Compilation of energy efficiency policy roadmaps

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1 Introduction

In the context of the PUBLEnEf project, Energy Efficiency Policy Roadmaps were developed to support public authorities in implementing effective and efficient sustainable energy policies. The emphasis was put on achieving concrete actions in line with national, regional and local objectives and policies.

A total of 15 roadmaps were developed covering local, regional and national cases and also addressing a broad range of needs and topics. This document offers an overview of the roadmaps, their objectives, development, implementation, impacts and main findings. It enables cross-comparison of the roadmaps through concise summaries.

1.1 Aim of the Energy Efficiency Policy Roadmaps

The PUBLEnEf project focussed on assisting European Union Member States in implementing effective and efficient sustainable energy policies (with the focus on energy efficiency). As core element of the project, partners developed roadmaps to enhance public authorities’ capacity to implement energy efficiency pathways towards sustainability. Starting from the national/regional/local objectives and policies, the emphasis was put on helping public authorities materialising the existing policy framework and their strategic plans into concrete actions.

Objectives of the roadmaps:
- improve the knowledge and capabilities of Member States with regards to the different options available for implementation of the EED requirements in line with the 2030 targets
- ensure that energy efficiency policies make a significant, long term contribution to the energy, environmental, economic and security goals of the EU and Member States under the Energy Union
- strengthen cooperation and improve the dialogue between national, regional and local policy makers across the EU with regards to policy development and implementation of energy efficiency policies and sustain an active platform for knowledge exchange of energy efficiency best practices beyond the project period

1.2 Overview of the roadmaps

Roadmaps refer to assistance to regions and municipalities in overcoming specific barriers they faced in implementing their existing energy plans (SEAPs or regional strategies).
PUBLEnEf partners worked closely with policy makers in implementing energy efficiency policies, starting from the existing plans (in the form of Sustainable Energy Action Plans (SEAPs) or Regional Energy Plans) to their actual implementation. Apart from having led to direct energy savings in the involved regions, the roadmaps provide useful replicable lessons for policy makers across the EU.

The roadmaps were development based on a guideline document designed in the context of PUBLEnEf. This guideline presented a series of concrete steps that enabled the best use of PUBLEnEf sources and activities. A total of 15 roadmaps were selected, developed and implemented covering local, regional and national cases and also addressing a broad range of needs (see figure and list of roadmaps below). Summary documents of the contents and the main findings of each roadmap are publicly available on the project website.
<table>
<thead>
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<th>Title of the roadmap</th>
<th>City/Region, Country</th>
<th>Project partner</th>
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<tbody>
<tr>
<td>The local heat energy transition in Midden-Drenthe</td>
<td>Municipality of Midden-Drenthe, The Netherlands</td>
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<td>The energy transition in the built environment: Potential future roles of local government and market parties</td>
<td>Municipality of Midden-Drenthe, The Netherlands</td>
<td>JIN</td>
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<td>Implementation plan for communication actions and energy efficiency measures supporting the SEAP of the municipality of Corinth</td>
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<td>Coal-mining municipality Gierałtowice energy cluster</td>
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<td>Supporting the implementation of SEAP in the city of Valladolid</td>
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<td>Municipality of Burgas reduction of energy consumption in residential buildings</td>
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<td>Identification of the regulatory and financial framework for EPC contracts for buildings, aimed at their valorisation, dissemination and market development in Italy</td>
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<td>Monitoring of energy consumption and identification of energy efficiency measures in public buildings in Castelbuono</td>
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<td>Supporting the improvement of the energy action plan in Bucharest Sector 1 – SEAP 2.0</td>
<td>City of Bucharest Sector 1, Romania</td>
<td>AEEPM</td>
</tr>
<tr>
<td>Supporting the improvement of the energy action plan in Bucharest Sector 4</td>
<td>City of Bucharest Sector 4, Romania</td>
<td>AEEPM</td>
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<td>Supporting the implementation of the regional energy action plan in Alicante</td>
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<tr>
<td>From strategy to implementation: Upper Austria’s GEP programme</td>
<td>Upper Austria, Austria</td>
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<tr>
<td>TEA Energy Efficiency Policy Roadmap</td>
<td>Tipperary, Ireland</td>
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<tr>
<td>Acting locally for energy efficiency in the Ile-de-France region</td>
<td>Ile-de-France, France</td>
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<tr>
<td>System for monitoring, measurement and verification of energy savings Approach &amp; Tool (SMIV)</td>
<td>Croatia</td>
<td>IEECP</td>
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</tbody>
</table>
The PUBLEnEf roadmaps focus on a range of different topics (see table below) relating to the implementation of energy efficiency policies in the EU. They provided inspiration to several other regions and cities outside the project consortium for follow-up actions.

**Summary of PUBLEnEf roadmaps**

<table>
<thead>
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<th>Overview of roadmaps per country</th>
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<tbody>
<tr>
<td><strong>The Netherlands</strong></td>
</tr>
<tr>
<td>JIN developed two roadmaps in The Netherlands. The first one aimed to help the municipality of Midden-Drenthe in its heat energy transition. It focused on bringing together the key actors, in order to get a process started for defining the future heating landscape of the town of Beilen, and the municipality at large. Although the heating transition is seen as an important topic and challenge by all actors, such as the municipality, private companies, and the housing cooperative, we found that there is a lack of coordination among these parties, since there is no natural leader who governs the local heat transition. As a result of this roadmap process, the main actors have been convinced of the need for early (pre-commercial stage) cooperation and coordination.</td>
</tr>
<tr>
<td>In the second Dutch roadmap JIN collaborated with the Municipality of Midden-Drenthe to identify and analyse possibilities for accelerating the energy transition in the built environment, with a focus on the residential sector. The main challenge in this sector lied with upgrading or converting the existing housing stock to become energy or even climate neutral. The PUBLEnEf analysis showed that scaling up and accelerating the transition for existing buildings will foremost require additional efforts from all private and public stakeholders within the sector. To speed up the process the sector can benefit from combining their knowledge and resources to develop and implement 'integrated energy solutions' for buildings. However, developing integrated energy solutions in a highly fragmented and diversified stakeholder landscape is challenging. With several market parties, including construction and installation companies, mortgage advisors, real estate agents, and energy consultants, we discussed and explored how the building refurbishment process can be simplified so that the transition can be accelerated. This has led to three possible future organisational modalities or approaches, in which local authorities and market parties can streamline the energy transition in buildings.</td>
</tr>
<tr>
<td>Country</td>
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</tr>
<tr>
<td>Greece</td>
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<tr>
<td>Poland</td>
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<td>Spain</td>
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<td>Croatia</td>
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</tbody>
</table>
Bulgaria

ABEA developed a local roadmap in the Municipality of Burgas in Bulgaria to support the implementation of the SEAP with a target of a 21% reduction in energy consumption by 2020. The focus of this roadmap was the housing sector, as it has the highest energy consumption and no major energy efficiency measures had been undertaken. As part of the roadmap activities, energy efficiency measures were realised in more than 18,000 dwellings. The roadmap development improved the knowledge of the municipal experts about the amount of energy consumption and fuel types, how to collect and process energy data.

