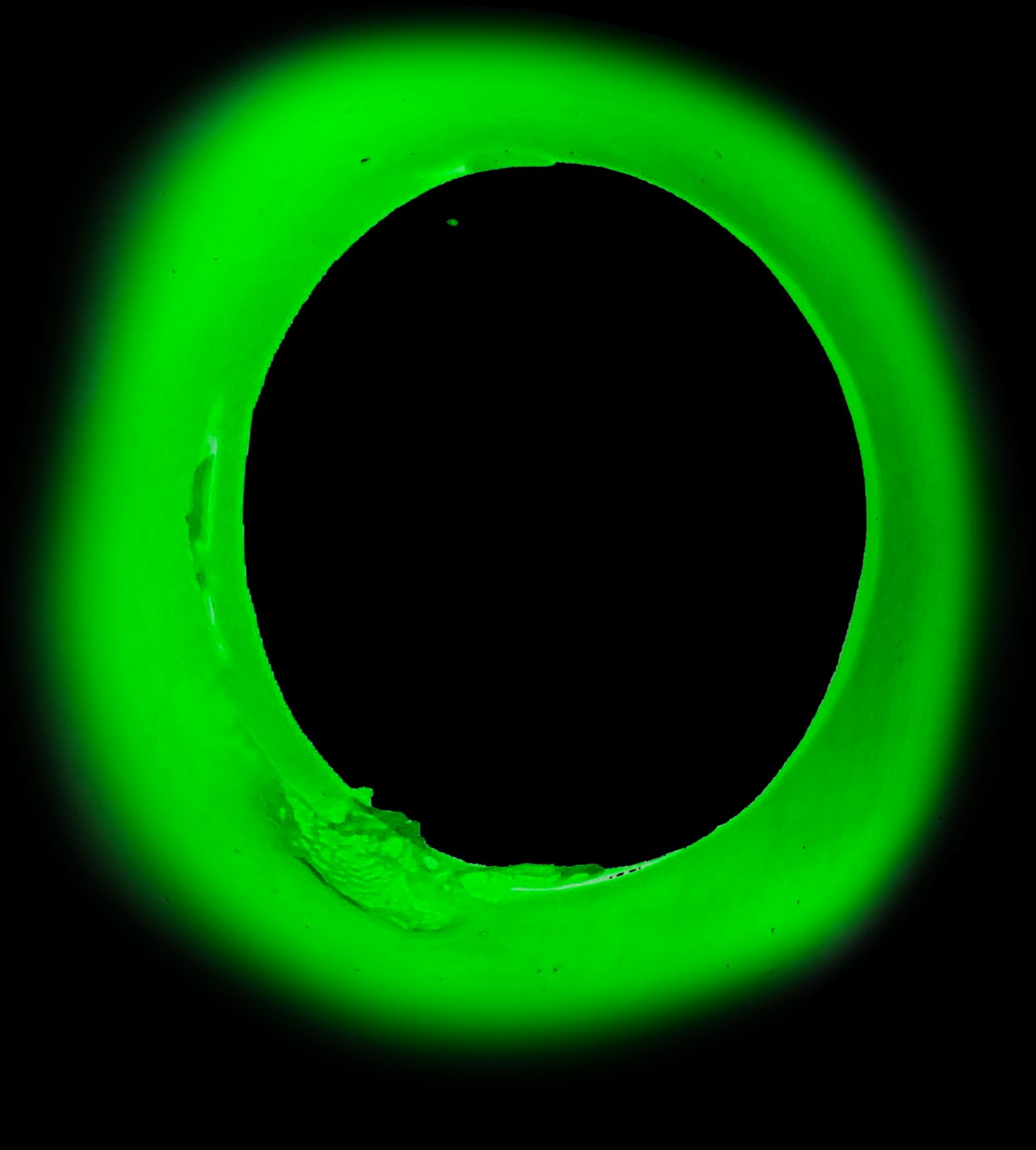
Guidebook for Achieving Carbon Neutrality by 2050



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C-Track50
Putting regions on track for carbon neutrality

WWW.C-TRACK50.EU

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EXECUTIVE SUMMARY

Avoiding the most devastating effects of climate change requires cities and regions to lead the way towards carbon/climate neutrality. A number of cities and territories across Europe have embraced this challenge. They are developing and implementing long-term energy and climate plans that aim for carbon/climate neutrality by or before 2050. In order to reinforce and facilitate such efforts, it is vital to have clear guidance on what carbon neutrality means and how local and regional authorities can ensure that this is achieved within their sphere of influence.

The Guidebook for achieving carbon/climate neutrality by 2050 has been developed within the framework of C-Track 50, a project funded under the European Union's Horizon 2020 research and innovation programme, which supported local and regional authorities in long-term energy and climate planning. The Guidebook describes the key steps in the planning process, along with important considerations in each step. It also presents best practices to inspire cities and regions and help them better design actions to take forward in the decarbonisation process.

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Local & Regional Authorities Paving the Way

WHAT IS CARBON AND CLIMATE NEUTRALITY?

Carbon neutrality means net zero carbon dioxide (CO_2) emissions, that is to say when there is a balance between CO_2 emissions and the removal of carbon from the atmosphere over a specified period. There are two different ways to achieve carbon neutrality, which work in tandem: reducing anthropogenic CO_2 emissions and actively removing CO_2 emissions.

Similarly, becoming 'climate neutral' means achieving a net-zero emissions balance, i.e. reducing greenhouse gas emissions as much as possible, and compensating for any remaining emissions.

Fully eliminating emissions is not realistic, however, the lower the emissions the easier it is to ensure that emissions produced are fully offset, for example through natural carbon sinks such as soil, forests and oceans. On the other hand, as the carbon stored in natural sinks can be released back into the atmosphere through forest fires, changes in land use or logging, it is essential to focus on reducing carbon emissions to reach climate neutrality.

WHY GO CARBON NEUTRAL?

The impact of climate change on the environment, ecosystems, and humans is already evident. Extreme weather events, such as drought, heatwaves, heavy rain, forest fires, floods and landslides are becoming more frequent around the world. Other related impacts include melting ice and rising sea levels, ocean acidification, and loss of biodiversity. Humans are also directly affected, for example from extreme weather that leads to injury and loss of life, and indirectly (e.g. from reduced crop yields, damage to crops and losses in livestock, damages in infrastructure). These impacts are expected to intensify in the future, with devastating consequences.

From the recent Intergovernmental Panel for Climate Change (IPCC) special report, it is evident that the global temperature increase must be kept below 1.5°C compared to pre-industrial levels to avoid some of the worst climate impacts and reduce the likelihood of extreme weather events. Carbon neutrality by the mid-21st century is essential to achieve this, and in turn limit further the catastrophic impacts of climate change. Therefore, immediate and decisive action on climate change is necessary.

1 Intergovernmental Panel on Climate Change, Global warming of 1.5°C - An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, 2019

Arctic region

Temperature rise much larger than global average
Decrease in Arctic sea ice coverage
Decrease in Greenland ice sheet
Decrease in permafrost areas
Increasing risk of biodiversity loss
Some new opportunities for the exploitation of natural resources and for sea transportation
Risks to the livelihoods of indigenous peoples

Mountain regions

Temperature rise larger than European average
Decrease in glacier extent and volume
Upward shift of plant and animal species
High risk of species extinctions
Increasing risk of forest pests
Increasing risk from rock falls and landslides
Changes in hydropower potential
Decrease in ski tourism

Atlantic region

Increase in heavy precipitation events
Increase in river flow
Increasing risk of river and coastal flooding
Increasing damage risk from winter storms
Decrease in energy demand for heating
Increase in multiple climatic hazards

Mediterranean region

Large increase in heat extremes
Decrease in precipitation and river flow
Increasing risk of droughts
Increasing risk of biodiversity loss
Increasing risk of forest fires
Increased competition between different water users
Increasing water demand for agriculture
Decrease in crop yields
Increasing risks for livestock production

Continental region

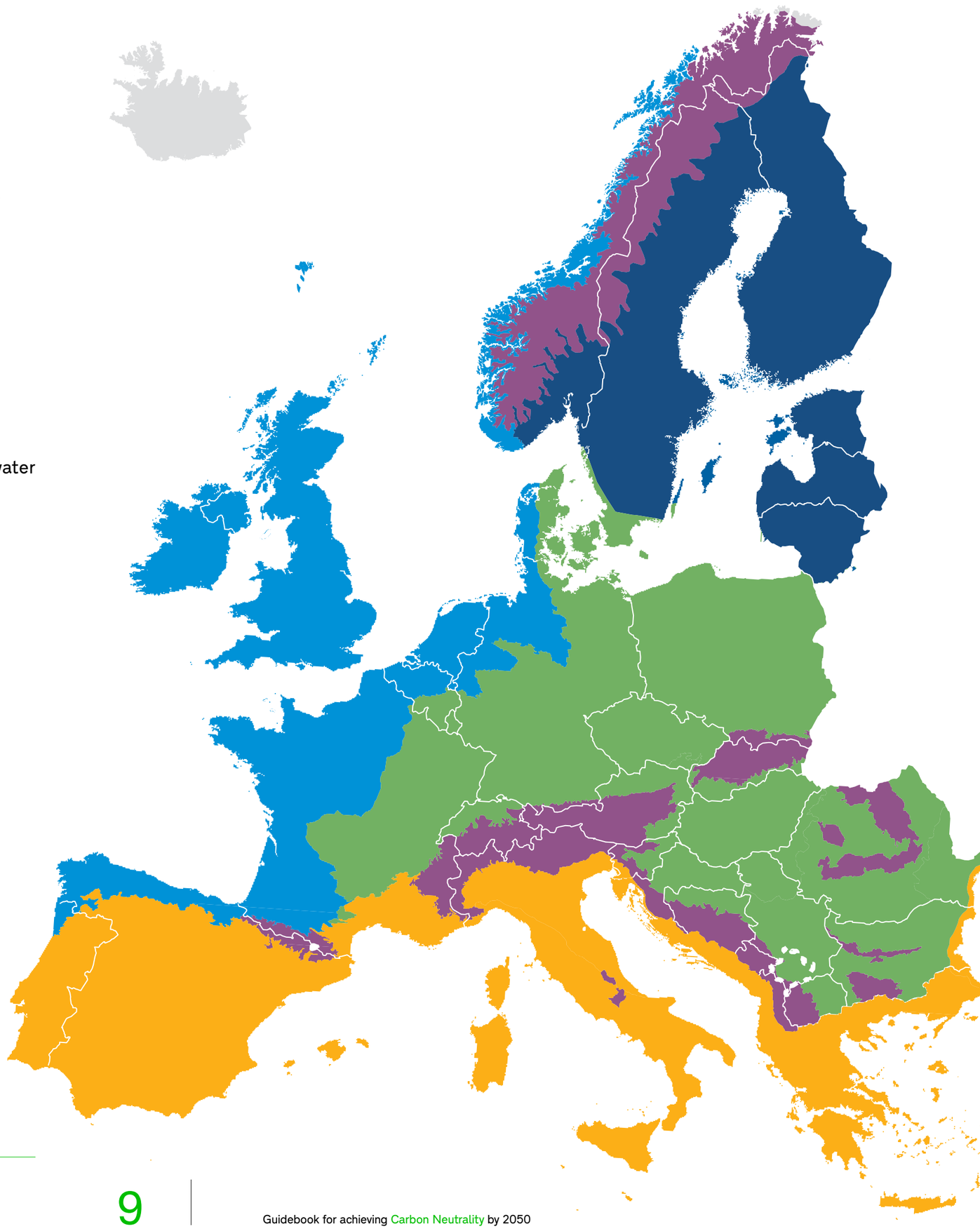
Increase in heat extremes
Decrease in summer precipitation
Increasing risk of river floods
Increasing risk of forest fires
Decrease in economic value of forests
Increase in energy demand for cooling

Boreal region

Increase in heavy precipitation events
Decrease in snow, lake and river ice cover
Increase in precipitation and river flows
Increasing potential for forest growth and increasing risk of forest pests
Increasing damage risk from winter storms
Increase in crop yields
Decrease in energy demand for heating
Increase in hydropower potential
Increase in summer tourism

Coastal zones and regional seas

Sea level rise
Increase in sea surface temperatures
Increase in ocean acidity
Northward migration of marine species
Risks and some opportunities for fisheries
Changes in phytoplankton communities
Increasing number of marine dead zones
Increasing risk of water-borne diseases



Source:
https://www.europarl.europa.eu/news/en/headlines/society/20180905STO11945/infographic-how-climate-change-is-affecting-europe

Relevant Policies & Measures

With the Paris Agreement that formally entered into force on 4 November 2016, the first-ever legally binding international treaty on climate change, leaders from around the world collectively agreed that climate change is a threat to the environment and humanity, and that global action is needed to stop it. As a result, the goal to limit global warming to well below 2°C and pursue efforts to limit it to 1.5°C has been set.

The EU's initial target under the Paris Agreement was to reduce greenhouse gas emissions by at least 40% by 2030 compared to 1990. However, recognising that climate change is an existential threat to Europe, in 2019, the EU endorsed the objective of achieving climate neutrality by 2050, in line with the objectives of the Paris Agreement. To enable the EU to move towards a climate-neutral economy, the 2030 greenhouse gas emission reduction target for 2030 is currently being revised.

The European Green Deal

The European Green Deal sets out how to make Europe the world's first climate neutral continent by 2050. It aims to transform the EU into a modern, resource-efficient and competitive economy, where there are no net emissions of greenhouse gases by 2050, and economic growth is decoupled from resource use. It also aims to protect the environment and human health, and in parallel ensure that the transition to climate neutrality is just and inclusive, and no person and no place is left behind.

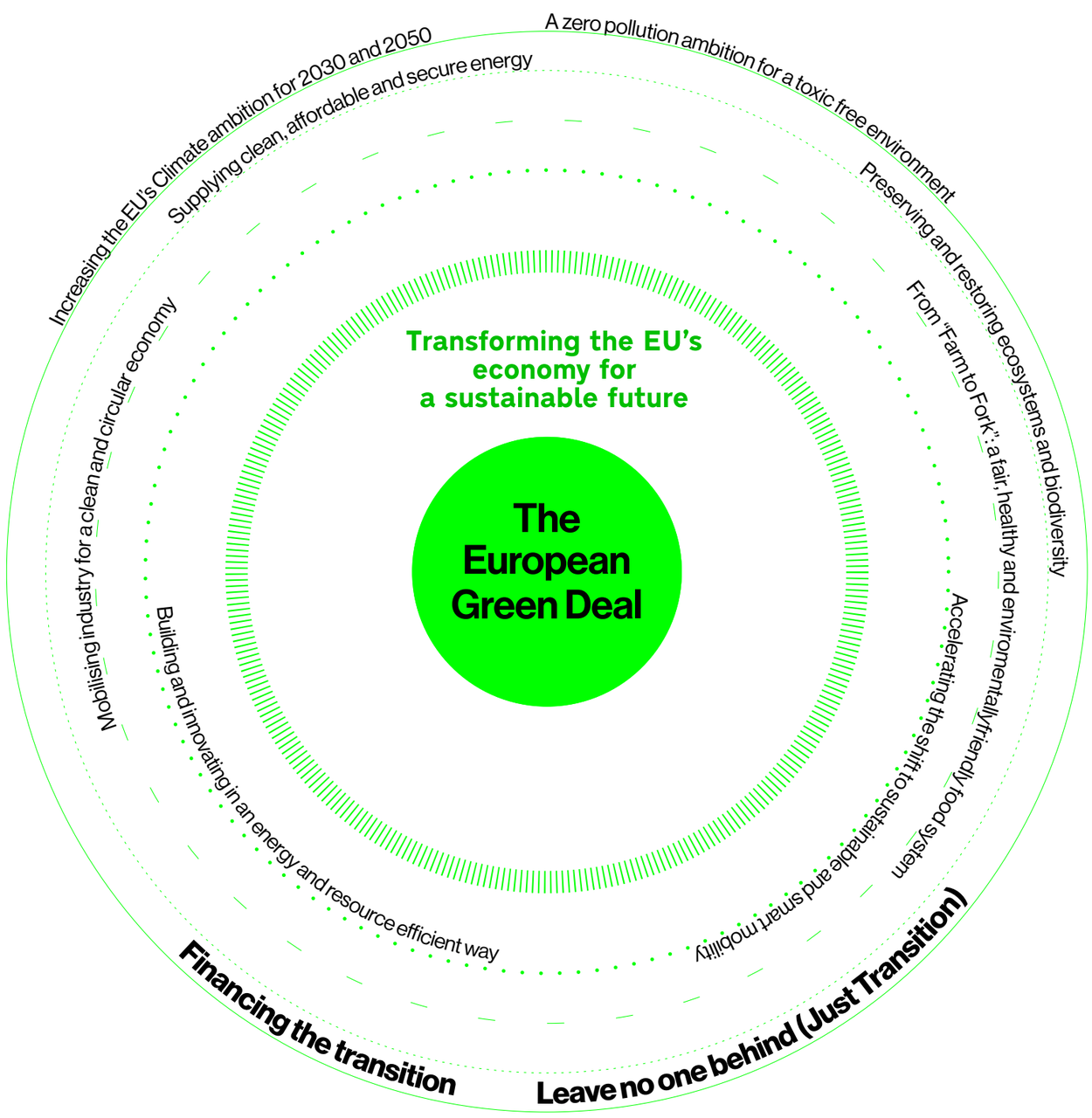
The European Green Deal includes an ambitious package of measures that focus, amongst others, on reducing greenhouse gas emissions and investing in research and innovation. The first climate action initiatives under the Green Deal include:

- The European Climate Law to introduce a legally binding target of net zero greenhouse gas emissions by 2050.
- The European Climate Pact to effectively engage citizens and stakeholders in climate action.
- The 2030 Climate Target Plan to reduce greenhouse gas emissions by at least 55% by 2030.
- A New EU Strategy on Climate Adaptation to make Europe a climate-resilient society by 2050.

Mobilising Research & Fostering Innovation

To be able to deliver the European Green Deal, there is a need to rethink existing policies and design a set of deeply transformative policies, especially on:

Figure 1: The various elements of the Green Deal[2]



2 Communication from the Commission, The European Green Deal, Brussels, COM(2019) 640 final

Carbon/Climate Neutrality Seems Impossible Until it is Achieved

Why Should Regional & Local Authorities Lead the Way Towards Carbon/Climate Neutrality

The role of regions and cities in EU policy-making has been widely recognised over the years, as these play a crucial role in implementing EU policies, but also in managing public investments. In addition, the effectiveness of EU policies can be improved by encouraging the involvement of regional and local government in the EU policy-making process.

According to the Council of European Municipalities and Regions (CEMR), an organisation representing European local and regional governments, more than 60% of the decisions taken at the European level have a direct impact on municipalities, provinces, and regions, whilst 70% to 80% of public investments in Europe are made by local and regional authorities. As such, the increasing importance of European local and regional governments in both the economy and the life of citizens is evident.

Furthermore, regional and local authorities are the governance level nearest to the people and their needs and demands. In principle, they are in a much better position than national governments to deal with matters that require local knowledge and an understanding of local needs and priorities, such as energy planning and climate adaptation. They are also in a better position to ensure that citizens participate effectively in the decision-making process affecting their daily lives, and in mobilising the public in implementing sustainable energy solutions, while at the same time acting as catalysts for change.

According to the UN Habitat, cities consume 78% of the world's energy and produce more than 60% of greenhouse gas emissions, with the biggest contributing sectors being buildings, energy production and transport. This makes cities a priority for action, whilst their urban density can be considered an asset for achieving a lower carbon footprint through more efficient infrastructure and planning. Cities are also particularly vulnerable to climate change, with many cities already dealing with the adverse impacts of climate change, and its associated financial costs, for example relating to repairing damage to infrastructure due to storms, flooding, and droughts. Evidently, climate change directly affects sub-national government, so climate change mitigation and adaptation should be a priority at local and regional level.

On the other hand, regions and cities have a key role in facilitating the implementation of sustainable solutions in many sectors, such as renewable energy production, the energy renovation of buildings, waste and water management, mobility and spatial planning. Recognising the important role they can play, regions and municipalities are developing numerous plans that outline actions and projects they intend to implement, such as:

- Strategic plans.
- Sustainable urban mobility plans.
- Spatial, land use and urban development plans.
- Energy management/action plans.
- Climate adaptation plans.
- Waste management plans.
- Flood risk management plans, river basin management plans etc.

Energy planning at a local level has been further encouraged through the Covenant of Mayors for Climate & Energy initiative (CoM). This was initially launched in 2008 in Europe, with the ambition to gather local governments to voluntarily commit to achieving and exceeding the EU climate and energy targets. Nowadays, CoM signatories also endorse a shared vision for 2050, that is to accelerate the decarbonisation of their territories, strengthen their capacity to adapt to unavoidable climate change impacts, and allow their citizens to access secure, sustainable and affordable energy. In order to turn political commitments to actions, CoM signatories commit to develop a Sustainable Energy and Climate Action Plan (SECAP), thus further encouraging the development of local energy and climate plans. To date, more than 10,500 municipalities across Europe are CoM signatories, with more than 7,500 cities subsequently developing action plans.

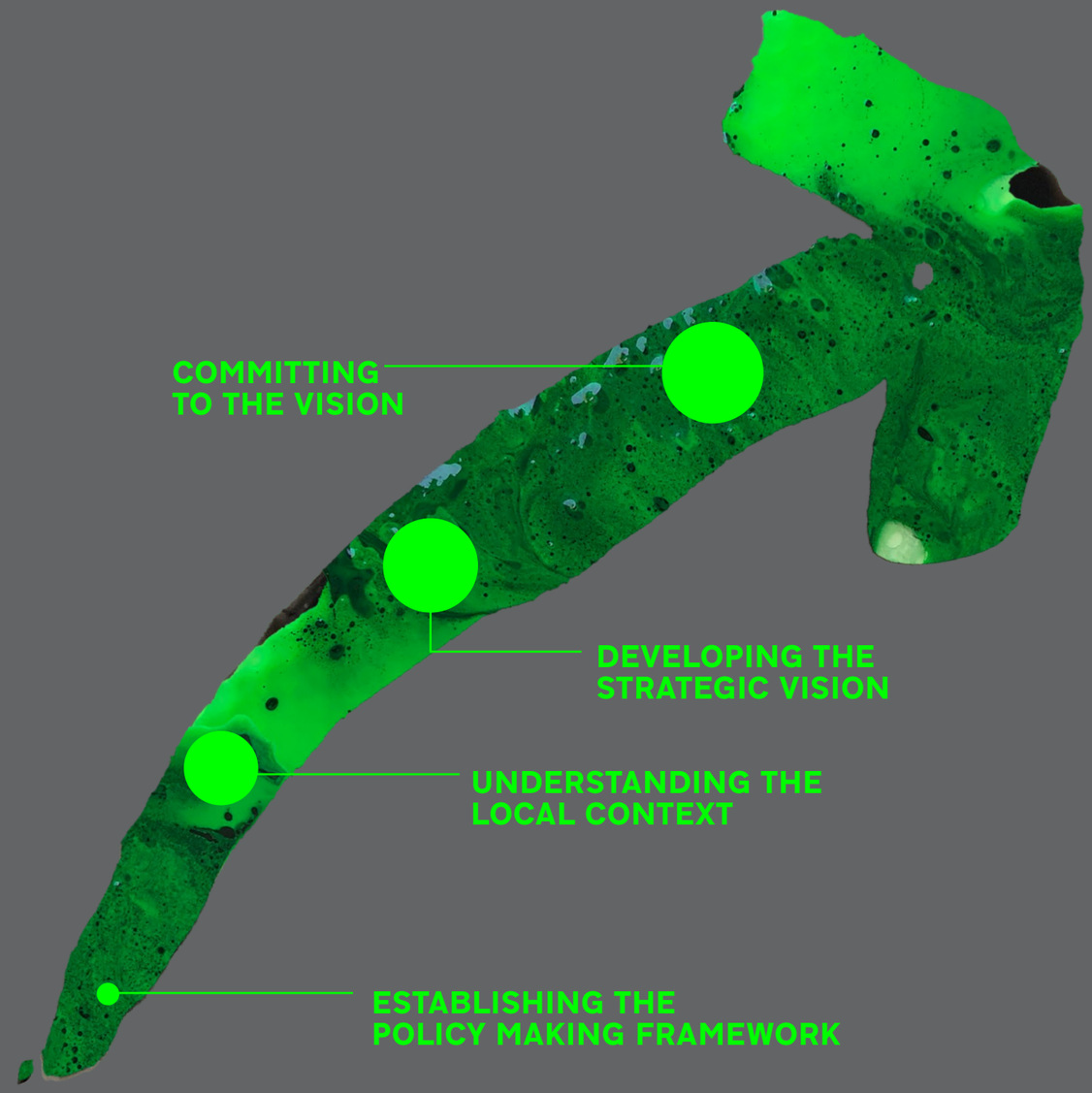
Regardless of the format and type of energy and climate plans that local and regional authorities develop, there are clear benefits in developing and implementing them, as these accelerate the decarbonisation in the territory. The implementation of these plans does not only positively contribute to achieving national and sub-national energy and climate targets, but also ensures the sustainable development of local communities, and supports social inclusion, innovation and economic growth. Besides guiding cities and regions mitigate and adapt to climate change, these plans can also ensure that the transition to a low carbon economy brings new opportunities for local enterprises, more local jobs, capacity building prospects, as well as energy security/independence, better infrastructures, and funds.

