

LOCAL ENERGY AND CLIMATE ROADMAPS

5 city visions for 2050



energycities

WHERE ACTION & VISION MEET

October 2018

INTRODUCTION

The EU is currently designing a new 2050 strategy for reducing its GHG emissions, which should be compatible with the Paris climate agreement. On the surface, it appears as an exercise to design climate action policies, but in fact, it is much more than that. Thinking about 2050 today leads us to ask ourselves: how should our (urban) societies look like in 2050? How can we achieve a high quality of life while respecting our planet's resources? How will we share responsibilities and benefits in a transformed energy and mobility landscape?

Many European cities have already engaged in the long-term planning for the mid-century mark. By developing their 2050 roadmaps, these cities are designing clear pathways to transform their societies to become resilient and resource-efficient, running entirely on clean energy sources and providing social and economic wellbeing to their citizens. Cities' long-term roadmaps are transversal, as they target all sectors and societal areas. But most importantly, their roadmaps are the result of a societal consensus: as all stakeholders

on their territories are involved through inclusive and participatory methods in the roadmaps' design and implementation, responsibilities and benefits are shared effectively among all local players in new, innovative forms of collaborative governance.



Examples of EU SEAPs with long term CO₂ reduction targets

COUNTRY	SHARE OF SIGNATORIES	SHARE OF POPULATION	EXAMPLES OF URBAN AREA AND THEIR LONG TERM TARGET
Germany	7%	31%	München with 50 % by 2030 Essen and Hannover with 95 % by 2050; Berlin and Düsseldorf with 85 % target by 2050; Bremen and Hamburg with 80 % target by 2050;
France	5%	17%	Paris with 75 % by 2050; Grand Lyon with 75 % by 2050; Lyon; Grand Besancon with 50% by 2050; Bordeaux Metropole, Rouen; La Rochelle with 75 % by 2050
United Kingdom	5%	11%	Leicester with 50% by 2025; Birmingham with 60 % by 2027; Aberdeen, Sunderland with 50% by 2030; Milton Keynes with 60% by 2030; Leeds, Bristol and Poole with 80 % by 2050; Dumfries and Galloway Council with 42% by 2050
Spain	12%	8%	Murcia with 40% by 2030; Sevilla with 52 % by 2030; Dénia 100 % by 2040
Italy	37%	7%	Padova with 80 % by 2050; Palermo and Rimini with 30% by 2025; Trento with 40% by 2030
Sweden	5%	5%	Växjö with 100% by 2030;Stockholm with 100% by 2040; Luleå and Haninge with 100 % by 2050 Västerås with 90% by 2050;Kristianstad with 85% by 2050; Göteborg with 80% by 2050
Belgium	9%	4%	Leuven with 100 % by 2030; Brugge with 100 % by 2050; Region Zuid-West-Vlaanderen with 100 % by 2050; Gent with 80 % by 2050
Netherlands	2%	3%	Utrecht with 100% by 2030; Rotterdam with 40% by 2030; Nijmegen and Lingewaard with 100% by 2040; s-Hertogenbosch with 100% by 2050
Latvia	2%	3%	Riga with 85% by 2050
Finland	3%	3%	Vaasa with 100% by 2040; Helsinki with 100% by 2050
Denmark	3%	1%	Frederikshavn with 94 % by 2030; Aalborg and Albertslund with 100 % by 2050

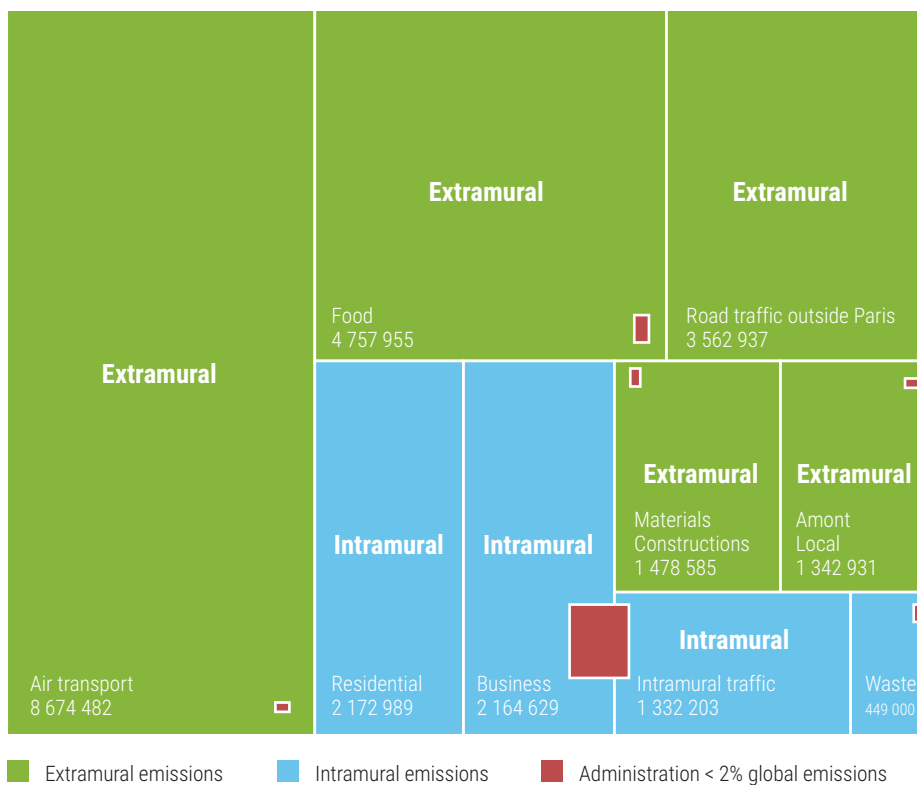
Covenant of Mayors cities with long-term CO₂ reduction targets (Source: Joint Research Centre 2018)

Seeking a strong partnership with their citizens and stakeholders is indispensable for cities in their 2050 roadmaps, as often, the direct impact of the city administration on the city's carbon footprint is minimal. In fact, the lion share of urban emissions derive from areas that lie beyond a city's control and influence. As the infographic from Paris' 2050 climate plan shows, the

French capital can tackle directly only a limited amount of carbon emissions on its territory. Therefore, it needs to mobilise all local actors to achieve its target of becoming carbon neutral by 2050. In this publication, Energy Cities will showcase five exemplary European cities that have succeeded in the design and implementation of their 2050 roadmap with all

local actors on board. Embark on the inspiring journeys taken by Grenoble (France), Manchester (UK), Münster (Germany), Salzburg (Austria) and San Sebastián (Spain), which show that planning now with ambition and cooperation for 2050 is possible and beneficial for catalysing the energy transformation of our societies.

Paris Carbon footprint



Direction of green spaces and of environment
 Urban ecology agency - April 2018



MÜNSTER

How Münster is excelling in renewable energies, energy efficiency, citizen engagement and experimentation in its 2050 roadmap

The city of Münster is the cultural centre of the federal state of North-Rhine Westphalia. As a job magnet for its surrounding area, Münster attracts a high number of commuters each year, which results in high levels of traffic and energy consumption. In order to tackle these challenges, the city has developed a roadmap with ambitious targets for 2050: reducing GHG emissions by 95% compared to 1990 levels, cutting its final energy consumption by 50%.

Münster's roadmap acts as a strategic instrument involving **19 actions**, which were developed during several workshops with about 1,200 citizens and stakeholders, and are set to be implemented by 2020. The city's inhabitants, nicknamed the *Münsteraner*, took on a major role in bringing their ideas and strategies into Münster's roadmap, thereby exemplifying how citizen participation can effectively shape the long-term climate and energy future of cities.



INHABITANTS 311,850

SIGNATORY OF COVENANT OF MAYORS Since 2008

STATE North-Rhine Westphalia

ENERGY INFRASTRUCTURE 79% of all buildings in the city are connected to the district heating system, which for now mostly uses natural gas; 40% of the city's electricity needs are covered by local renewable energy (RES) installations

NETWORK OPERATOR Stadtwerke Münster GmbH; Westphälische Fernwärmeversorgung GmbH

PARTICULARITY: METROPOLE OF CYCLISTS Cycles are the most frequently used mode of transport. 40% of all trips in the city are done by bike, and there are 100,000 cyclists per day on the city's roads. Moreover, with a bike station of 3,500 spaces – the largest in Germany—Münster is without a doubt one of Germany's major cycling cities



PARTICIPATIVE FOOTPRINT OF 1,200 PARTICIPANTS DEVELOPING 19 ACTIONS



**100% RENEWABLES
100% ELECTRO MOBILITY FROM RENEWABLES, TRIPLING OF RENOVATION RATE**

BACKGROUND: MASTERPLAN 100% KLIMASCHUTZ- INITIATIVE

Since April 2016, the city of Münster has been one of the 41 *Masterplan 100% Klimaschutz* municipalities in Germany. The *Masterplan 100% Klimaschutz* is an initiative of the German government which offers funding to German municipalities that have committed to a 95% reduction of their GHG emissions by 2050 (based on 1990 levels) and to halving their energy consumption. Thanks to this funding scheme, Münster will receive a subsidy of over EUR 700,000 until 2020 for the development and implementation of its 2050 roadmap. Apart from this crucial funding, the so-called *Masterplan Kommunen* also receive support from a wide range of actors (such as universities, local energy and climate experts...) and comprehensive guidance materials in order to develop their transition roadmaps. This initiative illustrates that the German government relies on its municipalities as key actors to contribute to its national climate and energy policies.