Austria

ESV’s regional level roadmap consisted of the development and successful implementation of the "Gemeinde-Energie-Programm" (GEP) – a programme specifically designed to trigger energy-related investments in Upper Austrian municipalities. It was developed following an assessment of needs carried out by the ESV in the context of PUBLEnEf and discussions with regional funding bodies. It supports municipalities in preparing concrete investments through a range of activities based on the principles of activation, motivation and provision of technical advice. In addition to offering extensive facilitation services, the programme funds the technical and financial planning of energy efficiency and renewable energy investments, information activities supporting project implementation and the optimisation of installations. Approval for financial support is conditional to a mandatory energy advice visit by the ESV. During this visit, energy saving potentials in the municipality are assessed and concrete projects are discussed. During the lifetime of PUBLEnEf, the GEP programme supported projects totalling investments of over 6 million Euro programme (65 projects triggered, 34 already implemented). By helping increase energy-related investments, the roadmap is contributing to the energy transition in the region of Upper Austria.

Italy

ENEA worked on two roadmaps at the local level in Italy. In the municipality of Catania, the second largest city of Sicily after Palermo, the main objective was to contribute to diffuse the application of EPCs for public buildings and to facilitate the fulfilment of EED requirements. In this roadmap, ENEA and the University of Catania have identified the barriers and the regulatory framework needed for an effective adoption of EPC in Italy for public buildings.

In the town of Castelbuono, in the Metropolitan City of Palermo, Sicily the main objective was to promote energy efficiency in heating and cooling in public buildings. Specifically, the roadmap worked on the monitoring of energy consumption of geothermal heating and cooling systems installed in the secondary public school 'Minà Palumbo' to verify their energy efficiency and their appropriate installation. The roadmap collected monitoring data and worked hand in hand with the municipal staff that was trained to adequately and autonomously run the installation.
**Ireland**

TEA developed a regional roadmap in the Tipperary region of Ireland oriented at overcoming barriers and facilitating progress on the national and local public lighting strategy, improving knowledge and information and implementing demonstrated solutions. The objective of the roadmap was to facilitate progress on the national public lighting strategy through engagement with key stakeholders, preparation of national strategy position papers, expansion of knowledge on both technical and financial instruments to assist national strategy, bringing together the full community of stakeholders at national level to communicate strategic requirements and identifying key action points to be addressed. Alongside overcoming the local barriers to implementation, this roadmap also actively engaged with the local authority to make step change progress towards implementation, presented technical and financial solutions to the identified barriers, engaged with best practice experts in this field from across EU to replicate existing good practices, facilitated specific trial retrofitting projects within the local authority as a demonstration of opportunities and prepared a strategy to address the Public Lighting solutions for Tipperary County Council to 2020 and beyond.

**France**

ARENE IdF worked on a roadmap in the region of Ile-de-France in France targeted to local authorities (from municipalities to Regional Council) and focused on renovation of public buildings and lighting through a local pilot experimentation. The actions were oriented to train and inform about the new technical and financial energy efficiency solutions through capacity building workshops targeted to elected people and technicians. A pilot energy project was implemented in order to be further replicated in all the municipalities of the region.

**Romania**

In Romania, AEEPM worked on two roadmaps in the city of Bucharest. The roadmaps supported the municipality in the development, implementation and monitoring of its SEAP. AEEPM worked closely with the local authority, acting as a facilitator-interlocutor with all municipality staff and local stakeholders in the delivery of the updated energy plan. The roadmaps were specifically oriented towards reducing the energy consumption of the city’s buildings (public and private) and increasing the penetration of renewable energies. In the context of the roadmap, AEEPM supported the city of Bucharest by, among others, preparing guideline documents, carrying out studies, presenting recommendations and providing practical information.

In order to enhance cooperation and exploitation of synergies among the different roadmaps, they were grouped in clusters according to the different thematic and addressed needs (see the figure below). In this way, roadmaps of the same cluster could exchange experience and explore solutions for the common challenges. Significant overlapping between the different clusters reflects the fact that roadmaps are multifaceted and deal with different issues at the same time.
Clustering of the roadmaps

As shown in the figure above:

- Most roadmaps worked, among other, on end user information and capacity building issues in the form of capacity building workshops and road shows, web pages, on-site energy consultation and support visits and other activities specifically tailored to each roadmap target.

- Some roadmaps worked with issues that affect public buildings’ energy efficiency in different ways including renewable energy installations for heating and cooling of electricity production (such as in ENEA’s, JIN’s and CIEMAT’s roadmaps) or monitoring issues (such as in the IEECP’s roadmap).

- Public lighting has been the main topic of TEA’s roadmap while ESV and ARENE IdF also focussed to a certain degree on public lighting optimisation in their regions.

- Although the residential sector is a challenging sector to work with via public authorities, three roadmaps included actions to improve residential sector energy efficiency in different ways.

- Three of the roadmaps have taken advantage of specific financing programmes for the implementation of energy efficiency measures.

The development and implementation of these roadmaps has had significant impact on achieving energy-efficiency related goals in the participating localities and regions. This is highlighted in a separate report on the outcomes and energy savings resulting from the roadmap implementation. For more information, visit the PUBLEnEf project website at www.publenef-project.eu.
2 Local level roadmaps

2.1 Municipality of Midden-Drenthe (roadmap 1), The Netherlands

1) **Title of the roadmap:** The local heat energy transition in Midden-Drenthe

2) **Level of the roadmap:** local (municipality of Midden-Drenthe, the Netherlands)

3) **Roadmap developed by:** JIN Climate and Sustainability (JIN), the Netherlands

4) **Summary of the roadmap and key impacts:**

   The energy transition is a key challenge of the coming decades, also in the municipality of Midden-Drenthe. We focus on heat (and not on electricity and transport) given that more than half of the energy consumed in the municipality is for heating. The PUBLeEnEf roadmap of the heat transition in Midden-Drenthe focused on bringing together the key actors, in order to get a process started for defining the future heating landscape of the town of Beilen, and the municipality at large. As has followed from the various discussions, the heating transition is seen as an important topic and challenge by all actors, such as the municipality, private companies, and the housing cooperative. We found that, there is a lack of coordination among these parties, since there is no natural leader who governs the local heat transition. This results in a situation where potential collective heating solutions (like heat grids) are insufficiently considered, as for each stakeholder it remains easier to develop its own tailored transition at the building level. Consequently, the transition process could become more costly as low-cost collective options do not mature. In the roadmap process, the main actors have been convinced of the need for early (pre-commercial stage) cooperation and coordination.
5) Background, initial context and selection of the roadmap:

The municipality of Midden-Drenthe (Central Drenthe) has a population of about 33,300 and a surface area of about 342 km². The main towns and villages in the municipality include Beilen, Westerbork, Smilde, and Bovensmilde.