Covenant of Mayors
for Climate & Energy
www.eumayors.eu

Cities and regions are at the heart of the transition to carbon/ climate neutrality and need to step up and pave the way to 2050

Setting a vision for 2050

The decarbonisation pathway to 2050 starts from assigning roles and responsibilities, and continues by understanding the local context, establishing the vision, and gaining a strong commitment to implement a mutually accepted plan. These steps are essential parts of a decarbonisation strategy, and should precede the implementation of actions and projects.



Policy Making Framework

Formulating and implementing a long-term energy and climate plan is a challenging and time-consuming process that has to be systematically planned and managed. It requires the collaboration and coordination of various departments in the administration of the local/regional authority. In order to ensure its success, it also requires the collaboration and support of external organisations, stakeholders and the public.

Decarbonisation Core Team

A clear organisational structure and assignment of responsibilities are prerequisites for the successful development but also implementation of a long-term energy and climate plan. Therefore, local/regional authorities should assign responsibilities to specific departments with appropriate competencies, as well as sufficient financial and human resources to implement the actions outlined in the plans.

Where organisational structures have already been created for other related activities (e.g. a Covenant of Mayors implementation team established within the public authority), then the responsibility to develop, implement and monitor the long-term plan can be assigned to this structure. When such a structure does not exist, it is recommended that a decarbonisation core team is formed.

The decarbonisation core team should be responsible for implementing all the phases of the decarbonisation process. The team's focal role should be to facilitate the process, from understanding the local context, formulating the vision, assessing the baseline, designing and coordinating the implementation of actions, accessing resources and overseeing the engagement of stakeholders and the public, to monitoring and evaluating the implementation of the plan.

It is critical that team members cover different expertise and capabilities and their role is well-defined and clear to ensure strong ownership of the process. As such, team members may come from various departments and units within the public authority, such as the technical, land use and spatial planning, financial, mobility and procurement departments. This will ensure that the plan focuses on the real needs of the territory from multiple sectoral perspectives, and builds on existing local/regional policies and actions. It will also help accomplish a coordinated approach in dealing with mitigation and adaptation, benefiting from interdependencies to maximise efficiency and prevent trade-offs.

It is equally important that the actions incorporated in the long term plans are also integrated in other plans and initiatives run by other relevant departments of the local authority, and that synergies between actions are realised. Therefore, multi-departmental and cross-sectoral involvement is an asset.

Moreover, gaps in technical and management competencies within the team should be acknowledged and addressed, for instance through trainings. In essence, the team should build its technical capacity for analysing, formulating and implementing climate mitigation and adaptation plans, and in turn build the local/regional authority's capacity.

Finally, the local/regional authority may also want to establish a climate policy steering committee, comprised by local/regional policy makers to provide strategic direction and help ensure the necessary political support to the process.

Practical tips for setting up a collaborative process

- Identify key drivers for the collaboration (define the benefits and the added value of the collaboration).
- Define the scope of the collaboration and create realistic expectations of what this can deliver.
- Build trust and establish an open communication channel among the different levels of governance - communicate regularly and transparently.
- Encourage traditional forms of communication (face-to-face meetings) as these are often more effective in encouraging people to work together in a truly collaborative way.
- Formalise the collaboration if relevant (e.g. by signing Collaboration Agreements and Memoranda of Understanding).

Multi-level Governance

The decarbonisation core team should embrace the principles of Multi-Level Governance (MLG) and pursue the collaboration with public authorities at all governance levels, to design and deliver plans and actions more effectively. This should include vertical collaboration (i.e. cooperation between national, regional and local authorities) and horizontal collaboration (e.g. cooperation between different municipalities but most importantly other local public entities within the territory, such as municipal utilities providing electricity, water and sewer services).

Multi-Level Governance brings multiple benefits, helping local/regional authorities to:

- Ensure coherency between plans - a collaborative process can help link plans and policies at national, regional and local level.
- Develop clear and consistent visions - sharing knowledge and ideas can enable ambitious and realistic visions to be created, whilst at the same time taking into account local realities and needs.
- Share expertise, skills and knowledge – building the capacity of public authorities can facilitate the replication of good practices, innovative and joint actions.
- Establish more favourable financing conditions - partnering up with other authorities can create more secure and stable conditions to attract investment.
- Pool resources, skills and techniques: through joint-working different skills, planning techniques and resources can be combined, facilitating the transition process, for example by sharing the workload for designing and implementing joint activities or by taking advantage of economies of scale through joint procurement.
- Communicate more effectively: defining objectives collaboratively ensures that messages are harmonised (avoiding confusion).
- Establish consistent monitoring and reporting structures: streamlining monitoring and reporting ensures plans are monitored more coherently at different government levels.

Participatory Design and Implementation

In order to achieve carbon/climate neutrality, local authorities will have to coordinate and/or implement a number of complex actions embedded in energy and climate plans that rely on the participation of various stakeholders. For example, the upgrade of street lighting relies on the private sectors' participation if this is being financed and delivered through a public-private partnership. Besides being able to support the implementation of actions, stakeholders are also likely to be influenced by actions. Furthermore, stakeholders' involvement can help stimulate behavioural changes needed to complement technical actions.

On the other hand, citizens live and work in cities so they have opinions, views and preferences on how their city and its infrastructure can be improved, and as a consequence their quality of life. As such, they should participate in the design and decision making process for greening and decarbonising their city or region. In addition, citizens are also consumers, so they can drive the transition to climate neutrality by making lifestyle choices that minimise their carbon footprint.

Therefore, actively involving key stakeholders and the public, including stakeholders from the private sector, civil society and the local community, is crucial for planning and implementing successful long-term energy and climate plans. Citizens and key stakeholders should be empowered to be actively involved in the different stages of the decarbonisation process, especially in formulating and implementing actions. In doing so, decisions and actions will depict local needs and better address local challenges. Moreover, an open, collaborative process will ensure a just and inclusive transition towards carbon/climate neutrality, with a fair distribution of benefits. Finally, participatory policy-making helps to establish a broad consensus and improves the quality, acceptance, effectiveness and legitimacy of the long-term energy and climate plan. In parallel, it helps ensure the lasting acceptance, viability and support of actions embedded in the plan.

Practical tips for engaging stakeholders and the public when developing long-term plans

- Establish an open collaboration process and build trust.
- Explain the benefits of decarbonisation (e.g. it increases the territory's attractiveness to businesses and people, stimulates economic development, reduces households and businesses energy costs, improves the urban environment, people's quality of life and heath).
- Communicate the benefits of being actively engaged in the transition process.
- Facilitate collaboration by encouraging openness, mutual understanding and free expression of different views.
- Steer discussions/consultations towards the qualitative aspects of the plan (i.e. the vision, and different types of actions being considered).
- Handle debates and conflicts as part of the collaboration process and as an opportunity for argumentation.
- Seek consensus on the key elements of the plan.
- Keep the participatory process open for the future (e.g. when re-designing the plan or specific actions).

Consequently, the first step is to develop a communication/dissemination strategy that will outline the way the local/regional authority will reach its target groups, stakeholders and other key local actors. The activities that the strategy will encompass should aim to keep stakeholders and the public informed and motivated throughout the transition process, whilst also give visibility to the actions being implemented and the results achieved. More specifically, it is important to communicate the benefits of mitigation and adaptation actions, such as the positive impacts these have on the well-being and quality of life of citizens and on making cities more liveable and attractive. This will help alleviate citizens' and stakeholders' concerns and encourage their participation.

Subsequently, the active participation of stakeholders and citizens can be pursued through a variety of ways. Local/regional authorities should develop a stakeholder engagement strategy to outline the different ways that stakeholders and citizens will be involved, tailoring these according to stakeholders' interest, importance and influence in the transition process, as well as according to the different phases of the process itself.

Level of involvement	Engagement and communication channels
Information and education	Brochures, newsletters, website, social media, printed publications, press releases, informational campaigns, exhibitions
Information and feedback	Advice centre, public events, teleconferences, surveys and questionnaires, polls, visual tools (e.g. GIS tools showing the energy performance of the various areas or the hydrogeological risk)
Involvement and consultation	Workshops, roundtables and other participatory events, consultation meetings, forums, pilot demonstration of technologies and solutions, public consultations (e.g. of the draft plan)
Extended involvement (co-development and co-implementation)	Advisory groups/committees, working groups, living/co-creation labs

Understanding the Local Context

It is crucial to understand the local context when designing and implementing long-term energy and climate plans, as each municipality/region faces different challenges and has different needs and strengths. It also important to identify all key stakeholders and take into account existing local and regional policies and plans.

Local characteristics

Therefore, the first step is to identify local characteristics and circumstances that can better shape the vision of a carbon/climate neutral future. This includes, amongst others, the territory's geography, local environment, demography, socio-economic situation, industry, history, local/regional regulations and the energy market. Different and unique local characteristics may introduce complexities or even challenges for the decarbonisation of the territory, so these should be carefully considered when formulating the overall plan. In addition, possible interlinkages need to be evaluated, as these may create hidden opportunities, but also barriers that may affect the decarbonisation pathway.

Local context analysis to develop a local energy and climate plan in Spain

- Principado de Asturias, together with the regional administration, business associations, trade unions and other key stakeholders, analysed the effects that long-term plans in general and the energy transition in particular will have on the region. This was very important as the region has a great coal mining tradition, with electricity generation based primarily on fossil fuels (coal) and a very powerful and energy-dependent industrial sector.
- From the analysis, the need to develop a Regional Energy Strategy arose, that takes into account objectives and criteria established at national level, but also the uniqueness of the region in order to allow the energy transition to become an opportunity, not only for energy and for improving the environment, but also in terms of generating activity and employment.
- At the same time, and in a coordinated manner, since the Asturias Energy Foundation collaborates with different levels of governance, work is on-going with local administrations. More specifically this includes developing or supporting the development of Climate and Sustainable Energy Action Plans, as well as defining specific energy improvement projects, aligned with regional and national energy policies and with the National Integrated Climate and Sustainable Energy Plan. As such, the developed plan takes into account the local context, and in particular the use of coal for electricity production in Asturias.

Stakeholders

The engagement of relevant stakeholders is a critical success factor both for shaping an ambitious, realistic vision but also for developing and implementing a long term plan. Therefore, the thorough mapping of stakeholders is imperative, to ensure that all key stakeholders have been identified and will be actively involved at the different decarbonisation stages.

Engaging a diverse range of stakeholders can facilitate the transition process in different parts of the community, while skills, expertise and methodologies can be consolidated with no cost, enriching the dialogue and the design and implementation of actions.

As a minimum, the following stakeholders should be considered: public authorities at all governance levels, civil society organisations, energy agencies, local businesses and their associations, local industry, financial institutions, private/public transport companies, energy suppliers/utilities, building companies/developers, consumer associations and academic institutes.

As the transition to 2050 affects various sectors, the different stakeholders identified will have a variable level of interest to contribute to and participate to the decarbonisation process. In addition, stakeholders will also have a different "influence" to the process, namely the power to facilitate or impede the design and implementation of long-term plans. Therefore, these elements need to be assessed for each stakeholder to be able to better map them.

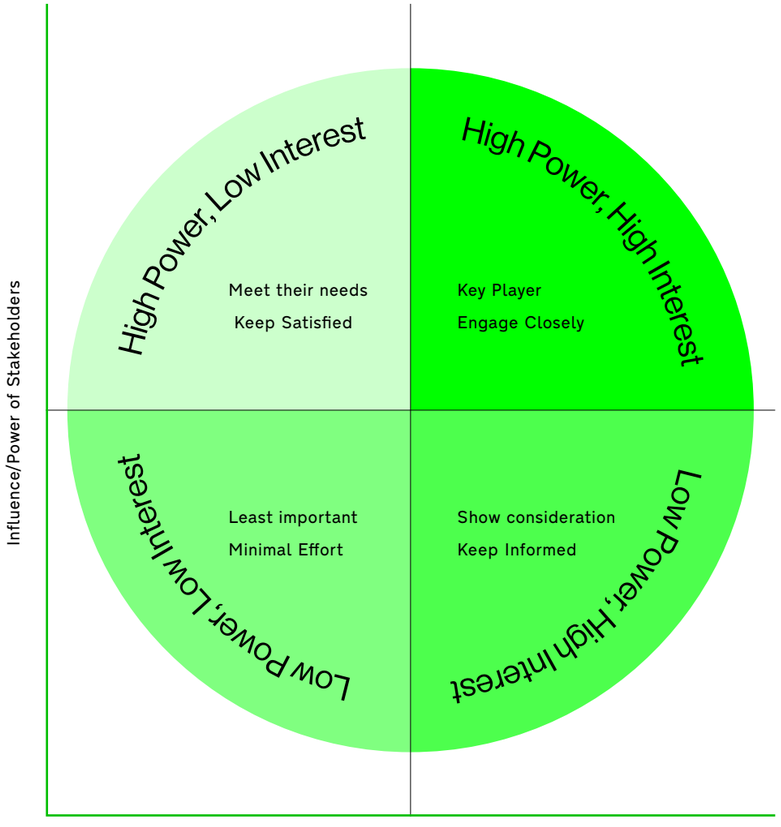
The following steps can help in the mapping and prioritisation of stakeholders:

1. Identify all possible stakeholders, with an emphasis on stakeholders whose interests are affected by the transition, whose activities affect the transition, who possess/control information, resources and expertise needed for formulating and implementing the plan and whose participation/involvement is needed for the successful implementation of the plan.
2. Assess their interest in the different stages of the decarbonisation pathway (for enabling the comparison between stakeholders, a score can be assigned).
3. Examine their role and influence in developing and implementing the long-term plan and actions (similarly to above, a score can be assigned).
4. Estimate the impact of their engagement (e.g. by combining the scores previously assigned).

Stakeholders "importance" could also be considered in the analysis, that is the degree to which the design and implementation of the plan cannot be considered successful if needs, expectations, and issues of stakeholders are not addressed.

Having completed a thorough stakeholder analysis, the stakeholders' interest-influence matrix below can help local/regional authorities visualise the assessment of the interest (or alternatively importance) and influence of stakeholders in the transition process.

Figure 2: Stakeholders' Interest-Influence matrix



This can in turn help define the level of effort that local/regional authorities should put to engage different stakeholders. However, it is equally important to evaluate the interest (or importance) and influence of stakeholders in the different stages of the decarbonisation process, to better clarify key stakeholder roles, but also to define as much as possible when to strongly pursue the active participation of each group of stakeholders.

Integrated Planning and Public Participation for Sustainable Urban District Development in Germany

The City of Freiburg, in order to address the pressing local housing shortage, developed the sustainable planning of the Rieselfield district. The 70 hectare mixed-use Rieselfeld concept includes high density energy-efficient building blocks, good public transport connectivity as well as a socially mixed and inclusive demographic make-up. The development of the concept was based on the ideas and needs of local government decision makers, energy planners, architects, consultants, business owners, developers and citizens, through the prism of environmental and social sustainability. The "Rieselfeld" district showcases how green policies can be effectively operationalized at local level.

Existing local and regional plans

In order to better understand the local context, it is essential that local/regional authorities examine existing local and regional plans, especially those that affect activities, infrastructure, the urban environment and the energy consumed within the territory. There are various types of sectoral and cross-sectoral plans at local and regional level, the most common and relevant to climate and energy planning are outlined below. Integrating these plans in long-term energy and climate plans ensures synergies between actions planned and avoids trade-offs.

Sustainable Urban Mobility Plans (SUMPs)

A SUMP is a strategic plan that helps cities address transport related challenges and problems in urban areas in a more sustainable and integrated way. More specifically, these plans foster the balanced development of all transport modes to satisfy the mobility needs of people and businesses in cities and their surroundings, while at the same time encouraging a shift toward more sustainable modes. The development of a SUMP is a structured process whereby mobility policies are defined in the context of a clear vision and measurable targets to address the long-term challenges of urban mobility. The process also seeks to ensure the involvement of stakeholders at appropriate stages and the collaboration between relevant policy areas and authorities. SUMPs are typically voluntary, although these are mandatory in some cases, for example in the region of Catalonia in Spain, and more recently in Greece in municipalities with more than 30,000 inhabitants, whilst in a few other countries SUMPs are required to access specific national or regional funding.

Overall, SUMPs are important to consider when formulating long-term energy and climate plans. More specifically, there are clear synergies and interlinkages between mobility policies included in SUMPs and climate mitigation and adaptation actions for the transport sector.

Sustainable Energy & Climate Action Plans (SECAPs) & Sustainable Energy Action Plans (SEAPs)

SECAPs and SEAPs are plans that help cities curb energy demand within their territory and mitigate climate change. Both plans have been developed by cities that voluntarily joined the Covenant of Mayors initiative. A SEAP outlines how a city intended to reach its CO_2 reduction target by 2020, whilst a SECAP outlines how a city intends to reach its CO_2 reduction target by 2030. Both plans include an assessment of the current situation, i.e. a Baseline Emission Inventory, set clear goals and targets and describe planned actions together with time frames, assigned responsibilities and estimated impacts. Nevertheless, SECAPs do not only focus on climate mitigation (e.g. increasing energy efficiency and the uptake of renewable energy sources) but also address climate adaptation, by including a Risk and Vulnerability Assessment and climate adaptation measures to implement.

SECAPs and SEAPs are vital to consider when developing long-term plans. In particular, both already include the baseline assessment, as well as short and medium term actions that local/regional authorities will implement or have already implemented to increase energy efficiency and renewable energy production within the territory. Thus, these actions should be incorporated in energy and climate plans for 2050.

It should be noted that, besides SECAPs and SEAPs, there is a plethora of different types of energy and climate plans across Europe developed at a local and regional level. These may be voluntary plans or plans required by national legislation. These plans vary in the sectors they cover and the methodology employed to develop these, but are equally important to consider when developing long-term energy and climate plans. For example, in Greece local and regional authorities must develop energy performance plans for municipal and regional buildings and update them every two years, whilst regions must develop climate adaptation plans. In Germany, the development of municipal energy and climate plans is funded by the National Climate Initiative (German: Nationale Klimaschutzinitiative - NKI). In Poland municipalities have already developed low-carbon economy plans (PGNs) that are co-financed by national and regional funding. In Romania local authorities prepare an Energy Efficiency Improvement Plan (Planul de Imbunatatire a Eficientei Energetice – PIEE).

Waste Management Plans

Waste management plans typically aim to protect the environment and human health by preventing or reducing the generation of waste and minimising the adverse impacts from the management, collection, recovery and disposal of waste. Such plans allow public authorities to evaluate the existing situation within their territory (e.g. waste generated per waste stream), define objectives and appropriate strategies to put in place, and identify the necessary measures to implement. Under the Waste Framework Directive, Member States must prepare national waste management plans, whilst in some countries this obligation is transferred to regional and/or local authorities. For instance regional waste management plans in Italy, and local and regional plans in Greece are compulsory.

Overall, the efficient management of waste can reduce greenhouse gas emissions from landfills, as well as fleet, materials and energy use. In addition, the avoidance and recovery of waste (i.e. as secondary materials or energy) prevents emissions in other sectors of the economy, such as energy and forestry. Hence, there are clear benefits in reviewing these plans when developing long-term energy and climate plans to pursue interlinkages.

Spatial, land use management and urban development plans:

Such plans provide the strategic framework for the growth of a city or a territory, determining the physical uses of space that will influence how people live and move. These plans often aim to achieve the efficient use of land, prevent land use conflicts and restraint urban sprawl, while in parallel preserve green and open spaces and safeguard natural resources. Although such plans are not obligatory, land-use management and urban development decisions are usually taken at local or regional level.

Spatial, land use management and urban development plans are important to consider when developing long-term energy and climate plans, as these can help better design climate adaptation actions, in order to increase resilience and prevent climate impacts such as flooding, drought, water scarcity and heat stress.

Strategic local plans

A strategic plan defines the local/regional vision and objectives, identifies the priority areas for residents and local businesses, and outlines how the territory plans to face continuous regional, provincial, and global change. It serves as the roadmap for developing tactical plans, for designing actions to achieve objectives and for determining how resources should be invested. These plans frequently cover several sectors, such as urban planning, mobility, energy management and production, buildings, agriculture, waste management, economic development, and tourism.

Strategic local plans can inform long-term energy and climate plans, as these usually incorporate key actions that the local/regional authority plans to implement in the short, medium and/or long term, which can contribute to climate mitigation and adaptation.

Finally, depending on the country and region, other sectoral plans may be available and relevant to consider when designing long-term energy and climate plans, such as plans that focus on agriculture, tourism, transport, environmental protection, and natural disasters prevention. For instance, a law was recently enacted in Greece that requires large and medium-sized municipalities to develop Electric Vehicle Charging Plans to define publicly accessible rechargeable points for electric vehicles and parking spaces to promote e-mobility.

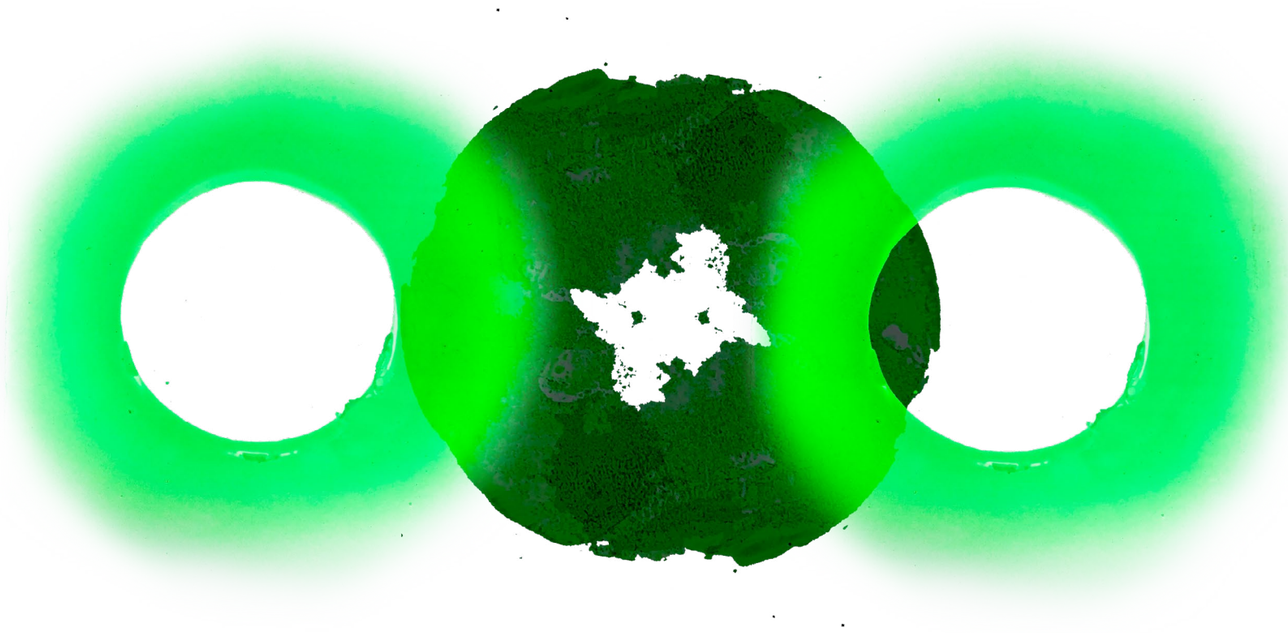
National and local planning documents used to inform local energy and climate plans in Latvia

Existing national and local planning documents in Latvia were reviewed, and integrated into the local energy and climate plans developed by the municipalities supported by C-Track 50. These included:

- Local planning documents: sustainable development strategies, development programs, spatial plans.
- National planning documents: the national energy and climate plan for 2030 and the strategy for carbon neutrality 2050.

Developing The Strategic Vision

The strategic directions of a region's/municipality's decarbonisation pathway need to be carefully defined to ensure the development of an integrated, long term energy and climate plan. Thus, it is crucial that a clear, ambitious but also realistic decarbonisation vision is established. The vision's success depends on understanding the local context, identifying all key stakeholders and properly considering existing policies, plans and regulations at all levels.



"Vision without action is merely a dream. Action without vision is merely passing time. But vision with action can change the world."
Joel Barker

Policy/Regulation

The EU's emission reduction target for 2030 is currently 40%. More recently, the European Parliament backed climate neutrality by 2050 and a 60% emission reduction target by 2030 (compared to 1990 levels), which is a more ambitious target than the Commission's proposal of 55% and the existing target of 40%. Members of the European Parliament are calling for the Commission to set an additional interim target for 2040 to ensure progress towards the final goal.

Although EU policy on energy and climate shapes national policies and regulations in Member States, these may vary across countries. For example, from the five EU countries that have already set the target of climate neutrality in law, Sweden aims to reach net-zero emissions by 2045, whilst Denmark, France, Germany and Hungary by 2050. As national policies inform local/regional strategies and plans, it is important that local/regional authorities gain a clear understanding of the current national policy and regulatory framework, which affects the decarbonisation process and may set boundaries on actions and activities being considered. Hence, the following should be reviewed:

- National, regional, and local targets set (including specific targets set per sector, e.g. energy, waste, and water) in policies and regulations.