AMBITION OF THE ROADMAP

OVERALL ENERGY & TRANSPORT GOALS BY 2050

- > **To reduce final energy consumption by 50%;**
- > **To reduce GHG emissions by 95% compared to 1990**
- > **To become almost climate neutral**

OBJECTIVES

- > Raise **awareness** and provide information to trigger **positive lifestyle changes** for more sustainable lifestyles
- > **Increase quality of life** while **reducing the usage of resources** in private households
- > **Create a dialogue to connect all stakeholders** and reinforce **support for projects** led by civil society actors

TARGETS

- > Achieve **100% RES** energy mix by 2050
- > Increase **renovation rate** from 1% to 3% by 2050
- > **Modal split** increase from 71% to 80% environmentally-friendly means of transport
- > Shift transport to **100% electro mobility** by 2050, relying on RES

3 SCENARIOS AND 4 SECTORS – From business-as-usual to systemic change

To define the roadmap's milestones, a sectoral potential determination was applied based on four sectors:

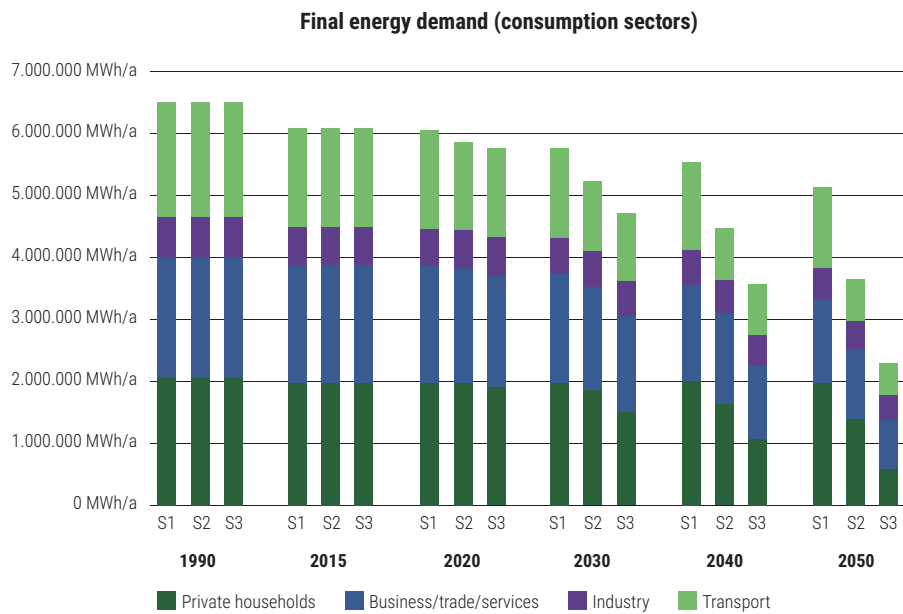
- private households,
- business/trade/services,
- industry,
- transport,

as well as three different scenarios:

S1 / The *trend* scenario implies that no specific measures will be taken for climate action.

S2 / The *ambitious-realistic* scenario implies that the potentials for climate protection will be increased in an ambitious and consequential manner.

S3 / The 3rd is the masterplan's *target scenario* (the most ambitious scenario driving systemic change) to achieve the targets of reducing final energy consumption by 50% and GHG emissions by 95%, and is the only scenario that is enough to achieve the roadmap's goals (see corresponding graphs)



(Source: Münster Masterplan 2050)

PRIORITY SECTORS AND MAIN LEVERS OF IMPLEMENTATION

For the tailored implementation of the roadmap, several priorities have been identified. In order to target the specific sectors strategically, several actions are taken within these priorities.

CLIMATE FRIENDLY BUILDINGS AND DISTRICTS

The roadmap aims at realizing high energy building standards while reducing the land use per person. In order to achieve this, three measures have been identified:



MEASURES AND TARGETS

- Increasing the refurbishment rate in the building stock to 3% from 2040 onwards. This should result **in energy savings worth 70-80%** in the building sector.
- Promoting sustainable, flexible urban areas: climate protection, housing, energy supply, mobility and local resources need to be considered in an integrated way.



HOW WILL IT BE ACHIEVED

1. Implement three pilot projects per district. Thereby, the projects should include topics, such as energy efficient renovation, or "local island heating systems" starting in 2020 at the latest
2. Implement the restructuring management system, provided by the Federal Ministry for the Environment, Nature Conservation and Nuclear safety (BMU), for a duration of 5 years. This will result in 180 energy-related consultations being conducted and **a doubling of the refurbishment rate** within the three districts during the term of the reorganization.



SPECIFIC CHALLENGES

The high rate of historic buildings and a largely privately-owned building stock, made up mainly of small family houses, pose major challenges to boosting the renovation rate; additionally, there is a chronic housing shortage in the city

CLEAN ENERGY SUPPLY AND RENEWABLES

Under this priority, the city seeks to cover 100% of its energy needs with RES by 2050. This means that it will not only import only RES, but also strengthen its own RES production and fully exploit the local potentials for producing energy from RES. Therefore, energy import from RES needs to be intensified: from 2030 to 2050, 1,298 GWh per year need to be imported from RES (in addition to the local yields) so that fossil fuels can be replaced by RES. In addition, 32% of the required RES will be produced locally.



MEASURES AND TARGETS

- Develop cross-sectoral supply concepts
- Exploit local potential for energy and heat production from RES
- Use existing heating grids as the backbone of future heat supply



HOW WILL IT BE ACHIEVED

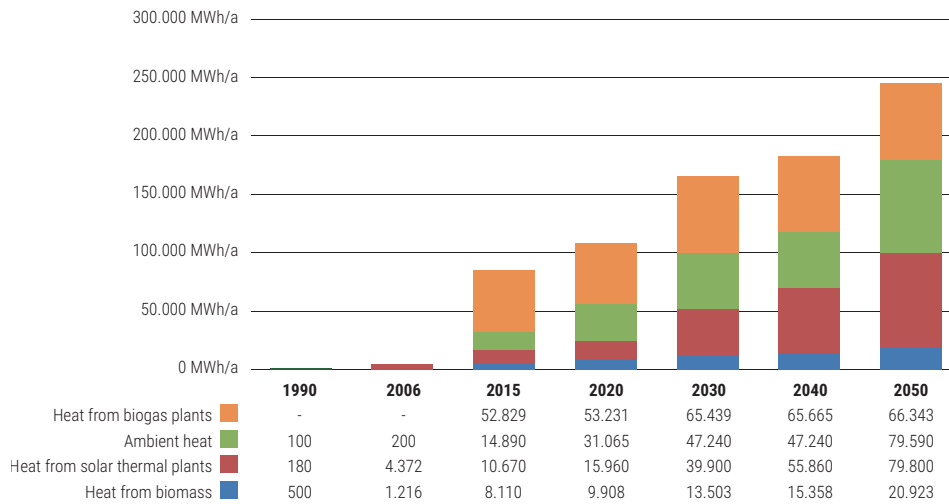
1. RES will be sourced mainly from the surrounding rural countryside, thereby consolidating the urban-rural link and leading to positive socio-economic effects for the region. Furthermore, this action cuts energy losses in transport and energy conversion. Moreover, the city's individual infrastructures will be merged (electricity, gas, heat), using e.g. technologies like **power to heat and power to gas**.
2. **Photovoltaics:** e.g. expansion of the roof surface potentials for solar panels, in total a potential of **197 GWh/y** has been calculated;
3. **Solar Thermal:** For the masterplan's target scenario, a technical potential for a heat production of **79.8 GWh/y** from solar thermal has been identified;
4. **Wind power:** A wind energy potential of approximately **85 GWh** per year has been calculated;
5. **Ambient heat (e.g. geothermal):** The target scenario assumes a potential of **80 GWh/y**;
6. **Biomass:** Only an increase of arable land for energy crops can lead to an increase in energy produced from biomass. Based on the target scenario, a potential for electricity of nearly **45 GWh/y** and a potential for heat of about **21 GWh/y** has been calculated.
7. **Biogas:** The heat potential of biogas is set at roughly **66 GWh/y**.