In July 2017, the local council adopted a motion including the ambition to become energy neutral and reduce the emissions of greenhouse gases, and asking the local government to prepare an action plan for the next 10 to 15 years. It is the ambition of the local government to develop this action plan in close collaboration with relevant (local) stakeholder groups (e.g. citizens, house owners, SME’s and other relevant stakeholder groups).

Looking at the energy transition, a distinction can be made between three energy carriers: electricity, heat, and transport fuels. With wind and solar energy capacities expanding year-on-year, the transition in the electricity system has already reached a certain level of maturity. Influencing the transition in transport fuels is considerably more challenging, particularly since municipalities have a lower degree of (policy) influence on the mobility sector.

Out of the total energy consumption in Midden-Drenthe (5,590 TJ in 2015), more than half (3,139 TJ) is heat, compared to 670 TJ for electricity and 1,781 TJ for transport fuels. Midden-Drenthe is not exceptional in this. Also in the country as a whole, heat makes up more than half (about 55%) of the energy consumption.

About 22.7% of all energy consumed in Midden-Drenthe is coming from renewable resources. This shows that Midden-Drenthe still has a long way to go to become energy-neutral (in heat, transport and electricity combined). This 22.7% is higher than for most other regions in the Netherlands because of the renewable electricity generated by a large waste incineration plant located in Midden-Drenthe, which is processing the waste of a large part of the Northern Netherlands.

Most heat in the Netherlands is generated using natural gas, with about 96% of all households being heated using natural gas. The Netherlands (still) is the European Union’s largest natural gas producer. This mainly is because of the Groningen gas field, the largest on-shore natural gas field in Europe. However, the end of the gas production is in sight, as reserves are steadily declining. On top of that decades of onshore gas extraction has started to induce a rise in earthquakes, particularly in the Northern part of the Netherlands. Thus far the most severe induced earthquake in the North has been at 3.6 Richter scale, which is quite high in a country that is not located near any major fault line of the tectonic plates. This also makes that large-scale gas production is no longer considered socially acceptable. Apart from lowering gas consumption to reduce greenhouse gas emissions, additional (political) drivers for the heat energy transition include maintaining energy security, lowering (future) import-dependence of natural gas, and earthquake prevention.
The heat transition is becoming more and more important in the Netherlands. On 10 October 2017, four political parties (VVD, D66, CU, CDA) published their political agreement to form the government for the 2017-2021 period. One important paragraph of that agreement includes that by 2021, all new buildings will no longer automatically be connected to the gas grid, and there is the ambition to disconnect around 50,000 existing buildings per year from the gas grid. The final goal is to convert the entire Dutch building stock to alternative forms of heating by 2050. Since the heat transition has a strong local focus, with local solutions and local actors, municipalities can anticipate a role as facilitator and mediator in the heat transition (including space heating for houses and other buildings, and for industrial processes). In fact, the intergovernmental programme between the national government and municipalities states that each municipality will need to develop their own regional energy and climate strategy. As part of this strategy, municipalities need to have developed a heat transition plan ('warmteplan') for their region by the end of 2021.¹ These heat transition plans, mainly target the built environment.

6) Roadmap objectives and main targets:

Within Midden-Drenthe under a 'business-as-usual' scenario, about 1.1% of the total housing stock of about 14,000 is replaced annually, through demolition and/or new construction (see the table below). This usually contributes positively to the energy performance of the housing sector, as demolition often involves older buildings, while newly constructed houses have to comply with the latest building standards with regard to energy performance.

Assuming that the rate of demolition and new construction remains constant, most of the heat transition would involve conversion of the existing building stock. Considering that an average house is substantially renovated once per 45-50 years, about 2.25% of houses in Midden-Drenthe are renovated annually. If the municipality ensures that the heat transition is included in all new construction and all renovations, about 3.35% of the building stock can undergo the transition every year, which would mean that in principle in some 30 years the entire local housing stock can be converted. However, much needs to be done in order to ensure that the right individual (at household level) and collective (at area level) actions will be taken.

¹ In Dutch [https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/brieven/2018/04/03/brief-aan-gemeenten-over-aardgassvrij-wijken/BriefCollegesvanbenwaardgassvrijewijken.pdf]
Rough calculation of the number of houses that can be covered by the transition in Midden-Drenthe, 2018-2050

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>Number of houses converted per year</th>
<th>Cumulative in 2018-2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demolition</td>
<td>Business as usual 1.1%</td>
<td>155</td>
<td>5,115</td>
</tr>
<tr>
<td>New buildings</td>
<td>Business as usual 1.1%</td>
<td>155</td>
<td>5,115</td>
</tr>
<tr>
<td>Renovation</td>
<td>Policy focus links to 'natural rate' of renovation 2.25%</td>
<td>320</td>
<td>10,560</td>
</tr>
<tr>
<td>Total</td>
<td>3.35%</td>
<td>475</td>
<td>15,675</td>
</tr>
</tbody>
</table>

The PUBLEnEf project aimed to assist Midden-Drenthe in the process to become energy neutral in the area of heating. The support focused on helping the municipality and other relevant local stakeholders to carry out an inventory and identify the specific local preferences with regards to efficient and alternative heating systems. Aside from helping in the local preferences, there has also been an assessment of which contextual factors (demographic, social, economic and environmental) influence the capability and willingness of individuals or organisations to invest in the heat transition from the bottom-up. A key ingredient in this process has been to seek meaningful and effective collaboration with existing networks in the neighbourhoods, villages and countryside. These could be for example a district council, sports club, or school, but there is also a key role for the social housing corporations.

7) Roadmap development and implementation:

Based on the abovementioned developments, the demand for heat will have to be filled in another way than using natural gas. A lot of existing buildings will need to be retrofitted. The transition will also have huge social implications, as it will affect the houses of seven million households in the Netherlands.

First and foremost, the heat transition requires major investments in both energy efficiency and energy savings measures. Roof, floor, wall insulation, double glazing, etc. will all be needed to bring down the heat consumption. After that, alternative heat generation and supply systems will need to be embedded in the energy system to enable the replacement / phase-out of gas-based equipment.