- The legal framework (licensing and permit laws, public procurement procedures, services and public work procedures, environmental restrictions, historical/cultural considerations etc.) that may affect the implementation of actions.

Having a clear view of the policy and regulatory framework, local/regional authorities can better assess opportunities, constraints and challenges to overcome. For instance, obsolete local legal/permit restrictions may be identified that the local/regional authority can revise to facilitate the decarbonisation process. Another example is that of all direct and indirect subsidies to fossil fuels, which should be phased out by 2025 at an EU level at the latest. This means that local/regional authorities cannot benefit from or create such subsidies (for instance for replacing inefficient old-boilers with more efficient ones).

C-Track 50 report: Eleven country reports reviewing the energy planning process

The above-mentioned report can be a valuable resource for information about the regulations and policies at different levels of government in eleven European countries. More specifically, this includes:

- A review of core national goals for energy and climate by 2030 and 2050, and a review of the relations between the EU and national authorities (procedures put in place for complying with EU goals)
- A review of the national target setting procedure in these European countries.
- A review of the process for formulating national energy and climate policy plans (along with the role and involvement of local and regional governments in the national planning process).
- A description of the interactions of important actors from different levels of government with national authorities.
- An analysis of roles and responsibilities (of ministries and departments, and related national institutes such as national energy agencies).

Vision development

The vision of a local/regional authority defines the direction in which it wants to head. It clearly expresses the local/regional authority's political commitment and gives a strong message to citizens and stakeholders on how the territory aims to develop in the future, paving the way for substantial investments in urban areas, infrastructure and buildings.

Overall, the vision of a city/region should be ambitious but also realistic. It should be in line with the EU's vision to become climate neutral by 2050, but also to become climate resilient. In should also incorporate the needs and expectations of the local community, so ideally it should be developed in collaboration with its stakeholders.

Local vision development in Germany

- In 2019, the Constance municipal council unanimously passed the resolution on climate emergency. In order to give climate protection the highest priority as promised in the resolution, in addition to basic organisational measures, initial decisions on climate-relevant topics and projects were taken.
- A group of measures was drawn up in the course of the year. In order to have the necessary resources not only in terms of personnel and organisation, but also financially, the climate change budget was also adopted at the end of 2019.
- The public, as well as schools, businesses and other local stakeholders have been strongly involved, not only in dedicated engagement activities, but also through continuous reporting of progress from the administration to the public.

Objectives and targets

Once a vision is established, it is necessary to translate it into more specific objectives and targets, including for the different sectors in which the local/regional authority intends to take action. By comparing these with the current local situation, actions needed to reach the desired objectives can be better identified.

Overall, targets and objectives set should be SMART, namely:

- Specific - i.e. well-defined, focused and detailed, clearly outlining what should be done, how it should be done and who is doing it.
- Measurable – adopting specific indicators to ensure that progress in achieving them can be clearly monitored (kWh, investment, % reduction, etc.).
- Achievable - that is to say feasible and attainable within the proposed timeframe and given the available resources (e.g. budget and human resources).
- Relevant - in particular for achieving the vision of the local/regional authority.
- Time-Bound – i.e. with a defined deadline or time schedule.

In addition, targets and objectives need to be ambitious, in order to ensure that carbon/climate neutrality is achieved, and clear, so that everyone understands these.

Hence, a long-term energy and action plan must contain a clear reference to mitigation and adaptation goals and targets set. More specifically, it should include a greenhouse gas emission reduction target (%), but also energy savings and/or energy production targets. In addition, sector-specific targets would be beneficial. On the other hand, adaptation objectives should clearly address the territory's vulnerabilities and risks, defining desired impacts (even if these are adverse impacts avoided, which could be difficult to measure). The latter should also be mainstreamed with on-going development plans and existing sectoral strategies, as well as climate mitigation.

According to the EU's Low Carbon Roadmap, it is necessary for the EU to achieve domestic emission reductions of at least 80% by 2050 (compared to 1990) to meet the 2°C global target. From the analysis undertaken, this was shown to be both technologically possible and economically feasible. Local/regional authorities should take up this challenge and aim to reduce greenhouse gas emissions in their territory by at least 80% by 2050.

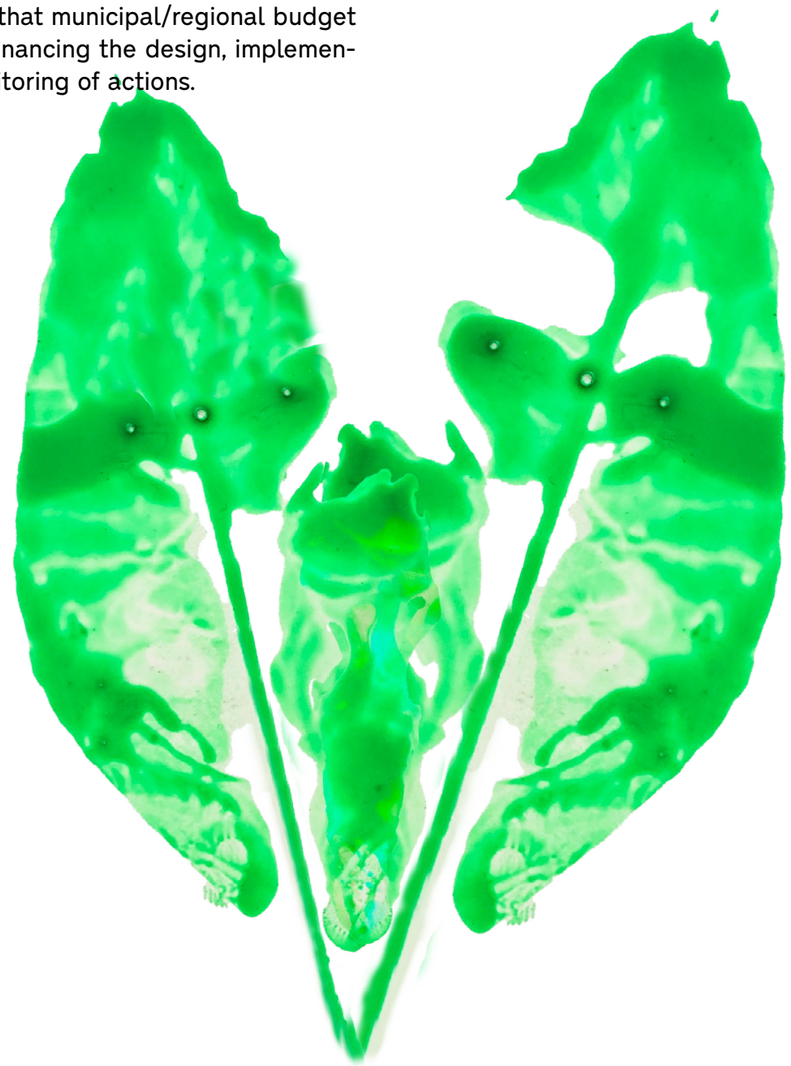
Moreover, local/regional authorities should also set intermediate targets to ensure that the city/region is on track in meeting its long term targets. These intermediate milestones will also help local politicians and decision makers understand better the level of ambition that is required to achieve carbon/climate neutrality by 2050, in order to influence and better shape future strategies, plans and actions.

Committing to the Vision

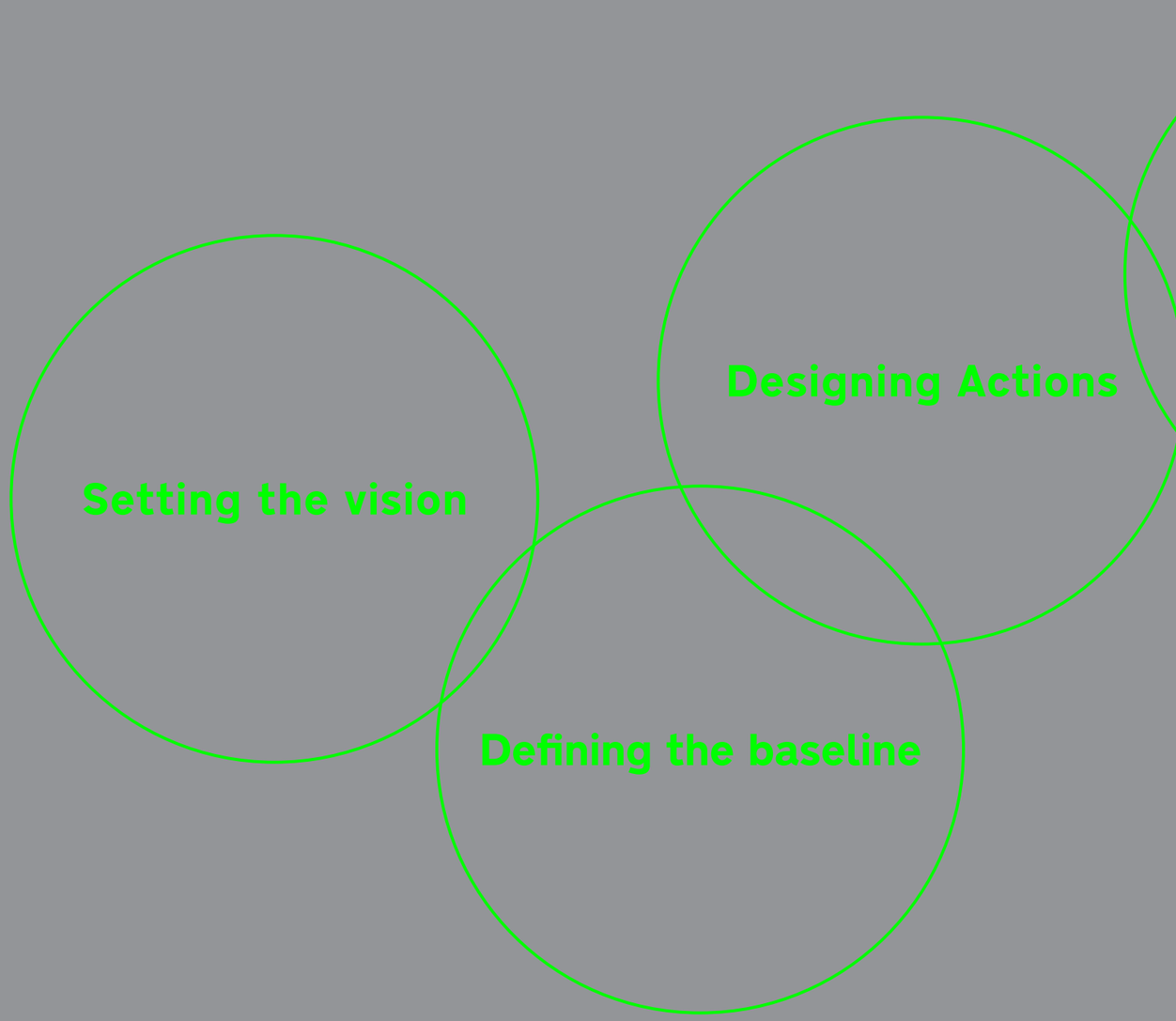
The road to decarbonisation is long and requires continuous support and resources. It is a significant commitment for any local/regional authority.

Decision makers and politicians can play a key role in this process. They can put decarbonisation priorities high in the political agenda and instigate the revision of policies and legislation so that these facilitate the implementation of actions included in the long-tern energy and climate plan. They can also support the approval process for implementing actions or for applying for funding, as well as ensure that municipal/regional budget is earmarked for financing the design, implementation and/or monitoring of actions.

Consequently, strong political support should be fostered to ensure the success of the plan, from design to implementation and monitoring. This support can be sustained by having the long-term energy and climate plan approved by the municipal/regional council (or equivalent decision-making body). Alternatively a formal pledge by the city council may be sufficient for establishing the process in the long-run.



Turning the vision into action



In order to effectively realise any decarbonisation vision, regions and municipalities need to clearly define the baseline within their territory, identify appropriate actions to implement, and then design, implement, monitor and evaluate these.

Therefore, cities and regions should develop action plans that cover all these activities, to ensure a smooth and efficient transition. As such, the plan should as a minimum include the following elements:

- The local/regional authority's vision, objectives and targets.
- A description of local characteristics, along with the plan's interdependencies to other national, regional, and local policies and plans.
- A baseline assessment that includes a greenhouse gas / carbon dioxide emission inventory for identifying principal anthropogenic sources of emissions, and a climate change risk and vulnerability assessment for identifying and assessing hazards and vulnerable sectors.
- Mitigation and adaptation actions that the local or regional authority will implement, along with actions that require the collective efforts of citizens, local businesses and other stakeholders.
- The implementation process that incorporates key steps to be followed, potential funding mechanisms to explore and ways to engage different stakeholders and the civil society.
- The monitoring of the results and the evaluation of the actions to quantify their effectiveness and further consider in the revision of the Action plan.

Important factors that contribute to the development of a successful decarbonisation plan include: the availability and analysis of accurate data, extensive research on technological prospects, embedded local context in actions, and a robust governance structure.

Given that the energy and climate plans towards carbon/climate neutrality incorporate activities in the short term, but also in the mid-term and long-term, it is important that these are treated as "live" documents. Thus, plans need to be regularly revised to ensure that long-term targets are met, and that technological advances, changes in regulatory frameworks, and other relevant developments are considered, so that plans do not become obsolete.

There are a number of detailed guidebooks and tools available that help local and regional authorities develop such plans. For example:

- The European Commission's Joint Research Centre has developed a Guidebook for the Covenant of Mayors (CoM) signatories on 'How to develop a Sustainable Energy and Climate Action Plan (SECAP)' that includes information on the SECAP process, insights for the elaboration of Baseline Emission Inventories and Risk and Vulnerability Assessments, as well as measures and policies that can be implemented at local level.

- The Covenant of Mayors - Europe Office and the European Environment Agency have jointly developed the Urban Adaptation Support Tool that guides the user through the steps needed to develop and implement an adaptation strategy and provides valuable guidance materials and tools.

- The Global Covenant of Mayors (GCoM) has developed a common reporting framework (CRF) to streamline measurement and reporting procedures, and ensure robust climate action planning, implementation and monitoring.

- The Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) offers cities and local governments a robust, transparent and globally-accepted framework to consistently identify, calculate and report on city greenhouse gases.

- C40 has developed, amongst other useful resources and tools, a guidance document for conducting a climate change risk assessment in line with Global Covenant of Mayors and C40 Cities requirements, as well as a City Inventory Reporting and Information System (CIRIS) tool for managing and reporting city GHG inventory data.

- ICLEI has developed, amongst other useful resources and tools, a guide to help cities set science-based targets by 2030 and 2050, and a climate neutrality framework.

- The United Nations Human Settlements Programme (UN-Habitat) published "The Guiding Principles for City Climate Action Planning" that reviews typical steps in the city-level climate action planning process in light of a proposed set of globally applicable principles (shown below), along with supplementary material.

Guilding Principles for City Climate Action Planning

Ambitious
Setting goals and implementing actions that evolve iteratively towards an ambitious vision

Inclusive
Involving multiple city government departments, stakeholders and communities (with particular attention to marginalised groups), in all phases of planning and implementation

Fair
Seeking solutions that equitably address the risks of climate change and share the costs and benefits of action across the city

Comprehensive & Integrated
Coherently undertaking adaptation and mitigation action across a range of sectors within the day, as well as supporting broader regional initiatives and the realisation of priorities of higher levels of government when possible and appropriate

Relevant
Delivering local benefits and supporting local development priorities

Actionable
Proposing cost-effective actions that can realistically be implemented by the actors involved, given local mandates, finances, and capacities

Evidence-based
Reflecting scientific knowledge and local understanding, using assessments of vulnerability and emissions and other empirical inputs to inform decision making

Transparent & verifiable
Following an open decision-making process, and setting goals that can be measured, reported, independently verified, and evaluated

Energy Agencies assisting the transition to climate neutrality at a local and regional level

In order to encourage the development of expertise in tackling energy policy implementation challenges at local and regional levels, the EU supported the establishment of more than 250 local and regional energy agencies across Europe (via the SAVE and the Intelligent Energy Europe programmes). According to ManagEnergy, a European initiative launched in 2002 that assists regional and local energy agencies become leaders in the energy transition and increase sustainable energy investments in regions and cities, over 350 energy agencies are currently operating in Europe.

Energy agencies, typically provide assistance to local and regional authorities to develop and mature climate and energy plans, as well as contribute to the implementation of sustainable energy policies and support the implementation of projects. They also promote energy efficiency, renewable energy sources, and sustainable transport.

The support that energy agencies provide is vital, especially since local and regional authorities often do not have sufficient knowledge, experience and/or human resources to develop climate and energy plans. In addition, energy agencies have an insight into the current situation, especially local problems and challenges that need to be tackled. Therefore, energy agencies can help municipalities and regions develop good quality, ambitious but also realistic plans, and subsequently facilitate their implementation.

Through their role as project developers, aggregators and facilitators for public authorities, energy agencies are in a unique position to support the energy transition in their regions and cities.

In addition, there are a number of organisations that support local and regional authorities in developing such plans, such as CoM Coordinators, CoM Supporters, and energy agencies.

Baseline Assessment

Understanding which sectors contribute to climate change and to what extend is key for better prioritising and designing actions to mitigate climate change. On the other hand, understanding the likelihood of future climate hazards and the potential impacts of these hazards on cities spatially and per sector is fundamental for better prioritising and designing climate adaptation and resilience actions. Thus, a sound assessment of the baseline in terms of energy and greenhouse gas emissions, as well as of climate hazards, vulnerabilities and impacted policy sectors is vital.

Baseline emission inventory

The development of a greenhouse gas emission inventory, allows the identification of the principal anthropogenic sources of emissions per sector within the local/regional territory. It also helps set specific targets, prioritise actions and monitor progress in achieving targets. **When developing a greenhouse gas inventory, local/regional authorities should:**

- Carefully consider the baseline year for the inventory, that is the reference year against which the emissions reduction target will be compared to. EU commitments to reduce GHG emissions refer to the year 1990, whilst the reference year in the EU Effort Sharing Decision is 2005. Typically, it is recommended that local and regional authorities choose one of these as a baseline year, however, the reference year of previous local targets, as well as the availability of sufficiently comprehensive and reliable data over time should be carefully considered.

- Select an appropriate methodology, which is aligned to existing commitments (e.g. signatory of the Covenant of Mayors) and/or aspirations. This usually defines the scope of the emissions considered. For example, under an activity-based approach, one of the most commonly used approaches by local authorities in Europe, emissions that occur due to energy consumption within the territory of the urban authority, either directly (fuel combustion) or indirectly (consumption of electricity and heat/cold) are included. When choosing the methodology, the availability of local data needs to be considered, for instance assess whether reliable activity data for the transport sector are available for the territory or whether fuel sales data are only available. Other important methodological considerations include, which greenhouse gases to include (e.g. solely CO_2 emissions or CO_2, CH_4 and N_2O emissions) and what emission factors to use (local emission factors or default national/EU/global emissions factors, such as the IPCC (2006) and the CoM default emission factors provided in the Guidebook).

- Identify all emission sources in the territory that are significant, as well as other activity sectors in which the local/regional authority intends to take action, and quantify energy consumption, renewable energy generation and emissions. Typically, it is recommended that local and regional authorities include as a minimum buildings (most importantly residential, commercial and municipal/institutional buildings and facilities) and transport (e.g. municipal, public and private and commercial transport, including different modes of transport, such as on-road, rail, and off-road).

- Identify the probability, intensity and time horizon of the key hazards in the territory, taking into account historic trends, the current situation and future scenarios based on available scientific evidence through to 2050. The variability in hazard exposure across the territory should also be acknowledged, and the local/regional specificities that may contribute to aggravating the consequences of a specific climate hazard should be understood.

- Prudently document the methodology, assumptions, information and data sources used in the baseline assessment to facilitate the monitoring of the plan and any future revisions.

Regional energy and greenhouse gas observatories

There are a number of regional energy and greenhouse gas observatories that have been established in Europe to help energy planning at the local and regional level. Most of these structures are supported by public authorities and integrated within existing regional organisations, such as energy agencies. The activities of observatories are usually very diverse, although typically they collect, analyse and provide energy data, often free of charge, to improve knowledge about the region, in terms of its energy and greenhouse gas footprint. In order to facilitate the collection and exchange of data, they form strong collaborations with key public authorities as well as utilities, energy suppliers and distributors. Moreover, observatories typically help assess progress in achieving local/regional objectives and evaluate the impact of different actions and policies implemented, by quantifying and monitoring energy consumption and greenhouse gas emissions. Some observatories also provide expertise and advice in policy development and in the decision-making process, for instance by identifying opportunities for action. In certain cases, air quality, social, economic or environmental effects are also evaluated.
Energee-Watch is the European network of such organisations that exchange knowledge and experience in the collection, monitoring and dissemination of climate and energy data at local and regional level.

Risk and vulnerability assessment

A climate change risk and vulnerability assessment helps determine the nature and extent of climate risks by analysing potential hazards and assessing the vulnerability of people, property, livelihoods and the environment, and subsequently helps prioritise adaptation measures. When developing this, local/regional authorities should select an appropriate methodology, considering existing commitments and/or aspirations, along with available resources and data. For example, a spatially explicit approach relies on climate impact models to produce hazard maps, so smaller municipalities may need to use a simpler approach to assess their climate vulnerability and risk, like an indicator-based assessment.

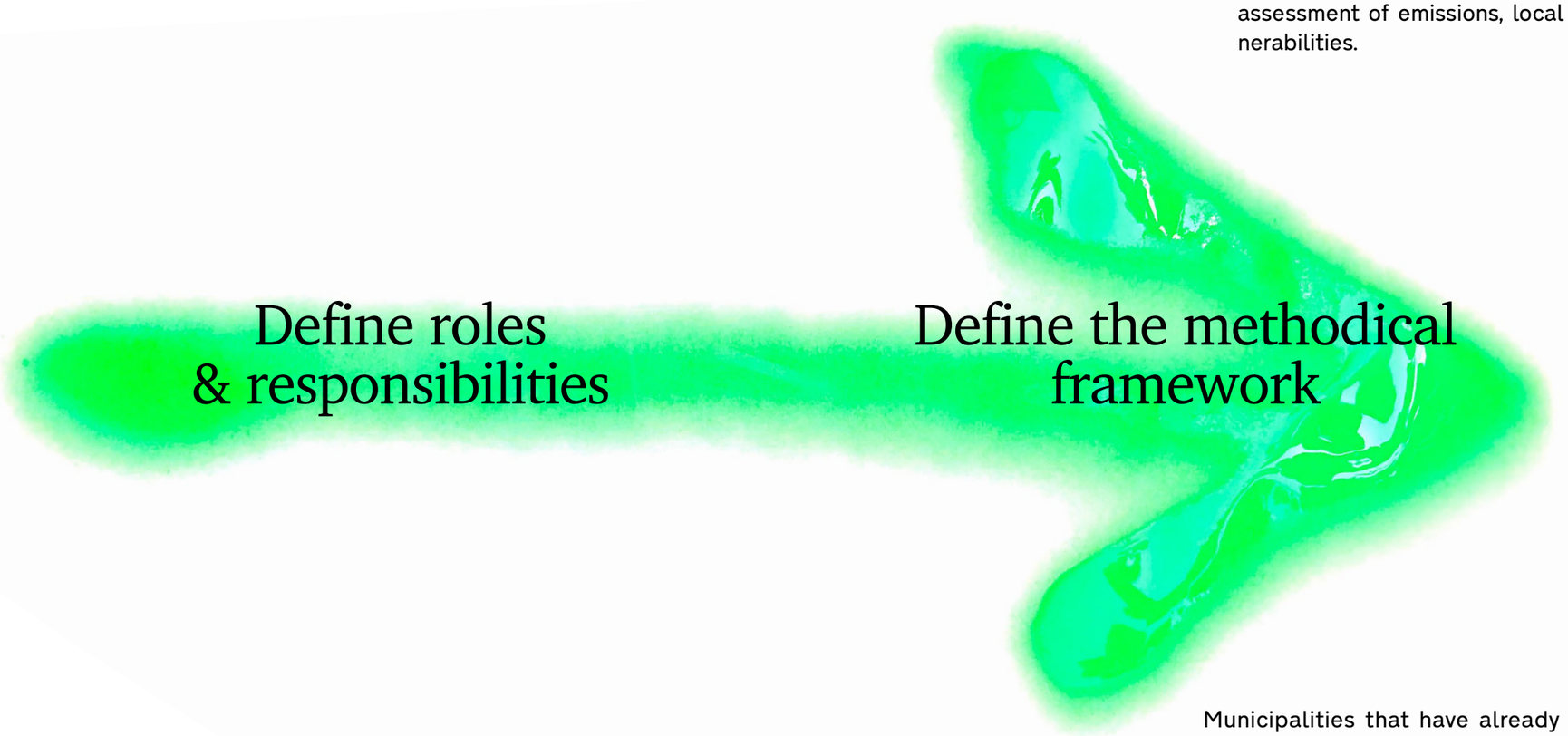
Facilitating the baseline assessment

Overall, the assessment of the baseline can be effectively facilitated by:

- Clearly identifying the municipal departments that will be involved in the assessment, including the specific roles and responsibilities of involved civil servants.
- Considering existing local/regional commitments and the availability of data when discussing and defining the methodological framework that will be employed for the assessment.
- Actively engaging key stakeholders in the baseline assessment process to correctly understand the urban system from multiple perspectives (and data sources) and ensure a pragmatic assessment of emissions, local risks and vulnerabilities.

