds to challenges such as climate change, rapid population growth, and political and economic instability by fundamentally improving how it engages society, applies collaborative leadership methods, works across disciplines and city systems, and uses data information and modern technologies to deliver better services and quality of life to those in the city (residents, businesses, visitors), now and for the foreseeable future, without unfair disadvantage of others or degradation of the natural environment."*

The geographic boundaries considered for the Mission are the same in use for the CoM commitment: Florence intends to develop its strategy over its whole administrative area, spreading sustainability and innovation without distinction among the districts, but considering each specific context needs with the aim of scaling up best practices and models at metropolitan level.

To be consistent with the other plans, the CCC has been developed following CoM rules with some exclusions depending on municipal competences also established by national law.

With the SECAP development, both the BEI at 2005 and the MEIs have been updated to take into account the main Green House Gasses (CO₂ and also CH₄ and N₂O) through CO₂ equivalent calculations, more detailed and comprehensive; the emissions of water and waste management also outside the city's boundaries have been added, including some scope 3 calculations. Industrial processes are considered, while product use is not foreseen.

The city's policies have been regularly monitored and steered thanks to the Total Quality Management System in use, the European Energy Award, that has been adopted after the first SEAP and reached the Gold level in 2021.

Recently, through the evaluation of results at 2020 and the approval of the SECAP with the resolution n.2023/00014-00022DPC by the Council on the 8th of May 2023, Florence has paved the way towards sustainability: based on consistent data, considering all aspects impacting on its emission profile (Scope1 direct emission, 2 indirect emission and 3 emission outside boundaries for waste and water management), the city has adopted a path that empowered by the active participation of the whole city system can extend the actions already designed to maximise their impacts.

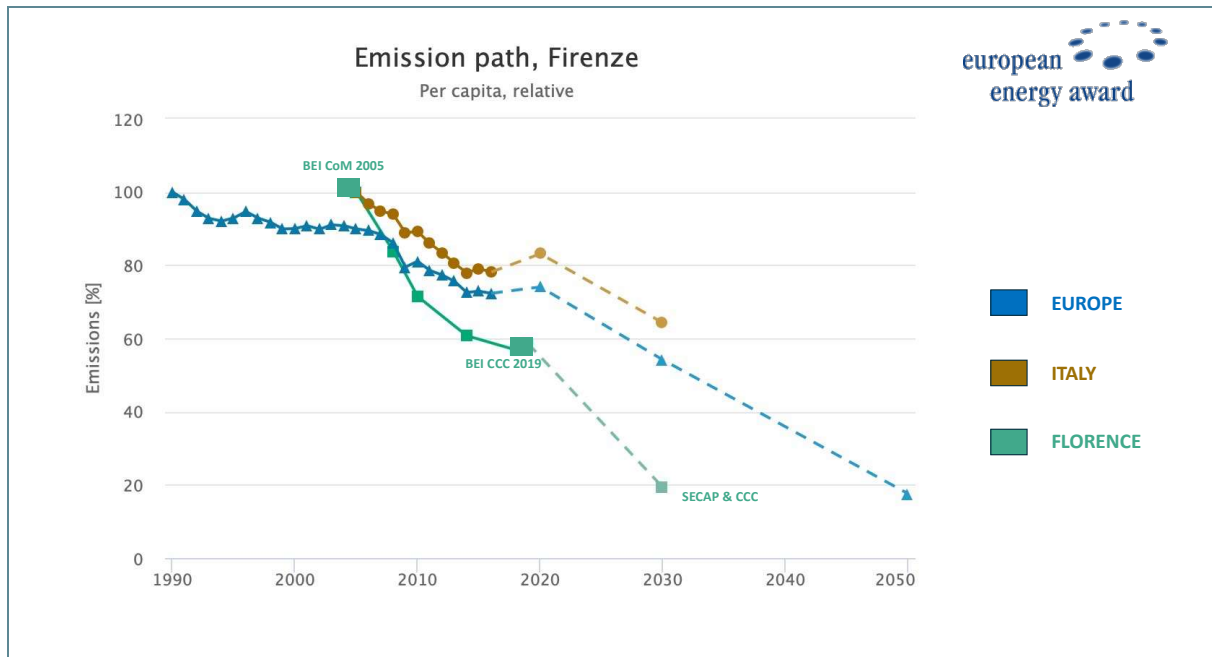


Figure 4 – Florence emission path 2005-2019 and projections 2030

By deploying these measures, Florence SECAP is expected to reach at least a reduction of -60% at 2030 and R&I actions impacts (not yet quantified) could even improve the target (hydrogen, ICT, other sustainable fuels...). The optimisation of the emission factor for electricity together with the green energy purchase and local increased carbon sinks will further contribute to the net-zero ambition.

The Secap fully pursues the forward-looking objectives outlined by the cities mission's vision, trying to implement into concrete actions the ambitious goals.

CLIMATE PLANNING PILLARS

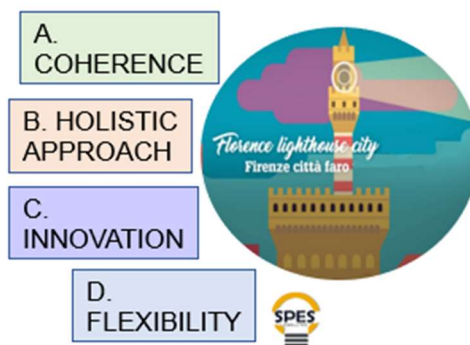


Figure 5 – Climate planning pillars, in use for Florence SECAP and CCC

The pillars of SECAP/NCZ strategy are:

- > the coherence with previous plans,
- > the integration of policies, through a holistic approach,
- > the innovation (in all the three main aspects: technological, social and financial) to optimise results and overcome barriers,
- > the flexibility to face new challenges.

3 Key priorities and strategic interventions

Florence is committed to reach climate neutrality by 2030, exceeding the target set by the European Commission (which means the reduction of 40-55% CO₂ compared to the 2005 baseline of the city), as well as to ensure the resilience of the territory to cope with climate changes.

During the last decade, and more in the aftermath of the Covid-19 pandemic, Florence has increased its engagement in the green transition, setting the framework for urban transformation in conjunction with national and regional institutions as well as all relevant stakeholders, inviting everyone on board in this ambitious and important journey. Thank to multilevel governance the digital and green transition is accelerating combining all the fund opportunities.

Florence 2030 strategy is aligned with the *main European objectives*, in particular:

- *a smarter city* through innovation and digitalisation
- *a greener & low carbon city* through investments in renewable energy, energy efficiency and circular economy to fight climate change.
- *a connected city* through investments in mobility and digital networks as instrument to increase social inclusion, territorial cohesion, liveability, and sustainability.
- *a city that cares about its inhabitants*, implementing measures against poverty and social exclusion. Energy transition can only be successful if all social implications are considered.

Since 2011, Florence has been deploying actions to boost and accelerate its path towards decarbonisation, collating all different available resources on sustainable projects.

The city is now managing the recovery funds, with more than 37% reserved for green actions. Moreover, thanks to the additional of the React-EU resources, the Italian government increased the NOP Metropolitan Cities 2014/2020 by over €1B and Florence has additional 80M€ of which 55% is located for the digital and green transformation, giving the city the opportunity to accelerate the path towards climate neutrality, focusing on efficiency of buildings, e-mobility, efficiency of the drinking & waste water distribution networks, strengthening digital infrastructure, improving green areas and urban forestry or even study innovative technological process.

Starting from the *transport sector*, which had the largest impact in the baseline and required substantial and integrated action to achieve a significant reduction of emissions and noise, the city is going to complete the actions started: in case of the tramline network, for example, three new lines are planned, thus covering the extra metropolitan area in order to reduce the use of the private vehicle for commuters. The investment for the completion of the whole tram network amounts over € 1 billion. The promotion of sustainable mobility considers e-mobility in all its forms, from public infrastructure improving the number of public sockets and fast recharge stations, to sharing services (e-bike, e-car, e-scooter), as well as public transport with an improved service, a renewed e-bus fleet and incentives for purchasing the travelcard for public transport. Interconnected bike lanes (Bicipolitana) are another measure which is improving more and more and extending its plans also outside city boundaries.

The challenge concerning existing *buildings* is quite crucial in Florence, due to its unique historical heritage. Since 2010, the urban planning focused on refurbishment and reuse of dismissed buildings to prevent soil consumption (Zero Volume Plan). The new Plan highlights the link with the SECAP and the related actions/targets. Hence Florence intends to attract virtuous real estate investors (Invest in Florence) by leading urban regeneration towards sustainability to fulfil the commitment. Thanks to REPLICATE project the city also collaborated with energy providers to deploy energy efficiency (Retrofitting of 300 social housing flats and innovative district heating with a seasonal solar thermal storage) and ICT solutions for energy management and users' awareness.

The Volume Zero Plan is helping to transform abandoned and unused structures, improving energy efficiency, creating new job opportunities, and developing innovative restoration techniques merging tradition with innovation. In the next three years, the city will boost the electrification of public buildings to play an exemplary role and in parallel it intends to facilitate the creation of renewable energy communities through available areas mapping and agreements with key stakeholders providing technical and legal support. Florence will foster the installation of PV panels also unblocking the regulations that binds most of the city areas.

If energy efficiency is the second pillar for a cultural heritage city such as Florence, the third is *green and blue infrastructures* both for its mitigation and adaptation potential. Water management is becoming more and more important to save resources (water and energy), provide renewable energy (mini-hydro), keep affordable tariffs and the city safe from floods. Together with the Region, the Metrocity and the water system operator Publiacqua, Florence is improving blue infrastructures and promoting sustainable behaviours through specific communication campaigns. The city has recently launched and near to adopt the first city Green Plan to maintain and improve, in close cooperation with private sector, its already impressive and various green stock (historical parks, green parks and urban forests, pocket gardens, green streets, green walls & roofs), enhancing wellbeing of citizens and decreasing soil temperatures.

Innovation is our way to reach targets in a difficult urban and historical environment: after the first Italian solar seasonal storage project, the ICT supporting implementations (Smart City Control Room, IoT, smart grid advanced control, ...) other new technologies are under analysis. For example, the consumption of fossil fuel in both transport and building sectors will benefit also from the promotion of more sustainable choices as advanced biofuels, SAF for aviation, e-fuels and hydrogen. The Smart City Control Room is the flag project for the unique co-existence of innovative technologies and approaches putting together all services and data providers (water, lighting, waste, transport, green, energy ...) for an efficient management and an enhanced resilience/adaptation of the city.

The city has decided since the beginning to focus on *vulnerable people, energy poverty and social inclusion* prioritising intervention in low income districts and social housing (advanced Xlam wood structure and high RES integration, smart metering with home devices and dedicated APPs, measures to mitigate discomfort during works like temporary housing, helpdesk, ...), providing advanced mobility services for vulnerable people, affordable public mobility, dedicated trainings on digital competences for elderly people and info-points for one-click access. Security and emergency issues, that have been especially targeted in the last pandemic years, can benefit from the support of intelligent infrastructures (data platforms supporting territorial management and APP development, smart lighting with surveillance systems, IoT, smart grid, ...), services (Energy demand management, sharing systems, e-mobility, ...) and information/engagement channels to prevent isolation.