There are numerous options for alternative heat supply, including heat pumps, district heating, block heating, wood/pellet stoves, solar boilers, geothermal, heat storage/buffering, biogas, renewable gases (incl. hydrogen), etc. Which option eventually will prevail largely depends on local circumstances, local potentials and preferences. While the Dutch government’s 'Energy Agenda' states that in principle no new gas grids will be built in new construction areas, and gas fired heating systems will not be converted from low-calorific (domestic) to high-calorific (imported) gas, the national government leaves it up to local governments (municipalities) to decide on the most appropriate energy savings and
alternative heat options. The main instrument to govern this will be the regional heat transition plans ('warmteplannen') that each municipality needs to submit by the end of 2021.

It is expected that per type of housing (e.g. terraced housing, semi-detached housing, apartments, farmhouses, etc.), per neighbourhood, per region, but also per household (financial capacities) and per individual (age, education level, etc.), the preferred heat transition measures will differ. The role of the municipality will be to trigger and facilitate an inclusive process that provides affordable, acceptable and sustainable solutions for each area. These solutions can entail both individual actions as well as collective actions (e.g. district heating system).

Within PUBLEnEf we focussed on a specific area in Beilen, the largest town in Midden-Drenthe. Within that region there is a good technical potential for developing a district heating system. However, we found that there was no 'natural leader' amongst the group of relevant stakeholders that would start the early stage development.

We first targeted a relatively small number of key stakeholders in the area. Rather than involving a large number of individual households and small businesses, the development of a heat grid would require the development of a backbone of potential heat supply and demand. By arranging a number of meetings and interviews with key stakeholders, we could be able to assess if a collective solution for the area would be viable. Based on this approach, the following organisations were identified for participation, for potential (future) heat demand and/or supply. See the figure below for a map of the key buildings of these organisations in Beilen.

![Map of Beilen](image_url)

*Map of Beilen, indicating some of the major heat users including public buildings (blue), private companies (green), and apartment buildings owned by a housing cooperative (yellow)*
- Municipality of Midden-Drenthe, as owner or manager of a range of public buildings, including the town hall, a swimming pool, and various schools.
- 'Woonservice' housing cooperative, as owner of a large number of dwellings, as well as a few large-scale apartment buildings.
- Drents-Overijsselse Delta water board, as operator of a sewage treatment plant.
- Jumbo supermarket chain, with a large distribution centre in Beilen.
- GGZ/Icare, operators of a psychiatric institution in Beilen.
- Royal Friesland Campina dairy company, with a major dairy factory in Beilen.
- Province of Drenthe; feasibility study on thermal energy extraction from surface water.

The results from the interviews revealed that – although all stakeholders recognized the interesting potential for a district heating system – their own transition strategies were more focused on solitary / individual actions. All stakeholders indicated that, they are interested in informally exploring any future cooperation, but that there currently is no natural leader in this process that will start developing a heat grid. None of the interviewed stakeholders indicated that they would want to be the entity to start developing it. In most cases because heat grids are not part of their core business activities, and on the other hand engaging in a multi-stakeholder process without any certainty about the outcome could potentially jeopardize the own transition strategies and targets of the involved organisations. We concluded that without any strong coordinated effort, with a strong leading partner, a collective solution would not materialize and that significant low-cost heat transition potential would be lost. On top of that we recognize that the 'go-it-alone' strategy for individual organisations in most cases is beneficial from a governance and decision making perspective, although in many cases it can be more costly relative to collective solutions. Individual (building-specific) interventions allow for customisation, but the investments are usually higher, while collective measures generally are more cost-effective. Even in the situation where individual measures are preferred, coordination may be beneficial, as a grouping of measures may lead to cost reductions and a more straightforward process.

It is clear that these issues require central coordination, but there is a 'chicken or the egg' dilemma. Potential suppliers or operators of district heating are hesitant to set up a heating network without sufficient demand. Moreover, since such industries generally also will have the task to phase-out natural gas in their processes, it will remain uncertain how much excess heat they will have available in the future as it will become more interesting to start recycling or upgrading low-grade heat flows (e.g. with heat pumps) and feed them back into their main process.

On the other hand, potential customers, such as the housing cooperative, are cautious to take initiative as long as it remains unclear whether there will be sufficient supply. On top of that each potential future heat consumer is also likely to have its own heat transition strategy (with associated budgets, finance and timelines linked to that) which can significantly influence future heat demand. We found that there already are some potential future heat users that are planning to implement all-electric heating systems, indicating that they are likely not to participate in a district heating system in the future. With future heat
demand dropping out, the number of potential connections (and thus cost-effectiveness) per km of district heating reduces. For this reason, there is a need for a regional transition manager. From the various market parties, there is the expectation that this role would be reserved for a public authority, most likely the municipality or the province. However, from the side of these public bodies, there is an impression that a potential district heating network should be driven by the market. For commercial enterprises the early (pre-commercial) stage inventory assessment and development would be too uncertain and costly to sustain. Moreover, very early stage developments should ideally include all relevant stakeholders and should not fix themselves in pushing for a single solution (e.g. a district heating system) in order to have credibility and to retain public acceptance. In this early more exploratory stage we consider that a public body could be one of the key drivers. Once a robust set of preferred options are chosen, commercial enterprises could, such as Enpuls ‘take-over’ the process and further develop and propose a business case. Enpuls is a subsidiary of an energy network operator that aims to market scalable energy transition solutions, including district heating networks. With Enpuls now showing initial interest there is a potential central actor in the picture who would be able to act as the main coordinator of a district heating network. In this process a useful next step would therefore be to set up a working group including at least the main actors as introduced above in the figure.

8) Impact of the roadmap and replicability:

Ensuring progress towards a heat transition strategy for Midden-Drenthe has proven to be a slow and challenging process. Although the need for the transition is clear among stakeholders, there remains insufficient collaboration, and there is a lack of coordination. The PUBLEnEf roadmap has therefore had effects mainly on two issues. Firstly, the knowledge and awareness on the challenges has increased among relevant stakeholders. The meetings, interviews, and publications in the framework of this roadmap have made these key stakeholders aware of the situation, and on the challenges ahead. Secondly, there is a more in-depth understanding of the need for collaboration among these partners, and that more coordination is essential. In the coming months, more meetings among the major partners are foreseen, in order to come to a common understanding and strategy for the heat transition.