Updating baseline assessments in Poland

The ten municipalities supported by C-Track 50 in the Wielkopolska region already had low-carbon economy plans (PGNs), which were mostly in line with Covenant of Mayors requirements for a Sustainable Energy Action Plan. The PNG documents have been updated, by considering new data available, and data related to climate change adaptation. More specifically, available statistical and disaggregated data were gathered and processed from energy invoices, data repositories, databases created by municipalities and/or energy providers and utilities. In addition, information and data included in a national project devoted to the development of climate change adaptation plans in 44 Polish town and cities were thoroughly considered.



Municipalities that have already assessed the baseline for existing plans, for instance plans for 2020 and 2030, should revise their assessment, especially if better, more reliable data are available, and supplement their assessment with data on new sectors included in the decarbonisation plan.

Actions & Measures

When defining actions to be implemented by 2050, local and regional authorities should consider the findings from the baseline assessment and explore different decarbonisation solutions in order to identify those that are most relevant to the local context and will help them meet their strategic vision.

Designing actions

When defining and designing actions local/regional authorities should:

- Assess the probable change by 2050 in the territory's greenhouse gas emissions if no further climate action is taken (i.e. due to population, economic and sectoral energy intensity changes) and the changes in frequency, severity and the scale of all significant climate hazards identified.

- Map the strengths and weaknesses of each sector, along with the different solutions that can be employed for each sector (assess these in terms of pertinence, technology/resources availability, technical maturity, availability of funds/financing options etc.).

- Consider actions to incorporate for all sectors that have a high carbon footprint, including all sectors in the emission inventory and all sectors identified as vulnerable to climate change under the risk and vulnerability assessment. Heating and cooling of buildings, industry and businesses, as well as transport of people and goods account for the majority of energy consumed in a territory and of greenhouse gases emitted, so actions should as a minimum focus on these sectors.

- Consider how to leverage existing local, regional, national and sectoral strategies, plans and actions that focus on climate change mitigation and adaptation, or are complimentary to this despite being focused on other policy areas. This will strengthen carbon reduction efforts and help better address short, mid and long-term climate risks, whilst at the same time help prevent trade-offs, spill over effects, and maladaptation.

- Evaluate the impact of the actions (e.g. energy savings, renewable energy produced, greenhouse gas / carbon dioxide emission savings and cost savings for mitigation actions and the outcome reached for climate adaptation measures) to ensure that targets set are met and that identified risks and vulnerabilities are addressed, as well as explore available funding opportunities and financing mechanisms.

- Set interim milestones/targets to review and monitor the impact of the actions more effectively. This is especially important for meeting long-term targets and implementing actions that have a long lifetime.

- Estimate the needed resources (e.g. financial, human), including the costs related to the implementation of the actions for the local authority and citizens/stakeholders, and identify appropriate financing sources.

- Define the responsible body for implementing each action, as well as key indicators to monitor progress.

- Develop an approximate timetable for the actions, prioritizing the most cost-effective actions first, namely actions with the highest ratio of investment cost over emission reduction. This will ensure that the territory benefits from the actions earlier and that the most urgent risks are addressed first, building momentum and demonstrating quick wins.

The development of local action plans in France

Local authorities in France with more than 20,000 inhabitants are required to develop a sustainable energy and climate action plan. Guidelines are available for understanding, formulating and implementing such plans, including good practices and quantified targets. The majority of the territories have set objectives that are compatible with national and regional objectives. Some of them, the positive energy territories for instance, have set more ambitious objectives.
Regarding the elaboration of plans within the framework of C-Track 50, Baseline Emission Inventories were developed for municipalities in the Auvergne-Rhône-Alpes region, using data provided by the regional energy observatory, which include the climate, air quality and energy profiles of the local authorities.
Subsequently, AURA-EE developed a strategy based on the results of the analysis and formulated long-term plans. Strategic and operational objectives were defined, and communicated with all key stakeholders in the area. The action plans defined the measures to be implemented by the local authority and by the various socio-economic actors, in order to progressively reach the set objectives. The measures cover several sectors, such as: urban planning, mobility, energy management and production, buildings, agriculture, waste management, economic development, tourism, awareness raising and communication, and build on actions identified from existing local, regional and national plans. The targets set comply with national targets defined in the energy transition law and have been adjusted according to the territory's strengths and weaknesses. For each action AURA-EE specified:

- The impact in terms of renewable energy production, energy savings and greenhouse gas reductions.
- The investment costs.
- The economic impacts for the territory in terms of employment.

Besides the elaboration of the action plans, a monitoring and evaluation mechanism was defined to measure the impact of the plans in meeting set objectives.

Facilitating the design of actions

Overall, the selection and design of actions can be effectively facilitated by:

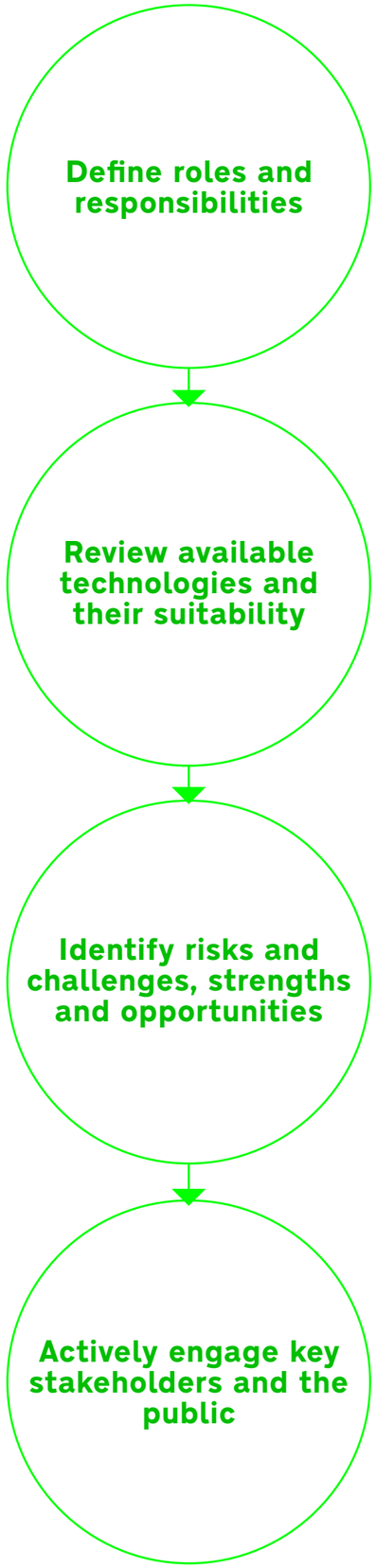
Clearly identifying the municipal departments that will be involved in the selection and design of the actions, including the specific roles and responsibilities of involved civil servants.

Identifying risks and challenges, but also strengths and opportunities at an early stage, as well as useful guides and tools to inform the energy planning process.

Reviewing available technologies and their suitability and potential uptake in priority sectors.

Actively engaging key stakeholders and the public in the energy planning process, for example by organising workshops to discuss actions proposed and by launching public consultations to gather views from citizens, businesses, private organisations, and other public administrations on the plan. This will help foster local actions, and in turn ensure citizens and stakeholders collaboration when implementing actions.

As previously mentioned, several municipalities and regions across Europe have developed a plan or a strategy on energy (and climate in some cases) for 2020 or 2030. These local/regional authorities, should update existing plans or develop new plans if needed, to ensure that the decarbonisation target for 2050 is feasible.



Long-term planning support provided in Hungary

In Hungary, municipalities usually develop a Sustainable Energy Action Plan, as a result of joining the Covenant of Mayors for Climate and Energy initiative, which means that they set targets by 2030. Long term planning, namely setting targets and designing local strategies/actions for 2050, is not common, mainly due to the lack of expertise, but also in some case due to political priorities. Energy agencies, such as LENERG, can support municipalities to develop successful plans for 2050 and ensure that multilevel-governance is introduced in the planning and implementation phases.
Within the framework of C-Track 50, LENERG actively involved local governments, through workshops, and presented the benefits of long-term planning, including what does it mean and how it can be achieved. Subsequently, LENERG supported ten municipalities in long-term planning and helped them elaborate climate and energy policy plans for 2050. More specifically, LENERG developed baseline emission inventories, and provided information and guidance to local authorities on setting a realistic local vision, as well as on available financing opportunities for investing in climate protection projects, besides Operational Programmes. LENERG also shared best practices in energy planning, including from the C-Track 50 project, whilst in parallel explained to mayors and civil servants what multi-level-governance means, how it can be beneficial for local authorities, and how to foster it.

Specific challenges and opportunities for 2050

Setting carbon/climate neutrality as a target for 2050 is not sufficient to trigger the necessary actions and measures required. Local/regional authorities need clarity and information on what carbon/climate neutrality actually means for the territory and how this affects short and medium term policy decisions and strategies. Clear long-term plans of how to achieve a fully decarbonised economy can ensure that the municipality/region will design and implement effective local policies and actions that will lead to carbon/climate neutrality.

Furthermore, long-term plans need to assess what decarbonisation means for individual sectors, in order to inform business and investment strategies, private investment decisions, as well as the design of local, regional and national incentives and funding programmes. In particular, many critical investment decisions need to be made in the short-term to enable the long-term transformation of key sectors. For example, the transformation of the electricity sector requires substantial investments in plant infrastructure and in transmission and distribution networks, including storage, with sufficient flexibility to accommodate the increased uptake of renewable sources. Delays in investments, and investments in the short-term in unambitious projects will result in a carbon lock-in, missed opportunities but also stranded assets resulting from the effects of climate change or from societal and regulatory responses to climate change. For example, natural gas is considered an important transition fuel, as it reduces greenhouse gas emissions when compared to coal. However, investing mostly in natural gas now will hinder investments in renewable alternatives and create a lock-in into natural gas, whilst more drastic and costly investments will be required in the future if carbon/climate neutrality is to be achieved.

Therefore, understanding the local/regional decarbonisation pathway, and breaking this down into long-term, medium-term and short-term actions is imperative for helping public authorities, companies, investors and the public make sound investments that will ultimately lead to carbon/climate neutrality in the long-term.

On the other hand, actions incorporated in long-term plans, need to be realistic and achievable, but at the same time aspiring and ambitious in order to meet the targets set. **When selecting and designing actions to incorporate in local/regional long-term plans, public authorities should ensure that these:**

Enable them to lead by example

Actions focusing on the municipal/regional sector (i.e. buildings, facilities, transport street lighting, infrastructure) typically result in low carbon emission reductions. Nevertheless, designing and implementing ambitious and innovative actions to improve the energy performance of the sector has multiple benefits. It demonstrates that the local/regional authority is committed to lead the way, and it fosters greater acceptance and demand for energy efficiency and renewable energy solutions. In essence, it encourages people to implement similar solutions, and use less energy, more efficiently.

Promote the 'Energy efficiency first' principle

Energy efficiency is key for achieving deep decarbonisation as it decreases wasteful consumption of fossil fuels and pollutant emissions. However, it needs to be considered first, before any investments in fuels and supply-side infrastructure. Therefore it is imperative that local/regional authorities demonstrate, promote, but also facilitate energy efficiency first in all key sectors to reduce total final energy demand within their territory. Besides typical energy efficiency interventions (e.g. insulation of walls and roofs), softer measures should also be facilitated, such as smart meters and thermostats that optimize energy use and comfort at a household level.

Promote renewable energy sources

It is important to maximise the efficient use of renewable resources to achieve carbon/climate neutrality the soonest possible in a cost effective way. Thus, local/regional authorities should ensure that valuable renewable resources within their territory, such as good wind and solar sites, are not wasted and support the increased penetration of renewables in the territory. At the same time, it is imperative that the local /regional authorities are aware of the actual exploitable potential of renewable energy that is inherently limited, e.g. in terms of land availability and biomass production, so that they plan accordingly.

Include the best available technologies and solutions

There are a number of solutions and technologies available at a commercial scale that can facilitate decarbonisation. For instance, electrification can play a key role in meeting energy needs for heating, cooling and transport, and can accelerate the transition towards carbon/climate neutrality when combined with the increased penetration of renewable energy in the power sector. In particular, technologies such as electric vehicles and heat pumps use considerably less energy than petrol or diesel vehicles and gas or oil furnaces to heat and cool dwellings, improving the energy efficiency of the system, whilst also fostering the deployment of renewable electricity. In addition district heating and cooling can also contribute to achieving carbon/climate neutrality, if based on clean fuels such as renewable electricity (through heat pumps), geothermal and solar thermal energy and waste heat from industry. Another example is making public transport more efficient and attractive to citizens; for instance through the use of digital technologies to optimize service frequency and density, also significantly supporting the decarbonisation of a territory. Encouraging the use of sustainable transport modes, such as walking and cycling, by creating/extending pedestrian zones, bike lanes and bike sharing systems in cities, is also another example of an action that can contribute to a carbon/climate neutral future. Therefore, a diverse portfolio of technologies and innovation is required to achieve decarbonisation, whilst local/regional authorities should also follow technological and other advances closely to ensure that the actions in their plans remain contemporary.

Avoid carbon lock in and maladaptation

Local/regional authorities should promote and facilitate no-regret and "win-win" actions, namely actions that would be justified under all plausible future scenarios and actions that deliver multiple benefits simultaneously, such as climate mitigation actions that also bring economic benefits. At the same time they should avoid actions that can create a carbon lock-in and maladaptation (or carefully plan them so that these adverse impacts are prevented). For example, adaptation actions should not increase greenhouse gas emissions, nor should they increase the vulnerability of those most at risk. Therefore, climate mitigation and adaptation interdependencies should be identified, so that the interactions can be leveraged.

Take advantage of local circumstances and strengths

Local/regional authorities should consider local preconditions, so that actions are aligned with these and can benefit from these. For instance, if an existing district heating network is present, actions could focus on replacing fossil fuels in district heating systems by wind power, heat pumps or heat storages or a combination of those.

Reinforce the direct involvement of citizens and stakeholders

Citizens and stakeholders should be encouraged to contribute to, but also directly benefit from the clean energy transition. For instance, inspire citizens to improve the energy performance of their dwellings, which in turn improves their living conditions, energy expenses and health. It is equally important to influence citizens and stakeholders behaviour, motivating them to use energy more efficiently and embrace more sustainable transport modes. In addition, citizens and stakeholders should be encouraged to take up more innovative actions, for example to act as prosumers (i.e. consuming but also producing energy) and to participate in energy cooperatives, as they can play an important role in the decentralised energy system.

Prevent exacerbating energy poverty or inequalities

The decarbonisation pathway may impact the level of energy poverty in the territory, so it is essential that this problem is recognised and addressed in actions. In order to ensure that citizens do not become further entrenched in poverty and suffer negative health impacts, but instead improve their quality of life, and above all remain supportive of the transition, the affordability of actions needs to be assessed and any distributional inequities that arise need to be addressed. For example, who pays for, and who benefits from an action is an important consideration, and measures should be taken to mitigate burdens on low-income, vulnerable or energy poor households.

Local authorities in Greece addressing energy poverty in long-term energy and climate plans

Within the framework of C-Track 50, NTUA and EPTA supported more than ten municipalities in Greece in developing long-tern energy and climate plans that aim to achieve carbon neutrality by 2050. Most of these municipalities have recognised that energy poverty is an important challenge that local authorities can help tackle. As such, specific actions that can help alleviate energy poverty within the territory have been included in their plans. For example, most local authorities have decided to establish a local energy efficiency, renewable energy and energy poverty advice centre that provides information and guidance to citizens, and helps them escape energy poverty.

We cannot phase out fossil power plants, and move to a low-carbon economy while wasting energy every day

Implementation Process

Once the most suitable actions have been selected and included in long-term plans, these need to be matured and implemented.

Improving street lighting in Romania

In order to improve street lighting in the Insula and Sancrai neighbourhoods, the municipality of Campia Turzii identified all economically significant and technically feasible energy saving opportunities and the factors that can improve the lighting parameters of the public lighting system. During the development of the plan, there were numerous discussions to better identify municipal needs, prioritise actions and measures based on the resulting energy savings and public benefits, propose alternative technical and economic scenarios for the most important actions, and identify funding sources, while vital support was provided during the preparation of the project application.

Implementing actions

In order to facilitate their implementation, local/ regional authorities should:

- Clearly allocate the implementation of actions to relevant municipal departments, whilst also define specific roles and responsibilities of involved civil servants.
- Undertake all the preparatory work required to turn actions into mature projects, for example by developing the required engineering studies (such as feasibility studies, energy audits, technical studies, and environmental impact assessments), economic studies (e.g. investment plans, financial feasibility analysis) and other relevant material (e.g. informational material for awareness raising campaigns).
- Ensure compliance with the regulatory and legal framework (e.g. obtain the necessary permissions for the project, comply with public procurement processes).
- Engage stakeholders and the public during the implementation of actions, by promoting the actions, their added value, impacts and benefits to citizens and stakeholders, as well as encourage their active participation (e.g. to become prosumers).
- Earmark funds for the implementation of actions when these will be implemented using municipal budgets.
- Explore and pursue different financing / funding opportunities to secure funds for the implementation of actions, including working in partnership with private sector actors that can finance and support the actions.
- Periodically update and improve actions (both planned and those being implemented) to reflect the latest climate science, technological developments, financing/funding opportunities and development capacities, as well as ensure these continue to meet the wider development goals of the territory.

Financing actions

The successful implementation of a long-term plan requires sufficient financial resources, so it is necessary that local/regional authorities secure investments to implement actions included in their plans. **There are numerous ways to fund sustainable energy projects, and these opportunities vary depending on:**

- the sector involved (e.g. municipal buildings and street lighting, residential buildings) and who will be implementing the project (the local authority, citizens, businesses, private actors etc.),
- the phase of the project (including design and construction/implementation),
- the technology required (e.g. smart meters/thermostats, heat pumps, photovoltaics),
- the financing instruments and funding mechanisms pursued (such as Structural Funds and the Cohesion Fund, the European Local Energy Assistance facility– ELENA, Energy Performance Contracting, Public–Private Partnerships, soft and other type of loans) and the source of funds (European, national, regional/municipal, investors, banks etc.).

For municipal/regional-led actions, namely projects that focus on municipal/regional buildings, infrastructure and fleet, as well as urban/spatial planning projects, local/regional authorities should:

- Identify available internal and external resources, financial mechanisms and funding programmes and select the most appropriate one to pursue for each project.
- Assign staff resources to the project, and undertake all the preparatory work to mature the project (to the level required by the financing instrument/mechanism selected) and ensure there are no regulatory or legal barriers.
- Assess the economic viability of the project and its associated risks, and ensure it is economically attractive. The latter is particularly important when the aim is to attract private sector investments.
- Develop the application/proposal/tender documents, in line with requirements (legal framework, the financing instrument/funding mechanism requirements etc.) and public procurement processes.

Regarding actions that focus on triggering energy efficiency and renewable energy investments from citizens and businesses, local/regional authorities should launch ambitious awareness raising campaigns, whilst in parallel provide information and guidance on available financial instruments and funding mechanisms to facilitate the process.

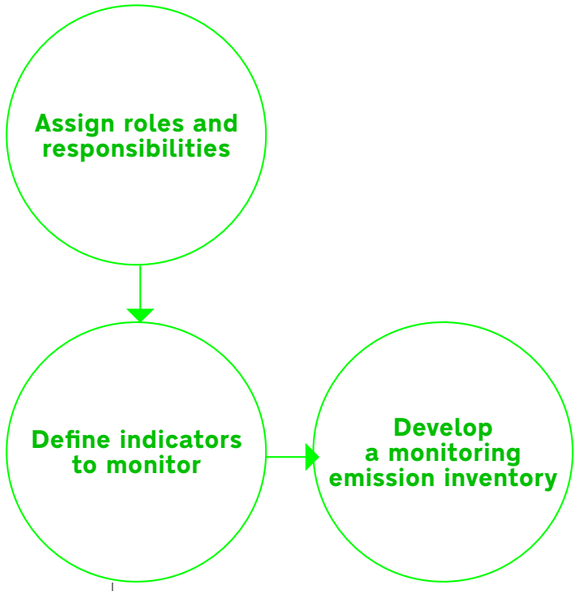
European City Facility (EUCF)

The EUCF is a European initiative that provides financial support (EUR 60,000 grants) to local authorities to accelerate investments in sustainable energy. The grant does not directly finance investments, but finances the development of investment concepts, such as technical feasibility studies, market, legal, economic and financial analyses, related to the implementation of actions identified in climate and energy action plans, which in turn trigger investments (e.g. from ELENA and private actors).
A country expert has been appointed in all eligible countries to support applicants and beneficiaries to apply to receive EUCF support. The EUCF application process consists of two steps: an eligibility check and an online application.

Monitoring & Evaluation of Actions

Effective long-term plans are living documents that are periodically updated and improved, to reflect the latest climate science, technological developments, new financial opportunities and development capacities, as well as supplementary actions needed to meet targets. In order to efficiently update and improve existing plans, it is essential to closely monitor the implementation of actions, as this is an important part of the learning process. Regularly monitoring progress helps local/regional authorities assess whether decarbonisation will be achieved within the planned timescales, and enables the introduction of corrective and supplementary actions when needed. It also helps improve the on-going engagement of stakeholders and the public, whilst at the same time ensuring that the plan continues to meet the wider development goals of the territory.

All actions, including new constructions, infrastructure improvements, building renovations, modal shifts, the penetration of low carbon technologies, citizens and stakeholders engagement and the uptake of behavioural measures, need to be monitored and their impact needs to be estimated, in terms of energy savings and greenhouse gas/carbon dioxide emission reductions, as well as in mitigating risks and vulnerabilities.



Monitoring can be effectively facilitated by:

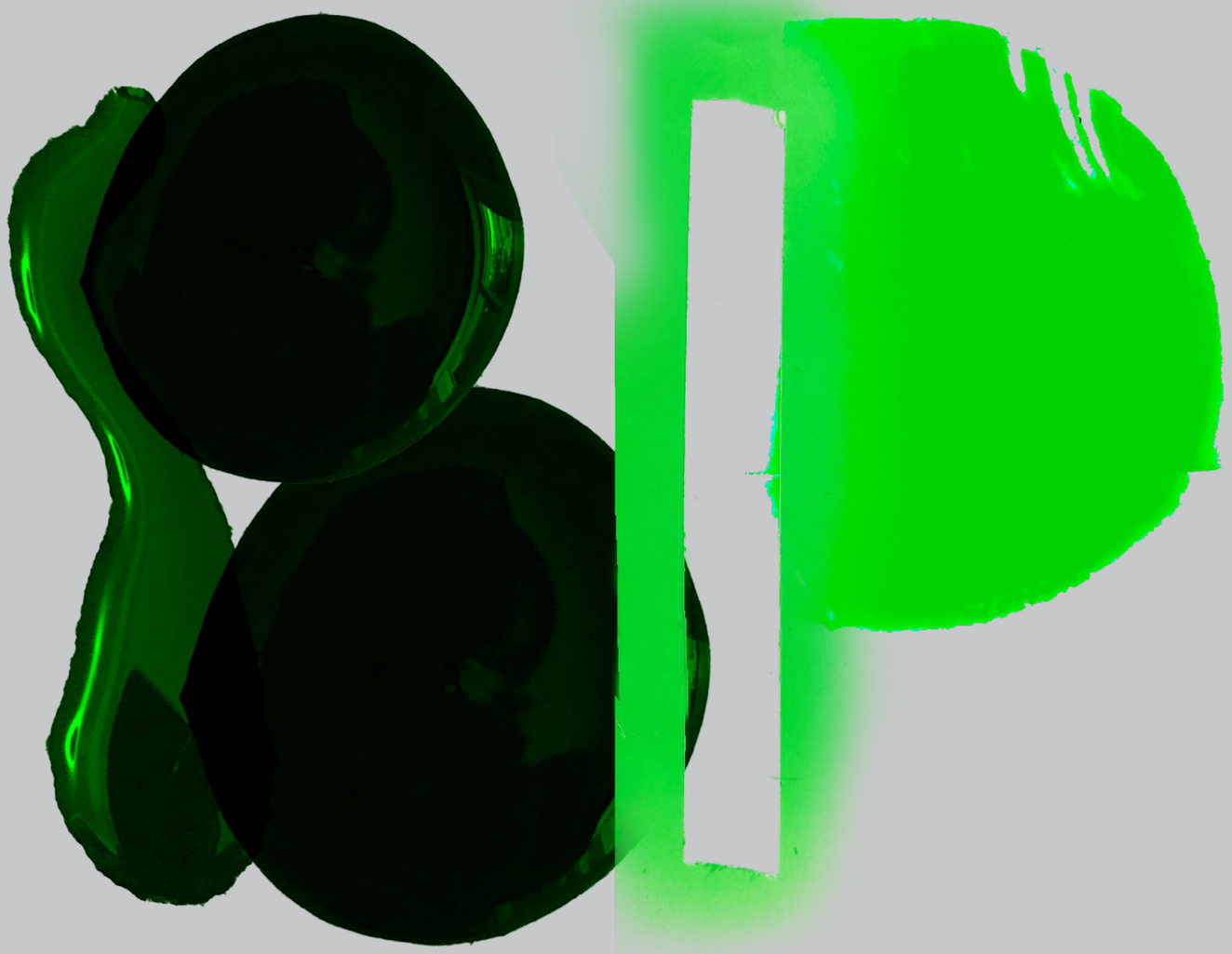
- Clearly identifying the municipal departments that will be involved in the assessment, including the specific roles and responsibilities of involved civil servants.
- Defining relevant indicators for each action to monitor (for instance, number of citizens reached, budget already spent for the implementation of actions, energy savings achieved), revising these when appropriate and establishing the frequency of monitoring.
- Developing monitoring emission inventories to properly assess the impact of mitigation actions and compare this to the baseline. This is particularly important for evaluating the effectiveness of actions that the municipality/region cannot monitor closely (for example the number of energy efficiency interventions implemented in dwellings, where permits are not required to be granted by the local/regional authority, e.g. for switching to a heat pump).