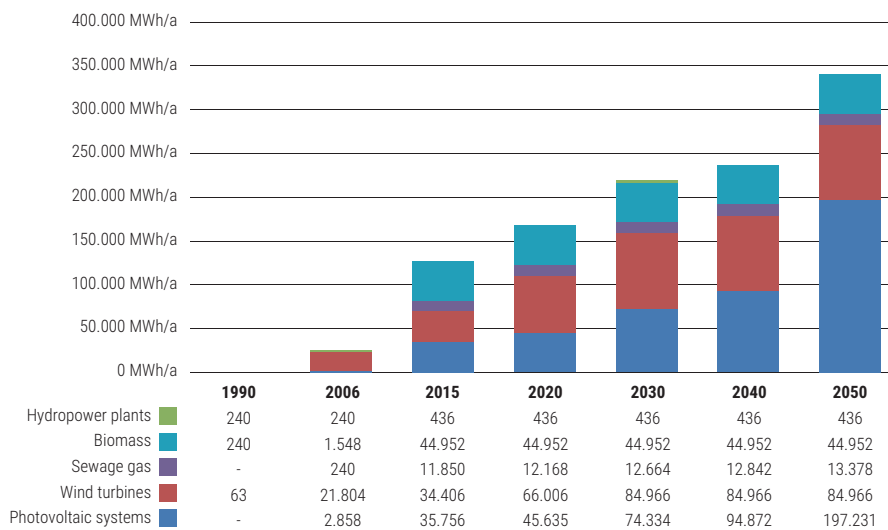
SPECIFIC CHALLENGES

Due to existing ground water protection requirements, the respective target for ambient heat (e.g. geothermal) appears to be challenging to achieve.

Heat from renewable energies, High Case scenario – according to the climate protection sub-concept of the city of Münster



Electricity from renewable energies, trend scenario – according to the climate protection sub-concept of the city of Münster



Münster's scenarios for RES heat and electricity potential (Source: Münster Masterplan 2017)

GOVERNANCE

Two bodies play a crucial role in the governance process of Münster's roadmap. The first body is the climate action coordination office, KLENKO, which is responsible for coordinating projects of civil society organisations, institutions, and businesses, thereby facilitating a permanent dialogue process among these local actors. Moreover, KLENKO also supports these actors in their initiatives. Thanks to its work, KLENKO contributes significantly to the development of a citizen dialogue on climate action in Münster. The second body is the "Klimabeirat", i.e. the climate advisory committee, which is set to receive extended competencies and take on a more strategic and advisory role within the governance process. Since 2011, the climate advisory committee has contained representatives from science, business, institutions and politics. It accompanies Münster's roadmap process with an advisory function and prepares recommendations for fostering civic engagement, citizen dialogue and the participatory process of the roadmap as a whole. Due to its longstanding experience and well-conceived structure, the climate advisory committee is considered as key in successfully implementing the city's roadmap.

THE CITIZEN PARTICIPATION PROCESS

Münster deployed various innovative participatory measures during the preparation of its roadmap, ensuring that both experts and non-experts could take an active role in the process. The process started with a dialogue of 80 experts from all areas related to energy and sustainable urban development, who gathered to jointly propose measures for the roadmap. This was followed by a one-week citizens' forum. In the introductory event of the forum, citizens were given information about the roadmap and participants could voice their concerns, wishes and visions on what Münster should look like in 2050. The forum was the core of Münster's engagement process and gathered more than 500 citizens in various in-depth workshops. During **three visioning workshops** on the topics of mobility, solar power and households, groups of experts presented the current state of affairs, including research, technical possibilities, living and lifestyle trends, and market innovations to the broader public. This was followed by discussions and first ideas for projects proposed by the participating citizens and experts.

As a follow-up, the results and ideas of these participatory visioning and scenario workshops were collated and subject to further in-depth discussions. The aim was to design **one common, jointly owned vision** for the Münster of 2050. During this future vision scenario workshop, the results collected from the previous events were hence further developed, which resulted in a possible pathway towards a climate neutral Münster for 2050. The result is a visual, realizable perspective for a climate neutral Münster, which is illustrated in the graph below. These ideas were presented to the wider public, which then had the opportunity to submit its ideas online in the form of projects. Even though the roadmap has been already completed, citizens can still provide their input to the roadmap online, which illustrates the remarkable **continuous character of the citizen engagement process** in Münster.

In total, **19 measures were developed** by more than **1,200 participants** during all the activities involving Münster's citizens, and all have been incorporated into the final roadmap. This illustrates a **clear, exemplary participatory footprint** of Münster's roadmap.



SAN SEBASTIÁN

Rethinking urban lifestyles to transform San Sebastián into a carbon-neutral city in 2050

The Basque city of San Sebastián (Spanish), home to about 186,000 inhabitants, is the administrative capital of the province of Guipúzcoa and a major culture and tourist hub in Northern Spain. As a coastal city, San Sebastián and its people, nicknamed the *Donostiarra*s, are aware that they are on the frontline of climate change and therefore have to strengthen their resilience and take ambitious climate and energy action. In June 2018, the city has adopted its long-term roadmap “Plan de Acción Klima 2050 de Donostia / San Sebastián”, which reflects a clear commitment to tackle climate change, catalyse the clean energy transformation and maintain an urban environment that makes responsible use of our planet’s resources.



INHABITANTS 186,000

SIGNATORY OF COVENANT OF MAYORS Since 2008

PROVINCE Guipúzcoa

ENERGY INFRASTRUCTURE The heating system of San Sebastián is based presently on a decentralized gas boiler system and a relatively small share of electric heating. As a first step in decarbonising its heating system, the city is currently developing in the framework of the EU-funded HotMaps project a district heating system using sustainable biomass and CHP in its Txomin-Enea neighbourhood that is home to 5,000 residents.

PARTICULARITY: CITY OF PEDESTRIANS AND CYCLISTS San Sebastián is an attractive city for cyclists, as it has an infrastructure of more than 30 km of cycle paths in place. Its urban transport system also favours walking as efficient mode of transport. Consequently, half of all journeys within the city are currently made by foot or by bike.



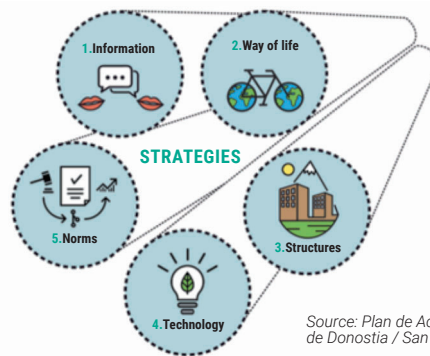
**INFORMATION, LIFESTYLES,
STRUCTURES, TECHNOLOGY,
NORMS**



**CARBON NEUTRALITY, ZERO
EMISSIONS IN TRANSPORT, ZERO
WASTE, WIDESPREAD ADOPTION OF
CIRCULAR ECONOMY**

BACKGROUND: AN INTEGRATED APPROACH

San Sebastián's 2050 roadmap, the "Plan de Acción Klima 2050 de Donostia / San Sebastián", was developed in 2017 and adopted by the city in 2018. Its trajectory of emissions for 2030 and 2050 is based on the 2050 Climate Change Strategy of the entire Basque Autonomous Community. San Sebastián followed an integrated approach in the development of its roadmap. Firstly, **five strategic areas of action** were identified: **1. Information**, i.e. the way citizens get to know and share information about climate issues, **2. Lifestyles**, i.e. the relationship between citizens' actions and GHG emissions, **3. Structures**, i.e. the way citizens experience the city's physical (e.g. infrastructure like buildings) character, **4. Technology**, i.e. the way citizens apply knowledge gained through e.g. smart applications to reduce their emissions and finally, **5. Norms**, i.e. the way citizens adjust to and support each other within their social relations. Those five strategic areas of action (see picture below) were then applied to four different sectors: **Energy, Circular Economy, Land Use and Mobility**. This exercise within the city's roadmap resulted in a diverse set of actions that will enable San Sebastián to reach carbon neutrality by 2050.