Information and capacity building is another pillar of the strategy, to keep the engagement active, empower stakeholders and citizens, collect new ideas and provide feedbacks and updates about the achievements.

To put the strategy into practise, Florence intends to follow the Smart City Plan approach which has closely linked and interconnected all topics together in a unique vision towards sustainability and citizens' well-being.

4 Principles and process

The *co-creation and co-design* pathway of Florence has been implementing has been pivotal for the approval of major plans and strategic programs. Direct participation to decision making started with the town meetings in 2010 and constantly grew thanks to initiative as "one hundred places" (2011 and 2012) followed by the "listening marathons " (from 2015), until the three recent campaigns "Rinasce Firenze" for the post-pandemic recovery, "Firenze prossima" for the operational plan and "Firenze respira" for the green plan.

Both the SECAP and the Smart City Plan, already adopted, have been widely participated, engaging the main territorial stakeholders with system thinking techniques, citizens and city users in a public consultation process.

The *holistic and participatory vision*, together with the need of a wide set of skills, were the reasons for the formal set up since 2010 of the internal Working Group, which was at first dedicated to the CoM initiative and the monitoring of energy related actions (named "eea Energy Team") , then extended to all the activities related to sustainability, innovation/smart city and climate neutrality (actual "*Climate Task Force*") with an intersectoral and interdepartmental nature as specific feature.

The team is highly dynamic, adapting its configuration to different upcoming challenges (Smart City, SUMP, pandemic management and local recovery plan, ...). From time to time, in accordance with the specific agendas of different sessions, other divisions and stakeholders that are not official members but that are nevertheless directly affected by the issues and competent in matters of relevance are invited to participate in the sessions.

Facing new challenging and joining further initiatives, the group has already included new members to cover and integrate all relevant aspects. The team, in other words, has become a permanent "task force", flexible and active to support the upcoming needs of the city, ready to face any challenge, inviting when needed internal/external components contributing to the achievement of the objectives. It holds regular meetings to monitor activities, tune other plans under development, benchmark and exchange with other cities and initiatives.

The Climate Task Force interacts with the other "habitat teams" composed by specific stakeholders and citizens, managing an interactive and iterative exchanges. Each member of the internal steering group is responsible for one topic: the internal responsible coordinates the sub-groups and then reports the results to the steering group, following the "sense checking" method.,

The city, in accordance with the on-going activities of the Climate Task Force and thanks to the active support of the Mayor and the Deputy-mayors, intends to adopt a multi-level approach consisting in three steps aimed at reaching the wider possible participation.

01

Climate Task Force internal to the municipality and interdepartmental

02

Services: Publicacqua, Alia, Sifli, Casa Spa, others (Muse, etc)
 Other public authorities: Region (including health sector), Metro city...
 Research: UNIFI, CNR, eventual tech companies
 Active collaborations :specific projects/agreements

03

DSOs: rete elettrica, gas...
Transport & infrastructures: Mobility Managers working group, Logistic operators working group, Ferrovie, Autolinee Toscane, Aeroporto...
Financial institutions: Ente cassa, Fondazioni...
Big consumers: energy & mobility managers from industrial and tertiary sector

04

Commerce sector: Camera di commercio, HoReCa, Confesercenti, Confcommercio, tourism operators...
Buildong sector: builders, owners, tenants, building managers, designers associations...
NGOs: environment, mobility, social sector...
Citizens
City users

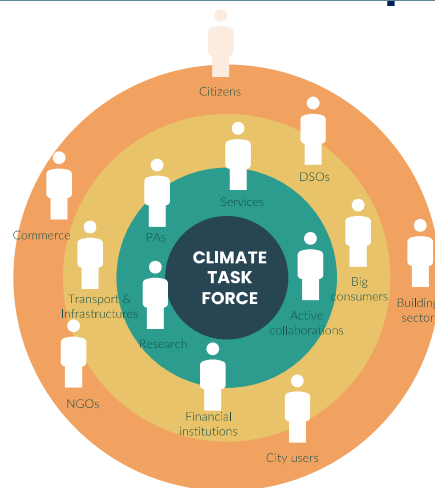


Figure 6 – The Stakeholders’ engagement map

At the beginning, the main public bodies (as the regional authority and metro city), the utilities managing public services (water, waste, public lighting and data, social housing, museums...) and the companies/research bodies already cooperating in working tables or innovation projects have been asked to represent the first group of stakeholders to start the present contract with.

Soon after all the stakeholders providing infrastructures (grid and transport), technology and financial support are asked to join the CCC together with the main consumers, from industrial and tertiary sector, not yet involved in the first stage. Then, Florence will widen its action field involving all stakeholders through relevant associations to co-create for each one a specific strategy and, thanks to the communication campaign under definition, citizens and city users, whose massive initiatives and behavioural changes could make the difference in terms of boosting the response to climate change.

The impacts of the extended set of measures will be continuously monitored in order to adapt the strategies, if and when needed.

Thus, the CCC will be updated yearly in an iterative process able to steer the alignment to climate neutral target including any additional or modified action and updated KPIs/inventories in line with the eea TQMS methodology in use.

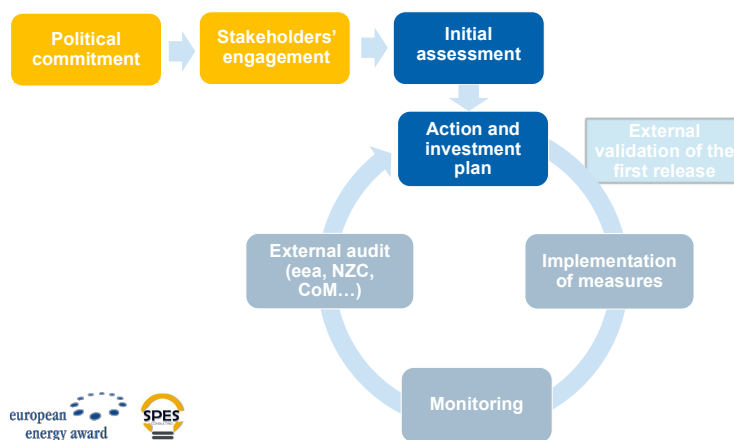


Figure 7 – Circular process of the different initiatives (SECAP and CCC) and standards (eea)

5 Signatories

Hereafter is reported the first list of signatories who are supporting the city in its path towards climate neutrality at 2030; their contribution is detailed in the specific annex. The list is open and will be updated together with the regular monitoring of the present CCC.

Name of the institution	Sector/Area	Legal form	Name of the responsible person	Position of the responsible person
Regione Toscana	Governance	Public Authority	Monia Monni	Councillor for the Environment
Città Metropolitana di Firenze	Governance	Public Authority	Giacomo Parenti	City Manager
UNIFI – University of Florence	Academia	Public body	Alessandra Petrucci	Rector
Alia Servizi Ambientali Spa	Integrated Waste Cycle management	Public company	Lorenzo Perra	Chairman of the board of directors
SILFI	Public lighting and ICT (smart services)	Public Company	Matteo Casanovi	President
PUBLIACQUA	Water management	Private company (with mixed public-private capital)	Nicola Pierini	President
Fondazione CR Firenze	Philanthropic / social interest	Non-profit organisation (foundation of banking origin)	Salvadori Luigi	President
THALES	Aeronautical and aerospace industry	Private company	Donato Amoroso	CEO & Country Director
El.en. S.p.A	Laser products	Private Company	Caterina Delibassis	Sustainability manager



Climate City Contract

2030 Climate Neutrality Commitments

Appendix to the Climate Neutrality Commitments of Florence



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- 6 Contract with signatures3

5 Signatories

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Name of the institution	Sector/Area	Legal form	Name of the responsible person	Position of the responsible person
Thales Italia SpA	Defence, security and aerospace industry	Private company	Donato Amoroso	CEO & Country Director
Città Metropolitana di Firenze	Governance	Public Authority	Giacomo Parenti	City Manager
Firenze SMART - SILFI SpA	Public lighting and ICT (smart services)	Public Company	Matteo Casanovi	President
UNIFI – University of Florence	Academia	Public body	Alessandra Petrucci	Rector
Sesa SpA	Technological Innovation and digital services	Private Company	Alessandro Fabbroni	CEO
Alia Servizi Ambientali SpA	Integrated Waste Cycle management	Public company	Lorenzo Perra	Chairman of the board of directors
PUBLIACQUA	Water management	Private company (with mixed public-private capital)	Nicola Pierini	President
Casa SpA	Social Housing	Joint-stock Company (with total public participation and public control)	Luca Talluri	President
Municipia SpA	Information technology	Private company (Engineering Group)	Stefano De Capitani	CEO
e-distribuzione	DSO	Private company (Enel group)	Enrica Sanguedolce	Head of Toscana-Umbria area (delegated to sign)
Fondazione Cassa di Riparmio Firenze	Finace	Philantropic fundation of banking origin	Luigi Salvadori	President

Short description of the stakeholder

Thales is a global leader in advanced technologies, investing in digital and “deep tech” innovations – connectivity, big data, artificial intelligence, cybersecurity and quantum computing – to build a confident future crucial for the development of our societies. The Group provides its customers – businesses, organisations and governments – in the defense, aeronautics, space, transport, and digital identity and security domains with solutions, services and products that help them fulfil their critical role, consideration for the individual being the driving force behind all decisions.

Strategy and policy at 2030

As part of its strategy towards 2030, Thales is going to play an even more important role in protecting our societies and their future. Our societies are going to have to deal with multiple threats in the coming years. At Thales it is both our privilege and our responsibility to be able to take action to protect them at all levels: to protect them against exceeding the planet’s limits, by helping reduce greenhouse gas emissions through the implementation of circular economy models, for example, and more frugal digital technology; to protect them by preventing and countering attacks on the physical and digital infrastructures they rely on; to protect them against the fear of technology – real or imagined – by strengthening our commitments in terms of ethical standards.