In the framework of the roadmap, there have been various meetings with other municipalities, and the province of Drenthe, as well. Also the PUBLEnEf publications have been shared among a range of municipalities. The impact of the roadmap has therefore been mainly on knowledge and awareness of civil servants and stakeholders, not only in Midden-Drenthe but also in other municipalities in Drenthe province and beyond.

9) For more information:
   Contact person/organisation: Erwin Hofman, JIN Climate and Sustainability, erwin@jin.ngo
2.2 Municipality of Midden-Drenthe (roadmap 2), The Netherlands

1) Title of the roadmap: The energy transition in the built environment: Potential future roles of local government and market parties

2) Level of the roadmap: local (municipality of Midden-Drenthe, the Netherlands)

3) Roadmap developed by: JIN Climate and Sustainability (JIN), the Netherlands

4) Summary of the roadmap and key impacts:

Many Dutch municipalities have formulated the ambition to become 'energy neutral' over the coming decades. As part of the EU-funded PUBLEnEf project, JIN Climate and Sustainability collaborates with the municipality of Midden-Drenthe to identify and analyse possibilities for accelerating the energy transition in the built environment, with a focus on the residential sector. The main challenge in this sector lies with upgrading or converting the existing housing stock to become energy or even climate neutral. The PUBLEnEf analysis shows that scaling up and accelerating the transition for existing buildings will foremost require additional efforts from all private and public stakeholders within the sector. To speed up the process the sector can benefit from combining their knowledge and resources to develop and implement 'integrated energy solutions' for buildings. However, developing integrated energy solutions in a highly fragmented and diversified stakeholder landscape is challenging. With several market parties, including construction and installation companies, mortgage advisors, real estate agents, and energy consultants, we discussed and explored how the building refurbishment process can be simplified so that the transition can be accelerated. This has led to three possible future organisational modalities or approaches, in which local authorities and market parties can streamline the energy transition in buildings.
5) **Background, initial context and selection of the roadmap:**

The municipality of Midden-Drenthe (Central Drenthe) has a population of about 33,300 and a surface area of about 342 km². The main towns and villages in the municipality include Beilen, Westerbork, Smilde, and Bovensmilde.

In July 2017, the local council adopted a motion including the ambition to become energy neutral and reduce the emissions of greenhouse gases, and asking the local government to prepare an action plan for the next 10 to 15 years. It is the ambition of the local government to develop this action plan in close collaboration with relevant (local) stakeholder groups (e.g. citizens, house owners, SME’s and other relevant stakeholder groups).

For Midden-Drenthe, however, just as for most smaller and medium-sized municipalities, it is challenging to devise and implement effective policy solutions. The built environment is a particularly tough sector, considering the wide variety of building owners that need to be engaged or encouraged to implement energy savings measures, including private households. Key reasons for this difficulty include the lack of dedicated staff and therefore a lack of time, as well as a lack of knowledge and a lack of resources. In order to make optimal use of the limited resources available, it was therefore considered to increase the involvement of market parties such as real estate agents, to act as intermediaries and change agents on behalf of the local government.

The PUBLEnEf roadmap was proposed to support the municipal staff in engaging the relevant market parties, and to formulate general recommendations for municipalities in the planning of policies and stakeholder engagement in the built environment, with a focus on households. The challenges faced by Midden-Drenthe are common among municipalities in the Netherlands and beyond. Midden-Drenthe is with a population of 33,000 a rather average Dutch municipality, considering that 250 municipalities (66%) are medium-sized with a population between 15,000 and 60,000.

6) **Roadmap objectives and main targets:**

Through the PUBLEnEf roadmap, it was aimed to support the municipality of Midden-Drenthe in identifying and analysing possibilities for accelerating the energy transition in the built environment, with a focus on the residential sector. For that, we examined what role the various public and private stakeholders can play in speeding up this transition process.

A significant challenge is to find a suitable approach of contacting home owners, so that they will consider implementing energy savings interventions. The municipality has some resources available, for example for subsidising a basic energy scan or analysis of homes for energy efficiency interventions. However, it is difficult to reach building owners, not only because of a lack of staff and lack of time but also due to the fact that such communications would require a continued effort for at least several years to ensure that all home-owners are reached.
From the perspective of the home owner, preparing and implementing interventions for energy savings or generation is often a complicated and confusing process. As the figure below shows, the process often sees the involvement of a wide range of actors, which means that the home owner will have to manage a complex project. For the municipality, therefore, only ‘reaching’ the home owners is not enough: the home owners will need targeted support in order to ease the process and ensure that the project can be carried out in an effective and efficient way.

### Relevant stakeholders in the energy transition for households.

The objective of this PUBLEnEf roadmap is to devise an approach for the municipality to better ‘reach’ the building owners, in collaboration with market parties, and devise methods for guiding and supporting the process towards energy efficiency interventions. Initially, it was foreseen to establish a collaboration with local real estate agents and ask them to act as an intermediary to inform (future) home owners about possible energy saving measures. But throughout the project we learned that there are no strong incentives for real estate agents to sustain such actions. As such we broadened the scope to include more market parties, such as financial advisers, construction companies, installation companies, and engineering consultants.

The target of the suggested approaches is to increase the level of involvement of market parties in the energy transition in the built environment, and indirectly increase the number of building owners to implement energy savings measures. Other goals include increased capacity in the municipal government, increased networking possibilities among stakeholders, and finally a lower energy intensity in the municipality.
7) Roadmap development and implementation:

The roadmap process has been carried out in close collaboration with the relevant staff at the municipality of Midden-Drenthe. Based on initial planning by the municipality, it was decided to focus the efforts on the 'natural moments' of house sales, purchases, and renovations. In this framework, the municipality of Emmen (also in Drenthe) implemented a pilot programme in 2017, titled 'Buying a house? Save energy now!' ("Huis kopen? Energie besparen doe je nu!"). The pilot programme focused on the involvement of real estate agents as intermediaries between the local government and home buyers. For this reason, the roadmap has started by closely following the process and results of the pilot programme in Emmen.

Although initial interest among Emmen’s real estate agents was encouraging, the results of the pilot programme have been unsatisfying. In practice, agents did not see added value in providing information on energy saving to home buyers. Some real estate agents did offer a voucher for a free energy scan to home buyers, but in those cases the buyers did not redeem them, probably because such a scan would delay the purchasing process too much in the current tight housing market.

The results of the Emmen pilot were confirmed by the assessment in Midden-Drenthe: indicating possible required investments for energy saving does not fit into the business model of the real estate agent. The roadmap focus was therefore broadened: how can the municipality increase energy savings in collaboration with a variety of market parties, i.e. not only real estate agents but also other relevant actors.