The Energy Management Information System for monitoring long-term plans in Croatia

The Energy Management Information System (ISGE) is a system established under the United Nations Development Programme (UNDP) project “Encouraging energy efficiency in Croatia”. The fundamental purpose of this system is to monitor energy and water consumption in the building sector in Croatia, through energy and water bills. So far, only public sector buildings are included in the system (approx. 75 % of public buildings). According to the Law on energy efficiency (OG 127/14, 116/18, 25/20) all suppliers in Croatia (both energy and water) are obliged to provide data on metering and consumption of energy and water by the public sector and incorporate them in ISGE once a month. As a result, a quick and clear picture of the energy and water consumption of public buildings can be obtained and when needed, corrective actions can be taken promptly to address possible critical points, such as the bursting of water pipes.

Best practices

Governance & Decision - making



Positive Energy Territories (TEPOS) in France by 2050

PUBLIC AUTHORITY	1,907 municipalities in 37 territories in France
SECTOR	Energy planning
LOCAL AUTHORITY CHARACTERISTICS	Urban and rural authorities
NUMBER OF INHABITANTS	4,273,000
INVESTMENT (€)	206 million
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	54%

BRIEF DESCRIPTION

The concept of Positive Energy Territory (TEPOS) was introduced to promote the green transition to 2050. Tools and services are made available to all TEPOS: exchange days, training courses, individual support, guides, experience feedback sheets, etc. The TEPOS strategy is based on 7 pillars in each territory: economic actors, resources and material effectiveness, mobility and transport, urban planning and landscaping, renewable energy, buildings and governance.

INNOVATION

- Strengthening multi-level governance, vertically between municipalities, territories (composed by several municipalities), the region, the state, and horizontally between territories.
- Sharing experiences, tools and services, which enables new local public authorities to implement measures more quickly and older ones to strengthen their expertise on the energy transition.
- Availability of an internal energy transition officer in each authority, who is more proactive in responding to calls for projects and innovative projects, and therefore the authority benefits more easily from regional, national and even European funds.

KEY SUCCESS PARAMETERS

- Regional coordination through a steering committee (made up of regional and national public authorities), a network facilitator and the regional energy agency.
- Funding provided by the region, to help the territories set up an internal referral agent to lead this network.

CHALLENGES

- Monitoring and assessing the impact of measures implemented by the territories.
- Involving local actors and ensuring that they carry out and implement projects.

GOVERNANCE

Multi-level governance is vertical (between municipalities, territories, the region, the state) and horizontal (between territories). The TEPOS network is coordinated by a steering committee, which meets regularly. Technical committees are organised every 3 months to monitor the progress of the territories and prepare for exchange meetings. About 3 to 4 exchange meetings, which bring together all the 37 TEPOS, are organised each year. Sharing experiences, tools and services enables new local public authorities to implement measures more quickly and older ones to strengthen their expertise on energy transition.

FUTURE ENABLING PARAMETERS

The objectives, in the coming years, are to improve the monitoring of the measures implemented at each local level and to evaluate the impact of these measures at a regional level.

Governance & Decision -making

Smart city concept realization via Jelgava municipality's operational information centre

PUBLIC AUTHORITY	Jelgava municipality, Latvia
SECTOR	Smart City
LOCAL AUTHORITY CHARACTERISTICS	Urban authority
NUMBER OF INHABITANTS	56,062 (Year: 2019)
INVESTMENT (€)	745,660 € (67% funded by ERAF)
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100 %

BRIEF DESCRIPTION

Jelgava municipality's operational Smart City information centre was set up; this centre uses comprehensive communication, information exchange and analysis mechanisms for ensuring the direct communication between Jelgava city residents, infrastructure managers, operational services, state and municipal institutions, commercial companies and the Civil Protection Commission.

INNOVATION

- Monitoring of infrastructure and security via sensors and a smart GIS platform, including amongst others traffic flow, water level in rivers, city lighting, and fluctuations in the electrical network.
- Online Platform for interactive city management, citizens' participation, civil protection, personnel coordination, communication and other functionalities.

KEY SUCCESS PARAMETERS	The key parameter that contributed to successfully creating and running the operational information centre was political support and the vision of the city to become a smart city.
CHALLENGES	There were no significant challenges to create the centre, apart from this being the first time such a centre was created in Latvia.
GOVERNANCE	Roles were clearly defined, along with how the centre will function and will be managed. A hierarchical approach was adopted so that the Information centre, municipal police and municipal services effectively work together.
FUTURE ENABLING PARAMETERS	The centre is open for new ideas for tools and methods that can be used for its daily operation.

Governance & Decision -making

Organizational restructuring of administrative & structural procedures as a consequence of calling out a climate emergency in the City of Konstanz

PUBLIC AUTHORITY	Constance, Germany
SECTOR	Public authority/administration
LOCAL AUTHORITY CHARACTERISTICS	Urban/rural (Lake Constance)
NUMBER OF INHABITANTS	285,325 (2019)
INVESTMENT (€)	-
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100 %

BRIEF DESCRIPTION

On May 2, 2019, the Constance municipal council unanimously passed a resolution on climate emergency. In order to give climate protection the highest priority as promised in the resolution, in addition to basic organizational measures, initial decisions on climate-relevant topics and projects were taken. A collection of measures was drawn up in the course of the year. In order to have the necessary resources, not only in terms of personnel and organization, but also financially, the climate change budget was also adopted at the end of 2019.

INNOVATION

- Resolutions and interim report. Every decision of the local council was examined for its climate relevance (climate protection and alternative options for action). In addition, the resolution also includes reporting to the local council and the public every six months on progress and difficulties in reducing emissions.
- Establishment of the "Climate Protection Task Force". The task force has a sound impact, not only on the administration, the municipal holdings and the city society but also on identifying areas, relevant to climate protection within the administration (19 found).
- Climate Citizens' Council. According to the motto "by citizens for citizens", the 20-strong climate citizens' council (10 of them randomly selected) has a budget of 20,000 euros a year that it can allocate to private projects that protect the climate.
- Job creation. Increase in personnel in order to deal with the issue of climate protection in the administration more quickly and more effectively.
- Climate protection for new tenders. For new tenders, e.g. of events, climate protection aspects should be taken into account in the future. Change of vehicles. For the public fleet, instructions were given to only purchase small electric vehicles from now on, provided that there are no special uses for which alternative vehicles are not currently available on the market.

INNOVATION

- Reusable instead of one-way. Amendment on the prevention, recycling and disposal of waste (waste management statute), e.g. Use of reusable crockery for events, edible materials to serve food and drinks, and paper bags. Exceptions only in justified cases upon written request.
- Solar requirement for new buildings. Mandatory demand on building owners to equip new buildings with PVs. Exceptions accepted only in financially non-viable cases.
- Car-free inner city. Together with specialist offices and citizens, converting the inner city plaza into a car-free and otherwise used area in the future will be explored.
- Climate budget. A 2020 climate supplementary budget of 5 million euros was drawn up.

KEY SUCCESS PARAMETERS

Public pressure applied by the Fridays for Future movement led to the political declaration and the subsequent report on organizational and structural measures taken up by the local council.

CHALLENGES

- Conflicting goals: Conflicting goals and measures are inevitable when it comes to climate protection measures.
- Overall framework conditions at the federal level: There are cases in which climate protection-compliant solutions cannot be implemented at the local level because the overall framework conditions at the federal level are not (yet) available.
- Municipal budget law: The framework for municipal borrowing sets limitations, for example borrowing is only possible if the expenditure serves future generations.
- Limits of local action: Only around 40% of the carbon dioxide is emitted locally in Constance, by local energy uses. The rest is mainly due to supra-regional functions, which can only be influenced indirectly at the local level.
- Social justice: To act with the required speed without endangering social cohesion is the main challenge at local and national level. Climate protection must therefore be designed to be socially acceptable.
- CO_2 savings benchmark: The CO_2 savings benchmark is important. However, the precise assessment is often difficult and, in the case of soft measures (e.g. raising awareness and mobilizing the city society), it is hardly reliable and possible with reasonable effort.
- Tenant-investor dilemma: Climate-friendly buildings require higher investments, but benefit tenants only over the life cycle due to lower ancillary costs.
- Materials dilemma: Rapid creation of affordable living space versus climate-problematic construction with concrete and steel.

GOVERNANCE

The climate emergency call and subsequent actions in Constance are governed by the Administration, headed by the Mayor, as well as the Local Council. The public, as well as schools, businesses and other local stakeholders are strongly involved, not only in dedicated engagement activities, but also through the Administration continuously reporting progress.

FUTURE ENABLING PARAMETERS

The continuity of the resolutions and actions taken, largely depends on maintained public pressure, political will, financing and the forging of a network of cities in Germany that want to be local leaders in the climate transition and can, together, set more ambitious examples driving the transition bottom-up.

Governance & Decision -making

Living Lab in Koprivnica

PUBLIC AUTHORITY	City of Koprivnica, Croatia
SECTOR	Smart city, public lighting
LOCAL AUTHORITY CHARACTERISTICS	Urban
NUMBER OF INHABITANTS	30,854
INVESTMENT (€)	60,000 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	25 %

BRIEF DESCRIPTION

The Living Lab in Koprivnica (LLKC), the first of its kind in Croatia, aims to support entrepreneurs in developing, testing and promoting smart city (SC) products and solutions on areas such as waste management, parking, smart grid, smart city infrastructures etc. The public lighting infrastructure was the first pilot of the Living Lab. The first actions were implemented in 24 testing fields, focusing on retrofitting luminaires, integrating smart city solutions and involving several producers/ distributors of LED products. LLKC is open for other stakeholders, citizens and academic & research institutions to get involved in the design and implementation stages of the project. The vision includes the integration of functionalities for sectors such as sustainable buildings, sustainable mobility, water management, waste management, other public and utility services, etc., while the long-term objective is the full deployment of decarbonisation solutions.

INNOVATION

- New ecosystem: Citizens are becoming aware about resource use (energy, water, waste etc.), the authorities develop new sustainable infrastructures (charging stations network, public bicycles, etc.) while the private sector is encouraged to develop new smart and environmentally friendly products.
- Project development: A participatory design process was established. Citizens, public authorities, private companies, and academic institutions contributed in designing and developing the project. These stakeholders not only participated but also benefitted from the project.

KEY SUCCESS PARAMETERS

- Provision of a platform for open collaboration between incubators, various organisations and citizens.
- Citizens' active participation.
- Function as a role model to be followed by other cities.
- High acceptability of the project by many stakeholders.
- LLKC became a test field for testing and deployment which encouraged industry to participate.

CHALLENGES

- No initial capital for expenditures. The project relied on funding from industry, that used the test fields of the living lab as a new free marketing channel.
- Technological challenges connected with smart city solutions in public lighting infrastructure requiring power supply during the day as well.
- Low trust. A number of policy makers and citizens were reluctant to contribute as they didn't believe that their opinion would be taken into account during the design process.

GOVERNANCE

The Regional Energy Agency North as a public, independent and not-for-profit institution is the managing partner of the Living Lab in Koprivnica. The project is envisaged to develop depending on its success to attract key stakeholders. Indeed, the development process of the project involved various stakeholders (citizens, public authorities, the private sector, academia).

FUTURE ENABLING PARAMETERS

- Involvement of all stakeholders in the development of the lab.
- Partners need to provide expertise and technological solutions for the interoperability of the systems to face silos (different technologies, equipment and technical environments).
- Empowerment of the eco-system by promoting and establishing partnerships with supporting institutions like business incubators, chambers of commerce and other public authorities. Special attention will be given to citizens' support and participation.
- Availability of financial resources, new financing tools and new partnerships.
- The industry partners are located nationwide. There is a need for a stronger collaboration and incentives to keep them active on the project.
- Facilitating responsive governance is of high priority, so as to encourage citizens to keep on participating, and the Living Lab to continue to test the viability of systems for implementing these within existing city infrastructure.

Governance & Decision -making

Regional roundtable for the promotion of electric vehicles in Asturias

PUBLIC AUTHORITY	Principado de Asturias, Spain
SECTOR	Transport
LOCAL AUTHORITY CHARACTERISTICS	Public and private sector
NUMBER OF INHABITANTS	1,050,000
INVESTMENT (€)	-
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100%

BRIEF DESCRIPTION

Collaboration has been established between all regional actors involved in electric mobility, to propose specific actions to promote the use of this technology to different sectors of activity.
Since the end of 2017, joint actions have been taking place between companies and administrations in order to have a greater share of electric mobility in transport, mainly in roads.

INNOVATION

Designing a tool for a strong public-private collaboration and the development of collaborative proposals with companies, administrations, associations and users of electric vehicles.
Regular meetings, the design and execution of joint activities such as fairs, publications, vehicle testing for individuals and businesses, international congresses, etc. have allowed electric mobility to grow considerably in the region, which has the largest fast recharge infrastructure of electric vehicles throughout Spain.

KEY SUCCESS PARAMETERS

- Successful collaboration between different actors with a focus on problem solving.
- Problems and needs of each actor articulated, allowing a fluid dialogue and knowledge of the capabilities of each of the companies.

CHALLENGES

Each company had its own strategy and technology initially. During the roundtables the focus was problem solving in a collaborative way.

GOVERNANCE

The roundtable for the promotion of electric mobility in Asturias has been led by the regional Ministry with competences on energy, with the technical and management support of FAEN. This allowed companies to value the strong support of the regional government from the outset and that the actions to be implemented would have a strong institutional background. Meetings were also held to involve local administrations in the events and activities to be carried out. This created an opportunity for companies and municipalities to exchange views and dialogue on their problems and needs and how these could be solved.

FUTURE ENABLING PARAMETERS

- Continuity of collaboration and dialogue between interested actors.
- Other/new technologies, such as hydrogen, may boost the transition.

Governance & Decision -making

An application for smartphones "Jelgavaspilseta"

PUBLIC AUTHORITY	Jelgava municipality, Latvia
SECTOR	Smart City
LOCAL AUTHORITY CHARACTERISTICS	Urban authority
NUMBER OF INHABITANTS	55,972 (Year, 2019)
INVESTMENT (€)	-
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100% plus visitors/tourists

BRIEF DESCRIPTION

An application has been developed for smartphones, namely “Jelgavaspilseta", with the help of which residents can provide recommendations for improving the urban environment. The mobile application provides many functionalities, such as problem/damages reporting with geolocation, emergency calls, public utility services, monitoring/reporting.

INNOVATION

- The citizens are informed about the actualities in the city.
- The citizens can actively monitor processes in the city and inform the local authority if something is wrong.

KEY SUCCESS PARAMETERS

- Technical expertise, which ensured the creation of a user friendly and practical tool.
- The involvement in the international project: “Improvement of the civil protection system in Jelgava and Siauliai (C-System)“ ensured significant improvements in the system.

CHALLENGES

Not all elder citizens use smart phones. This challenge is changing year by year.

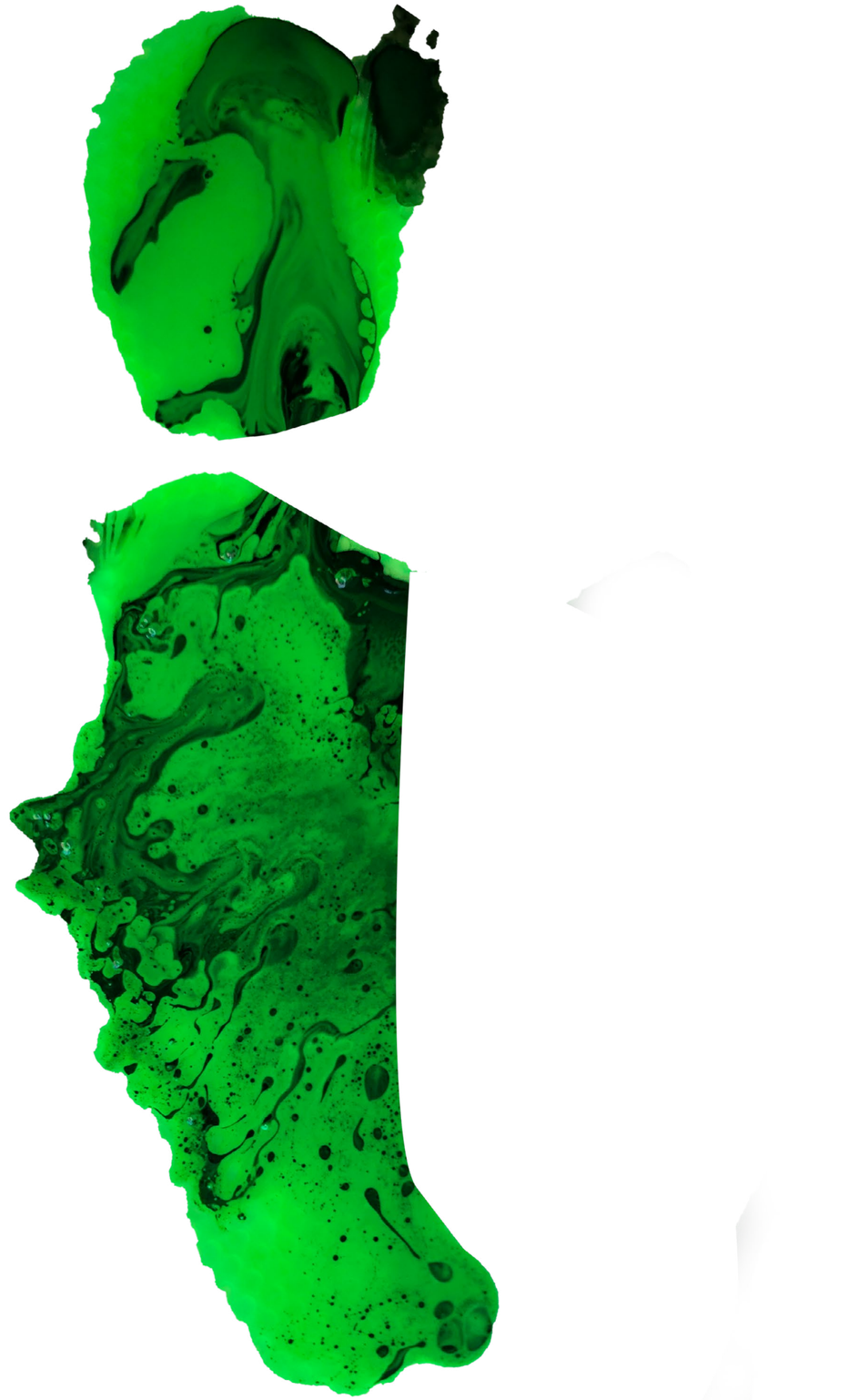
GOVERNANCE

The application was created to support the activities of the municipality’s operational information centre and to ensure that information is spread and gathered in a fast, modern and interactive way among the citizens of Jelgava.

FUTURE ENABLING PARAMETERS

Updates and new functions done via app.

Infrastructure



Infrastructure Smart Trikala

PUBLIC AUTHORITY	Municipality of Trikala, Greece
SECTOR	Smart city
LOCAL AUTHORITY CHARACTERISTICS	Rural Municipality
NUMBER OF INHABITANTS	81,355
INVESTMENT (€)	-
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100%

BRIEF DESCRIPTION

The Municipality of Trikala has developed the Smart Trikala initiative, incorporating smart city infrastructures, services and applications since 2014, aiming at a shift to sustainable municipal services and making citizens' lives easier. Several smart actions have been implemented across a variety of sectors, mainly through clustering with technology companies for testing applications/solutions, as well as with research projects, many of which are funded by Horizon 2020. These actions indicatively include:

- Transport sector - A sensors' parking system to discourage drivers from parking illegally (e.g. on ramps) has been adopted. This notifies the road traffic police in such cases. Also, a smart parking system covering a limited number of spots has been launched as a pilot. These actions are complemented by a traffic light monitoring system and a smart street lighting system, that allows monitoring and in the latter case, also remote control and programming. In terms of public transport, the driverless bus has been tested in the municipality in the past, within the framework of a Horizon 2020 project. Such buses will be used in the coming period for municipal public transport.
- Waste sector - In the waste sector, the municipality adopted a smart management system, based on bins' volume, to optimize collection routes. The adoption of this method has led to an overall reduction of 40% in costs, with only a 24,000€ investment.

BRIEF DESCRIPTION

- Municipal buildings and infrastructure - Smart sensors provide real time information on energy demand and use in municipal buildings and street lighting. With data analytics, measures can be taken to reduce consumption. In addition, a Smart City Control Centre has been established on the ground floor of the City Hall, where terminals monitor the smart city systems that trigger actions.
- Other services - Through the smart open mall application, local stores share commercial offers to citizens via a local wi-fi network. The "20000" online platform and application provide information on the progress with citizens' transaction requests to the local authority. The Tele-Care system is utilized for a selected number of residents in need; this enables health and welfare services, through IT and communication technologies to provide comprehensive primary healthcare services to vulnerable social groups. e-KEP (Automated Citizens Service Centre) are ATM-style machines offering residents the option, at any time of the day or night, to request and print out municipal clearance certificates, civil register certificates, and other related municipal authority documents, quickly, simply and easily.

The successful pilot actions are planned to be scaled-up with funding from national and European funds, or with partnership with vendors.

INNOVATION

- Smart city applications on municipal services and infrastructures.
- Collaborative development of the projects with technology companies and academia.
- Financed from a blend of municipal funds, market actors and research funds, while a similar blend is being used for scaling-up of the pilot projects.

KEY SUCCESS PARAMETERS

- Strong political commitment is the most crucial success parameter.
- Strategic vision is needed to create the pathway.

CHALLENGES

- Limited funding available from regional or national sources.
- Changing citizens behaviour and disbelief towards innovative projects and political intentions.

GOVERNANCE

A specific unit was established within the municipality, to coordinate all actions and activities under the smart city program.
Moreover, the "20000" online platform and application were used to coordinate smart city solutions and to facilitate the digitalisation of citizen interaction with municipal services (requests, certificates, legal documents etc.). The Smart City Control Centre is another useful infrastructure that helps the local authority monitor smart services.

FUTURE ENABLING PARAMETERS

- Lower costs of innovative products.
- Financing opportunities (e.g. through national funding programs).
- Capacity building for municipal personnel.

Infrastructure

Improved street lighting with LED technology & Smart city technology in San Martín del Rey Aurelio

PUBLIC AUTHORITY	San Martín del Rey Aurelio, Spain
SECTOR	Public
LOCAL AUTHORITY CHARACTERISTICS	Local authority
NUMBER OF INHABITANTS	16,584
INVESTMENT (€)	999,790 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100%

BRIEF DESCRIPTION

The City Council carried out the retrofitting of conventional luminaires with new LED ones, applied in half of its street lighting system. For half the number of luminaires, there is stand-alone dynamic controlling while the remaining number of luminaires were just replaced with new, LED ones. The new public street lighting infrastructure incorporated technology that provides additional services such as Wi-Fi services in rural areas with scarce availability. The new system reduces energy costs and emissions by 68%.

INNOVATION

- Dynamic regulation and control systems in each luminaire for optimised operation according to local needs.
- Street lighting infrastructure with the addition of smart technology equipment becomes the backbone of the smart city system, offering services on street lighting, waste management and the traffic lights network.

KEY SUCCESS PARAMETERS

- The interest of the City Council to provide new public services to the facilities it owns.
- The collaboration of an energy manager in the Town Hall, with expert technicians and the Regional Energy Agency sets up indispensable collaborative work scheme to develop innovative projects.
- National support lines for the implementation of these projects facilitates their implementation. Qualified personnel for the identification of applicable economic lines of support is an important factor.

CHALLENGES

In order to address the main challenge faced, collaboration between the City Council, companies and experts in the sector, together with the contribution of entities that play a dynamic role, such as Energy Agencies, has been key for the decision to move forward and incorporate innovative systems.

GOVERNANCE

The collaboration between the City Council and support entities, such as the Regional Energy Agency, and the existence of a Municipal Energy Manager, help form an appropriate framework with sufficient resources to implement energy improvement projects in the municipality. This allows politicians to take decisions ,based on clear techno-economic considerations.