Source: Plan de Acción Klima 2050 de Donostia / San Sebastián

AMBITION OF THE ROADMAP

OVERALL ENERGY & TRANSPORT GOALS BY 2050

- > **To become carbon neutral by reducing CO₂ emissions by at least 80% compared to 2007**
- > **Zero emissions in transport**
- > **Zero waste**
- > **Widespread adoption of circular economy**

OBJECTIVES

- | | | | |
|--|--|--|--|
| <ul style="list-style-type: none"> > Reduce land use by limiting the artificial occupation of more territory | <ul style="list-style-type: none"> > Decarbonise the energy sector | <ul style="list-style-type: none"> > Produce and consume goods based on principles of circular economy | <ul style="list-style-type: none"> > Sustainable maintenance, construction and usage of infrastructures and buildings. |
|--|--|--|--|

TARGETS

- > **80% of buildings with high energy efficiency**
- > **Minimum of 80% share of renewable energy in final energy consumption**
- > **Electrification of private and public transport**

MILESTONES FOR 2030

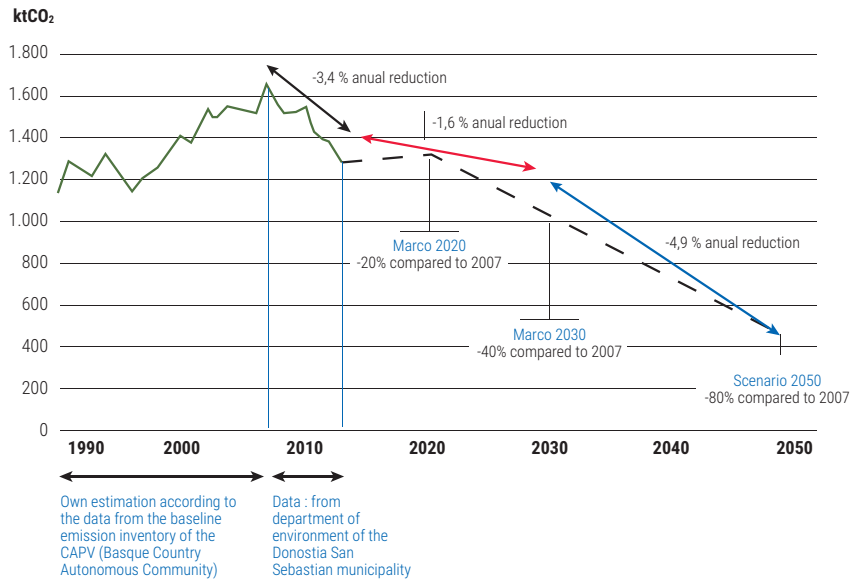
Energy

At least 40% reduction of GHG emissions.
 20% share of renewables in energy mix.
 20% reduction of primary energy consumption compared to 2007
 Eradicate energy poverty

Transport

60% share of public transport in the modal split.
 20% reduction of individual motorised trips
 Improve air quality according to WHO norms
 Equip the municipal fleet with clean vehicles

Trajectories of the GHG reduction emissions in Donostia San Sebastian according to the new 2030 objectives of the Global Covenant for Climate and energy



Foreseen trajectory of GHG emissions
 (Source: Plan de Acción Klima 2050 de Donostia / San Sebastián)

PRIORITY OBJECTIVES AND MAIN LEVERS OF IMPLEMENTATION

DECARBONISE THE ENERGY SECTOR AND ELIMINATE ENERGY POVERTY

The roadmap aims at decarbonising the energy sector by shifting to renewables, while at the same time increasing energy efficiency. In addition, energy poverty should be eradicated in San Sebastián



MEASURES AND TARGETS

- Min. 80% reduction of GHG emissions by increasing renewables & energy efficiency
- Min. 80% share of renewable energy in final energy consumption by 2050.

HOW



1. Implement programmes for **energy savings and improve energy efficiency** measures for **a) industrial and tertiary activity, b) events, c) domestic housing**, including air conditioning, hot water and lighting that will **stimulate decarbonisation**.
2. Implement **advisory programme** to support companies in their decarbonisation activities and energy savings.
3. Guarantee that energy supply of all facilities and properties belonging to the municipality is based on **renewable sources**.
4. Develop an elaborated **investment programme** and **management plan** for the generation of energy from renewable sources in municipal facilities.
5. Develop a **communication programme** that encourages the installation of private facilities that generate energy from renewable sources.
6. Establish a **municipal energy service company** that not only generates, distributes and promotes energy from renewable sources, but moreover is self-consuming and promotes energy efficiency and energy saving measures.
7. **Approve new regulation on municipal energy efficiency and environmental quality of buildings** based on climate criteria.
8. Implement **rehabilitation programmes** and **regeneration of buildings** based on energy efficiency and decarbonized sources
9. Implement **support programme for financing and taxing energy** and social rehabilitation of the dwellings based on energy efficiency and decarbonisation standards
10. Improve **energy efficiency standards** for trade, services and restoration and include these, where appropriate, in the plans of the climate activity centres (e.g. companies, universities, hospitals, etc.).
11. Establish an **aid programme** for those suffering from energy poverty.

ZERO EMISSIONS IN MOBILITY SECTOR

San Sebastián wants to achieve zero emissions for its mobility sector by 2050. Therefore, motorized transport (especially individual car trips) need to be greatly reduced, and private and public transport substantially cleaned and electrified.



MEASURES AND TARGETS

- 60% of all motorized journeys within the city covered by public transport by 2030
- 20% reduction of the trips made by private motorized transport by 2030
- Electrification of the entire bus fleet by 2030



HOW

1. Align mobility plans of activity centres (e.g. companies, universities, hospitals, etc.)
2. Develop a **school road programme** based on sustainable mobility principles.
3. Introduce **speed limits of 30 km/h** throughout the city (20km/h in high density areas).
4. **Improve cycling and walking infrastructure**
5. **Develop further the Donostialdea metro** service
6. **Ban diesel cars** from the city starting in 2020
7. Gradually **replace delivery vehicles with low- emission vehicles** or non-motorized vehicles.
8. Create **zero emission zones** without cars in the city and limit parking spaces in public areas
9. Develop widespread electric charging infrastructure for public and private transport

GOVERNANCE

In San Sebastián, several existing policies are already aligned to the objectives of the roadmap. However, there are also 19 different plans coexisting within the municipal administration that are currently operating outside of the roadmap's scope. Therefore, a **redefinition of the city's governance architecture** is required, so that each administrative body links the roadmap to the plan it is ultimately responsible for. The development of San Sebastián's roadmap provided the perfect occasion to face this transformation towards a **new administrative culture**. In the roadmap, policies and measures have been allocated equally among different municipal departments through the **principle of transversality**. Consequently, various new channels of communication, cooperation and management structures have emerged, thereby changing the governance of the city administration. However, implementing this new administrative culture of transversality within the city administration requires presently inflexible structures and methods of working to become more flexible and thereby efficient. In order for San Sebastián's roadmap to succeed, every municipal department will from now on be **obliged to incorporate climate and energy objectives** into its own plan, and also the roadmap actions it is responsible for. Such an integrated approach exemplifies how climate mainstreaming can be introduced into the everyday working culture of the city administration.

Furthermore, a set of different governance bodies are responsible for the implementation of San Sebastian's roadmap. The city's climate coordination board, *Klima DSS 2050*, represents the plan's political-technical management body and is responsible for encouraging and facilitating all departments to align their sectoral policies for achieving the climate commitments. Led by the mayor's office, the board will supervise, evaluate and promote the implementation of the plan's measures and respective climate policies. Finally, its task is to ensure that climate actions of the different organs, such as sectoral councils and the social council, will be complementary. The DSS 2050's technical commission will ensure that the councillors responsible for ecology, finance, mobility, sustainable urbanism, presidency, as well as the promotion of citizen participation and the office of strategic planning and the Cristina Enea Foundation (a key environmental stakeholder in the city) are on board.

In order to strengthen and expand the existing municipal governance structure of the city hall, the city's bureau *Oficina Klima DSS 2050* will address climate aspects and extend its capabilities in analysis, advice and intervention.

The Observatory of Sustainability and Climate will take over tasks that are currently performed by the Observatory of Sustainability, as well as a number of additional tasks related to knowledge and training on climate change. Coordinated by the Municipal Information Unit of the Presidency and the Data Observatory of the city, it will cooperate with the departments that manage the different public policies related to climate change. Its tasks will include the publication of informative materials, preparation of instructions and technical recommendations, municipal internal training courses, citizen training courses, the consultation centre.

Finally, the Klima DSS 2050 Advisory Council aims to strengthen municipal policy with the contributions from people who are intervening and investigating in the different facets of change climate in the whole Basque Autonomous Community. This Advisory Board will also incorporate economic and social agents.

CITIZEN PARTICIPATION

Public participation in San Sebastián's roadmap goes beyond the understanding of public participation as an open debate or discussion. Instead, it includes commitment and intervention of all local stakeholders and citizen in decision-making processes, as well as in the development of policies and measures. Furthermore, citizen engagement in the Basque city also involves the stimulation of citizen initiatives and the establishment of possible public-private partnerships.

Consequently, the development and implementation of San Sebastián's roadmap is about designing new forms of collaborative governance within the city by mobilising the collective intelligence of its inhabitants. The city thereby encourages active and informed citizenship, thus enhancing democratic values, reinforcing the concept of people power, while at the same time strengthening transparency, distribution of responsibilities and accountability.