The assessment of the challenges and potential solutions has been carried out by interviewing a range of actors in Midden-Drenthe and surrounding municipalities. Meetings have also been organised with representatives from the provincial government, local authorities across the province, and actors such as mortgage advisors, construction companies, installation companies, energy consultants, etc. More inspiration and information was collected through the attendance of conferences and workshops, including those of the Dutch national association of mortgage advisors (SEH) and the Covenant of Mayors.

After careful consideration and based on the inputs by stakeholders, a set of possible solutions have been formulated. These have been discussed and confirmed with a range of stakeholders, both in the public and private sector.
8) Impact of the roadmap and replicability:

The result of the roadmap process is a guidance document, providing inspiration and suggestions for stakeholder engagement. The guidance document, which includes three possible approaches as discussed below in section 8, has been discussed and verified with a range of stakeholders, and introduced to the contact persons in the local government.

The roadmap’s impacts on energy savings will have to materialise in the future, when, based on the suggested approaches, the local authorities and market parties will collaborate on encouraging households to implement energy savings measures. In the short term, the roadmap has led to effects on stakeholder behaviour and networking. There is wide agreement about the need for collaboration among relevant actors, and the roadmap process has led to increased awareness of this need, and the possibilities for partnerships.

From the beginning of the roadmap process, there has been a focus on replication of the roadmap results, in order to ensure that the effects will go beyond the municipality of Midden-Drenthe alone. There have been various meetings with the provincial authorities of Drenthe, as well as with municipalities in the province of Drenthe and beyond, also through for example the national association of municipalities VNG. A key impact of the roadmap is therefore the sharing of information and experiences from Midden-Drenthe, from the pilot programme in Emmen, and from other involved municipalities.

9) Policy lessons and practical recommendations:

The first suggested way forward is the appointment of an external energy director or 'energy transition broker/coach'. Such a broker would support a home owner in the purchasing and installation of a range of no-regret interventions to improve the energy performance of the building. The broker should not only have sufficient recent knowledge on technologies and sustainable energy solutions, but is also versed in financing issues, government regulations, available subsidies, and permitting issues. A key question remains how this energy transition broker can be funded? We suggest that in the early stages, local government assume a role in subsidising such brokers for pilot or experimental purposes. Eventually, the market should take over and internalise the costs for such services.

A second option is that the building sector takes a leading role and 'removes' the building owner from the transition process. This option envisages that building or installation companies purchase existing houses themselves, carry out a full renovation to make the building energy neutral, and subsequently sell the property again. One key advantage of this option is that the building and construction and installation companies can implement the required energy savings measures much faster in comparison to a process where the building owner and construction company enter in a dialogue to define and fine-tune the options and preferences, while many building owners lack knowledge and expertise to properly validate the quality and price of the agreed measures and services provided.
Using this purchase-renovation-sale model, much fewer stakeholders are involved, making the process simpler, faster and cheaper for the building and/or installation company. Especially in popular urban areas, this can be interesting for institutional and private investors, developers, and companies in the construction sector. A question remains whether it will also work in rural regions with a declining population. Here local governments could provide additional incentives or guarantee funds to market actors to pursue this.

A third option to speed up the transition is to better train and equip building owners to manage this process on their own. In addition to those building owners that have sufficient knowledge and expertise themselves to manage such a process, in general better training and equipping building owners (e.g. planning/budgeting tools, checklists) to adequately manage and monitor energy transition of their own building. Although we anticipate that this ‘do-it-yourself’ option will have more relevance for larger and/or rural buildings and/or a more select group of building owners, we consider it worthwhile to better equip this category of home owners.

10) For more information:
   Video: www.youtube.com/watch?v=3GYqlONsIFU
   Contact person/organisation: Erwin Hofman, JIN Climate and Sustainability, erwin@jin.ngo
2.3 Municipality of Corinth, Greece

1) **Title of the roadmap:** Implementation plan for communication actions and energy efficiency measures supporting the SEAP of the Municipality of Corinth

2) **Level of the roadmap:** local

3) **Roadmap developed by:** Center for Renewable Energy Sources and Saving (CRES), Greece

4) **Summary of the roadmap and key impacts:**

The Municipality of Corinth has been selected for the implementation of the PUBLEnEf roadmap in Greece based on the findings of the data collection phase of the project. The project roadmap aims to support the Municipality to adapt the existing SEAP to the current situation and implement the actions foreseen according to the present priorities and financing opportunities using the PUBLEnEf methodology.

5) **Background, initial context and selection of the roadmap:**

The Municipality of Corinth is a Greek Municipality located in the Peleponnese region with an area of 611.29 Khm$^2$ and a population of 58,192 people. The seat of the municipality is Corinth. The Municipality has joined the Covenant of Mayors initiative and has submitted the SEAP which was approved on 19/3/2014 committing for overall CO$_2$ emission reduction target of 29%. The Action Plan foresees the following actions in the relevant sectors:
Public sector: Energy inspection, certification and upgrading of public buildings (schools and administrative buildings), training of municipality staff for sustainable energy use, replacement of old public lighting and replacement of water pumping stations.

Residential and tertiary sector: Information campaigns and promotion of national financing programmes.

Transport: Replacement of older fleet, training of drivers to eco-driving practices, public fleet management, urban upgrading through pedestrian, parking and bicycle lanes.

The main needs of the Municipality as these have been initially identified were:
• lack of training opportunities for Municipal staff in energy sector
• lack of experienced staff in energy efficiency issues
• lack of in-house expertise about financial tools
• lack of time of key stakeholders
• absence of an Energy Efficiency National Fund

The cooperation with Municipal representatives concluded to the following topics to be included in the roadmap:
• Training of Municipal staff on energy efficiency measures & ISO 50001& green procurement.
• Dissemination actions on EE & use of RES for citizens.
• Municipal lighting
• Municipal fleet management and Eco driving training sessions for drivers of municipal cars and machinery

6) Roadmap objectives and main targets:

The main objective of the roadmap is to support the Municipality to adapt the Sustainable Energy Action Plan (SEAP) to the current situation and implement the actions foreseen according to the present priorities and financing opportunities.
Some of the main targets for the Corinth Municipality Roadmap are the following:
• Support the Municipality to i) improve the planning and implementation of the existing SEAP energy efficiency interventions and actions, ii) "transform" the energy efficiency policies and targets into concrete actions and energy projects enriching the SEAP.
• Enhance the Municipality capacity (improve the knowledge and capabilities) to plan and actually implement energy efficiency projects towards sustainability.
• Improve the dialogue and strengthen cooperation between national, regional and local actors and policy makers.
• Identify and record beneficial current financing opportunities that can support replication of best practices selected from the PUBLEnEf toolbox.
• Map the required resources to achieve successful implementation of the roadmap.
CRES experts in cooperation with Municipal staff identified specific actions to increase energy efficiency in the sectors of direct influence of the Municipality (e.g. staff capacity building, public buildings, fleet management/driving and public lighting). These actions were gradually implemented within the PUBLEnEf time life in Corinth and are expected to be continued acting as a best practice for private sector and citizens after the project end (long term impact and effect).