Supporting actions (2019-2030)

- sector:

- Energy systems
- Mobility & transport
- Waste & circular economy
- Green infrastructure, water & nature based solutions
- Buildings environment
- Information & communication
- Research

- description:

- **Mobility & transport:** in line with PSCL, Thales is implementing the following actions
 1. Participate to JoJob real time car pooling platform for the Firenze Metropolitan City area
 2. Micromobility recharging stations Thales Italia sites
 3. Intercompany shuttle: together with neighbour companies in the Osmannoro ecosystem, the project consists in the implementation a intercompany shuttle from T2 Guidoni tramway station to the companies’ sites premises
 4. Reduced CO2 emission company fleet
 5. Company agreements in favour of employees and their families to incentivize micromobility usage and public transport

Timing:

Analysis: 2022-2023



Planned for 2023-2024-2025

- **Waste & circular economy:**

1. Differentiated waste improvement internal campaign and challenge
2. Application of Lifecycle Perspective Assessment on all projects, product and solutions and Ecodesign
3. Contribution to Confindustria Firenze table on Sustainability
4. Participation to Scuola Superiore Sant'Anna (Pisa) Sustainability and Circularity study

Timing:

Analysis: 2023

Planned since 2023 with improvement on the methodology for LCA in 2024

- **Green infrastructure, water & nature based solutions:**

1. Re-lamping: substitution of florescent lamps with lower consumption led lights
2. Re-activation of water well and meteoric water storage for irrigation purpose
3. Implementation of Electric Meter with the scope of optimizing consumptions
4. Data Center cooling optimization with advanced temperature control
5. GREEN Thales Platform: global initiative to re-use obsolescent hardware for social and societal needs

Timing:

Analysis: 2023-2024

Planned since 2023 with further improvements on 2025

- **Building environment:**

1. Feasibility Study to move the Florence Thales site to a more sustainable and eco-designed building completely aligned to the Volume Zero plan of Florence City and with the public transport evolution of the wider metropolitan area
2. Alternatively: Self production of energy (i.e. photovoltaic panels) for fleet vehicles charging facilities and office use and installation of charging facilities in favour of the community in the private parking area

Timing:

Analysis: 2023-2024

Planned starting from 2025

- **Information & Communication:**

1. As founding members of ACSI (Associazione per la Cultura e lo Sviluppo Industriale) we are part of the project BiG Academy through which we support the growth of medium and small enterprises and their managers. Our top management, together with UNIFI Professors, teach young managers practices and processes typical of big size enterprises on topics such as circular economy, sustainability, ESG, cybersecurity.
2. As part of the Confindustria network, we regularly and actively participate in projects (such as round table on *Innovation and Sustainability*, series of meetings *Sostenibili davvero*) on the relation between industry and sustainability.

Timing:

Ongoing

- **Research:**

1. Analysis of potential research programs at regional, national or EU level -like for instance Horizon Europe- to be addressed together with Florence Municipality and other interested partners aimed to improve adoption of direct sustainability measures for mobility and other services
2. Address research programs together with Florence Municipality and other interested partners aimed to improve adoption of digitalization (and its cybersecurity) to foster optimization of operative processes and make them greener and more controllable

Timing:

Analysis: Since 2023, continuously

Planned first participations since 2023, continuous action

Ongoing: Joint participation to a proposal to be submitted in November 2023

- impacts:

All the initiatives are intended to reduce CO2 emissions on the different scope (1,2 and 3). In particular the micro-mobility and public transport incentives are expected to shift employees' behaviour toward a more sustainable commuting.

Other projects – as Re-lamping campaign – will contribute directly to Scope 2 CO2.

The optimization of waste management and lifecycle aims to reduce the waste intensity and increase the waste recycle (sorted waste and cradle to cradle approach for products).

Finally, Thales Italia ESG program includes an awareness campaign in line with group initiatives and format, for all the employees: we expect such cultural revolution will produce positive effects also outside the working activities perimeters.

Main Group Objectives to which Thales Italia shall comply:

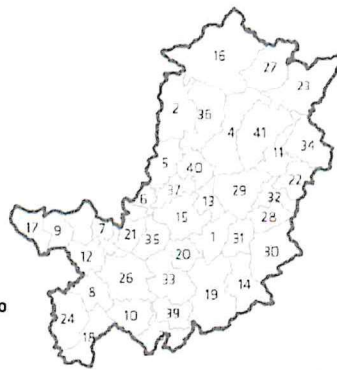
- over 80% of recycled waste in 2026
- Scope 1&2 CO2 reduction: - 50% in 2030 (vs 2018 baseline)
- Other CO2 emissions: -15% in 2030 (vs 2018 baseline)

METROPOLITAN CITY OF FLORENCE

Short description of the stakeholder

The Metropolitan City of Florence extends over an area of 3,500 km², with a population of just over one million inhabitants (1,007,252 residents for an average population density of 288.4 inh./km²). It is made of 41 municipalities.

- 1 - Bagno a Ripoli
- 2 - Barberino di Mugello
- 3 - Barberino Val d'Elsa
- 4 - Borgo San Lorenzo
- 5 - Calenzano
- 6 - Campi Bisenzio
- 7 - Capraia e Limite
- 8 - Castelfiorentino
- 9 - Cerreto Guidi
- 10 - Certaldo
- 11 - Dicomano
- 12 - Empoli
- 13 - Fiesole
- 14 - Figline e Incisa Valdarno
- 15 - Firenze
- 16 - Frenzuola
- 17 - Fucecchio
- 18 - Gambassi Terme
- 19 - Greve in Chianti
- 20 - Impruneta
- 21 - Lastra a Signa
- 22 - Londa
- 23 - Marradi
- 24 - Montalone
- 25 - Montelupo Fiorentino
- 26 - Montespertoli
- 27 - Palazzuolo sul Senio
- 28 - Pelago
- 29 - Pontassieve
- 30 - Reggello
- 31 - Rignano sull'Arno

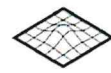


- 32 - Rufina
- 33 - San Casciano in Val di Pesa
- 34 - San Godenzo
- 35 - Scandicci
- 36 - Scarperia e San Piero
- 37 - Sesto Fiorentino
- 38 - Signa
- 39 - Tavarnelle Val di Pesa
- 40 - Vaglia
- 41 - Vicchio
- 42 - Vinci



RESIDENTI
1.007.252
(38% a Firenze)

DATA ISTITUZIONE:
8 Aprile 2014
OPERATIVA DAL:
1.1.2015



SUPERFICIE
3.500 kmq

CONFINI:
CM BOLOGNA
PROV. PRATO
PROV. AREZZO



26,8%
Montagna



68,7%
Collina



4,5%
Pianura

Densità abitativa
288,49 ab./kmq



21.731 euro
Reddito pro capite delle
famiglie consumatrici
(18.604 Toscana, 17.307 Italia)

71,1 tasso
occupazione
(68 Toscana, 59,8 Italia)

vocazione
alla bellezza
30% delle opere
d'arte più importanti
al mondo
(cfr. UNESCO)

vocazione
al volontariato:
1.287 volontari
su 10.000 abitanti;
66,8 istituzioni
no-profit su 10.000 ab.

vocazione al
territorio aperto
30% superficie
attività agricole
52% superficie
boschi

The strong attraction that the Metropolitan City of Florence exerts internationally is determined not only by factors related to artistic and cultural heritage, but also from a vital economy, in which companies strongly rooted in the territory operate and where the production is characterized by quality, excellence and – with increasingly widespread – from the ethics of processes and products: all winning added values, which these companies have been able to assume as a terrain to compete on global markets.

The sector of small and medium enterprises and crafts is also active, synthesis between the continuity of the local tradition, the search for innovation and maximum specialisation.

The Florentine Fashion Pole, home to important international brands, and the textile district of Prato, constitute an important resource for the local economy.

Strategy and policy at 2030

In terms of sustainability, the Metropolitan City has already taken the lead a series of activities to raise awareness of environmental issues and for the reduction of consumption, respect for animal life e energy efficiency.

In particular the Strategic Plan at 2030 and the Agenda 2030 about SDGs are the reference document for the transition towards sustainability. Among the competences of the Metropolitan city is the mobility planning of the area which has been developed in the Sustainable Urban Mobility Plan (2021) and Sustainable Urban Logistic Plan (SULP) with ambitious targets at 2030.

With the 2030 strategic plan, the Metropolitan City of Florence proposes a mid-term change to improve the quality of the life of all the inhabitants of the metropolitan territory, which can't prescind from the improvement of the environment and the climate mitigation and adaptation aspects.



RINASCIMENTO METROPOLITANO

VISION 1



STRATEGIE

- 1.1 MOBILITÀ MULTIMODALE
- 1.2 CITTÀ SENZIENTE
- 1.3 GOVERNANCE COOPERATIVA
- 1.4 COMUNITÀ INCLUSIVA

VISION 2



STRATEGIE

- 2.1 MANIFATTURA INNOVATIVA
- 2.2 FORMAZIONE INTRAPRENDENTE
- 2.3 RIUSO 100%
- 2.4 ATTRATTIVITÀ INTEGRATA

VISION 3



STRATEGIE

- 3.1 PAESAGGIO FRUIBILE
- 3.2 FILIERE IN RETE
- 3.3 AMBIENTE SICURO

The strategy includes the following aspects:

- multimodal mobility
- metropolitan platform
- integrated economic eco-systems

- zero emissions industry
- reuse of buildings and spaces

The metropolitan city of Florence has committed itself to defining its 2030 metropolitan agenda for sustainable development, to be able to guide strategies towards an increasingly sustainable development, based on the characteristics and priorities of the Florentine metropolitan area and "not leaving anyone behind", thus promoting a development process that involves the whole population, including the most vulnerable bands.

The pandemic emergency and the consequent social and economic crisis have made it possible to underline once again the importance of creating dynamic territories and have also highlighted aspects and critical issues of cities underestimated so far, such as the need for proximity services and the importance of greenery in urban contexts. The main targets connected with climate issue are:

- ⇒ Contrast housing poverty and encourage the quality of living
- ⇒ Enhance and safeguard the agricultural and natural territory
- ⇒ Promote circular economy practices and optimise water management
- ⇒ Improve climate mitigation and adaptation
- ⇒ Make mobility more sustainable, integrated and accessible

Supporting actions (2019-2030)

- sectors:

- Mobility & transport
- Buildings environment
- Information & communication
- Green & nature based solutions

- description:

1. Mobility: the area is characterised by a high number of vehicles per inhabitant. The strategy (included in the strategic plan, Agenda 2030 Objective 9, SUMP and Sulp) foresees an improved synergy among transportation modes, the promotion of car sharing and pooling, the creation of hubs and integration of infrastructures (train, tram, sharing, soft mobility...) and ticketing services. The info-mobility and sentient city control room will facilitate the integration and the promotion of the services.

2. *Sentient City Control Room*: The Sentient City Control Room project consists in the creation of a Metropolitan Big Data aggregator, with the ability to provide Sentient City services for analysis, to collect data integrated, to provide assistance to public and private metropolitan users (both citizens and companies) and decision-making support to operators. The aim is to monitor the state of the city and its services in the various domains, share information between the various operators, optimize the services themselves by reducing their costs and improve the reaction capacity of the city with respect to critical issues, to obtain better services and provide ready answers.