*"The city of the future needs people like those who have made the city of the present a reality. Citizens who are **responsible, active and trained to achieve global, changing evolution**, which is only possible by means of strong values and social capital. Citizens who cooperate, who organise themselves, who lead the way in a life without violence and projects and who open the way to permanent, sustainable development."*

Source: <http://www.donostiafutura.com/en/strategic-plan-for-san-sebastian>



GRENOBLE

Citizen Engagement at the core of the energy transformation of the “Capital of the Alps”

The Grenoble-Alpes-Métropole Region consists of 49 municipalities, among them the capital Grenoble. The metropolitan area is home to ca. 500,000 inhabitants, out of which more than 1/3 live in Grenoble. The Grenoble metropolitan region is a major winter tourism and research hub, and often nicknamed as the “Capital of the Alps”. The city of Grenoble houses some of the country’s best universities and was ranked repeatedly as the best French city for students. Grenoble is considered to be one of the climate action frontrunners in France, and was also the first French metropolis to have a Green politician, Eric Piolle, as mayor.



INHABITANTS Approx. 500,000

SIGNATORY OF COVENANT OF MAYORS Since 2008

REGION Auvergne-Rhône-Alpes

ENERGY INFRASTRUCTURE Grenoble is one of the few cities in France that has a local energy company (GEG – *Gaz Electricité Grenoble*) and can therefore influence energy infrastructure decisions vis-à-vis the national monopolist EDF

PARTICULARITY: CITIZEN ENGAGEMENT CHARTER Grenoble has a “*charte d’engagement*” in place, i.e. a citizen engagement charta where every local stakeholder can list its climate and energy actions and commit to the objectives set by the city.

AMBITION OF THE PLAN

OVERALL 2050 GOALS

- > **To reduce GHG emissions by 75%**
- > **Halve energy consumption**
- > **Achieve 100% renewable energy**
- > **Improve air quality by halving nitrogen oxide and particle (PM 2.5) emissions**

INTERMEDIARY MILESTONES

- > At least 50% reduction of GHG emissions by 2030
- > At least 40% reduction in final energy consumption by 2030
- > 100% renewable electricity by 2022
- > At least 35% RES by 2030

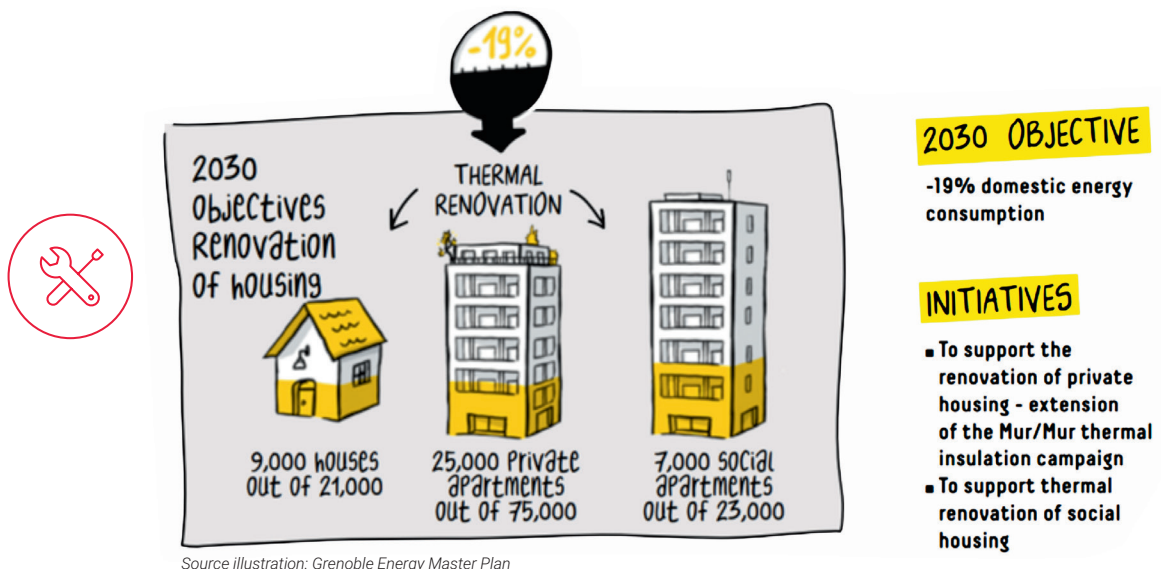
PRIORITY OBJECTIVES AND MAIN LEVERS OF IMPLEMENTATION

CLEAN AND EFFICIENT BUILDINGS

As 42% of the total energy costs are related to buildings in the Grenoble metropolitan area, retrofitting the buildings sector is considered as a major priority in the roadmap.



MEASURES AND TARGETS



HOW



Grenoble-Alpes Métropole encourages not only its residents, but also its tertiary sector to **commit to substantial thermal renovation**. In order to mobilise action, the city of Grenoble for example stipulates in its Local Urban Plan that the performance of new buildings must be 20% higher than the current thermal regulation requirements, exemplifying how local building codes can drive high energy efficiency ambition.

CHALLENGE



Most of the Grenoble's metropolitan region's houses have been built between 1945 and 1970, including offices, universities and hospitals, and are therefore not very energy efficient. They will require major and deep retrofitting, for which Grenoble will have to mobilise substantial upfront investment volumes

GOING 100% RENEWABLE

With the conversion to renewable energy-based electricity and heating systems, coal will be banned completely by the Grenoble metropolitan region, while also fuel oil boilers will be progressively phased out. Furthermore, Grenoble will use a mix of local renewable energy sources on its pathway towards 100% renewable energy, focusing especially on decarbonising its heating sector.



MEASURES AND TARGETS 2030

- Increase production of renewable and recovered energy via heating networks by 160%
- Quadruple solar thermal energy production
- Increase Geothermal production by a factor of 12.5
- Increase use of biogas and sustainable biomass



HOW

Grenoble's Heating network is already the 2nd largest in France. Nevertheless, the metropolitan area will invest in **8 new local heating networks by 2030**, running on renewables, while the main heating network will be further densified through mandatory connection of new buildings.

In order to boost solar thermal energy, feasibility studies and investments in public solar thermal systems will be considerably supported, in particular via the Local Heating Fund.

The use of geothermal energy will be boosted by the creation of compact geothermal networks, including a shared outlet network that will power 300,000 m² of buildings in the metropolitan area.

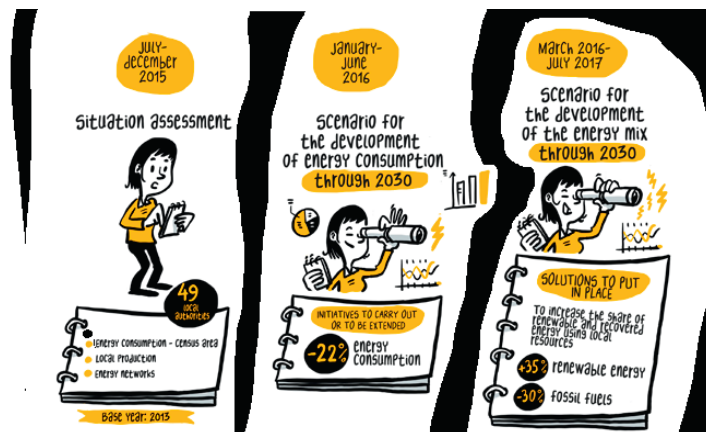
Finally, excess heat produced on industrial sites will be recovered and injected into the heating network. This will be beneficial for the metropolitan area's amount waste policy, as it will lead to less waste being incinerated to generate heat.

GOVERNANCE

In order to implement its energy roadmap in conjunction with all relevant local stakeholders, the Grenoble metropolitan region has established a public energy committee. This new body includes stakeholders such as network operators, regulated tariff energy suppliers and other players from the energy production, distribution and demand management side. The public energy committee will be ultimately responsible for the swift and effective delivery of the roadmap's ambitious targets, in particular in the field of energy. The new body also represents a major opportunity for Grenoble-Alpes-Métropole to strengthen its partnerships with all relevant energy stakeholders on its territory.

CITIZEN PARTICIPATION

During the development of its roadmap, the Grenoble metropolitan area launched a three-stage citizen participation process within two years, consisting of several rounds of discussion so that citizens and local stakeholders could gain ownership of the plan. As a result, a wide variety of stakeholders could provide their inputs in the drafting of the roadmap – e.g. all 49 local authorities in the metropolitan region, the citizens' panel energy users committee, the local urban development agency, energy authorities, researchers, the air energy climate plan committee, distribution network operators as well as the local energy and the climate agency.