7) Roadmap development and implementation:

In brief, the following main activities carried out:

- Municipal staff participated to the seminars "Possibilities and prospects for improving energy efficiency in public and wider public sector buildings", "Energy management in public sector and wider public sector buildings - The role of the energy manager" and Energy management issues organised by CRES.
- Meetings were held with the participation of the Mayor of Corinth and the staff during the project (getting the first picture, definition of objectives and needs, setting priorities, preparation of events, roadmap development and monitoring implementation).
- On 30 June 2017, the 1st regional event was held at the Municipal hall with the participation of about 30 people. Detailed presentations on the issues of great interest to the Municipality have been given and selected best practices from the PUBLEnEf library have been presented.
- The technical package of the Public Lighting funding tool of the Deposit and Loans Fund has been provided to the Municipal staff in order to examine the possibility to submit an application.
- Municipal staff gathered data on energy consumption for the Municipality facilities and infrastructure for the years 2017 and 2018.

The main target groups and stakeholders involved in the process were: City council representatives, municipal staff, local and regional energy agencies, sectoral associations, ESCOs, funding bodies, University and research or technological centres, experts involved in European projects, Technical Chamber representatives, Commercial organisations, Managing authorities, local press and Citizens.

The stakeholders participated in the events and working meetings providing feedback on barriers, needs, exchanging experience in the field of implementation of strategies and realization of projects at local level. CRES had also discussions with regional representatives regarding cooperation for energy efficiency in public buildings.

Financial bodies and Technical chamber have participated in the events to support on technical basis. Several interviews following the events in local TVs of Argolida and Corinthia
and several press releases, radio interviews, etc. raised awareness of the citizens in the field of energy efficiency.

CRES experts succeed to have Mayor’s commitment during the first meeting in the municipality and that was of crucial importance. During the project life time, sometimes top level priorities changed due to other problems the Municipality faced. Constant communication and municipal staff’s interest, ensured commitment to the project. Also the ongoing CRES projects that could possibly fit to the Municipal needs maintained municipal interest.

Consultation took place with European energy agencies and CRES’ experts in the fields of energy efficiency in public lighting and energy management.

8) Impact of the roadmap and replicability:

The Roadmap is a guidance document that is practically used by the Municipal staff. It is continuously updated and been monitored.

Key impacts:
- The minimum energy savings are 1% resulting from the actions undertaken during the implementation of the roadmap for Corinth Municipality
- The Municipality completed an energy review for all the 22 communities.
- Korinthos, the capital municipality submitted a proposal for the energy upgrade (nearly zero Energy Swimming Pool) of the Municipal swimming pool. Total proposed budget 1,053,144 Euro, primary energy reduction 39.64 % - CO₂ emissions reduction 22.52 %
- 3 Municipalities the ones of Tripoli, Dionysos and Ilioupoli, submitted proposals for the energy upgrade of public lighting
- Interaction with 8 other municipalities and 2 regional authorities that participated in PUBLEnEf workshops and seminars. In some cases collaboration with them followed to further support and implementation of actions

Replications actions have been already implemented during PUBLEnEf lifetime:

Municipality of Nafplion (Peloponnese): Representatives have attended both national and 1st regional event. The 2nd regional event was organised there. Main interests are the energy upgrade of the Municipal swimming pool and the reduction of the energy costs of the Municipal pump stations. Following the event in Nafplion during summer vacations, interventions to school buildings have been realized.

Municipality of Dionsisos (Aticca): Their main interest is public lighting. The 3rd regional event was organised there in autumn 2018. A proposal for replacement of old lamps with led have been approved by the municipal council. CRES has hosted a visit from the 1st primary school of this Municipality. Energy Awareness actions and games have taken place and relative material with EE tips has been distributed for students and their families.
Additionally, the national and regional workshops came up with three more interested Municipalities to replicate PUBLEnEf actions. Municipality of Ag. Dimitrios and Ilioupoli in Attica and Municipality of Argos-Mikinon in Peloponnese. All contacts have been added to the stakeholders list they are kept informed on project outputs.

9) Policy lessons and practical recommendations:

The policies that were relevant in this roadmap were:

- NSRF - Transport infrastructure, environment and sustainable development operational programme.
- Law 4412 – Public procurement and the Co-financing programme of the European Investments Bank and the Deposits and Loans Fund (funding scheme street lighting)

The following concrete actions show tasks that went well:

- An application for funding was submitted for the energy upgrade of the main sports area and swimming pool.
- Municipal Board members received targeted information on technical and financial solutions regarding energy efficiency measures to improve decision making process
- Municipal staff increased skills in energy management and energy efficiency in street lighting.
- Municipality was triggered to allow more time and persons to collect data for their energy monitoring.

Some of the challenges encountered during the project implementation in Corinth, are:

- Changes to the priorities of the elected Municipal representatives
- Lack of time of municipal staff, due to other daily responsibilities and duties.
- The energy data collection and analysis is a time consuming process.
- Lack of national open calls for financing the interventions of interest for the municipality

Main lessons learnt and practical recommendations for other public authorities:

1. Energy efficiency interventions depend very much on political will of the Municipal Council and the skills of technical staff
2. The knowledge and the experience of energy agencies is valuable to provide technical support, platform for exchange of experience and opportunities for networking to local authorities
3. The financing framework is also crucial, not only the funding from programmes but also market uptake and existence of strong banks to improve the general feeling for investments

Project tools and best practices that were particularly helpful to the roadmap were:

- **MuLTEE** - The SMIV platform was presented during the regional workshop.
• **REACH** – It was promoted during the awareness workshops as low budget action for energy poor households.

• **ISO50001** - The introduction of this tool to the Municipality, raised awareness and inspiration to follow certain required step before starting the energy management.

• **Database for consumption of public buildings** – It was promoted to the municipal staff in order to change the energy behaviour of the staff working in municipal buildings, adopt a monitoring system for energy consumption and achieve energy and financial savings.

• **The Night Hawks – Night walks** - The approach in this case fits with Corinth municipality's interests on buildings, lack of expertise and lack of funding. Moreover, it included monitoring and it was very successful.

• **The Public Lighting funding scheme** is among the tools that were promoted and used, under the name "Implementation Actions to improve E.E. in street lighting".