The Sentient City Control Room project goes beyond pure reconnaissance and aggregation of data, as its potential allow you to implement actions capable of: integrating data from the various sources; keep under control the state of the city and its services in real time, to improve the services themselves, reduce costs, in accordance with the concepts of smart cities; Understanding the behaviour of its users and companies in order to learn typical trends, identify dysfunctions, define and stimulate adjustments; Assisting the users of the city in the use of services and stimulating them towards "virtuous" behaviours that can benefit the quality of life according to the strategic lines of the city, provide prescriptions and suggestions and decision -making support.
3. *Fiber network*: The Metropolitan City has started a series of pilot interventions and projects aimed at reducing the digital gap and guaranteeing a fast connection throughout the territory through the implementation of the fiber optical network, the use of wireless technologies and the distribution of free wi-fi networks on a metropolitan scale.
4. *Buildings*: In the territory of the Metropolitan City of Florence, the surplus of the existing building stock, generated by sustained urbanization processes and fuelled by the economic crisis, represents a malleable material on which to trigger small and large-scale urban regeneration processes.

In particular, the brownfields, abandoned areas that housed industrial complexes and present problems of soil pollution, become strategic for any urban regeneration process. The Metro city of Florence, in order to outline and quantify the phenomenon of abandonment in the area subway, draws up a mapping project for brownfields and abandoned areas in general and underused. Mapping is a constantly updated cognitive and analytical tool which allows, on the one hand, to present a composite picture of the phenomenon, on the other to offer detailed information for individual areas so that these can be evaluated with respect to the strategic vision aimed at urban and territorial regeneration.

Buildings retrofitting will be promoted, starting form public buildings stocks and social housing, as well as renewable energy production (Agenda 2030, objective 3 and 6)
5. *Industrial sector*: The Metropolitan City of Florence promotes investments that have a positive impact in terms of social and environmental sustainability.

The World Bank has experimented with the tool of "Green Bonds" to encourage investors to focus on sustainable projects and technologies. In fact, green bonds are bonds intended for projects that respect the environment. In line with these international initiatives, the Metropolitan City promotes initiatives for the issue

of "Green bonds" to encourage the use of renewable energy in the industrial sector. Precisely in this sector, in fact, high energy consumption limits the use of renewable sources and require large initial investments. Through investments derived from "green bonds" it is possible to finance the conversion and construction of industrial plants that they use renewable energies, pursuing the goal of Industry with low or zero emissions.

The strategic objective is to operate to reduce polluting emissions by promoting this way a more innovative and safer metropolitan area. The integration of marketing actions territorial and reduction of local pollution can lead to the development of a specific territorial brand (e.g. green lily).

6. Governance: Finally, the metropolitan city guides the creation of a network of relationships both in a "horizontal" sense, or between the municipalities, in the perspective to make the different territories more interdependent and encourage the homogeneous development of all areas, both in the sense "Vertical", especially towards the neighbouring provinces and of the Region, creating channels of cooperating dialogue on an administrative level otherwise absent. The Metropolitan City of Florence established the "Easy Metrocity" table, a metropolitan Authority on the simplicity and efficiency of the administration that operates as a control room for the integrated management of the functions of the metropolitan municipalities.
7. Urban green and food: as set in the objective 4 of the Agenda 2030, the metro city will promote sustainable forestry and green management and the local supply chains for food and agricultural productions. 48 Markets of farmers and sales points of agricultural cooperatives were activated, also called "short supply chain" or zero km, distributed over 22 municipalities in the metropolitan area, and over 90 solidarity purchasing groups.
8. Waste and water management (Agenda 2030 objective 5): the aim is to promote circular economy, with an integration of policies, replication of best practices and research & development activities. In parallel, high percentages of differentiated waste collection and decreased amount of urban waste per capita are pursued. Measures to decrease water losses in the pipes network will be implemented and sustainable use of drinking water promoted, also through free public distribution points (so called "fontanelli"). The waste water treatment system will target higher and higher performances and food waste discouraged.
9. Education, communication and research: Promoting a "civic sense" about sustainable development is the first tool identified in the Agenda 2030, which means educate, increase responsibility and care about public and common assets. Research and innovation activities are the second tool prioritised to identify and test innovative technologies and social approaches to overcome actual barriers.

The national recovery and resilience plan has assigned to the metropolitan city of Florence resources for soft mobility (National Cycle Plan), integrated urban regeneration plans focussed on sport and culture more than 150M€.

- timing:



☒ on going: from 2020

- impacts:

- energy savings and renewable energy production;
- digitalisation of services, advanced urban management and data availability;
- sustainable mobility and logistics (expected KPIs included in SUMP and Sulp);
- efficient water management
- circular economy
- green areas sustainable management and improvement and local food supply chains
- governance coordination both at vertical and horizontal level

SILFI Spa – FIRENZE SMART

Short description of the stakeholder

SILFI Spa is an "in house" company with entirely public capital which provides for the provision of plant engineering, IT and information services and is owned by almost all of the Municipalities that are part of the Metropolitan City of Florence.

SILFI Spa was born on 24 December 1984 as a mixed public/private company between the Municipality of Florence (30%) and the Piero Branzanti company of Ravenna (70%) and since 1 June 1986 it has been in charge of managing public lighting in the city, a task which - over the years - has also been joined by that of managing traffic lights, the Urban Traffic Controller, variable message panels, charging stations for electric vehicles, traffic lights at ZTL gates, the fiber network optics and video surveillance cameras.

From March 2016 SILFI Spa becomes an "in house" company wholly owned by the Municipality of Florence.

From May 2019 SILFI Spa incorporates, following a merger operation, LINEA COMUNE Spa, the "in house" company that deals with IT services, 055055 and Firenze Card, expanding its company to 9 new public shareholders in addition to the Municipality of Florence.

From September 2021 SILFI Spa acquires the entire activity carried out by FLORENCE MULTIMEDIA Srl, the "in house" company of the Metropolitan City of Florence that deals with infomobility, communication and institutional information.



“Firenze Smart” is the logo under which SILFI Spa provides services to citizens.

Strategy and policy at 2030

The integrated management of innovative public services today entrusted to SILFI Spa will allow - thanks to the savings given by centralized management and economies of scale - to make greater investments in technological innovation and communication to and from citizens as well as to participate as a protagonist in the process for smart urban management at municipal and metropolitan level.

Best practices will be promoted in the metropolitan area for replication.

Supporting actions (2019-2030)

- sector:

- Mobility & transport
- Buildings environment
- Information & communication

- description:

1. **Public lighting**: city lighting is increasingly an element of safety, improves the use of urban spaces at night, allows you to combine work and leisure.
Firenze Smart deals with the management of the public lighting service in the city of Florence, guaranteeing a continuous evolution of the lighting systems to maintain a high standard of quality and performance.
In the framework of PON METRO program, SILFI managed the “Firenze cambia luce” project to update most of the infrastructure in the city, making it more efficient and allowing advanced services (pilot action in Replicate project with WIFI, sensors and videocameras). The management system is in charge of the society who is leading the energy efficiency system in public lighting.
Specific intervention features refer to street lighting systems, characterized by careful assessments ranging from respect for the characteristics of the building, to road needs, to environmental constraints, up to the specific needs of the individual citizen affected by the installation.
In this context, the objectives we want to pursue are ambitious and go beyond the simple replacement of existing systems, placing furnishing needs at the center of the lighting solutions without neglecting efficiency and management effectiveness. The solutions adopted in recent years have been the result of a research process and technical evaluation of a constantly evolving technology, with great potential for the future of the public lighting service and for integration with other value-added services.
SILFI also deals with monumental lighting, intending to enhance the artistic heritage with high standards of sustainability, and with lighting during events, which will be increasingly green.
2. **Mobility services**: urban mobility, with the growth of city traffic, could no longer be conceived without the technological and functional aid that traffic light regulation systems and other management and information installations offer.
Firenze Smart takes care of the maintenance of the entire traffic light network, the variable messaging systems and the charging stations for electric vehicles in the Municipality of Florence every day.
The aim is to make the traffic more fluent, thanks also to the information services, the traffic lighting system more and more efficient and the electric public charging infrastructure capillary in all districts and always updated (SILFI is actually managing more than 200 charging stations).

The info mobility and videosurveillance control system to the LTZ will play an important role in the sustainable mobility policy of Florence in the next years, considering the “green shield” eco-roadpricing action just started by the municipality.

3. Optic fiber and video-surveillance: the coverage of the network will be more and more improved and guaranteed.
4. Smart City Control Room and Territorial information system: SILFI is supporting the municipality of Florence in the upgrade of its Smart City Control Room, an advanced urban management tool where several stakeholders are exchanging real time information and plans following the “Digital Manifesto” agreement. The Territorial Information System (GIS) is a tool for organizing spatial data, which allows you to associate various types of data (e.g. socio-economic, statistical, cadastral, environmental) to the geographical reference bases (e.g. maps, aerial photos, satellite images) different kind of data (socio-economic, statistics, environmental, built urban stock...). The service has wide extension potential to various applications connected with sustainable development and urban planning. SILFI will support the municipality in adopting advanced solutions for GIS data management.

- timing:

on going: from 2019

- impacts:

- energy savings (lighting system and e-mobility charging infrastructure);
- digitalisation of services, advanced urban management and data availability (Smart City Control Room, GIS...);
- improved efficiency of traffic management system (infotraffic, traffic lights, LTZ panels, ...);

Hereafter some indicators about last years results:

- ⇒ with the replacement of 85% of Florentine public lighting (48,500 light points) and 100% of traffic lights (3,900 lanterns) with LED lights, energy consumption was reduced by 40%, bringing the city's electricity bill from 5 to 3 million euros/year;
- ⇒ the metropolitan call center 055055, which serves a population of around 500,000 users, managed 455,194 contacts in 2020, achieving over 85% approval;
- ⇒ the 300 online services managed by Firenze Smart for the metropolitan municipalities managed over 300 thousand PagoPA transactions for a transaction amounting to around 30 million euro;
- ⇒ in 2020, 9,000 real-time bulletins on infomobility were broadcast by television, radio and local social networks, updated every 30 minutes;
- ⇒ the functioning of the 1,350 video surveillance cameras is guaranteed every day, served by over 300 km of proprietary optical fiber;

⇒ the energy efficiency measures carried out on lighting and traffic lights, together with the contribution given by the more than 200 charging stations for electric vehicles, allowed for a reduction of 3,500 tons of CO₂ in 2020

Università degli Studi di Firenze

Short description of the stakeholder

The University of Florence is one of the largest organizations for research and higher education in Italy; it has branches in various parts of the city and even beyond the urban area, with the establishment in Sesto Fiorentino and decentralized branches in Empoli, Calenzano, Prato and Pistoia. The University integrates its missions with the activities of the Careggi and Meyer (children's) hospitals.

The University of Florence is composed of : 21 Departments, 10 Schools, 10 Area-Centers, 21 Service Centers, 20 Research Centers, 52 Internuniversity Centers, 1 Library System and 1 Museum System.

The staff is distributed as follows (data as of 12/31/2022): 1,796 faculty members (Full, Associate, Assistant professors), 70 Language Experts and 1,436 administrative staff, 1.726 PhD students and post doc.