FUTURE ENABLING PARAMETERS

- The availability of national or regional funds and grants for the development of these projects is key. Collaboration between different actors allows the identification of other project financing options, such as Energy Service Companies.
- The existence of a Municipal Energy Manager facilitates the whole process. In small or medium-sized local administrations, in the absence or limited availability of such a manager, collaboration with Regional Energy Agencies can be a useful strategy for resolving this gap.

ENERGY SAVINGS	663 MWh/year	CO_2-eq EMISSION REDUCTIONS	345.5 tn/year

Infrastructure Reduction of greenhouse gas emissions and increase of the energy performance and the reliability of the public lighting system in Campia Turzii Municipality

PUBLIC AUTHORITY	Campia Turzii Municipality, Romania
SECTOR	Energy efficiency
LOCAL AUTHORITY CHARACTERISTICS	Local Urban Authority
NUMBER OF INHABITANTS	22,223 (2011 Census)
INVESTMENT (€)	280,290 € (205,254 as a grant)
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	More than 10 %

BRIEF DESCRIPTION

Street lighting retrofitting in Insula and Sancrai neighbourhoods of Campia Turzii Municipality to increase energy efficiency and road safety, along with significant reductions in CO_2 emissions and energy costs. The project aims to identify all economically and technically feasible energy saving opportunities and also to identify factors that can improve the lighting parameters of the public lighting system.
The proposed retrofitting solution includes:

- The replacement of 403 current lighting fixtures with LED fixtures.
- Dynamic lighting function.
- The installation of a remote management system.

INNOVATION

The main objective of the proposed solution is to ensure a higher level of energy efficiency of the public lighting system and introduce innovation, as most lamps do not use current and modern technology.

KEY SUCCESS PARAMETERS

Vision making: Development of a long-term vision that includes:

- Increased safety of citizens on public roads, by providing street lighting according to high standards.
- Reduction of the carbon footprint of the public lighting system.
- Contribution to national and international efforts to reduce energy consumption and greenhouse gas emissions.

CHALLENGES

- Lack of knowledge on energy efficiency of local / regional decision makers.
- Difficult access to consistent and reliable energy data.
- Insufficient funds to finance energy efficiency works.
- Poor availability in the Romanian market of innovative and proven technologies for energy efficiency.
- Lack of local contractors for the quality maintenance of the system.

GOVERNANCE

The local authority, the Campia Turzii Municipality has assumed a clear and ambitious energy policy. The plan for improving the energy efficiency of street lighting was developed with the help of the C-Track 50 project. During the development of the plan, there were many discussions around the identification of the municipality's needs, prioritisation of the identified actions and measures based on their impact on energy consumption and benefits to the public, proposition of alternative technical and economical scenarios for the most important actions, identification of funding sources, while essential support was provided during the preparation of the project application.
The municipality of Campia Turzii has allocated financial and human resources for the Energy Audit and the development of the project application to increase the energy efficiency of the Public Lighting System and is committed to provide the required resources for the implementation, operation and monitoring of the project results.

FUTURE ENABLING PARAMETERS

More financing schemes would enable better outcomes. Also, dedicated trainings for staff, as an end user, could maximize the outcomes of the project in the long - term.

ENERGY SAVINGS	273.4 MWh/year	CO_2-eq EMISSION REDUCTIONS	318 tn/year

Infrastructure LED lighting in tunnels in Madeira

PUBLIC AUTHORITY	Madeira Region, Portugal
SECTOR	Regional Directorate of Roads
LOCAL AUTHORITY CHARACTERISTICS	Island authority
NUMBER OF INHABITANTS	Approx. 260 thousand
INVESTMENT (€)	629,520 € (137,899 by national funds)
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	-

BRIEF DESCRIPTION

LED lighting was installed in 11 tunnels located on roads managed by the Regional Directorate of Roads.
For the implementation of this project, the Regional Directorate of Roads applied to the Energy Efficiency Fund (National fund), to secure financing for the installation of energy efficient LED lights that reduce electricity consumption by at least 60%. This represents a huge reduction in annual energy bills, since the lights in the tunnels are on 24 hours a day. The tunnels targeted by the intervention were the ones with the greatest need for intervention.
The interventions carried out have a payback period of around 40 months. “LED” technology was shown to be a viable solution, from an economic, ecological and social point of view, as it reduces energy consumption and in turn energy costs, without reducing the quality of lighting.

INNOVATION

This innovative project allowed the reduction of the energy and environmental impact of street lighting, and at the same time reduced energy bills, making more budget available for future interventions in other tunnels. Due to the small payback period and an expected lifetime for the LED technology exceeding 100,000 hours of operation, it is estimated that after 10 years, the LED solution will reduce energy costs by up to 90%.
In addition to municipal public lighting, tunnel lighting with LED technology is a solution that should always be considered and should become standard practice in all regions.

KEY SUCCESS PARAMETERS

Political support, technical expertise

CHALLENGES

The biggest challenge is securing the financing to replace the conventional tunnel lighting with LED technology, which only possible through financial support schemes.

GOVERNANCE

The action relied on administrative personnel.

FUTURE ENABLING PARAMETERS

New financing schemes.

ENERGY SAVINGS	2,152 MWh/year (462.89 tep/annually, 237,000€)	CO_2-eq EMISSION REDUCTIONS	1,151 tn/year

Infrastructure Electric vehicles in the public administration fleet in Madeira

PUBLIC AUTHORITY	Madeira Region, Portugal
SECTOR	Regional public administration services
LOCAL AUTHORITY CHARACTERISTICS	Public administration
NUMBER OF INHABITANTS	Approximately 260,000
INVESTMENT (€)	100% financed by the Environmental Fund (Fundo Ambiental)
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	Regional public administration services

BRIEF DESCRIPTION

Electric vehicles have been used by the Regional Public Administration since 2018. Currently, the Regional Government is using 15 electric vehicles (EVs), obtained through applications approved in the 1st and 2nd phases of the Public Administration Electric Mobility Support Program of the Environmental Fund (2017 and 2018). This financed the total cost (including VAT) of leasing EVs for a period of 48 months, as well as for the purchase and installation of charging stations, up to a maximum number equal to the number of vehicles leased.
Electric vehicles made it possible to substitute older vehicles (over 12 years old). These constituted a high cost for the region, namely in terms of fuel and maintenance costs, and many were "parked" for a long time waiting for parts, which often prevented the correct performance of some services.
Compared to conventional vehicles, electric vehicles consume 5 times less energy to travel the same distance, have much lower maintenance costs, emit no pollutants in urban centres and have low noise level. Thus, they contribute to improving. air quality and reducing the degradation of buildings in cities.

INNOVATION

The use of a more efficient technology, as well as the use of an energy vector different from that used in conventional vehicles, makes it possible to reduce external oil dependence, an important factor in the context of energy security. Electric vehicles also allow for a greater penetration of renewable energy and the consequent reduction in the use of fossil fuels to produce electricity.

KEY SUCCESS PARAMETERS

Political support

CHALLENGES

The challenge was to demonstrate the performance of EVs when used for public services, namely concerning the autonomy of the vehicles.

GOVERNANCE

The action focused on the administrative personnel.

FUTURE ENABLING PARAMETERS

New financing schemes to replace all diesel and petrol vehicles of the fleet.

ENERGY SAVINGS	80% savings when compared with internal combustion engines	CO_2-eq EMISSION REDUCTIONS	80% reductions when compared with internal combustion engines

Infrastructure

Incentives for the acquisition of electric vehicles in Madeira

PUBLIC AUTHORITY	Madeira Region, Portugal
SECTOR	Transport Citizens and Companies
LOCAL AUTHORITY CHARACTERISTICS	-
NUMBER OF INHABITANTS	Approx. 260,000
INVESTMENT (€)	Financed by the Environmental Fund (Fundo Ambiental)
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	Citizens and companies directly and indirectly benefit (e.g. environmental benefits in city centres).

BRIEF DESCRIPTION

Two incentive schemes were created and implemented by the Regional Government. The first, at Porto Santo Island, was created to support the acquisition of electric vehicles (EV) by citizens and companies. To implement this, Ordinance No. 434/2019 of 7 August was published, which regulates the incentive for Electric Mobility at Porto Santo Island, called “PRIME-RAM”, with a budget of 400,000 euros foreseen in the Region's Budget for 2019. This initiative is aligned with the Sustainable Urban Mobility Action Plan of the Autonomous Region of Madeira (RAM) and the “Porto Santo Sustentável - Smart Fossil Free Island” project. Overall, 42 electric vehicles were co-financed by the Regional Government.
A second incentive scheme, at the Madeira Region, financed the acquisition of EVs by citizens and companies. To implement this, Ordinance No. 110/202 of 1 April was published, which regulates the incentive for Electric Mobility at the Madeira Region, called “PRIME-RAM” with a budget of 1 million euros foreseen in the Region's Budget for 2020. Between April and October 2020, 174 electric vehicles (114 in private use and 60 in companies) and 16 electric bicycles were co-financed by the Regional Government.

INNOVATION

The use of a more efficient technology, as well as the use of an energy vector different from that used in conventional vehicles, makes it possible to reduce external oil dependence, an important factor in the context of energy security.
Electric vehicles also allow for a greater penetration of renewable energy and the consequent reduction in the use of fossil fuels to produce electricity.

KEY SUCCESS PARAMETERS

On a political level, the vision of sustainability for the coming years appears in the political agenda. In addition, the national legal framework can provide several financial benefits for citizens who intend to purchase an EV. In parallel, the ongoing awareness campaigns to foster the use of bike and the introduction of bike sharing schemes, will lead to a decrease on car dependence. Also, the increasing number of EVs reflect that citizens and companies are gradually accepting electric mobility.

GOVERNANCE

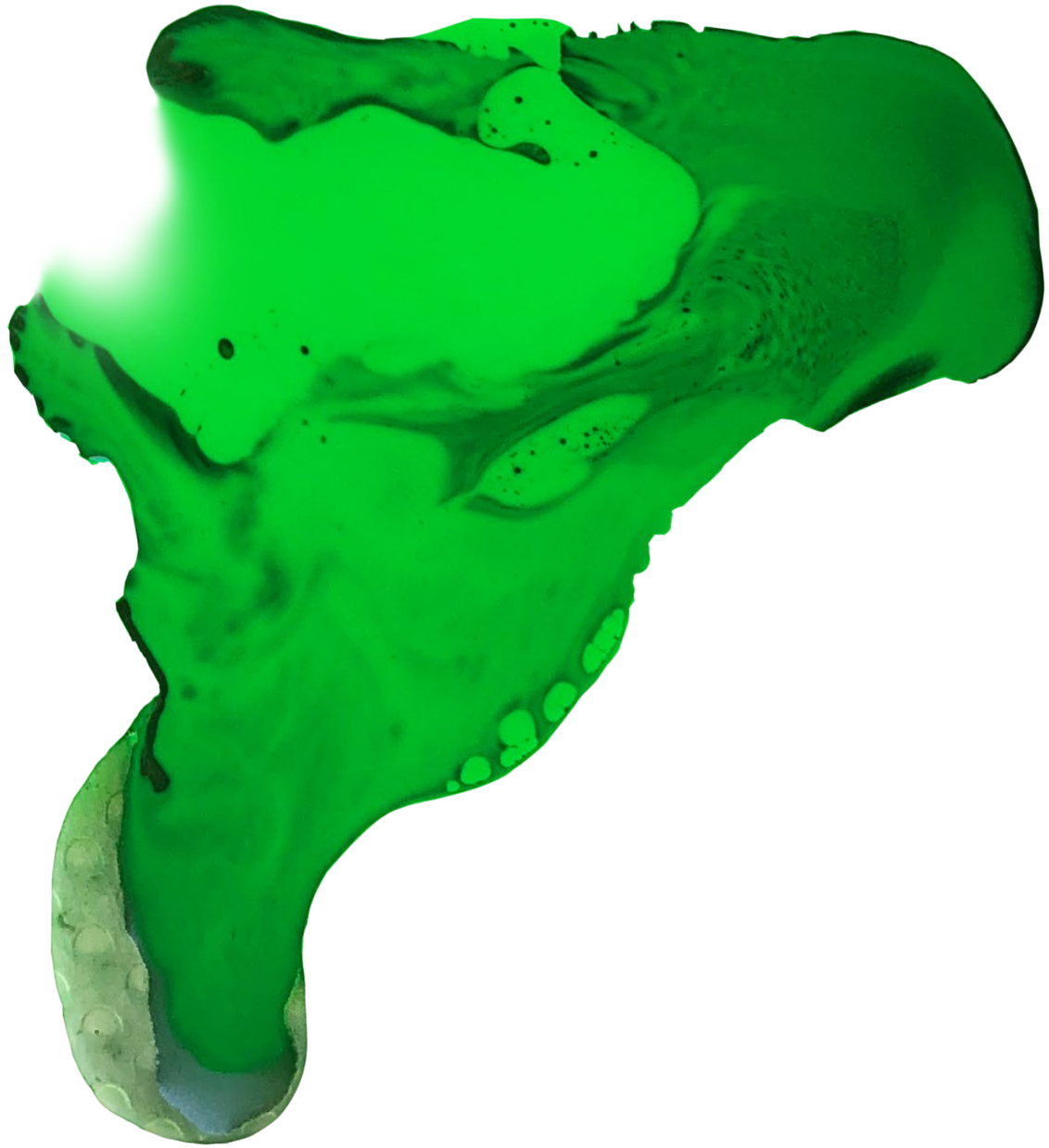
Administrative personnel.

FUTURE ENABLING PARAMETERS

New financing schemes.

ENERGY SAVINGS	1,832 MWh/year	CO_2-eq EMISSION REDUCTIONS	420 tn/year

Urban / Spatial Planning



Urban/ Spatial Planning

Integrated Planning and Public Participation for Sustainable Urban District Development in Freiburg

PUBLIC AUTHORITY	City of Freiburg, Germany
SECTOR	Urban Planning & Buildings
LOCAL AUTHORITY CHARACTERISTICS	Urban
NUMBER OF INHABITANTS	227,090 (2019)
INVESTMENT (€)	Site preparation, infrastructure and public buildings funded through the sale of plots and regional funds
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	4.4%

BRIEF DESCRIPTION

The City of Freiburg, in order to address the pressing local housing shortage, developed the sustainable planning of Rieselfield district. The 70 hectare mixed-use Rieselfeld concept is now fully developed and implemented, including comparatively high density energy-efficient building blocks, good public transport connectivity as well as a socially mixed and inclusive demographic make-up. The concept was developed in a staged approach taking into account the ideas and needs of local government's decision makers, citizens and stakeholders, under the prism of environmental and social sustainability. The "Rieselfeld" district showcases how green policies can be effectively operationalized at local level.

INNOVATION

- Public engagement underpinned the conception, planning and implementation of the Rieselfeld development. Engagement forms were dynamic and needs-based, to ensure that the district would be inclusive (especially for families and the elderly). An association was established to organize social / cultural events, as well as to function as a platform for citizens mobilization.
- Architectural and social diversity was promoted by limiting the size of building plots and their sale to individual developers, with a threshold set at 500 apartment units, and mixing privately financed and subsidized housing.
- Purchasers of plots were contractually obliged to meet low-energy building standards, with a maximum energy consumption of 65 kWh/m².a (which was very ambitious at the time). This also mandated that buildings are connected to the district heating network.

INNOVATION

- The integrated green space planning approach was employed to ensure that residents can avail of sufficient play areas, open spaces, as well as cycle paths.
- Low-carbon transport was prioritized by connecting the site to the city's tram network, implementing traffic calming measures and discouraging individual motorized transport ownership.
- A concept for rainwater infiltration was developed to reduce the volumes of water being discharged into the canal system.

KEY SUCCESS PARAMETERS

- Political leadership and high levels of public awareness with regard to environmental sustainability. The vision of sustainable urbanism ensured that ecological and social impacts were carefully considered from the outset. Public engagement at all stages ensured that the new district would be inclusive and a sense of community could be developed.
- Public ownership of the process. Local government invested considerable time and resources to formulate and refine concepts in all development stages. Furthermore, the city could bind developers to more ambitious sustainability targets than required by law, by drawing up contracts that had to be signed when purchasing plots.

CHALLENGES

- Former use. As the site had been used as a sewage farm for over one-hundred years, extensive ground surveys and soil removal / remediation had to be carried out.
- Public opposition. Greenfield development projects are met with considerable opposition in Freiburg. Extensive public consultation was conducted to build trust about the project, while urban development limitations were set for the hectares not built so far (designated as a NATURA 2000 sanctuary).

GOVERNANCE

- Local government had substantial experience in creating new districts in the city, with past projects of sustainable urban planning and development, such as the district of Vauban. As a result, local government has solid technical capacities and institutional arrangements for such complex projects.
- Stakeholders engaged in planning and implementing projects, such as Rieselfeld, include a range of local government departments, energy planners, architects, consultants, business owners, developers and citizens (who are involved in frequent public engagement activities).

FUTURE ENABLING PARAMETERS

- More Public engagement is needed to overcome public opposition. Efforts need to be made towards balancing the challenges of such projects, decarbonising the city while being socially inclusive and prosperous.
- The resolution of legal challenges resolution needs to be accelerated.
- Regional and national-level regulations (i.e. standards, targets, financing) will enable the development of local sustainable projects.
- European, national and regional) funds and financing tools are key parameters for designing and implementing green projects.

Urban/
Spatial
Planning

Exemplar green rural community of Megalos Evidrios Farsalon

PUBLIC AUTHORITY	Municipality of Farsala, Greece
SECTOR	Public
LOCAL AUTHORITY CHARACTERISTICS	Rural authority
NUMBER OF INHABITANTS	18,545
INVESTMENT (€)	4,000,000 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	5%

BRIEF DESCRIPTION

The exemplar green rural community project includes the design and implementation of interventions, which support "Green Development", leading to a net-zero energy use in the village of Megalos Evidrios.
Planned interventions relate to energy efficiency, renewable energy sources, sustainable transport, waste management, water resources management and bioclimatic urban spaces. Specific actions include:

- Building envelope renovations of 175 houses and 3 municipal buildings (in particular thermal insulation and window replacement).
- Installing solar water heaters, with three heating sources, in private homes.
- Retrofitting street lighting with autonomous lighting fixtures.
- Developing the infrastructure for electric bicycles and replacing municipal fleet vehicles with electric ones.
- Upgrading municipal water pumps with Inverter devices.
- Installing photovoltaic systems on buildings (residential and municipal buildings).
- Providing domestic compost bins.

Furthermore, a plant for the production of electricity from biogas and biomass will be built in the area through the JESSICA program.

INNOVATION

The project is very innovative as it targets different sectors, and aims to implement a vast, versatile palette of solutions/actions to successfully illustrate a sustainable community model that respects the environment, citizens and future generations, demonstrate Innovative solutions, and promote social and economic inclusion. As a result, the project will:

- Design and implement a new, innovative, sustainable development model.
- Achieve a zero-energy balance within the community, with the help of private investment for the installation of the largest photovoltaic park in Greece and the Balkans, with a total capacity of 9.99 MW.
- Protect the natural environment.
- Contribute to tackling climate change and achieving national and European environmental objectives.
- Create new jobs and consequently improve the life of inhabitants and enhance the region's development.
- Increase local technical job opportunities, especially for young scientists/technicians.
- Retain and empower the population within the community.
- Upgrade activities and touristic services.
- Protect vulnerable groups during extreme events (as a result of the energy upgrade of homes).

This sustainable community model, and in particular the different actions planned, can be replicated by different local and regional authorities across Europe, independently of geographical and climatic differences.

KEY SUCCESS PARAMETERS

Having the necessary technical expertise and sufficient resources was crucial for the design of the project and the preparation of all essential studies (such as feasibility and technical studies), as well as for the preparatory work (e.g. stakeholder engagement, and preparing tender documents).

CHALLENGES

In order to achieve local goals and implement the green community as a demonstration project in Greece, direct funding from the region of Thessaly or the central government is necessary. Securing this funding has proven to be a significant challenge.

GOVERNANCE

The project proposal was developed entirely by the technical department of the municipality. As such, considerable effort has been devoted in developing the project idea, preparing technical studies, and engaging key stakeholders, as well as mobilizing and coordinating vital resources and expertise.

FUTURE ENABLING PARAMETERS

In order to facilitate the design and implementation of innovative local projects, such as the green rural community of Megalos Evidrios, the following parameters are important:

- Available national or regional funds (or even European funds).
- A clear long-term vision (of the municipality/public authority).
- Stakeholders and citizens trust on (local) government actions that aim to achieve energy savings and protect the environment.

Urban/
Spatial
Planning

Establishment of a Climate and Energy Model Region in the District of Murtal

PUBLIC AUTHORITY	District of Murtal, Austria
SECTOR	Regional energy planning
LOCAL AUTHORITY CHARACTERISTICS	The district of Murtal consists of 20 municipalities, mainly rural
NUMBER OF INHABITANTS	72,000
INVESTMENT (€)	-
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100 %

BRIEF DESCRIPTION

Objective: With the Climate and Energy Model Region (KEM), the district of Murtal sets itself the goal of becoming a climate-neutral region in the medium term. The region, with its once classical heavy industry, has created the structural change needed to transform to a region with many innovative high-tech companies and a broad portfolio of materials.
Key points: The aim is to achieve climate neutrality, by increasing energy efficiency in buildings and processes, as well as in mobility, and by harnessing the abundant and as yet untapped potential of renewable energy, such as biomass, solar energy, wind and hydropower, as well as industrial waste heat. The substitution of fossil fuels with renewable sources is intended to stimulate and strengthen the energy industry. The outflow of purchasing power from fossil energy sources is to be redirected and invested in regional projects, thereby securing and creating jobs and income in a rural region characterised by emigration. With the energy and mobility turnaround, the regional economy will be boosted, active climate protection will be pursued and opportunities will be created for the younger generation to stay or return to the region.

INNOVATION

The innovation here lies in a broad participation process, involving many stakeholders from different sectors. After an analysis of the current situation, and the available potential for renewable energy and for increasing energy efficiency, an energy and climate protection model is developed (mission statement), and subsequently thematic priorities for implementation are set and concrete measures defined.

KEY SUCCESS PARAMETERS

- The involvement of stakeholders on a broad basis: public administration, politicians, economists, energy supply and infrastructure representatives, farmers, foresters and private companies.
- A good status quo analysis, with the strengths and weaknesses of the region, and also the available potential. Only then, it possible to reach a broad consensus for a common strategy and packages of measures for implementation. Only when people feel that their needs are reflected in a regional strategy, they will actively support the implementation and benefit from it.

CHALLENGES

A key challenge was to raise awareness in individual communities, some of which were afraid that a lot of work or additional costs would be imposed on them. In some cases, a lot of discussions were necessary in order to convince them.

GOVERNANCE

Involvement of stakeholders on a broad basis: public administration, politicians, economists, energy supply and infrastructure representatives, farmers, foresters and private companies.

FUTURE ENABLING PARAMETERS

Information and awareness raising on the thematic points of implementation.

Urban/
Spatial
Planning

Singular Project “0 emissions” in a natural park in Caso City Hall

PUBLIC AUTHORITY	Caso City Hall, Spain
SECTOR	Public
LOCAL AUTHORITY CHARACTERISTICS	Local authority
NUMBER OF INHABITANTS	1,574
INVESTMENT (€)	700,000 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100%

BRIEF DESCRIPTION

In the Natural Park of Redes (Asturias, Spain) various public-owned facilities (a swimming pool, a hotel, an interpretation centre, public housing of the regional administration) will be upgraded to become energy self-sufficient. The proposed actions incorporate renewable energy sources for thermal energy and electricity production, and the introduction of electric mobility. To achieve this, local resources and the energy service companies model will be used.

INNOVATION

- Administrative: New tendering procedures, as different administrations are involved in the development of the project and the management of the facilities.
- Technological: Novel technologies, such as cogeneration using forest biomass and hybridization with photovoltaics, are used. This entails the development of adequate energy management systems.
- Management: the energy services companies model is used for actions that focus on renewable energy sources and district heating. This is a model that has not been implemented in Spain as much.

KEY SUCCESS PARAMETERS

- Public-private collaboration to initially define the project through the participation of the regional energy agency and specialised companies.
- Political bet on proposing a project in an area of special interest.
- Agree on actions between the different administrations involved.
- Have adequate funding lines for its implementation.

CHALLENGES

- The fundamental technological challenges were to achieve energy self-sufficiency using local resources. This was resolved by encouraging a public-private partnership, in order to obtain the best technical solution.
- Collaboration between the different administrations for the management of the project. This was resolved through meetings led by the regional administration, which were attended by all the parties involved, and discussed problems and solutions.

GOVERNANCE

From project idea, the regional Ministry in charge of energy issues took the leadership. A working group was created, with different departments of the regional administration involved, the city council with its mayor and, as the Regional Energy Agency (FAEN) that was responsible for technical and administrative tasks (i.e. preparing the working documents for the meetings and explaining the possible technical and administrative solutions for the implementation of the project).

FUTURE ENABLING PARAMETERS

- National or regional grants for the development of such projects.
- Participant commitment in the concept of developing sustainable solutions, regardless the difficulties faced.