Source illustration: Grenoble Energy Master Plan

Throughout the process, questions regarding the transformation of the energy landscape, including the change of energy consumption patterns, innovations, the production of renewables, and, most importantly, regarding the **share of responsibility** were addressed. All the stakeholders could contribute so that their inputs and data modelling allowed for the scenario development. In addition, the calculation of potential environmental and economic advantages and risks resulting from initiatives, such as the replacement of boilers, the insulation of buildings etc. resulted in a number of approved initiatives, which were ultimately included in the roadmap's

scenario. This holistic approach was also key in Grenoble-Alpes-Métropole decision to establish the public energy committee in order to oversee the successful implementation of the roadmap, and represents an inclusive and effective decision-making process.

Grenoble-Alpes-Métropole citizen engagement charter, the "*charte d'engagement*", also played a critical role in the citizen participation process of its roadmap. Through the charter, each and every citizen could submit their ideas and activities for contributing to the achievement of the roadmap. Thereby, the citizen engagement charter is not only a truly inclusive process, but also fosters solidarity among the people of Grenoble-Alpes-Métropole and allows for sharing responsibilities among all the local players involved.



SALZBURG

A Sound of Change: The birthplace of Mozart composing a roadmap towards energy independence and climate neutrality

At the foot of the Alps, surrounded by mountains and pervaded by the river Salzach, the birthplace of Wolfgang Amadeus Mozart is taking up Mozart's composing art – in the form of a strategy to become a climate neutral, energy autonomous and sustainable territory. Just as Mozart managed to combine sounds in an artistic manner, so do the "Salzburger", Salzburg's residents, creatively combine their climate targets with inclusive and effective strategies.



INHABITANTS 153,377

MEMBERSHIP IN URBAN INITIATIVES Longstanding member of the European Energy Award

REGION Land Salzburg

NETWORK OPERATOR Stadtwerk Lehen (Lehen Municipal Utility)

PARTICULARITY: MODEL FOR SMART GRIDS AT URBAN LEVEL Since 2009, Salzburg is considered to be a model example for the roll-out of smart grids in its energy infrastructure.

BACKGROUND

Salzburg's roadmap has to be seen in the broader context of the climate and energy strategy of the region (Land Salzburg), which aims at becoming climate neutral, fossil fuel free and nearly energy independent by 2050. The following **milestones** have been set for Salzburg region on its 2050 pathway:



2020

**30% EMISSION REDUCTIONS
50% SHARE OF RES IN THE
ENERGY MIX**



2030

**50% EMISSION REDUCTIONS
65% SHARE OF RES IN THE
ENERGY MIX**



2040

**75% EMISSION REDUCTIONS
80% SHARE OF RES IN THE
ENERGY MIX**

In order to reach these milestones, Salzburg region strongly depends on the city of Salzburg's contribution. Salzburg's roadmap has therefore incorporated the regional headline targets and translated them into a set of clear climate and energy policy measures.

AMBITION OF THE PLAN

OVERALL ENERGY & BUILDINGS GOALS BY 2050

- > Achieve climate neutrality
- > Become free of fossil fuels
- > Become nearly energy independent by covering 80% of energy needs with renewables produced in Salzburg region
- > Reduce energy consumption by at least 45%

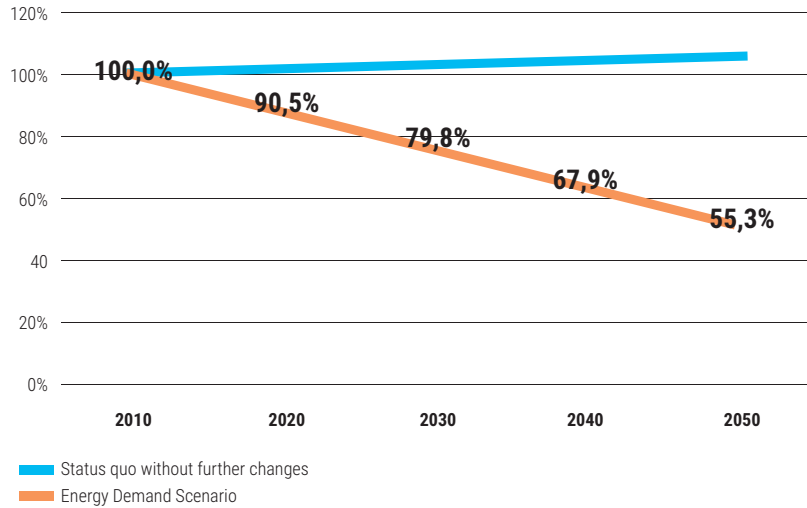
OBJECTIVES

- > Change consumer trends and values within society so that every citizen positively influences the city's energy demand
- > Intelligently link all production and distribution modes of energy to achieve maximum efficiency in supply and demand
- > Electrification of public and private transport, while at the same time boosting other modes of transport

TARGETS

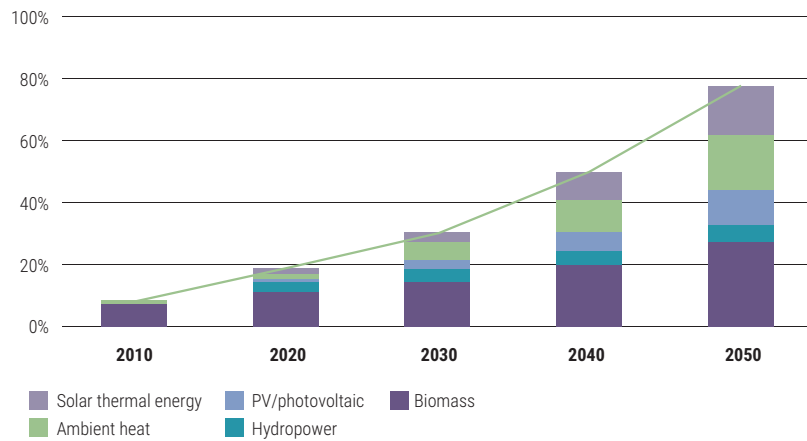
- > Beginning in 2040, increase renovation rate of all public and private buildings to 3%
- > Rehabilitate 100% of the gross floor area by 2050
- > Equip 70% of roof areas with solar panels
- > Increase renewable energy production from CHP, waste heat, heat pumps, hydropower and biomass while respecting the available local and regional resources

Energy consumption trajectory from 2010 to 2050 in Salzburg, according to most ambitious scenario



(Source: Salzburg Masterplan)

Trajectory of renewable energy produced in Salzburg region, according to most ambitious scenario



(Source: Salzburg Masterplan)

PRIORITY OBJECTIVES AND MAIN LEVERS OF IMPLEMENTATION

CLIMATE FRIENDLY BUILDINGS

In order to tackle energy waste, implement highly energy efficient building standards and improve its energy infrastructure, Salzburg's roadmap differentiates between private and municipal buildings. The latter should function as role models by becoming positive energy buildings. Moreover, it is important that every energy efficiency measure triggers change in energy consumption patterns, which is why most foreseen activities are combined with an awareness raising action.



MEASURES AND TARGETS



While increasing the refurbishment rate to 3% from 2040 onwards, 100% of the gross floor area will be rehabilitated by 2050, according to the most ambitious scenario in Salzburg's roadmap. The development of this rehabilitation plan in combination with a sustainability check will thereby allow for implementing highly energy efficient renovation standards. Every new construction project will have to go through the city's sustainability check in order to be approved.

In the entrance hall of all municipal buildings, their energy consumption will be clearly displayed in order to lead by example. Moreover, all new housing units will be connected to the city's smart grids network, which will progressively be also the case for the existing building stock.

RENEWABLE ENERGY

Salzburg's roadmap targets a fossil-fuel-free energy sector by 2050. Apart from a widespread campaign to motivate citizens to equip their roofs with solar panels, biomass, hydropower, CHP, waste heat as well as heatpumps represent the main renewable energy sources to be used in Salzburg's energy transformation.



MEASURES AND TARGETS



By 2025, Salzburg seeks to leverage a roof space potential of 700,000 square metres for its solar energy campaign. 140,000 m² of solar panels should be installed by then, which amounts to a solar energy production of 14,000 kWp. By 2050, **70% of the suitable roof spaces** (2.5 mil. m²) for producing solar energy will be used (60% PV and 40% solar thermal). Salzburg also seeks to use 5.000 tonnes of biomass for direct heating and 110.400 tonnes for district heating (CHP) by 2050. Furthermore, the potential for hydropower should be fully exploited while respecting the available resources in a sustainable manner, accompanied by an expansion of heat pumps.



CHALLENGE

In Salzburg's district of Rupertiwinkel, a plan for geothermal energy had to be interrupted due to economic problems, thereby putting the territory's geothermal ambitions to a halt for the moment being.