The Educational Offerings for A.Y. 2023/2024 are as follows: 71 Bachelor's and Single-Cycle Degree Courses, 74 Master's Degree Courses, 58 Graduate Schools, 45 Postgraduate Courses, 26 Doctoral programs, and 12 Professional Development Courses.

Strategy and policy at 2030

The University of Florence aims to consolidate its dimension as an University of excellence with high national and international standing in missions and areas of focus such as:

formation of competent and responsible citizens, valuing teaching to respond to the new challenges of society, work, and technology.

development of high-quality international research to respond to new global challenges and to contribute to the growth of the territory and impact on civil society by dialoguing with institutions and businesses, promoting scientific dissemination and cultural initiatives.

development of welfare and democracy through the transfer of research results and by fostering a collaborative environment, open to dialogue, inclusive, and attentive to promoting personal and professional growth; - strengthening the University's inclusion policies by fostering sustainable growth in line with the development strategy expressed in the UN 2030 Agenda, the priorities of the EU Cohesion Policy 2021-2027, and the strategic lines of the PNRR.

Supporting actions (2019-2030)

- sector:

X Energy systems

- description:



The University of Florence, aware of the importance of the theme of energy sustainability, has set up a University Working Group on Energy Saving. The University of Florence receives electricity from 88 delivery points, of which 22 in Medium Voltage and 66 in Low Voltage, located throughout the city, for an annual energy consumption of 34'210 MWh/y

In the coming years, the Working Group will focus on:

Analysis and monitoring of electricity consumption by reading the needs related to the monitored delivery points and periodic summary.

-timing:

X On going: January 2023 – December 2024

-indirect impact:

Awareness, evaluation of potential savings by the reduction of the opening of some buildings in specific periods. The information derived from the reading of consumption will allow to promote a useful exchange to the implementation of actions for the reduction of energy waste, also with the support of technical services.

Technical support to the administrative staff of the University on energy expenditure issues.

-timing:

X On going: January 2023 – December 2024

-impact:

Economic

Detailed measurements of some components of particularly energy-intensive buildings.

-timing:

X On going: June 2023 – December 2024

-impact:

Awareness, incorrect set points are identified.

Consolidation of the detailed monitoring of electrical consumption in the buildings.



-timing:

X On going: June 2023 – December 2024

--impact:

Awareness

Evaluation of the construction of a photovoltaic plant, and realization of a detailed monitoring of the electricity generated and reporting of the impact in terms of lower energy usage for the University.

-timing:

X On going: January 2024 – December 2024

--impact:

renewable production

Analysis of Building Automation and lighting solutions (lighting fixtures) in other university sites, in addition to the solutions already implemented.

-timing:

X On going: January 2024 – December 2024

- sector:

X Mobility & transport

-description

The University of Florence promotes sustainable mobility to make the city more liveable and reduce the negative impacts of urban mobility on the environment and climate.

Although this is an area in which the University can only act indirectly, the organization of urban transport has a strong impact on university activities; nevertheless, the organization of university activities significantly affects the demand for mobility in the Florence area, given the high number of people overall involved in the various fields - education, research and "third mission"- and related services and the spread of its locations in the city and metropolitan area.

Based on 2022 figures, in addition to the personnel already described in the premises, the university community includes 54,364 enrolled students, as well as adjunct and visiting professors, and the external staff of its 54 university spin-offs, and service workers (janitorial, cleaning, etc.). Altogether, this is more than 60,000 people, a number that is equivalent to about 16 percent of the resident population of the City of Florence.



The University can affect the mobility demand of staff and students (e.g., internal travel between its campus) and guide their modal choices by means of mobility management measures.

Moreover, it interacts as a stakeholder with institutions and providers to ensure that urban, metropolitan, and regional transportation meets the needs of the university community.

Finally, with its research units, the University of Florence is also involved in projects and initiatives aimed at promoting sustainable mobility (models, plans and programs, innovative technologies and services, etc.), in partnership with public authorities and other scientific institutions⁴.

The role of Mobility manager is carried out by the Rector's Delegate for Sustainable Mobility Initiatives, who reports to the Pro-Rector for Technology Transfer, Cultural Activities and Social Impact, and acts in collaboration with the General Management and the Green Office.

-timing:

X On going: 2023/2026

--impact

Significant direct impacts in terms of reduced CO₂ emissions can be achieved, in particular, by measures related to smart working, the split towards alternative modes to individual motor vehicles (incl. public transport, carpooling, sharing mobility, and active mobility), and the spread of electric motors. An assessment of these impacts will be made during the implementation and monitoring of the planned measures, taking into account the climate neutrality goals pursued by the Net-Zero Cities program.

Indirect contributions may be achieved through the awareness actions also carried out in the field of sustainable mobility by the Green Office of the University of Florence.

- sector:

X Waste & circular economy

-description

Waste that originates from activities carried out in classrooms, studios, offices and laboratories where no hazardous substances are present is assimilated to municipal waste.

The university carries out the appropriate separate collections, especially for plastic and paper. Analyses and evaluations are underway with respect to the development of sorting.

Waste generated in laboratories where hazardous substances are present, on the other hand (e.g., chemistry, biology, medicine, physics, agriculture, engineering laboratories, etc.) and WEEE (waste from electrical and electronic equipment) are not assimilated to municipal waste and must be delivered to an authorized company.

-timing:

X On going from 2023



--impact

The University of Florence has always been committed to proven actions that can contribute to the goal of circular economy, also according to the guidelines of the European Parliament, it focuses on prevention, reuse and recycling in order to subtract products from disposal, those that, for example, due to obsolescence and other assimilable causes, may be subject to disposal to third parties according to the procedures provided by the appropriate legislation on public accounting (think for example of furniture components, electronic equipment no longer functional, motor vehicles, etc)

- sector:

X Green infrastructure, water & nature-based solutions

Construction of works for the hydraulic safety - lamination tanks - of the Campus of Sesto Fiorentino

-description:

From the assessment of the risk determined by the current conditions of the network of drainage canals, within whose areas a part of the Sesto Fiorentino Campus falls, these works are aimed at securing the settlement.

Therefore, an expansion tank has been designed in the hydraulic left side of the Cinta Canal. Environmental mitigation measures have been planned with greening of the work through grassing of the embankment embankments and planting of trees arranged in the northern part of the till trying to recreate a landscape backdrop of fluvial relevance within a wetland area. The project aims to make the work as compatible as possible with the presence of on-site wildlife species. The fill area to the north of the till, in the area closest to the university settlement, will allow its future use for possible completion work that may be directed toward naturalization of the environment or harmonization with the urban mesh of the Campus.

-timing:

X Planned- 2024

--impact

With the construction of the new basin, there will certainly be a reduction in the risks of flooding and overflowing of the settlement and surrounding urbanized areas, while the mitigation works will improve green areas with new plantings and impacts on wildlife.

Construction of the New Bicycle Path and Adjustment of the Roadway at the Campus of Sesto Fiorentino

-description:

Within the Urban Implementation Plan of the Municipality of Sesto Fiorentino, now in force, it was agreed between the University and the Municipality to replace the peripheral route of the bike path with a central route in frieze of the Via della Lastruccia - Via Madonna del Piano axis, thus in a central position at the Campus.

In the agreement between the University and the Municipality, it was therefore established:

- the normative and functional adaptation of the existing road system;
- the construction of the bicycle path in the new central route.

-timing:

X Planned- 2024

--impact

With the construction of the new track, there will certainly be a reduction in CO2 emissions, with an indirect impact also on the behaviour of students and users who will sustainably reach the Sesto Fiorentino University Campus.

- sector:

X Buildings environment

Construction of new classrooms at the Sesto Fiorentino Campus.

-description:

The intervention consists of the construction of new classrooms at the University Campus of Sesto Fiorentino. The newly constructed building is located in a vacant area located to the west, on the side facing Via Edoardo Detti, in the plot of land identified in the Detailed Plan insisting on the campus area as plot number 14. The design of the building, and in particular that of the building envelope and systems, is oriented to the maximum energy containment and the minimization of impacts with respect to environmental pollution, the improvement of conditions of safety, well-being and environmental compatibility, the optimization of the operation and maintenance of the building, and the rational use of energy through BACS systems, also for the purpose of configuring itself as an NZEB building. The project also includes the implementation of systems aimed at saving water.

-timing:

X Ongoing - 2023

--impact:

Direct impacts: significant reduction in emissions and energy consumption due to high energy production from renewable sources and high energy performance of the building.

Indirect impacts: improved learning environment and student behaviour

Design of the new Agriculture school settlement at the Sesto Fiorentino Campus

-description:

The intervention involves the construction of seven functionally distinct but interconnected buildings and an area to be used as a parking lot for the new settlement intended for the Department and School of Agriculture, in the area identified as P19 within Plot No. 11 of the Sesto Fiorentino Campus Detailed Plan.

The project has been developed according to the requirements of LEED (Leadership in Energy and Environmental Design) certification and conforms to the LEED® BD+C v.4 for New Construction (Campus Program - Group Approach) standard, thus oriented to maximum energy containment and environmental sustainability.

A major photovoltaic system will be installed on the roofs of the buildings and on an area designated for car parking.

Energy needs not covered by renewable energy systems will be provided by alternative high-efficiency systems (high-efficiency cogeneration/trigeneration, centralized heat pumps, etc.).

The project also includes the implementation of water-saving and water-recovery systems.

-timing:

X Ongoing –from 2023

--impact:

Direct impacts: significant reduction in emissions and energy consumption due to high energy production from renewable sources and high energy performance of the building.

Indirect impacts: optimization of mobility, improvement of teaching and working environments.

The following describes interventions planned in the project that have been submitted to a MUR call for co-financing, which will be implemented if co-financed.

Construction of the New Teaching Complex at the Careggi Campus in Florence, Italy

-description:

The New Teaching Complex project at the Careggi Campus envisages a total area of about 8,500 square meters, for four above-ground floors each of about 2,120 square meters, in addition to a technology hub intended for facilities of about 350 square meters, and outdoor parking areas of 3,400 square meters.

The intervention includes alignment with the most current energy efficiency standards, the use of environmentally friendly materials and the production of energy from renewable sources, integrating with the already active trigeneration system that promotes a rational use of energy vectors.

-timing:



X Ongoing –from 2024

--impact

Direct impacts: reduction in energy consumption and emissions.

Indirect impacts: significant reduction in impacts on student travel, improved learning environment and student behaviour.

Construction of new classrooms for the University of Florence at the Sesto Fiorentino Campus

-description:

The intervention consists of the construction of new classrooms for the University of Florence with the aim of creating environments based on the concept of global learning.

The complex is developed on an almost rectangular plan, with four large university classrooms, three of which are about 200 square meters with a capacity of 134 classroom seats and one of 108 classroom seats, as well as 2 study rooms and office spaces and meeting and service rooms.