ENERGY SAVINGS	340 MWh/year	CO_2-eq EMISSION REDUCTIONS	67 tn/year

Energy Efficient Buildings

Energy Efficient Buildings

Public procurement of innovation - extensive transformation of a prefabricated kindergarten building in the city of Koprivnica

PUBLIC AUTHORITY	City of Koprivnica, Croatia
SECTOR	Construction Building, Energy Efficiency
LOCAL AUTHORITY CHARACTERISTICS	Urban
NUMBER OF INHABITANTS	30,854
INVESTMENT (€)	370,000 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	10 %

BRIEF DESCRIPTION

The pilot project delivered an innovative and replicable solution for the deep renovation of a 35 year old prefabricated wooden kindergarten. As the building was near to the end of its useful life, Public Procurement of Innovation was chosen in order to find an innovative solution to enhance the building and extend its lifetime, which can be easily replicated in similar cases.

INNOVATION

Combination of existing materials and basic techniques not previously offered or used in the market.
Public Procurement of Innovation (PPI) was implemented for the first time in Croatia. More specifically competitive procedure with negotiation was selected as the most suitable procurement procedure to finalize the PPI process (and procurement procedure), Thus, the public administration defined requirements, and the award criteria.

KEY SUCCESS PARAMETERS

- Identifying needs was the most critical part of the project and is the basis of the requirements and characteristics of the solutions included in the call for tenders.
- Extensive discussion with local end-users and all involved stakeholders.
- Requirements were defined without prescribing any specific solution (e.g. “maximize energy efficiency in a cost-effective manner”, “propose scalable and replicable solutions to attract nationwide interest”) to allow bidders to be innovative with their proposals.
- Extensive market research to identify the possible market size on a nationwide scale and determine capitalization opportunities for the future developed solution. This led to expressions of interest from 60 public administrations, business entities and faculties for the market engagement procedure.
- By using a PPI and Design&Build approach bidders were encouraged to compete with effective, long(er) lasting and innovative solutions. The award criteria included the quality and innovation of the proposal (50 % of the award score), and price (the other 50%).

CHALLENGES

- Market engagement and consultation process. Never before has such a procedure been implemented in such way in Croatia, so it was an unknown and risky operation.
- Building the tools used for the open market consultation. The tools included the Prior Information Notice, the Market Sounding Prospectus, and a web page with all the relevant information on participation/communication.
- Holding the market consultation workshop for the final shaping of the procurement requirements.
- A small and inexperienced procurement department. Thus, the support of external technical and legal consultants was necessary.

GOVERNANCE

Extensive discussion with local end-users and all involved stakeholders to identify and analyse the project’s needs. An open market consultation process (market sounding prospectus, emails to 15,000 addresses, telephone surveys to establish the market size and calls to more than 120 municipalities, organisation of a workshop etc.) was conducted.

FUTURE ENABLING PARAMETERS

- The market is not mature yet. The public authorities in Croatia have to invest more effort towards facilitating the market with procurement requirements.
- Suppliers to be more eager to provide details about the solutions proposed during the open market consultation phase.
- PPI is a performance-based procurement approach and requires a cultural shift from all stakeholders who are more familiar with prescriptive calls for tenders.
- Authorities need to propose replicable rather than revolutionary procurements and projects, as it is more possible to attract interest by the market.

ENERGY SAVINGS	128.39 MWh/year	CO_2-eq EMISSION REDUCTIONS	24.63 tn/year

Energy Efficient Buildings

Energy Management Information System in Croatia

PUBLIC AUTHORITY	Local and regional authorities in Croatia
SECTOR	Energy management
LOCAL AUTHORITY CHARACTERISTICS	Rural, urban and island
NUMBER OF INHABITANTS	-
INVESTMENT (€)	4,500,000 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	-

BRIEF DESCRIPTION

Energy Management Information Systems (ISGE) were installed for monitoring building's energy and water consumption in Croatia. Public sector buildings' data from energy and water bills are input into the system on a monthly basis, to obtain a quick and clear picture of the energy and water consumption of each public building, and deal with critical functions or emergency events encountered (e.g. ruptured pipes).

INNOVATION

The lack of effective monitoring of the energy and water consumption of public buildings is overcome by the collaboration of energy and water suppliers/distributors with local authorities' technical staff. The suppliers automatically send the invoices into the ISGE system, the ISGE analyses consumption, the local authorities receive the relevant reports by the ISGE system, and the authority's technical staff/experts identify and implement the necessary measures to increase energy efficiency and cost savings.

KEY SUCCESS PARAMETERS

Technology readiness: The key success parameter is the accurate monitoring of energy and water consumption, which resulted in reduced consumption over the years. Through the ISGE, the buildings with the highest energy consumption were identified and accordingly given priority for increasing their energy efficiency.

CHALLENGES

- The biggest challenge was to encourage public officials to enter data from bills correctly and regularly.
- A significant number of bill entries were wrong and thus needed to be constantly monitored and corrected, which was very time-consuming.
- Time-consuming for suppliers to insert data from every bill manually.

These challenges were overcome by automating the process (automated data entry), leaving local authorities with the task of monitoring consumption and implementing corrective actions.

GOVERNANCE

The aim of the project "Encouraging energy efficiency in Croatia" was to lay the foundations for the systematic and efficient energy management in the public sector, but also to educate and inform citizens about energy efficiency and energy-efficient products and systems that can reduce energy consumption and CO_2 emissions.
All ministries and some state administration bodies were actively involved in the project, through the energy management (EE) teams established. EE teams consisted of trained employees who monitored and managed energy consumption, but also undertook other activities, such as developing energy efficiency projects and providing citizen advice. Through various courses, workshops and lectures within the framework of project, more than 29,000 civil service employees were educated, whilst numerous brochures, manuals, publications and multimedia content were developed, playing an essential role in providing information. Moreover, 128 EE info points were established in 52 cities and 12 counties to inform citizens about energy efficiency, free of charge.
So far, REAN's employees monitor energy and water consumption for its founding cities and develop total energy consumption reports.

FUTURE ENABLING PARAMETERS

Further development of the ISGE system through new upgrades related to UI/UX, functionalities and data processing. It would be ideal if the system could be used for monitoring the whole buildings stock (private, commercial and public), which would facilitate the process of developing national, regional and local energy plans (such as SEAPs/SECAPs).

ENERGY SAVINGS	1 – 2 % energy savings from monitoring consumption	CO_2-eq EMISSION REDUCTIONS	Depends on energy savings

Energy Efficient Buildings

Energy Efficiency and Comfort increase in Tarnaveni key public buildings

PUBLIC AUTHORITY	Tarnaveni Municipality, Romania
SECTOR	Energy efficiency
LOCAL AUTHORITY CHARACTERISTICS	Local Urban Authority
NUMBER OF INHABITANTS	22,075 (2011 Census)
INVESTMENT (€)	1,166,747 € (991,735 as grant)
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	More than 25%

BRIEF DESCRIPTION

Deep renovation in two key buildings in Tarnaveni: “Andrei Barseanu” Theoretical High School and “Mihai Eminescu” House of Culture.
The two key public buildings in Tarnaveni are energy inefficient, with high energy costs, and low thermal discomfort. There is no air conditioning during the hot seasons, no mechanical ventilation for the indoor air, while the indoor lighting systems are below standards. Interventions in the building envelope, heating system, ventilation, air-conditioners, lightings, Building Energy Management Systems (BEMS), and solar thermal collector are proposed.

INNOVATION

- Increase indoor comfort, and reach the energy performance of a nearly zero energy building .
- LED technology used for lighting (flexible to meet the different lighting needs of a school and should accentuate the blackboard).
- Synergies of tools and services for Smart Buildings (Building Energy Management Systems - BEMS, enhanced control of heating, ventilation, and air conditioning - HVAC and lighting, combination and sequential use of renewable energy systems, future energy storage technologies for electric mobility and enhanced Demand Response capability).

KEY SUCCESS PARAMETERS

- Internal team with strong competencies.
- The project team members have experience in similar projects.

CHALLENGES

- Local/regional policymakers having poor knowledge on energy efficiency , and not having yet adapted to the nearly zero-energy buildings (nZEB) requirements.
- Difficult to access consistent and reliable energy data, especially from the retailers.
- Insufficient funds for financing Energy Efficiency projects.
- Difficulty in accessing private funds.
- Low availability in the Romanian market of innovative and proven energy efficient technologies.
- The gap between the local/regional level and national level in terms of identification of energy priorities and allocation of necessary resources for interventions.

GOVERNANCE

Tarnaveni Municipality will ensure the project management, technical management, measurement and verification of the project outcomes, by involving an internal team having strong competencies according to their specified roles. The project team members have been previously involved in several other finished or ongoing EU infrastructure projects.

FUTURE ENABLING PARAMETERS

- More financing opportunities would enable better outcomes.
- Dedicated trainings for staff and end users could maximize the outcomes of the project in the long - term.

ENERGY SAVINGS 906.72 MWh/year CO_2-eq EMISSION REDUCTIONS 206 tn/year

Energy Efficient Buildings

Municipal Hospital heating system in the municipality of Sighetu Marmatiei

PUBLIC AUTHORITY	Sighetu Marmatiei Municipality, Romania
SECTOR	Energy efficiency
LOCAL AUTHORITY CHARACTERISTICS	Local Urban Authority
NUMBER OF INHABITANTS	37,640 (2011 Census)
INVESTMENT (€)	804,674 € (683,973 as grant)
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100 %

BRIEF DESCRIPTION

Retrofitting interventions in the Sighetu Marmatiei Municipal hospital building complex to ensure lower energy costs, high efficiency and thermal comfort. The current state is poor insulation, decalibrated hydraulic system, outdated boilers and pumps, piping system with high thermal loses, uneven heat distribution within the buildings. These issues are planned to be addressed by replacing and calibrating equipment in the boiler room and heating network, installing heat exchangers for domestic water, and installing a high efficiency cogeneration unit.

INNOVATION

High efficiency cogeneration installation – this solution consists of a gas turbine with an integrated heat exchanger which will produce hot water and electricity for the hospital's own consumption. This solution also reduces the load of the existing boilers, while during the summer period ensures a minimum load needed for domestic hot water production.

ENERGY SAVINGS 605 MWh/year CO_2-eq EMISSION REDUCTIONS 318 tn/year (2022)

KEY SUCCESS PARAMETERS

Vision making: The long-term objective of Sighetu Marmatiei municipality is to
- Produce a good practice and raise awareness of other municipalities in the country on how they can ensure proper thermal conditions in hospitals and other public buildings.
- Reduce the carbon footprint of the buildings, as a local contribution to the national and international efforts to reduce energy consumption and greenhouse gas emissions.

Technical preparation: A well conducted energy audit detected the main problems, and recommended a set of energy efficiency measures in order to improve the thermal comfort in the buildings, reduce CO_2 emissions, increase the efficient use of energy and reduce energy and maintenance costs.
Financing: Allocation of the needed financial resources from the local budget. Effort will be put to ensuring that Implementation, operation and maintenance will be conducted according to financing priorities.
Governance: Previous municipal experience in managing deep renovation actions both for public and residential buildings, helped create a reasonable time schedule, predict the typical duration of the public procurement process, develop technical studies, technical requirements dossier, preparatory works and engineering verification during the execution period.
Technology readiness: Market ready solutions were selected, with multiple possible suppliers.

CHALLENGES

The main challenges that Sighetu Marmatiei Municipality has to overcome in order to achieve the project goals are:
- Poor knowledge on energy efficiency of local/regional policymakers.
- Difficult access to consistent and reliable energy data, especially from retailers.
- Insufficient funds for financing energy efficiency works.
- Poor availability in the Romanian market of innovative and proven technologies for energy efficiency.
- Lack of local contractors for quality maintenance.

GOVERNANCE

- Developed a clear and ambitious Energy Efficiency Improvement Plan with the help of the C-Track 50 project. During the development of the plan, there were many discussions around the identification of the municipality's needs, prioritisation of the identified actions and measures based on their impact on energy consumption and benefits to the public, proposition of alternative technical and economical scenarios for the most important actions, identification of funding sources and provision of support during the preparation of the project application.
- Ensured funding for the energy audit and project co-financing, as well as the commitment to implement and monitor the project at the highest standard.
- Ensured the efficient project management, technical management, measurement and verification of the project outcomes, by involving an internal team with sufficient competencies, according to their specified roles. The project team members have been previously involved in several other completed or ongoing EU infrastructure projects.

FUTURE ENABLING PARAMETERS

New financing schemes with more funds, combined with higher technical expertise within the local authorities could enable better outcomes in the future. At the same time political support has an important role. The power of example could be beneficial to motivate other local authorities interested in energy savings.

Energy Efficient Buildings

Energy retrofit of a primary school in Püspökladány and installation of a heat pump

PUBLIC AUTHORITY	Municipality of Püspökladány, Hungary
SECTOR	Renewable energy, heap pump
LOCAL AUTHORITY CHARACTERISTICS	Urban authority
NUMBER OF INHABITANTS	14,154
INVESTMENT (€)	425,500 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	9%

BRIEF DESCRIPTION

A local, three stories primary school was retrofitted in 2019. The school was built in 1975, therefore the energy performance of the building was very poor. Its wood windows were not efficient in terms of energy, there was no insulation. During the project, which was fully financed by the Territorial and Settlement Development Operational Programme, a 40 kW PV system was installed on the roof of the building, 11 doors and 107 windows were replaced to modern, energy efficient ones, the whole façade and the roof was insulated. The building had a gas boiler for heating, which was replaced with a heat pump system (water-water based). As a result of the investment, the building became “BB” category, a nearly zero emission building. After the project completion, more than 80% energy has been saved.

INNOVATION

In Hungary, even with state/EU support heat pump installations are rare, even though geothermal conditions are really good in the North-Great Plain; typically thermal water is used in SPAs (touristic and therapeutic). In Püspökladány, the installation of a water-water heat pump system to replace the old heating system was unique in terms of municipal investments. During the project 33 boreholes were drilled in a depth of 100 m each.
In order to raise awareness of the users of the building, a training about the investment itself and energy and climate topics was conducted.
This project can be considered unique due to the heat pump system installation; the conditions are good, and even in a relatively shallow depth water is heated to 40-60 °C to use for the heating of buildings.

KEY SUCCESS PARAMETERS

A key success parameter was the full financial support granted for the investment, otherwise the municipality would have not been able to install a heat pump system. Other success factors were the technical support provided by LENERG in planning and management, as well as in the preparation of the project.

CHALLENGES

During the implementation, the municipality wanted to replace some of the boreholes, because they did not want to undertake drilling activities in a small clay football pitch, therefore the engineers had to redesign the original place of the wholes. This was achieved and the system works well.

GOVERNANCE

Good governance was necessary to implement a successful project, as the cooperation between the management company, the municipality, engineers and controlling authorities was crucial.

FUTURE ENABLING PARAMETERS

In the future it would help if municipalities had more expertise on the topic, so they can participate during the project planning phase, e.g. an energy expert at all municipalities.

RENEWABLE PRODUCTIONS	420 MWh/year	CO_2-eq EMISSION REDUCTIONS	85.37 tn/year

Energy Efficient Buildings

Energy retrofits in two very old buildings in Nagyhegyes

PUBLIC AUTHORITY	Municipality of Nagyhegyes, Hungary
SECTOR	Building sector, renewable energy
LOCAL AUTHORITY CHARACTERISTICS	Urban authority
NUMBER OF INHABITANTS	2,714
INVESTMENT (€)	144,000 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	10%

BRIEF DESCRIPTION

Two, 56 year-old buildings were retrofitted to improve their energy performance in 2018. One of the buildings was the gym of the primary school, the other was the Mayor's Office. At the gym, old doors and windows were replaced by modern energy efficient ones, the building was insulated (façade, roof), and the old heating system was replaced by a gas-fired condensing boiler, as well as a 33 kW PV system was installed on the roof. The original energy performance was "HH" and after the investment it was upgraded "CC". The total energy savings were 58.54 MWh/yr, and the total CO_2 emission reduction was 11.3 t/yr. At the Mayor's Office a 15 kW PV system was installed on the roof. The building was renovated a few years ago. Its energy performance was "DD" and as a result of the investment the building was upgraded to "CC". After the investment, 38.5 MWh of energy was produced each year, saving 5.62 t/yr in terms of CO_2 emissions.

INNOVATION

The Government facilitates the transition to an energy-efficient, low-carbon economy and launches call for proposals for municipalities, considering local conditions in every county. The calls enables municipalities to invest in renewable energy systems in public buildings, and increase the energy efficiency of these buildings. 178 million EUR were allocated under the Territorial and Settlement Development Operational Programme to support municipalities renewable energy and energy efficiency investments. The rate of support was 100% for every project.

KEY SUCCESS PARAMETERS

The key success parameter was the full financial support granted for the investment, otherwise the municipality would not be able to fund such a huge investment. Other success factors were the technical support of LENERG in planning and management, as well as in the preparation of the project.

CHALLENGES

During the implementation, it had to be ensured that the façade of both buildings stayed the same, so that the ornamental of the buildings is protected.

GOVERNANCE

Good governance was necessary to implement a successful project, as the cooperation between the management company, the municipality, engineers and controlling authorities was crucial.

FUTURE ENABLING PARAMETERS

In the future it would help if municipalities had more expertise on the topic, so they can participate during the project planning phase, e.g. an energy expert at all municipalities.

ENERGY SAVINGS	97.04 MWh/year	CO_2-eq EMISSION REDUCTIONS	16.92 tn/year

Energy Efficient Buildings

Kindergarten energy retrofit and installation of a heat pump in Sáránd

PUBLIC AUTHORITY	Municipality of Sáránd, Hungary
SECTOR	Renewable energy, heap pump
LOCAL AUTHORITY CHARACTERISTICS	Urban authority
NUMBER OF INHABITANTS	2,225
INVESTMENT (€)	169,200 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	7%

BRIEF DESCRIPTION

The local kindergarten consists of two separate buildings, a small building and a kitchen, each is a one story building with a classical “tent-roof”. The buildings were heated via a district heating system fuelled by natural gas. The old system did not consider weather condition. Doors and windows had been partially replaced before and the small building had a 5 cm insulation layer. The buildings , were built more than 50 years ago and were quite energy inefficient. In the project, a 17 kW PV was installed, doors and windows were replaced to modern energy efficient ones, and the old district heating was replaced by 2 x 20 kW heat pump system. Façade, roof and plinth insulation was also done. As a result, the energy performance of the building reached A++.

INNOVATION

In Hungary, even with state/EU support, heat pump installations are rare, even though the geothermal conditions are really good in the North-Great Plain; thermal water is used in SPAs (touristic and therapeutic). In Sáránd, the installation of a water-water heat pump system to replace the old district heating system was unique in terms of municipal investments. During the project, 7 boreholes were drilled in a depth of 100 m each.
In order to raise awareness of the users of the building, a training about the investment itself and energy and climate topics was conducted.
This project can be considered as unique due to the heat pump system installation; the geothermal condition of the area are excellent, and even in a relatively shallow depth, water is heated to 40-60 °C to use for the heating of buildings.
The project was supported by the Territorial and Settlement Development Operational Programme.

KEY SUCCESS PARAMETERS

In the project one of the most success parameters was the 100% financial support of the investment, otherwise the municipality would have never installed a heat pump system. Other success factors were the technical support of LENERG in planning and management, as well as in preparation of the project.

CHALLENGES

Due to local conditions, during the implementation, the originally planned 40 kW heat pump had to be replaced by 2 x 20 kW heat pumps, so engineers needed to redesign the system.

GOVERNANCE

Good governance was necessary to implement a successful project, as the cooperation between the management company, the municipality, engineers and controlling authorities was crucial.

FUTURE ENABLING PARAMETERS

In the future it would help if municipalities had more expertise on the topic, so they can participate during the project planning phase, e.g. an energy expert at all municipalities.

ENERGY SAVINGS	1,057 MWh/year	CO_2-eq EMISSION REDUCTIONS	20.68 tn/year

Energy Efficient Buildings

Replacement of the heating system of the Judenburg-Stadt primary school (PPP-Model)

PUBLIC AUTHORITY	Judenburg, Austria
SECTOR	Public buildings
LOCAL AUTHORITY CHARACTERISTICS	Municipality
NUMBER OF INHABITANTS	10,000
INVESTMENT (€)	-
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	100 %

BRIEF DESCRIPTION

The Volksschule Stadt consists of a historical school building, the former girls and boys school. This was extended in the 1980's with the addition of a gym-hall, which also resulted in a beautiful assembly hall. The school building was heated with a night storage heating system in the last decades. This was not optimally controllable in terms of comfort, resulting in different temperatures in the classrooms.
In 2019, the Stadtwerke Judenburg AG - a 100% subsidiary of the municipality of Judenburg - installed a new heating system with radiators and connected the building to the towns' district heating system that uses waste heat (CO_2-neutral) from the Pöls pulp and paper mill. This is an innovative public-private partnership (PPP) model between the town and the ESCO, without high initial investment costs for the town.

INNOVATION

The key innovation is the business model adopted.
Replacing heating systems by other technologies can be seen as normal practice. However, such projects are often not implemented because funds or knowledge is lacking. In this case, there was no budget available for the investment. In cooperation with Stadtwerke Judenburg (ESCO), a contracting model was therefore developed in which the municipal utilities take over the investment costs for the project and subsequently also the energy supply from CO_2-neutral district heating. Investment costs are repaid using the stream of income from energy cost savings. Only this innovative model made financing and implementation possible in the first place.

KEY SUCCESS PARAMETERS

The decision to invest on replacing the heating system was postponed for a long time, because there was no budget available. Only through raising awareness and providing appropriate training to relevant municipal employees and political stakeholders was the planning process steered in the direction of a contracting (PPP) model. This means that in addition to promoting technical solutions, it is necessary that decision makers have the relevant know-how or involve experienced consultants.

CHALLENGES

The biggest challenge was to convince the decision-makers in the municipal council of the usefulness and cost-effectiveness of the solution. For this purpose, comparative calculations were made, for example, on costs for the next few years using different systems, and possible investment variants were compared. The PPP model emerged as the most economically sensible and also the most sustainable solution.

GOVERNANCE

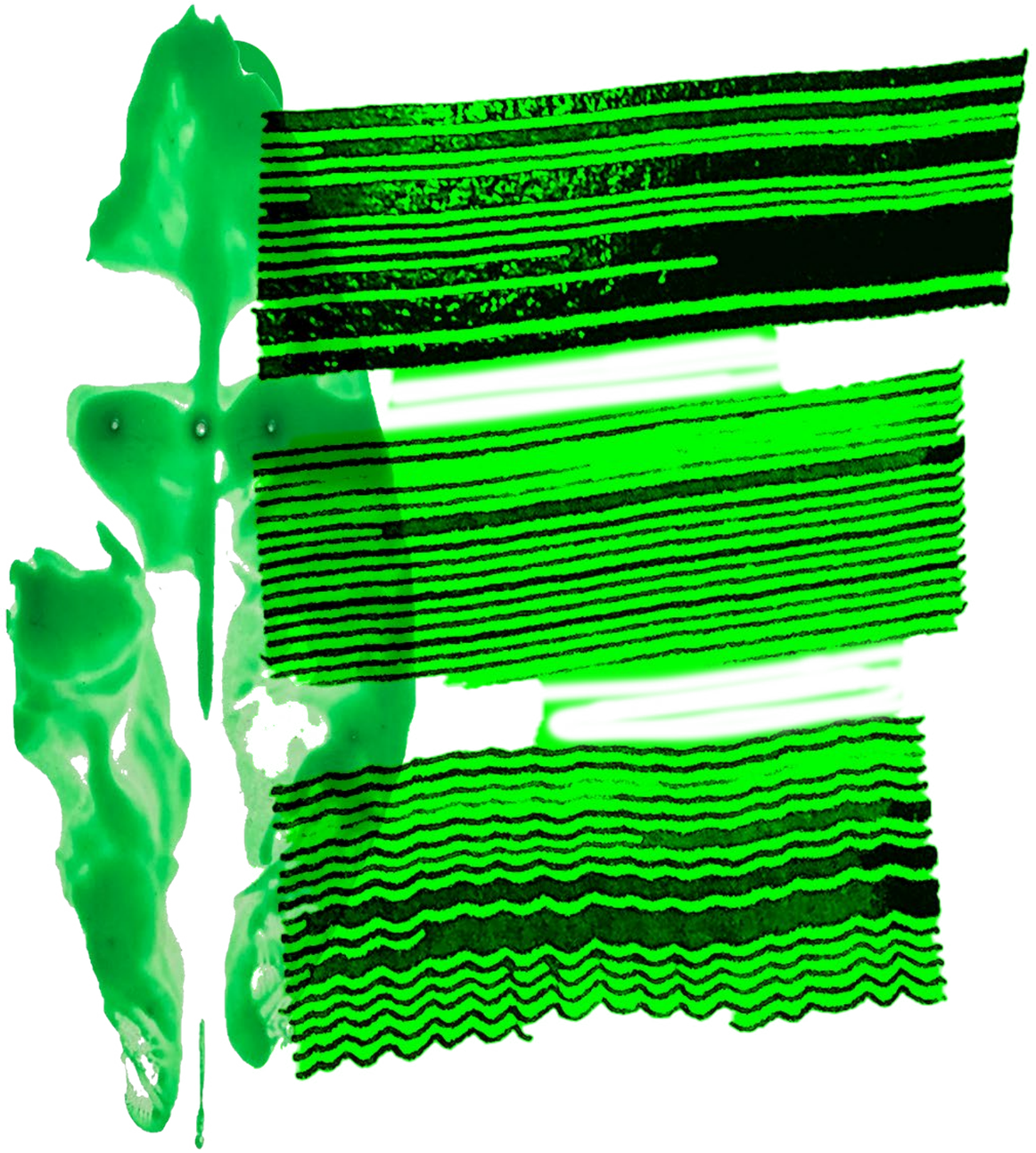
Staff members of the administration and policy makers were involved in the decision. The coordination process was complex and required numerous discussions on goals and issues that surfaced in order to reach consensus .