GOVERNANCE

Based on the broad range of subjects the masterplan touches upon, a respective organizational structure is required for implementing Salzburg's roadmap. This should not only lead to awareness and a higher level of acceptance, but also to sharing responsibility and raising commitment. Therefore, a high-level steering group was established, consisting of the regional energy company Salzburg AG and political representatives of the city, which is responsible for ensuring a high level of political acceptance and strategic implementation of Salzburg's roadmap. The overall development process of the roadmap was coordinated by a project team including several municipal departments and research institutes, such as the city of Salzburg's office for urban planning and traffic, the Salzburg AG, the AIT – Austrian Institute of Technology and the SIR – Salzburg's department for regional planning and housing.

Finally, the advisory board Smart City Salzburg is responsible for engaging local stakeholders in the implementation of Salzburg's roadmap. This body consists mainly of NGOs, local businesses and property developers and has a consultative function. It builds on Salzburg's already existing continuous dialogue with all local stakeholders.

CITIZEN PARTICIPATION

Salzburg's roadmap recognizes that broad citizen involvement is required in order to achieve its ambitious goals, especially when it comes to triggering changes in energy consumption patterns and ultimately, lifestyles. A multitude of projects included in the plan were introduced following discussions with citizens in a series of citizen fora, where participatory methods such as "Ideenwerkstatt" – ideas workshop – were used. In the framework of its roadmap, Salzburg is also running an education campaign aimed in particular at young people, such as for example an ecological certification scheme for all schools, as well as the introduction of green skills, ecology and renewable energy trainings into the educational programme.



MANCHESTER

Climate Change Strategy 2017-2050 How a centre of the industrial revolution becomes a centre of the energy revolution: From spinning yarn to carbon budgeting

The city of Manchester played a key role in the industrial revolution in the 19th century. As a former textile capital, the city has a history of paying attention to each and every detail as every single yarn adds its part to the garment. Today, Manchester is one of the frontrunners in the energy revolution with its roadmap to become a zero carbon city by 2050.



INHABITANTS 520,000

SIGNATORY OF THE COVENANT OF MAYORS Since 2009

REGION Greater Manchester

CHANGING CULTURE The roadmap specifies that a change in culture is an enabling objective. Thereby, an understanding of climate change and how to take action is embedded throughout the city, and expected to underpin action to meet all of the strategy's other objectives.

PARTICULARITY: HIGHLY INCLUSIVE ROADMAP INCLUDING SEVERAL CITIZEN-LED BOARDS The inclusiveness of Manchester's strategy is represented by several boards and actions that aim at involving the society as a whole. The youth board, for instance, is led by 16-25 year old residents. Furthermore, the Climate Change Board allows all city stakeholders to contribute to the strategy's ongoing development process and delivery, representing a collective approach to climate change action with a robust and transparent governance scheme.

AMBITION OF THE PLAN: A VISION OF ZERO CARBON

OVERALL ENERGY & TRANSPORT GOALS BY 2050

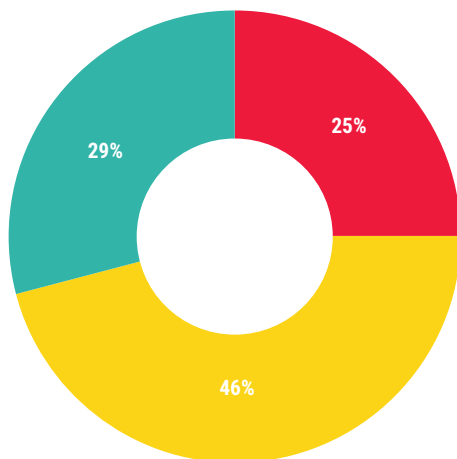
- > Zero carbon
- > Zero waste
- > Become fully climate resilient

“ Vision 2050 Manchester is playing its full part in limiting the impacts of climate change, locally and globally. It is a **thriving, zero carbon, zero waste, climate resilient city** where all our residents, public, private and third sector organisations are actively contributing to and benefiting from the city’s success. We compete and collaborate with cities around the world, ensuring that our collective efforts have limited global average temperature increases to well below 2oC, hopefully to 1.5oC, relative to pre-industrial level. ”

(Source: Manchester Climate Change Strategy 2017-2050)

PRIORITY OBJECTIVES AND MAIN LEVERS OF IMPLEMENTATION

In order to realise its vision and ambition, Manchester has identified five priority objectives: **sustainable economy and jobs; healthy communities; resilience to climate change; zero carbon and culture change**. Inherently linked, these objectives represent the fact the **successful delivery of this strategy will require joint action, an integrated approach, and collaboration across traditional areas of policy**. Based on these five priority objectives, six thematic areas of action were identified, including buildings, energy, transport, resources and waste, food and green spaces and waterways.



Manchester’s Scope 1 and 2 CO₂ emissions (2015 estimated)

- Business (1.169 ktCO₂)
- Domestic (724 ktCO₂)
- Transport (639 ktCO₂)

Our ‘zero carbon’ objective is that:

“ Manchester will adopt and stay within a scientifically robust carbon budget that is consistent with the Paris Agreement to limit global average temperature increases to well below 2°C, ultimately resulting in Manchester becoming a zero carbon city by 2050.

Manchester’s carbon budget, pathway and timescales for becoming zero carbon will be kept under ongoing review and be subject to revision, to ensure that the city plays its full role as part of the Paris Agreement. ”

It is hoped that the development of carbon budgets for Manchester will help to inform the development of the Greater Manchester Climate Change Strategy for 2020+. And that hopefully it will also help inform potential work by GMCA to agree a Greater Manchester carbon budget with UK Government, on the basis that, with the right devolved powers and funding, the city-region can deliver local action that makes a measurable contribution towards achieving UK CO₂ targets.

State of play of Manchester’s CO₂ emissions - Source: Manchester Climate Change Strategy 2017-2050

ZERO CARBON

In order for Manchester to become zero carbon, the energy that the city uses will be decarbonised by switching from fossil fuels to renewable energy sources, while also electrifying heat and transport. This will require new technologies such as battery storage to deal with fluctuating supply and demand. Furthermore, the city will adopt as one of the first European cities a comprehensive carbon budget approach.



TOWARDS A CARBON BUDGET

In the framework of its roadmap, Manchester plans to adopt a continuous, robust carbon budget consistent with the Paris Agreement by aiming at limiting global average temperature increase to well below 2°C. Manchester's carbon budget should also result in the city becoming zero carbon by 2050.

The idea behind Manchester's **carbon budget** is that it sets out how much CO₂ Manchester is *permitted* to emit in order to comply with the Paris Agreement. Manchester's roadmap will include five-year carbon budgets, which will be announced alongside future implementation plans, which will be published every 5 years. The carbon budget will be subject to ongoing revisions and modifications as required in this process.



Manchester's first carbon budget was announced in February 2018, and already laid out a detailed pathway and timescale for expenditure. In the framework of the EU-funded project SCATTER, the Tyndall Centre for Climate Change Research has calculated **a total carbon budget of 71 million tonnes CO₂ between 2018 and 2100 for Manchester**. 67 million tonnes of that budget are allocated to a series of 5 year carbon budgets for the period 2018 to 2038, with the remaining 4 million tonnes allocated to the period 2038 to 2100. Consequently, Manchester's annual carbon emissions will need to fall to near zero (below 0.6 Mt CO₂) already by 2038, in order to stay within the city's total carbon budget. Hence, Manchester will need to **reduce its carbon emissions by an average of 13% per year in order to be Paris-proof and comply with its own carbon budget**.

Apart from setting a clear climate action trajectory for the next three decades, Manchester's carbon budget also allows for calculating the city's contribution towards achieving the UK's carbon reduction targets (i.e. locally determined contribution), and thus represents a valuable, measurable and trackable tool for demonstrating the important role of cities in national climate policy.

CLIMATE RESILIENCE

Resilience to flooding, but also heat stress plays a crucial role for Manchester. Making the city and its infrastructure resilient to climate change includes the city's workers and supply chains. In return, this is expected to support businesses to prosper from selling their products and expertise needed to make Manchester and other cities worldwide resilient.



HOW IT WILL BE ACHIEVED



Through generating and distributing energy locally, this will help to climate-proof the energy infrastructure, which will also help to secure Manchester from disruption in energy supply. Building the capacity of communities and individuals to become resilient to flooding and heat stress will prevent the physical and mental health impacts that can otherwise occur. In addition, well-insulated and naturally ventilated buildings will avoid the need for air conditioning.