The planned building will be NZEB, thus aiming for energy efficiency and environmental sustainability, and equipped with building automation-oriented technological systems.

-timing:

X Ongoing –from 2024

--impact

Direct impacts: reduction of emissions due to NZEB features, automated room management and use of renewable energy.

Indirect impacts: improved learning environment and student behaviour.

Redevelopment and adaptation of the Santa Marta Complex in Florence.

-description:

The complex houses the departments and the School of Engineering and is located on the hill of Montughi in the municipality of Florence. The complex is surrounded by a large pertinent park with areas designated for greenery and parking, resulting in overall isolation from the surrounding built environment.

The extraordinary maintenance work to be carried out on the property includes: the upgrading of the facades, the replacement of window and door frames, and the installation of refrigeration units for air conditioning the building.

The intervention is designed with environmental sustainability and environmental comfort purposes in mind. During operation, not only does it not significantly affect the main environmental components, but it triggers a process of revalorization and regeneration of the surrounding environment with particular reference to the neighbouring public spaces, placing itself at the centre of public life as an active place of sociability, capable of bringing real benefit to the life of the community.



The installation of the refrigeration machines represents the most environmentally critical element, as they are large in size and impact the landscape. To reduce visual effects, as well as to dampen noise emissions from the machines, a fence covered with a "synthetic hedge" type cloth and a second tree barrier consisting of Platanor Vallis Clausa is planned.

-timing:

X Ongoing –from 2024

--impact

With the implementation of the intervention, there will be a reduction in current energy consumption and an increase in greenery with plantings of large trees capable of absorbing large amounts of CO₂.

Construction of the Modular Structure for Cetest and Crist at the Sesto Fiorentino Campus

-description

The technical and economic feasibility project concerns the construction of a new building for the CeTeCS and CRIST laboratories of the University of Florence, in the area of the Scientific and Technological Campus of Sesto Fiorentino, aimed at making up for the current shortage of space for research and teaching.

The intervention is designed with environmental sustainability and comfort in mind as it is NZEB and complies with the Minimum Environmental Criteria.

The 'building envelope has low heat loss, the air conditioning system with heat pump system is energy efficient and combined with a photovoltaic system to make the building completely autonomous. The electrical and special plant architecture will be of the BEMS (Building and Energy Management System) type.

-timing:

X Ongoing –from 2024

--impact:

With the implementation of the intervention there will be a strong containment of energy consumption and a reduction of current energy consumption

Expansion of the RISE B Complex at the Sesto Fiorentino Campus

-description

The intervention involves the expansion of the RISE B building, in a space adjacent to the main building. The existing building was completed in 2016 and is located in block No. 11 of the Detailed Plan, in the vicinity of the "industrial incubator, research centers and heavy laboratories" building.

The use of the X-LAM structural and technological wood system promotes respect for environmental sustainability, the guarantee of high energy performance and at the same time rapid execution. The building is compatible with possible future expansions, and the roof houses a photovoltaic system.

-timing:

X Ongoing –from 2024/2025

--impact:

Direct impacts: reduction of emissions and energy consumption due to high energy performance and production facilities from renewable sources.

Indirect impacts: high qualification of working environments and teaching laboratories.

- sector:

X Information & communication

-description

The University of Florence uses its Green Office for information, awareness and involvement actions of the academic community for everything related to sustainability. It also collects data for the compilation of international rankings, monitors the projects in which it is involved, and coordinates the executive aspects in the various areas of sustainability such as energy saving and energy production, waste management and reduction, rational use of water and other material resources; agricultural and green management; urban mobility and other actions of the University of Florence in the field involving research, education and active citizenship so as to bring sustainability from theory to practice and encourage the adoption of good practices. Finally, it participates in the drafting of the University's Sustainability Report, maintains and updates the Ateneosostenibile website and Facebook page, and organizes training courses on sustainability for technical administrative and teaching staff.

-timing:

X Ongoing – Strategic Plan 2022-2024 and Integrated Plan of Activities and Organization (PIAO) 2023-2025

--impact:

The impact generated within the University is not directly measurable, but it can be said that any initiative, event, concrete action, is perceived by students, technical administrative staff and teaching staff. The adoption of good practices in the daily conduct of study and work in such a large number of individuals (the academic community consists of more than 60,000 people), greatly affects the improvement of the environmental performance of the University of Florence.

The Green Office for example, but likewise other services that carry out public engagement activities, has adopted a policy of promoting its initiatives by eliminating the use of paper materials. Information, before and during the course of events, is through the use of digital tools (e.g., reading QR codes with a cell phone that links to online pages where the necessary details are published).

The sites (Unifi, Athensosustainable, Museum System...) have also been created taking into account certain arrangements:



- 1) that users are able to find the content they are looking for as efficiently as possible, thus avoiding unnecessary page loads and associated traffic;
- 2) that the size of images, materials and videos, are optimized as much as possible as well as their loading, thus leading to a significant reduction in the resource requirements needed to display formats or media that are too heavy.

The improvement of green performance of sites is still ongoing. Another area of focus for the purpose of reducing the environmental impact in information dissemination is institutional communication. Internet research has found that email correspondence generates CO₂ (a standard email comes to 4 g CO₂e while one containing attachment can weigh up to 50 g CO₂e) and, according to some estimates, an average user receives about 3,000 unwanted emails each year, responsible for 12 kg CO₂e. It has been possible to reduce the sending (and subsequent receipt of responses) of e-mail through the widespread use within the University of instant messaging (WhatsApp), which has a "milder" impact than sending an e-mail. At the same time, the massive sending of emails to staff (faculty and administrative technical staff) and students has been replaced with periodic newsletters that gather more information regarding academic life into a single commun

Sesa S.p.A.

Short description of the stakeholder

Sesa S.p.A., with Headquarters in Empoli (Florence), is the operating holding company of a Group with presence on the whole Italian territory and foreign countries that represents the reference player in Italy in technological innovation and digital services for the business segment.

Sesa Group has the mission of offering technological solutions, digital services and business applications to support the digital transformation and innovation towards sustainability of Enterprises and Organizations, through four main business Sectors: Corporate, VAD (Value Added Distribution), SSI (Software and System Integration), Business Services.

Sesa Group pursues a sustainable development strategy for the benefit of all Stakeholders, with a track record in the period 2012-2023 of continuous growth in employment, revenues and profitability. Sesa Group strategy of long-term value generation for all stakeholder is based on human resources skill development, environmental sustainability and social responsibility, with continuous improvement of ESG performance.

As of April 30, 2023, the Group distributed a net economic value of about Eu 309 million (+26% Y/Y), of which for over 60% to the remuneration of Human Resources, with 4,717 employees (+13% Y/Y), improved hiring programs (760 hires in FY23, +25% Y/Y), education (over 69,000 training hours, +14% Y/Y) and welfare programs to support parenting, diversity, well-being and work-life balance of Human Resources.

Sesa introduced in its corporate bylaw the sustainable growth as Board of Directors priority and starting from FY 2022 Sesa has published the Integrated Annual Report, providing a complete, measurable, and transparent representation of the Group value generation, at financial and ESG performance level. In terms of sustainability governance, the Group's main companies achieved the ISO 14001 certification and the UN Global Compact membership.

Strategy and policy at 2030

Aware of the climate changes that are affecting our planet, the Group is sensitive to the issue of environmental protection as a resource for the wellbeing of mankind and is committed to operating in accordance with the principles of sustainable development.

Sesa conducts its business with the objective of environmental protection and sustainable management of natural resources. The Group's operational management refers to environmental protection and energy efficiency criteria, pursuing the continuous improvement of occupational health and safety and environmental protection. In order to achieve and implement this commitment, Sesa has drawn up a Group Environmental Policy and obtained the environmental certification of the activities carried out, introducing an Environmental Management System, in accordance with the provisions of UNI ISO 14001:2015.

In order to exploit all possible synergies, the definition of the Environmental Policy and its implementation are managed in a unified way and are consistent with the Group's strategic goals.

This management:

- defines the environmental and sustainable industrial development policies;
- draws up guidelines for the implementation of the Group's environmental policy;
- identifies the indicators and guarantees the monitoring and control of the trend of corporate actions in terms of environmental impact;
- follows the evolution of national and European Union environmental legislation and prepares application guidelines for subsidiaries;
- handles relations with organisations, institutes, and agencies in the environmental field.



Thanks to the principles of protection and preservation mentioned above, Sesa undertakes a series of initiatives aimed at reducing and preventing possible negative impacts on the environment resulting from the exercise of its activity. These include the choice of energy supply from renewable energy sources. Sesa constantly monitors its energy consumption and related emissions, promoting efficiency improvement programmes including those indicated below:

- monitoring and efficiency of the waste produced and development of recovery activities (separate collection). Improvements: extension of ISO 14001 environmental certification to all major Group companies and dissemination of the Environmental Policy;
- hybrid working and digital collaboration modes adopted by the Group, maintaining a predominantly physical work organisation model for all human resources and Group locations;
- improvement of levels of awareness among personnel working in the Group or on its behalf, by implementing information and training. Improvements: HR training;
- raising awareness of environmental management principles among suppliers and contractors. Improvements: activities to raise awareness among employees and suppliers;
- commitment to actions aimed at maximising energy savings in its offices or premises, in the management of its vehicle fleet, favouring more efficient and less polluting technologies. Improvements: Increased efficiency of lighting (LED), controlled processes and energy-efficient materials, green building projects and certifications (Leed);
- reduction in the use of energy resources per unit of gas injected into the grid. Improvements: maintenance and improvement of facilities;
- optimisation of the use of transport fuels. Improvement actions: renewal of the vehicle fleet and innovative mobility management systems.

Supporting actions (2019-2030)

- sector:

- Energy systems
- Mobility & transport
- Waste & circular economy**
- Green infrastructure, water & nature based solutions**
- Buildings environment
- Information & communication**
- Research

- description:

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- optimisation of the use of transport fuels. Improvement actions: renewal of the vehicle fleet and innovative mobility management systems.

- timing:

Analysis / design phase

planned: *please indicate the foreseen start – end years*

on going: *please indicate the start – end years* → **2021-2030**

- impacts: *please indicate any direct (energy saving, emission saving, renewable production....) or indirect impact that your action could trigger (awareness, change of behaviours, number of people informed/impacted...).* Direct impacts can be reported both as % or absolute values, but if you prefer % please add a rough evaluation of your baseline consumption as reference.

The Group's risk of generating negative climate impacts is mainly related to its ability to take effective measures to reduce emissions, which in part also depend on the energy purchased by the company to run its operations. A reputation risk related to the difficulty in attracting and retaining customers, employees, business partners and investors could be added to this should Sesa fail to achieve its climate protection targets.

The measures taken to prevent and mitigate environmental risks are the ISO14001 - certified environmental management system and all initiatives to reduce greenhouse gas emissions related to the Group's activities (mainly offices and business travel), which may lead to increased capital expenditure in the short term before financial benefits are realised in the long term, and the use of renewable energy.