FUTURE ENABLING PARAMETERS

Educated and experienced stakeholders must be involved in the decision-making process, or at least know where they can obtain appropriate technical support to drive projects and maximise success.

ENERGY SAVINGS	378 MWh/year electricity replaced by CO_2-neutral heat	CO_2-eq EMISSION REDUCTIONS	97.5 tn/year

Energy Production



Energy Production

District heating grid based on waste heat from the pulp&paper mill Zellstoff Pöls AG, in the region of Aichfeld

PUBLIC AUTHORITY	Region of Aichfeld, part of Murtal, Austria
SECTOR	Heating sector
LOCAL AUTHORITY CHARACTERISTICS	Pöls, Fohnsdorf, Judenburg, Zeltweg, Spielberg, Knittelfeld
NUMBER OF INHABITANTS	55,000
INVESTMENT (€)	30 million €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	30 %

BRIEF DESCRIPTION

The Zellstoff Pöls AG annually processes approximately 2 million cubic meters of thinning wood and sawn timber into both pulp and paper. Together with the know-how partner "Bioenergie Wärmeservice Gmbh" from Köflach, an expert company for district heating and waste heat recovery systems, a joint venture was formed that evolved further into the company "Biowärme Aichfeld Gmbh". The objective was to use waste heat sensibly, in combination with an existing biomass heating plant and a large heat storage solution to smooth out peaks in demand. The result allows a sustainable, environmentally friendly and regional heat supply for more than 18,000 households in the greater Aichfeld area. For this purpose, the joint venture partners invested € 18 million and laid over 18 km of piping for the district heating project. This is a heat grid infrastructure project, to connect the cities, business and industrials parks in the region. The cities, business and industrial parks are served by ESCOs, which take over the heat from the infrastructure heat grid, and distribute it to customers. Additional investments have been made in the heat distribution grid to the end-customers.

INNOVATION

Biomass district heating has been in the region for around 30 years. On the one hand, however, it competes with the paper mill in the raw material sector, while on the other hand, the paper mill has a high, usable waste heat potential, which is released into the environment in the form of steam. This is wasting energy.
The innovation lays in the fact that the waste heat potential in the company was recovered and utilized, and at the same time an infrastructure heat pipe was built, which connects the distribution networks to the factory. This made it possible to transport the heat directly to households and companies. Primary energy was saved at a large scale.

KEY SUCCESS PARAMETERS

Initially, it was necessary to bring together the companies concerned, the paper mill and the operators of the other district heating networks, and to develop a business model accepted by all. It was also necessary to form a consortium for the high investment and to set up investment support schemes, because the project was very large for the existing support schemes. It was important to involve public administration and politicians at an early stage.

CHALLENGES

- The definition of prices for the heat from the factory, and for the delivery to district heating operators for distribution. The main reason for this is that each partner has his own benchmarks and targets aligned with their business models, and each part has to be profitable should the investment be realised.
- The application of subsidies; the project was very large for the available subsidy schemes.
- Agreements with land owners for the right to bury the passing heat pipes into the property.

GOVERNANCE

Involvement of stakeholders: public administration, politicians, district heating operators, large enterprises as heat customers, owners of properties, funding agencies.

FUTURE ENABLING PARAMETERS

Information and awareness raising on the importance of district heating and the advantages of using waste heat.

Energy Production

Energy communities: how photovoltaic plant villages have changed in scale in France

PUBLIC AUTHORITY	Project beginning: 5 regional natural parks. Now: 28 territories in France
SECTOR	Photovoltaic production through public and private investment
LOCAL AUTHORITY CHARACTERISTICS	Rural authority
NUMBER OF INHABITANTS	3,900
INVESTMENT (€)	7 million €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	-

BRIEF DESCRIPTION

In 2013, a new model of renewable energy production (PVs) was developed by AURA-EE and the regional parks, based on

- the close involvement of local public authorities and populations,
- the production of economic benefits for the territory,
- the respect of the architectural and landscape heritage.

The model is easily reproducible for production of PV plants, as far as technical, financial and juridical aspects are concerned. In 2014, the 1st PV plant village was inaugurated. In 2018, the national network of PV plant villages was created. Today, there are 52 territories engaged, 26 energy communities producing, and 320 PV installations.

INNOVATION

- The creation of an easily reproducible model has enabled the development of energy communities throughout France. This model could be adapted to any region in Europe.
- Moderate but sustainable economic viability. An inhabitant is given the opportunity to invest in renewable energy, up to his affordability, via energy communities. Local economic impacts also benefit the local installation companies. So the new model helps the local development and stakeholders.
- The PV plant villages bring together a large number of shareholders (mostly citizens), with the support of the local authority which may or may not be a shareholder.

KEY SUCCESS PARAMETERS

- An easily reproducible model.
- A strong support from the Auvergne-Rhône-Alpes Region in the start-up phase.
- Tools and services available to all energy communities: for example guide to facilitating public meetings, juridical analysis on company statutes, technical tools as selection criteria for roofs to be equipped with PV, etc.

CHALLENGES

The main difficulty was to elaborate this reproducible model. The first installations took a long time to complete, but quickly spread once they were proven to be successful.

GOVERNANCE

The project was elaborated with the support of the regional parks and tested by some motivated municipalities. The initiative may come from a municipality or a larger perimeter. It can also come from a group of citizens or a local association. In any case, it must be supported by elected representatives to be successful.

FUTURE ENABLING PARAMETERS

Human resources to manage projects and provide support for their emergence and share of good practices.

ENERGY SAVINGS	About 4.600 MWh/year (installed capacity of 4 MWp)	CO_2-eq EMISSION REDUCTIONS	-

Energy Production

19 “umbrella” projects – prosumer installations managed by municipalities in the Wielkopolska region

PUBLIC AUTHORITY	Wielkopolska region, Poland
SECTOR	PV micro installations, solar collectors, other micro installations
LOCAL AUTHORITY CHARACTERISTICS	Marshal Office of Wielkopolska Region
NUMBER OF INHABITANTS	3,4 million
INVESTMENT (€)	33,1 million €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	12.95%

BRIEF DESCRIPTION

Under the “umbrella projects”, many households in the Wielkopolska Region will be/were equipped with renewable energy (RES) installations. The beneficiary prepares and coordinates the implementation of RES micro-installations, with the participation of inhabitants from the area.
The installations are co-funded by the project and handed over to final recipients free of charge. After the project payback period, the beneficiary decides on further rules for the operation of installations by users.

INNOVATION

- Beneficiaries are local government units, and primarily the inhabitants of the commune. Solar installations are realised both on public facilities and inhabitants’ private houses.
- Only renewable energy micro installations with a matured technical design might be installed under the “umbrella project”.

KEY SUCCESS PARAMETERS

Co-financing of the “umbrella projects”.

CHALLENGES

- Limited amount of funds.
- Every commune was obliged to collect the approval of final recipients of the “umbrella project” to carry out a monitoring visit / on-site inspection of the project and to view project documents.
- The beneficiary has to select the final recipients of the support in an open, transparent and non-discriminatory procedure. This meant the need to develop and make public the rules for accepting applications from final recipients.

GOVERNANCE

The Managing Authority of WRPO 2014+ is the Marshal's Office of the Wielkopolska Region with its information points.

FUTURE ENABLING PARAMETERS

- More money dedicated directly to communes.
- Regulation flexibility in bundling RES investments on public and private facilities and installations.

Energy Production

Establishing the Energy Market in Ostrów Wielkopolski

PUBLIC AUTHORITY	Town and Community of Ostrów Wielkopolski, Poland
SECTOR	Energy cluster
LOCAL AUTHORITY CHARACTERISTICS	Urban and rural authority
NUMBER OF INHABITANTS	72,050
INVESTMENT (€)	-
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	30%

BRIEF DESCRIPTION

This innovative project will create a municipal energy system in Ostrów Wielkopolski, by building an energy cluster, as a coordination centre for all the Energy Market in Ostrów development activities. The objectives include: making municipal institutions prosumers, ensuring access to cheaper local electricity to the town's and poviat's residents and achieving a volume of electricity trading of 200 GWh by 2024. The town's strategic decision in 2014 was to buy electric buses. So far 54 cluster members, such as Ostrów Wielkopolski commune and its municipal units, entrepreneurs (energy producers and prosumers), and IT companies, are engaged.
The whole project will cover, among others, the construction of an intelligent energy management system and the development of electro-mobility. Local entrepreneurs and residents of Ostrów Wielkopolski will reap significant benefits, such as lower electricity charges, cheaper public transport, new jobs and improvement of air quality.

INNOVATION

- Building local power infrastructure and independence from the National Energy System and its threats.
- Integrating and stimulating the local community by encouraging their economic participation in the cluster and its development.
- Supporting residents and local entrepreneurs in building their own installations and the successive placement of PV installations in local government institutions.

KEY SUCCESS PARAMETERS

- Multi-sectoral cooperation: local government, the municipal sector, entrepreneurs, residents.
- Development of the first municipal ecological energy network in Poland (began in 2019).

CHALLENGES

- The imbalance of energy supply and demand is a key challenge in the energy market - the coordinator's task is to minimize imbalance.
- The development of a local electricity network in order to become more energy independent.
- The construction of renewable energy and heat generation installations.
- Lack of support and acceptance of energy systems that are parallel to the national power grids.

GOVERNANCE

- Multi-sectoral cooperation: local government, the municipal sector, entrepreneurs, residents.
- Dedicated municipal company established as a coordinator of the energy cluster (Ostrowski Zakład Ciepłowniczy SA).

FUTURE ENABLING PARAMETERS

- More funds for the further expansion of the cluster.
- Professional staff.
- Commercial and technical management software for the cluster.
- National contracts for clusters and cluster tariffs.
- Linking public procurement and purchasing energy within the local cluster.
- Support and acceptance of energy systems that are parallel to national power grids.

ENERGY SAVINGS	-	CO_2-eq EMISSION REDUCTIONS	About 17,500 tn/year

Energy Production

Biomass unit for the production of pellets in the municipality of Karditsa

PUBLIC AUTHORITY	Municipality of Karditsa, Greece
SECTOR	Renewables
LOCAL AUTHORITY CHARACTERISTICS	Rural
NUMBER OF INHABITANTS	56,800
INVESTMENT (€)	700,000 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	-

BRIEF DESCRIPTION

The Development Agency of Karditsa (ANKA) was established in 1989 and has been working ever since in the design of innovative mechanisms for the satisfaction of local needs. ANKA, who acts as an incubator for every new collective project, and the Cooperative Bank, which develops innovative Social Finance instruments, have a strong collaboration relationship since the bank's establishment, as this had been facilitated via ANKA's incubator programme. This relationship is the basis on which a "Collaborative Ecosystem" has been created in recent years, following the coordinated efforts of several local actors. This ecosystem is aiming at accelerating the development of Social Economy and at strengthening its role and participation in local affairs, in strategic planning, in the region's prospects for development and in the networks formed at the regional and national level.
Within the framework of the collaborative ecosystem's meetings, and in an effort to utilise one of the most abundant renewable energy resources in the region (biomass), that at the same time creates significant employment opportunities, the idea of developing a pellet production unit was conceived by the established energy co-operative (energy community), where citizens, local enterprises and local authorities from the region participate. Currently, the annual quantities of available biomass are estimated around 200 ktn.
The current pellet production plant has been built as a pilot action, producing 500kg of pellets per hour and with the possibility to extend this production to 1.5 tn per hour, in order to trigger the establishment of the biomass supply chain.

The unit has a budget of 500,000€, of which 50% was financed by the LEADER programme, and the remaining 50% from the energy community, while the land the unit is built on has been also provided by the latter. The unit is operating since 2017, using as raw material the remains from the wood processing plants, with ash content of less than 0.5% (high quality pellets), and has been experimenting with the production of pellets from logging residues as well. Experiments with energy crops (cotton, cynara, corn) have also been realised, where corn plantation presents the most promising results, while trees' pruning is also a good biomass source.
The potential for job creation in the supply chain, when this is established, is estimated at approximately 30 persons.

INNOVATION

The innovation comprises of two components. The first one is the collaborative environment through which the investment has been realised, under the leadership of strong local actors in the energy community. The second relates to the continuous efforts of the energy community to establish the supply chain, before upscaling the investment, and the pilot testing of alternative biomass resources for the pellets' production, in order to avoid operational problems.

KEY SUCCESS PARAMETERS

The key success parameter for the action is the collaborative ecosystem, through which the idea has been conceived and developed. Social economy is both a tradition and a comparative advantage for Karditsa Prefecture. In recent years, following the coordinated efforts of local actors, a "Collaborative Ecosystem" has been created, which articulates around the more experienced members, and aims at organizing and developing critical common services, such as documentation, training, and technical support that available to all members, with a view to increasing and maintaining the added value within the region, and at the same time spread key lessons learned and facilitate peer exchanges at the national level.

CHALLENGES

The main challenges that the energy community was faced with, when the pilot unit's operation was initiated, was that all vendors offering technical solutions considered the supply chain established. So, the efforts towards the establishment and further development of the supply chain with different raw materials were key for the operation of the unit. Another challenge is the competition with imported pellets that do not have VAT.

GOVERNANCE

In the action's governance a number of actors from the private sector have been engaged. The local authorities are partners to the energy community, but do not have a guiding role; nevertheless, they provide their strong political support to this local endeavour.

FUTURE ENABLING PARAMETERS

More support at the national level regarding the legislative framework when importing biomass pellets, that are not burden by VAT, and are thus distorting the competition

ENERGY SAVINGS 4,570 MWh/year (energy equivalent to the 968 tn produced annually)

Energy Production

Creation of a local loop to enhance the value of the biogas produced by the wastewater treatment plant in Vienne Condrieu

PUBLIC AUTHORITY	Agglomeration of Vienne Condrieu
SECTOR	Circular economy
LOCAL AUTHORITY CHARACTERISTICS	Semi-rural authority
NUMBER OF INHABITANTS	90,000 (30 municipalities)
INVESTMENT (€)	450,000 € for the construction of the private NGV service station and 1.35 € M for three city buses and two gas-powered garbage trucks
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	-

BRIEF DESCRIPTION

A local loop around a biogas plant (managed by the municipality) was created in order to use locally part of the biomethane produced by the Reventin-Vaugris wastewater treatment plant. This plant was already recovering biogas from sludge digestion. This was done by cogeneration in order to produce electricity. The remaining biogas was used on site for heating the building and was also injected into the gas grid. The local loop uses part of the biomethane produced, by building an natural gas for vehicles (NGV) service station linked to the mobility platform for urban buses. As of 2020, this service station supplies three urban buses and two gas-powered garbage trucks of the municipality. The objective is that 20% of the biomethane produced is transformed into bioNGV fuel.

INNOVATION

- Circular economy approach: Use waste from agriculture to produce energy and connecting these initiatives with the bioNGV production, in order to supply the service stations.
- Energy supply of local fuel for local use. The local authority and a national energy supplier ensure that part of the biomethane produced will supply local buses and household running on CNG.

KEY SUCCESS PARAMETERS

- The use of national funds enabled the renovation of the wastewater treatment plant and the investment in the NGV service station.
- Synergy with the EU project Greencycle.
- Collaboration with 30 farmers to develop local production of biomethane and ensure there is a significant amount of local biogas in the network.

CHALLENGES

- To find a national energy supplier who would like to collaborate with the local authority on this project.
- To accelerate the needed time to develop and design the project.

GOVERNANCE

Since 2009, the Agglomeration developed a Sustainable Energy Action Plan (SECAP). An energy transition officer was recruited in 2010. The local authority has joined the positive energy territories in 2014.

FUTURE ENABLING PARAMETERS

- Development of another public service station for professionals in the sector and raising awareness among other potential users on the ecological advantages of Compressed Natural Gas (CNG) vehicles.
- Study visits for local stakeholders, particularly farmers, in order to raise awareness, but also to identify future partnership opportunities. This requires time for coordination and entertainment.

ENERGY SAVINGS	4,845 MWh/year (biomethane production in 2018) 400 MWh/year (cogeneration in 2030)

Energy Production

Cooperation of the regional government, with academia and businesses to promote technological innovation limiting CO_2 and CH_4 emissions in the Wielkopolska Region

PUBLIC AUTHORITY	Wielkopolska Region
SECTOR	Regional government, academic institutions and the business sector
LOCAL AUTHORITY CHARACTERISTICS	Regional government
NUMBER OF INHABITANTS	3.4 million
INVESTMENT (€)	3.4 million €/MWe
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	10 %

BRIEF DESCRIPTION

A proprietary technology for the accelerated production and use of biomethane, was developed. The technology guarantees maximum biogas yield from almost any organic material, with many additional economic and environmental benefits. The developed technology under the trade name Dynamic Biogas® (DB) can be used in the production of electricity and heat and/or cooling, in the production of methane and in the anaerobic digestion process with the ability to use a very wide range of agricultural and other biological waste inputs. The benefits of DB include no residue formation, non-foaming process, no sediment formation at the tank bottom, mixer replacement does not require emptying the tank and the fermentation process is not interrupted. DB biogas systems are modular, allowing for easy scalability and a significantly shortened installation process.

INNOVATION

- Delivering all the elements of the installations in containers to the construction site (modular construction).
- Cooperation of the regional government, the scientific community and the business sector to promote the technology at different levels (local, regional, national, international).
- Supporting residents and local entrepreneurs in building and co-financing their own installations and the successive placement of biogas installations near academic institutions.

KEY SUCCESS PARAMETERS

- Technical expertise.
- Governance.
- Development of an advanced anaerobic digestion system.
- Multi-sectoral cooperation: the Wielkopolska Region Development Fund, the Fund for Development and Promotion of the Wielkopolska, the business sector, academic institutions and investors from other regions/countries.

CHALLENGES

- Promoting advanced anaerobic digestion systems through a cooperation with the region.
- Creating new jobs and retaining professional staff (management).
- The optimal cooperation of the company with partners in the field of: design, production, equipment supply, assembly, commissioning, biotechnology process and monitoring as well as with investors and staff.
- Lacking social support and knowledge.

GOVERNANCE

- Dynamic Biogas® company is the developer, owner and operator of the anaerobic digestion system developed.
- Cooperation of the regional government, academia and the business sector to promote the technology at different levels (local, regional, national, international).

FUTURE ENABLING PARAMETERS

- Reliable cooperation of the company with future partners in the fields of: design, production, equipment supply, assembly, commissioning, biotechnology process and monitoring as well as with investors, regional authority or other partners.
- Professional staff/ experts.

ENERGY SAVINGS	8,500 MWh/year (for 1 MW of installed capacity)	CO_2-eq EMISSION REDUCTIONS	About 6,800 tn/year (for 1 MW of installed capacity)

Energy Production

Inter-municipal energy cooperative in the Neustadt an der Waldnaab County

PUBLIC AUTHORITY	Neustadt an der Waldnaab County, Germany
SECTOR	Energy Policy
LOCAL AUTHORITY CHARACTERISTICS	17 municipalities of the same county (Kreis) part of one energy cooperative
NUMBER OF INHABITANTS	>174,000
INVESTMENT (€)	56 million € (20 million € direct citizens investment)
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	About 1% (more than 1,450 citizens are members of the cooperative)

BRIEF DESCRIPTION

17 municipalities have formed an energy cooperative called “NEW-Neue Energien West eG” in order to jointly implement renewable energy projects with citizen participation, with a governing board led by three mayors, other municipal representatives on the advisory board, and shares of at least 5,000 euros for each member. Another spin-off cooperative has been set up, oriented to citizens as members, with shares of 500 euros minimum. This group of cooperatives numbers 17 municipalities and 1,450 people as members, and 38,000 shares. The investment volume reaches 56 million euros in 20 photovoltaic (PV) installations, one wind park, a network of charging stations for electric cars and district heating. Their function now includes electricity supply, expert advice in energy savings measures, group purchases of pellets for domestic heat, and insurance for individual owners of PV installations.

INNOVATION

- Democratic principles: internationally agreed-upon principles and operation, according to a ‘one-vote-per-member’ principle. No disproportionate control is possible.
- Limited individual’s financial risk to the initial investment. Single shares can usually be bought for a comparatively low price. An energy cooperative is only liable towards the interests of its members and not towards any external parties.

INNOVATION

- Strong sense of community via the active participation of a local government, which builds public trust and encourages citizens’ participation. Local focus of the cooperatives expands further this sense of small-scale community.
- Pooling resources for investment. The local government can facilitate this process and enable cooperative’s operations in many different ways.

KEY SUCCESS PARAMETERS

- Local municipalities involvement as leaders of the regional energy transition.
- Frequent inter-municipal cooperation.

CHALLENGES

- Mostly depend on the voluntary engagement of members who might not always be professionals in the energy sector and may lack the experience to overcome administrative hurdles.
- Raising the initial capital can be a challenge if opportunities and benefits are not properly communicated to potential members.
- Energy cooperatives may have a hard time competing with established market actors for larger projects, where renewable energy projects are commissioned through tendering.
- Communication of the benefits of the energy cooperative to citizens.

GOVERNANCE

The nature of this project as an inter-municipal energy cooperative highlights the value of effective governance in enabling regional and local energy projects with citizens participation and acceptance. Cooperation of so many different players, and citizen participation through annual general assemblies, ensures that a diverse range of views and (technical) expertise is at the project’s disposal. Energy cooperatives are an effective way to capitalize on collective knowledge and dedication in order to provide concrete (financial and social) value to local communities.

FUTURE ENABLING PARAMETERS

- Establishment of a citizen-friendly enabling framework, e.g. exceptions and special rules for (real) citizen energy projects in the renewable energy sources act, would help energy cooperatives to compete with more established market actors on an equal footing and to ensure that value stays in the community.
- New business models for using and making a profit from renewable electricity without a feed-in-tariff is also key for the future. Currently, the potential of power-to-gas for creating integrated energy (storage) systems through the use of hydrogen is also being explored.

ENERGY SAVINGS	PV: >19,429 kWp Wind: >4,800 kWp	CO_2-eq EMISSION REDUCTIONS	-

Energy Production

Salaspils solar panel park developed by a district heating company: “Salaspils siltums”

PUBLIC AUTHORITY	Salaspils municipality, Latvia
SECTOR	Energy/District heating
LOCAL AUTHORITY CHARACTERISTICS	Rural municipality
NUMBER OF INHABITANTS	18,011 (Year 2019)
INVESTMENT (€)	7,259,000 €
PERCENTAGE OF INHABITANTS POSITIVELY AFFECTED BY THE ACTION	18,011 (2019)

BRIEF DESCRIPTION

The first and only solar energy park in Latvia consists of more than 1,700 solar panels (an active area of 21,672 m_2), where the heat carrier is heated to temperatures up to 90 degrees. In cloudy weather, the temperature could reach about 70 degrees. This park is not enough to cover fully the heating needs of the Salaspils municipality, but it can provide hot water for domestic use for every city resident.

INNOVATION

- The first company in Latvia to have created a district heating system that uses solar energy. Production of 12,000 MWh of heat per year, which is 20% of the total amount of heat transferred by the company.
- Tariffs for the residents of Salaspils region decreased by at least 5%.
- Use of wood chips for the production of heating and hot water. Under really low temperatures, natural gas is also used as an additional fuel. Natural gas is not needed in the summer as solar panels are sufficient.

KEY SUCCESS PARAMETERS

- Fuel diversification. The implementation of the solar project is complementary to the current use of local wood chips and natural gas.
- Retrofitting part of the equipment, thus reducing heat losses and low efficiency of existing heating systems.

CHALLENGES

Lack of knowledge on solar technologies and projects

GOVERNANCE

Thinking about the sustainable development of the district heating system, in 2011 SIA Salaspils siltums started the extensive modernization of production and a process optimization. In a short time, thanks to the support of the European Union Cohesion Fund and the municipality, as well as smart management, Salaspils heat has grown into a world-class heat supply company, offering consumers significantly greener, safer, more stable and cheaper heat energy.

FUTURE ENABLING PARAMETERS

- More efficient solar panels will be available in the future, but the energy efficiency already achieved is very high.
- Energy storage via a solar battery project in 2020, can make better use of solar collectors production.

ENERGY SAVINGS	2,000 MWh/year (which is 20% of the total amount of heat transferred by the company)	CO_2-eq EMISSION REDUCTIONS	80% reduction compared to 2011

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