Manchester's Businesses: Key to the Success of the City's 2050 Roadmap

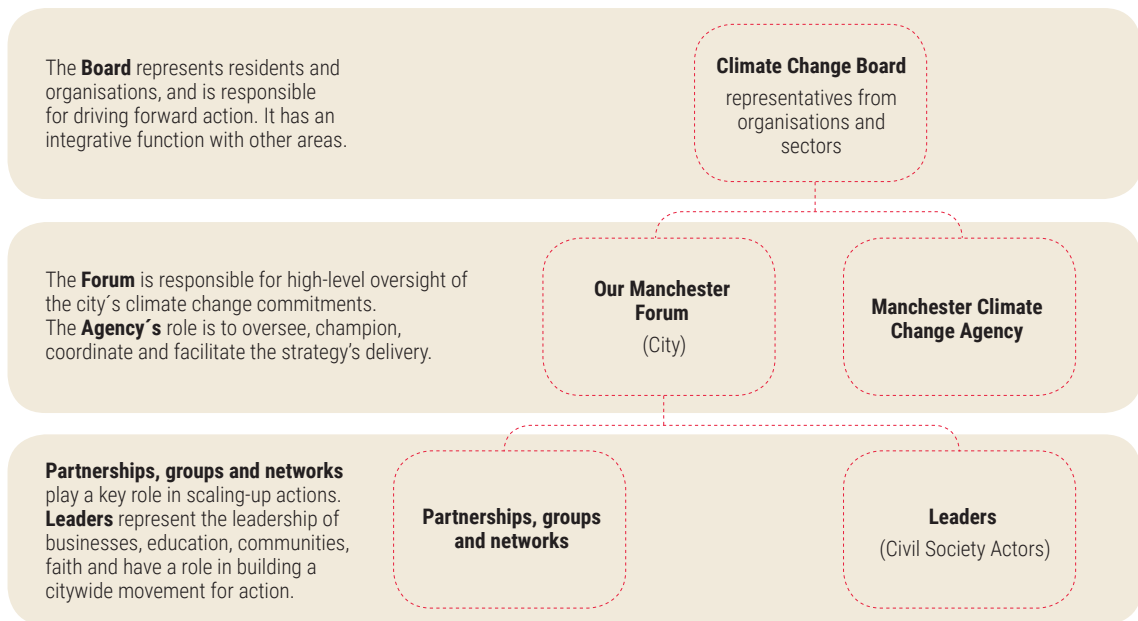
Manchester's industrial and commercial sectors are the city's greatest source of carbon emissions: 960,000 tonnes in 2017, equating to 45% of the city's total emissions. Bringing Manchester's businesses on board in the 2050 roadmap is therefore quintessential to its success.

With the definition of the zero carbon vision, the city's businesses have grasped the potential of designing new cutting edge, zero emission work spaces. In conjunction with the real estate sector and local universities, several flagship building retrofit projects are currently underway, such as for example the Oxford Road Corridor or Mi-IDEA, where NZeB and positive energy technologies are being used to make Manchester's industrial and commercial building stock progressively fit for the city's 2050 zero carbon trajectory.

GOVERNANCE

The **Manchester Climate Change Board**, established in February 2018, is responsible for driving forward the successful implementation of Manchester's 2050 roadmap. As part of the city's wider *Our Manchester* governance structure, the board contains a set of thematic sub-boards (e.g. the Climate Change Youth Board) that are each responsible in relation to their area of *the Our Manchester* strategy. The Manchester Climate Change Board also has an integrative function, as it integrates climate action into all areas of the *Our Manchester* strategy - from health, quality of life, jobs to economic success. The Board consists of representatives from different organisations and sectors across Manchester, and understands its mission as acting on behalf and in the interests of the city's residents and organisations. Therefore, the Board has committed to report publicly on its activities, by displaying the Board's meetings minutes on www.manchesterclimate.com and making formal accounts available at the Companies House at beta.companieshouse.gov.uk/company/09761661, thereby exemplifying the transparent, accountable and democratic character of Manchester's roadmap.

The **Manchester Climate Change Agency** is responsible for the coordination and delivery of the 2050 roadmap, while the **Manchester Forum** is overseeing that Manchester meets its commitments set out in its roadmap.



Despite the far reaching competences of the board, the forum and the agency, Manchester wants to ensure that really every part of the city is involved within the strategy. Therefore, in order to reach all local stakeholders and citizens, existing and **future partnerships**, groups and networks are all mobilised to play a critical role within the 2050 roadmap. Although political role models and leading by example can inspire and help drive action, Manchester acknowledges the fact that different stakeholders respond best to the activities and opinions of their peers and competitors. Hence, **leaders** of any societal level are encouraged to build on the city wide movement for action on climate change.

With this elaborated governance architecture in place, the city of Manchester demonstrates that in order to ensure the successful implementation of a 2050 roadmap, all residents, public and private sector organizations should feel responsible in doing their part in the city's climate action.

“ Through the Manchester Climate Change Youth Board, we aim to act as a voice for the young people of the city, to drive change across a number of sectors for a green and healthy future for ours and future generations ”

Tudor Baker, Manchester Climate Change Youth Board member

Manchester Climate Change Youth Board

The Manchester Climate Change Youth Board was established in November 2017 through an open application process. Made up of six talented 16-25 year olds who are studying and working in Greater Manchester, the Youth Board are vital members of the city's Climate Change Board, bringing energy and driving youth action in the city.

“ Our young people have the biggest stake in the city's future success. By creating jobs in the low carbon economy, cleaning our air, providing access to green spaces and enabling travel by walking, cycling and public transport, the city will prosper over the short term and into the future. This is why the Board and the Agency have established a new Manchester Climate Change Youth Board, to provide a platform for Manchester's young people to develop their own youth-led climate change initiatives ”

(Source Quote: Manchester annual report on Climate Change Strategy 2017-2050)

CITIZEN PARTICIPATION

During the months of July and October in 2016, Manchester launched a public consultation on the roadmap's overall vision, to which more than 700 residents and organisations replied. 85% of respondents agreed on the objective of becoming a zero carbon city by 2050, while another 6% found that this target was not high enough. Subsequently, the city respected the will of its residents and set a zero carbon vision in its 2050 roadmap.

Citizen participation in Manchester is also fostered by developing a low carbon culture within the city, which is characterised cultural and lifestyle change, ability and motivation of residents to take climate action. Manchester championed for example the Carbon Literacy Project, which raises awareness of the carbon dioxide costs and impacts of everyday activities. Consequently, this project contributes to increase the ability and motivation of Manchester's residents to reduce emissions on individual, community and organisational level.

CONCLUDING REMARKS

In a setting of mid-century planning and long-term visioning, time has come to embed all climate, energy, and resilient plans into citizens' **lifestyles and business cultures**, so that climate positive and resilient decision-making and behaviour become common practice. The investigation of roadmaps allowed us to understand that the energy transition is not only a technical task. Instead, it provides the opportunity to **sustainably transform society**, while constantly increasing the quality of life.

Future measures and strategies proposed in the roadmaps strongly depend on citizens' and stakeholders' engagement and lifestyle changes. Therefore, the involvement of all citizens and local stakeholders – not only in the development process, but moreover in the implementation – is critical in fostering **ownership and long-term dedication**. The transformation of the whole society needs to be shared and shouldered by all local actors as a common goal to strive for.

It could also be seen that a 2050 visioning and planning exercise **strongly affects local governance schemes and processes**. This process not only altered the ways administrative bodies interact and collaborate with each other within the city, but it also led to the establishment of new local forums and dialogue platforms,

representing new forms of collaborative governance at local level. Furthermore, designing long-term roadmaps has shifted away from being purely **a dialogue among experts to a real public debate involving all citizens**.

Local governments also increasingly focus on the necessity to foster **stronger and more diverse partnerships with all actors of society**, in order to better develop and implement their long-term energy and climate roadmaps. In particular, a stronger collaboration between local government and academia is emerging in this context. Moreover, an **enhanced coordination and communication** of respective measures result in inclusive and sustainable dialogues with an active citizenship.

The exercise of long-term planning allows moreover for identifying **new needs**. Cities are increasingly realising that in order to transform their energy systems to become fully renewable, they need to rely on their surrounding areas for meeting their clean energy needs. The roadmaps we analysed also show that cities are fully aware that they **need to respect and live within the planet's available resources**. Circular economy, energy sufficiency and carbon budgets (how much carbon a city is permitted to emit) are thereby becoming common concepts in cities' 2050 roadmaps in order to

become Paris-proof. In addition to this, their climate and energy roadmaps take on an integrated approach by covering all areas of society. **This cross-sectoral character of the roadmaps is thereby a milestone when it comes to long-term urban planning**.

The 2050 roadmaps analysed contain a **common language** and framing, showing that issues of clean mobility, high shares of renewables, energy efficiency and sufficiency potentials is a joint narrative shared at local level. Even though these are very different in terms of culture and economy, they face similar challenges in their energy transition and approach them from a similar angle. Despite these similarities, our analysis has also showed that there still remain differences with respect to the definition of the **landing point in 2050**. Targets of becoming fossil free, carbon neutral etc. are still defined in a diverse manner by European cities.

Planning for 2050 is happening now in European cities. These examples have shown how cities are redefining urban climate and energy governance and citizen participation in designing an ambitious mid-century future, and will hopefully inspire European leaders to design together with their citizens Europe's Paris-proof energy transformation by 2050.



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