To this end, a new business line was developed with over Euro 300 million in revenues in the financial year and about 150 specialised resources, with the aim of developing new technologies, products, and services for the production of energy from renewable sources and the efficient consumption of natural resources. Investments also continued in the Group's main owned buildings: in particular, during FY 2023, internal production of energy from renewable sources increased significantly (1.3 million Kwh +25% Y/Y), and the main indicators relating to emissions and consumption improved.

Sesa's ESG Team, with the direct cooperation of the Sustainability Committee, collects and analyses environmental data, periodically monitors indicators and helps create awareness and educate employees on these issues through internal communication events and initiatives.

The Group continues with determination on the path of integrating ESG criteria into its business, implementing an environmental sustainability strategy focused on achieving carbon neutrality, in line with the UN 2030 Agenda. There are several areas of intervention that will lead the Group to neutralise its carbon footprint by



2030 Climate-Neutrality Commitments



2030, through a plan that envisages three lines of action: monitoring and quantification of emissions; continuous processes of efficiency and impact reduction; and offsetting residual and non-reducible emissions.

To this end, an articulated and far-reaching project is related to the implementation of environmental impact reduction programmes for the Empoli technology pole. The project, in addition to allowing the expansion of the activities present in support of the business, will allow the area to be reorganised in terms of road functionality, public parking, public green spaces, and services for employees and citizens. The project will also reduce pollutant emissions caused by traffic, through sustainable mobility measures: free public parking spaces in connection with a bike-sharing station, public transport connections and the creation of cycle paths.

The project is divided into three distinct stages of progress and involves the construction of infrastructures and buildings using eco-sustainable and energy-saving materials, techniques and technologies (green building and related certifications). The aim of the project is to enhance the Technological Pole, through the regeneration of community relations, the protection of the wellbeing and health of citizens, the improvement of the quality of the environment and mobility, and the enhancement of social and cultural activities.



ALIA

The purpose of this document is to collaborate with the city of Florence on a collective and shared project to reduce CO₂eq emissions, to contribute to the improvement of the city's liveable conditions with the final aim of achieving climate neutrality.

Short description of the stakeholder

The tools managed by the company Alia Servizi Ambientali, the integrated waste cycle management concessionaire for the vast area of central Tuscany (ATO Toscana Centro), where Florence is the main attractor of traffic flows and waste production, are clearly those pertaining to the environmental services area, with reference to the collection, transport, treatment, recovery, and final disposal of waste. In this context, the company, which sees the Municipality of Florence as the majority shareholder, shares the shared objectives of climate improvement with the city government, through a progressive optimization of production and service processes that can substantially affect the reduction of emissions of CO₂eq.

Strategy and policy at 2030

The ambitions underlying the industrial strategies for the optimization of productions, services and the reduction of emissions for climate mitigation are approved by the Company's Board of Directors and by the shareholders' meeting.

The objective of reducing CO₂eq by 23,500¹ tonnes by 2024 through the implementation of the Florence Circular City project, may be implemented by a further 3,500 tonnes, as an estimate of the benefits obtained from the implementation of the following collateral projects:

1. Volumetric sensors: Technological implementation of the electronics installed on underground and above-ground waste road containers, with volumetric sensors for measuring the waste introduced into the container by each user. The punctual and progressive measurement of the degree of filling of the containers will make it possible to plan and execute optimized collection routes and the emptying of fully loaded road containers, with a significant reduction in the km travelled by collection vehicles, consumption and CO₂ emissions, estimated at at least 10% compared to current emissions (2,350-t of CO₂eq).
2. Enhancement of the virtuous behaviour of users: the tracing of waste deliveries by users and the analysis of the virtuous behaviour of the latter, in terms of effective

¹ Calculations have been made by ALIA adopting LCA approach



contribution to good separate collection and the increase in recycling, can be exploited through two alternative or complementary systems:

- the certification and remuneration of carbon credits, WCC (Waste Carbon Credits), on the voluntary market (VCM), with the redistribution of revenues as a reduction in the waste tariff in relation to the virtuous behaviour of users.
- Application of the Blockchain to waste recycling with models and initiatives that, through the tracking of the recycled, reward the participants, thus giving a tangible value to the recovered materials and recycling activities.

With these activities it is estimated to be able to further increase the qualitative yields of waste recycling, both in the separate collection chain and in the recovery plants, with a reduction of CO₂ in 2030, which can be estimated at a further 5% compared to the objectives set for 2024 (11.750 t of CO_{2eq}).

The goal set for 2030 covers the entire administrative territory of the city of Florence.

The CO₂ reduction target set for 2030 inherent to the specific activities carried out by the manager of the integrated waste cycle, Alia Servizi Ambientali, is part of a coherent contribution and in line with the definition of climate neutrality pursued by the Mission of the city of Florence.

Supporting actions (2019-2030)

- sector:

- Waste & circular economy

- description:

Among the strategic and systemic priorities to be implemented by 2030, the company Alia Servizi Ambientali undertakes to carry out the following projects:

- Completion of the Florence Circular City project by 2024: «Firenze Città Circolare» is the Waste Plan approved in 2020 aimed at improving the quality and quantity of differentiated waste through innovations in the collection system and stimulating greater awareness and responsibility of people. In this way, the City aims at achieving the targets set by the EU in the Circular Economy Package (Directive 2018/851). Based on urban characteristics, population density and attendance (tourists, city users, etc.), the territory of the city of Florence has thus been divided into zones, each of which has been associated with the most appropriate type of collection. The main objectives of the project are the spread of the 5R (Reduce, Reuse, Repair, Rot, Recycle) through the value chain, offering advanced services, the reduction of management costs while saving energy.

The project includes the industrial strategy of Alia in relation to the availability and strengthening of the plants for the most important recycling chains: Paper; Glass;



biomethane; plastic granule; biofuels; bulky waste. The discard will decrease to 5% for paper and 2% for glass.

- Implementation of electronics installed on waste containers, with the extension of volumetric sensors.

- Digitization of production processes, implementation of on demand services and optimization of resources, routes, consumption, and emissions.

- Enhancement of the virtuous behaviour of users, as an incentive system for recycling and a substantial contribution to the reduction of emissions and climate mitigation.

- timing:

on going: 2020-2030 with a milestone at 2024

- impacts:

The set of actions as mentioned are expected to reduce the emissions of 27.000 tonnes of CO_{2eq} calculated with the LCA approach. This result is the sum of the increased recycling, the reduced amount and logistics impacts.

The key principles supported by Alia Servizi Ambientali, at the basis of the Climate City Contract, are aimed above all at supporting and encouraging the virtuous behaviour of users in the field of waste recycling, as a contribution to cultural change and the progressive acquisition of awareness its contribution to climate change mitigation.

Publiacqua

Short description of the stakeholder

The integrated water cycle management (aqueduct and sewage) is entrusted to Publiacqua Spa with a public capital holding (60% of which 21.67%, owned by the City of Florence). The aqueduct system of Florence presents a remarkable complexity, deriving from the presence of a quite large historical core, which makes it difficult to adapt structures to the technological innovations and to the growth in demand due to the strong tourist presence. As for many Italian cities, the origin of the aqueduct system dates back to Roman times when, in the case of Florence, water descended from Monte Morello through the gentle slopes of the hills. Over the centuries, the growing demand for water resources has prompted the construction of other underground supply sources (wells) as well as other sources; it was also necessary to access the area's most important water resource, the river Arno.

All the drinkable water consumers (domestic, public and non-domestic) are provided with a meter for the measurement of water consumption. These currently operate on a mechanical system, with some interesting trials of smart metering (automatic and in proximity).

For several years Publiacqua has prepared a yearly Energy Efficiency Plan, identifying the programme of interventions aimed at recovering the efficiency of the systems (for both the installations and management standpoints). In a four-year period (from 2018 to 2021), the energetic consumptions went from 116,0 GWh to 106,3 GWh, with a reduction of over 8,5%.

Strategy and policy at 2030

The collaboration with Publiacqua, whose sustainability report is drawn up annually, is working on the issues of water saving, use of RES and the efficiency of distribution net and wastewater treatment plants. The partnership generated the best practice related to the drinking water fountains to reduce the use of plastic and transport of drinking water (455,000 l/y).

The Water Management Plans analyse the specific service and set ambitious performance KPIs for the next years.

The management vision aims at overcoming the segmented territorial logic to establish

an interconnected aqueduct network of the 2 areas Florence-Chianti and Prato-Pistoia.

Publiacqua Spa has planned significant replacement investments to renew the pipes infrastructures aimed at achieving two main environmental objectives related to water losses reduction (related to the Energy Efficiency Plan) and to water quality improvement. In 2019, the Water Safety Plan was drawn up and detailed analyses were carried out to introduce energy efficiency into the distribution systems and measures were activated to influence the company's consumption trends (-4,5% per year).

The water loss management is based on:

- pressure management;
- active leakage control;
- speed and quality of repairs;
- maintenance plan.

A series of strategic objectives have been defined, the main ones are listed below:

- improvement of technical quality in service management in order to align to the requirements of the future Eu-directive;
- Improved commercial quality through increased response performance to the user;
- security for its employees and for the company's information and real estate assets;
- environmental sustainability;
- increased efficiency and productivity;
- added value through innovative services and processes.

One of the main means of achieving these objectives is represented by the continuous technological and organizational evolution thanks to the introduction of ICT services and solutions to support the Line of Business.

Supporting actions (2019-2030)

- sector:

Green infrastructure, water & and nature-based solutions

- description:

Reduced water and energy consumption, biogas production, reduced emission from water and waste-water management.

The water management efficiency will be boosted both for mitigation and adaptation impacts: pipelines retrofitting to decrease leaks, ICT and innovative technologies implementation to detect losses and save consumption for water treatments and distribution, RES implementation and communication campaigns are some of the measures.

- timing:

on going: from 2019

- impacts:

- water savings (decrease in water losses and use);
- energy savings;
- optimal use of resources;
- production of alternative fuels (biogas);

- improved efficiency of water management system;
 - emissions reduction estimate (total) 21.000 t_{CO2eq};
 - Removed/substituted energy 3.700 MWh;
 - Citizens' awareness.
-

CASA SPA

Short description of the stakeholder

Casa S.p.A. is a joint-stock company with total public participation and public control established by the Municipalities of the 30 Province of Florence which are also its current shareholders.

Casa S.p.A., has the aim of carrying out, according to the directives given by the members and in compliance with the service contracts, the following activities:

- functions relating to the recovery, maintenance and administrative management of the assets destined for the social housing owned by the Municipalities;
- urban recovery and restructuring interventions, acting directly or participating in urban transformation companies;
- carrying out all ordinary and extraordinary maintenance interventions on one's own assets, on those assigned to be managed by other entities and on those of other public and private entities;
- assumption and negotiation of financing and granting of guarantees of any type in the interest of the common shareholders.

The one managed in total is a park of approximately 12,800 real estate units.

Strategy and policy at 2030

Casa S.p.A. provides the public residential building management service in compliance with the principles of public services and users' rights, as well as those relating to Social Responsibility (SA8000) and the AA1000 standard international social reporting tool.

. These principles represent the values on which the activity carried out by the company is based:

- ✓ Equality
- ✓ Impartiality
- ✓ Hospitality
- ✓ Continuity
- ✓ Participation
- ✓ Effectiveness and efficiency also related to energy issues
- ✓ Transparency
- ✓ Inclusivity
- ✓ Materiality
- ✓ Health & Safety

Casa S.p.A. has other certifications such as:

- ✓ ISO 9001
- ✓ ISO 45001
- ✓ ISO 37001

Supporting actions (2019-2030)

- sector:

- Energy systems
- Buildings environment
- Information & communication

- description:

Casa S.p.A. is managing public properties with the aim of increasing their efficiency and the wellbeing of users.

The main pillars of the climate actions are:

1. Energy saving: “sustainable housing” model and sustainable behaviours
<http://www.casaspa.it/risparmio-energetico-2/>
2. Energy Monitoring: energy audits of buildings and retrofitting programs
http://www.casaspa.it/monitoraggio_energetico/
3. Photovoltaic <http://www.casaspa.it/fotovoltaico/>
4. Zero Energy to reduce consumptions <http://www.casaspa.it/presentazioni03/>
5. The implementation of environmental issues
https://www.casaspa.it/documenti/tematiche_ambientali.pdf
<https://casaspa.portaletrasparenza.net/it/trasparenza/bilanci/bilancio-sociale.html>

- timing:

- on going: from 2019

- impacts:

- energy savings;
- production of renewable energy;
- awareness rising



Appendix: Individual Signatory Commitments

SIGNATORY MUNICIPIA S.p.A.

Short description of the stakeholder

Municipia is part of the Engineering Group, the Digital Transformation Company, leader in Italy and expanding its global footprint, with around 15,000 employees and over 70 offices.

Engineering (ENG) was founded in 1980 and is currently the first IT group in Italy and among the top 10 IT groups in Europe. In 2020 the value of production was 1.24 billion euro.

The Engineering Group supports the Digital Transformation of public and private organizations in several sectors, with a complete offer combining system and business integration, outsourcing, cloud services, consulting and proprietary solutions. In particular, ENG designs, develops and manages innovative solutions for various business segments, including Smart Government, Augmented City and Smart Transport.

MUNICIPIA is the company of Engineering group provider of digital transformation solutions for cities. Supports around 1000 municipalities in the digital transformation process and "augments cities" by acting on Sustainability (financial and environmental), Safety, Mobility, Welfare, Interactivity.

Municipia support cities of all sizes in their digital transformation process by creating innovative services through private investments and the absorption of operational risk.

Experience, reliability and innovative capabilities allow Municipia to collaborate with Municipalities throughout the world, to support local governments in implementing their urban strategies and transforming the Administration. The goal is to make the city more sustainable by improving public services, focusing on the experience of the person.

Mission

Municipia manages services for Authorities and their citizens, achieving greater levels of efficiency, effectiveness, transparency and sustainability through digital technology. The Company also intervenes with public-private partnerships and project financing formulas with investments and risks borne by Municipia and participation in the benefits deriving from the increase in revenues and the decrease in costs.

Municipia adds value to existing investments and technologies, making available its experience and the technological solutions of the Engineering Group intervening both with vertical initiatives and with cross-cutting projects in order to improve the quality of life in the city and to simplify the relationship between public administrations and citizens.

e-distribuzione

Short description of the stakeholder

e-distribuzione is a Distribution System Operator (DSO) and a subsidiary of the Enel Group, Italy's largest power company and Europe's second listed utility by installed capacity.

With about 32 million consumers and more than 1,100,000 km lines, e-distribuzione is the second largest DSO in Europe.

Activities include the transport and transformation of electricity, the network management and plants operation as well as network development and maintenance services.

e-distribuzione is world leader in the Smart Grids field. The Smart Grids are enabling infrastructure of innovative services for customers and Public Administrations, linked to the development of new technological and scientific skills to create a more efficient and integrated urban environment. As well as providing power distribution services to its household and business consumers, the company runs R&D activities with the aim to constantly improve supply services to consumers and facilitate new advanced services to the customers in the framework of smart grids developments. Solutions for the integration of renewable energy sources as well as the active participation of customers in the management of the electricity network have been investigated and tested by the company under different national and European projects.

Strategy and policy at 2030

The mission of e-distribuzione consists in "building and distributing value for the country with a particular attention to e-distribuzione customers' needs, ensuring people' safety and health, safeguarding the environment". The main innovative Network interventions, according to these pillars, are: Smart Grid, resilience, smart meter, development of digital platforms.

Innovation investments aim to improve performance in terms of efficiency, and therefore offer a higher quality of service to customers, adopting solutions to mitigate environmental impacts, contributing to increase value of the areas and communities. These investments are key factors to make business sustainable and competitive in the long run.

Among the objectives identified as priorities within e-distribuzione's competences, being also committed to:

- ensuring access to affordable, reliable, sustainable, and modern energy systems for all;
- building resilient infrastructure and promoting innovation and fair, responsible and sustainable industrialization;
- making cities inclusive and sustainable;
- promoting actions to fight climate change.

Therefore e-distribuzione, at the end of the 2022, has submitted several projects in response to two different NRRP calls published by the Italian "Ministero dell'Ambiente e della Sicurezza Energetica" (ex MITE):

- Avviso pubblico per la presentazione di proposte progettuali finalizzate ad incrementare la capacità di rete di ospitare ed integrare ulteriore generazione distribuita da fonti rinnovabili e ad aumentare la capacità e potenza a disposizione delle utenze per favorire l'elettrificazione dei consumi energetici da finanziare nell'ambito del PNRR, Missione 2 "Rivoluzione verde e Transizione Ecologica" Componente 2 "Energie Rinnovabili, idrogeno, rete e mobilità sostenibile" Ambito di Intervento/misura 2 Potenziare e digitalizzare le infrastrutture di rete" – Investimento 2.1 "Rafforzamento Smart Grid" (M2C2.2.1). Finanziato dall'Unione europea – NextGenerationEU.
- Avviso pubblico per la presentazione di Proposte di intervento finalizzate a migliorare la resilienza della rete elettrica di distribuzione a eventi meteorologici estremi da finanziare nell'ambito del PNRR, Missione 2 "Rivoluzione verde e Transizione Ecologica" Componente 2 "Energie Rinnovabili, idrogeno, rete e mobilità sostenibile" Ambito di Intervento/misura 2 "Potenziare e digitalizzare le infrastrutture di rete" – Investimento 2.2 "Interventi per aumentare la resilienza della rete elettrica" (M2C2.2.2). Finanziato dall'Unione europea – NextGenerationEU.

Two different projects, "Progetto Rafforzamento Smart Grid Toscana e Umbria" and "Progetto Incremento Resilienza Toscana e Umbria", are funded by the "Ministero dall'Ambiente e della Sicurezza Energetica" (ex MITE).

Supporting actions (2019-2030)

- sector:

- Energy systems

e-distribuzione' Smart Grids projects and resilience projects in Florence allows the implementation of measures and functionalities, on existing electricity distribution networks, to upgrade the digitalization of the grid, and to increase the grid resiliency to cope with extreme weather events.

Moreover, this will also give the possibility to increase network efficiency, fostering the development of new Renewable Energy Sources plants (RES), allowing the electrification of final users and increasing the resilience of the grid.

In particular, e-distribuzione, within the city area of Florence, planned a series of investments in "Progetto Rafforzamento Smart Grid Toscana e Umbria" and "Progetto Incremento Resilienza Toscana e Umbria" for approximately 15 M€.

The projects feasibility, the effectiveness of interventions and the amount of the investments depend on the right timing of the permitting process for all authorizations, permits, clearances, necessary and/or other approvals and authorizations required. Any time delay in authorization and permission would affect the project scheduling. In the worst case it could determine the project failure. Meeting the timing of the permitting process will foster the Project success.

- Mobility & transport
- Information & communication
- Research

- timing:

- Analysis / design phase
- planned: 2023-2026 for NRRP measures
- on going:

- impacts:

The intervention will increase:

- the electrification of final users, increasing the available power for approximately 80000 inhabitants of the city area;
- the resilience of the grid to extreme weather conditions such as heat-waves, ice sleeves and tree falls due to windstorms;

Moreover, as a secondary effect of the interventions, the hosting capacity (the capability of the grid to host new renewable distributed generation) of the grid will be increased.

FONDAZIONE CASSA DI RISPARMIO DI FIRENZE

Short description of the stakeholder

We are a philanthropic institution that uses the profits from our assets to operate in the territory. The Fondazione CR Firenze is a foundation of banking origin, a non-profit entity pursuing the interests of society with a select programme of contributions and projects in its area of operations: Florence and the metropolitan city area, and the provinces of Grosseto and Arezzo.

Strategy and policy at 2030

We have been committed from the outset to supporting the community with four tools to launch, promote and support socially relevant initiatives for the territory:

1. The Fondazione for People: we stand by the side of the needy with projects, calls for tender and initiatives. Our targets are youngsters, seniors and fragile members of the community, job-seekers and trainees. We sound out the territory's real needs, we support and promote the non-profit sector.
2. The Fondazione for Culture: we support the territory's institutions of excellence, artistic and cultural production for the benefit of the community.
3. The Fondazione for Innovation and Research: we activate projects and collaborations to promote technological transfer in the innovative local ecosystem through acceleration programmes for digital startups, initiatives in support of research and of our best areas of expertise.
4. The Fondazione for the City and the Territory: from our artistic and environmental riches to the skills and expertise handed down from one generation to the next and the construction of new, lasting infrastructures for the community, we save, preserve and innovate our vast local heritage for the benefit of all.

Supporting actions (2019-2030)

- sector:

Finance

- description:

The Foundation CRF is financing projects in line with its strategic pillars reported above. Hereafter some numbers describing our activities.



Our figures for the community

Every year our activities translate into concrete actions for the territory

**600 thousands
people**

impacted by the solidarity
projects we support

**450
cultural
workers**

operate thanks to our
contributions

**150
researchers**

are involved in innovative
research projects

**3
millions euro**

are activated in the territory
thanks to our Europe Counter

- timing:

Analysis / design phase

on going: 2019-2030

- impacts:

The projects we support have impacts on different fields of action (energy poverty, awareness, energy efficiency, research and innovation...) and already counted under those measures.

For example, the Foundation CRF has co-financed the retrofitting of 18 social housing flats in the city of Florence to improve their efficiency and users-comfort; it is impacting 18 vulnerable families at risk of energy poverty.

Another action involve the analysis of the potential for energy communities: a pilot study has been financed to evaluate opportunities and obstacles and support the take-off of the first examples of energy communities facilitated by the municipality.