• **EMPOWERING** This project tool was presented as Knowledge transfer, Lessons learned and provision of tools and information that supports municipal staff.

• **Covenant capaCITY SEAP training tool.** We registered to the platform as trainers to gain wider knowledge and guidelines to help municipality and region in achieving the SEAP completion.

**10) For more information:**

- **Video:** [www.youtube.com/watch?v=7BNv6wQUhCY](http://www.youtube.com/watch?v=7BNv6wQUhCY)
- **Contact person/organisation:** Kiki Papadopoulou, Centre for Renewable Energy Sources and Saving, [kpapad@cres.gr](mailto:kpapad@cres.gr)
2.4 Municipality of Gierałtowice, Poland

1) Title of the roadmap: Coal – mining municipality Gierałtowice energy cluster

2) Level of the roadmap: local

3) Roadmap developed by: Polish National Energy Conservation Agency (KAPE), Poland

4) Summary of the roadmap and key impacts:

KAPE has been working on a local roadmap of Gierałtowice in Poland to support them in becoming the successful energy cluster. The concept of energy clusters is relatively new in Poland. It has been introduced by the Ministry of Energy as civil law agreements between different entities including local governments, which aim at becoming energy efficient regions through a more effective use of renewable energy sources. As the concept of energy clusters is not very clear for local public bodies, KAPE decided to support the municipality in creation of the energy cluster. The whole process of energy cluster development was conducted in cooperation with the municipality public authorities and other parties such as National Fund of Environmental Protection and Water Management (financing institution), representatives of Ministry of Energy, Silesian Institute of Projects and Analysis. All the steps from the main idea, identification of potential energy cluster members, defining their roles, analysis the potential energy cluster investments, creation all the necessary documents, as well as advising the municipality on how to engage the local community have been described in a guideline document to support and further replicate to other municipalities.

5) Background, initial context and selection of the roadmap:

Gierałtowice is an agricultural and mining municipality in Silesian Voivodeship with a large mining area (4 mines).
The energy efficiency policy of this municipality is based on The Low Emission Economy Plan. Other documents supporting the implementation of policies on energy efficiency in the region include:

- The programme of Environmental Protection of the Gierałtowice Municipality until 2019 with a perspective until 2023;
- Assumptions for the heat, electricity and gaseous fuels supply plan;
- The "Śląskie 2020" Śląskie Voivodeship Development Strategy;
- Regional innovation strategy of the Silesia Voivodeship 2013 - 2020;
- Low emission reduction – Śląskie voivodeship’s resolutions
- Electromobility strategy

As Gierałtowice municipality is located in Upper Silesia – the region with significant exceedances of air quality limit values, especially in heating season, it has also other obligations imposed by law to overcome the air pollution issues.

According to the aforementioned strategy documents the energy efficiency policy of the municipality focuses on:

- increase of local energy security;
- development of RES;
- facilitating the distribution of local energy sources;
- introduction incentives and programmes for the development of the RES;
- low emission reduction,
- improvement of competitiveness and innovation of the local economy;
- increasing the awareness of the local community’s prosumers;
- optimisation of local energy mix;
- developing of local energy production and reducing their dependency on external support mechanisms;
- reducing energy poverty by providing cheaper energy sources;
- optimisation of local distribution network operation through intelligent energy sources management and popularization of RES, energy storage and prosumers systems;
- ensuring of energy self-sufficiency of the municipality based on methane from mines and agricultural resources (biogas)
• testing of products and solutions within e-mobility
• transformation of the mining municipality into a "green" municipality.

### Resources of renewable biomass energy sources
- Energy from straw 21996 GJ
- Wood waste energy 1836 GJ
- Energy from grass 43236 GJ
- Biogas energy 869 GJ
- Sewage treatment plant
- Energy from silage 3698 GJ

Total: 71,635 GJ 19898 MWh (~ 20,000 MWh)

### Renewable resources of other (sun, wind) sources of energy
- Solar energy 9775 GJ (2715 MWh) - 10% (photovoltaic), 8833 GJ (2453 MWh) - solars
- Wind energy 9500 GJ (3650 MWh) - 1.5 MW

Total: 28 108 GJ (8 818 MWh)

### Methane resources (1.5-2) MW of electricity (Budryk Coal Mine)

The energy efficiency policy objectives of Gierałtowice Municipality are compatible with the energy cluster idea. As the energy cluster concept is relatively new in Poland and the existing information on energy clusters is very theoretical there is not many experts on energy clusters at local level. The main need identified in Gierałtowice Municipality and other Polish municipalities is lack of staff and lack of knowledge on how to proceed to develop energy cluster successfully. One of the barriers identified is also difficulty in mobilizing the local stakeholders as well as the stakeholders from other institutions at different level of administration.

As the municipality Gierałtowice had a capacity to develop the energy cluster, KAPE decided to support the municipality in step by step process. The activities undertaken during the project duration aimed at successful creation of energy cluster and certification by the Ministry of Energy. The idea of the roadmap was to describe the practical solutions on the example of Gierałtowice municipality in a way that they will be replicable for other Polish municipalities.

6) **Roadmap objectives and main targets:**

The main objective of the roadmap was to support the transformation of the mining municipality into a "green" municipality through creation an energy cluster ensuring energy self-sufficiency of the municipality based on methane from mines and agricultural resources (biogas). The activities undertaken under the PUBLEnEf roadmap aimed at energy cluster certification by Ministry of Energy what gives the opportunity to apply for external funds for energy cluster investments. Additionally the actions have been described in a guideline.
document what provides other municipalities solutions for numerous issues that energy clusters in Poland may face during their creation.

7) **Roadmap development and implementation:**

On March 2017 KAPE signed the cooperation agreement with the Mayor of Gierałtowice Municipality. The first steps under the PUBLEnEf roadmap were to identify the potential energy cluster members. To do this the meeting with representatives of citizens, local companies, other local institutions was organised in the municipality to explain the idea of energy cluster, the roles of the possible energy cluster members and to present the next steps to develop the local energy cluster. Afterwards the letters of intent were gathered from all interested parties. It was necessary to have the first view of what members will be engaged to conduct technical and economic analysis and to apply officially for including Gierałtowice energy cluster into the Ministry’s list of energy cluster best cases.

Two important steps in the beginning of cooperation with the municipality were the creation of energy cluster statute and strategy. It was preceded by discussions, meeting, phone-calls, teleconferences with the municipality representatives, KAPE and the representatives of Institute of Project and Analysis – the Silesian consulting company.

In next step the technical and economic analysis with a focus on multi-profiled energy production and consumption and energy balance was conducted. All data were gathered during the on-site visits to identify the solutions used and from local monitoring of energy use.

*Health Centre in Gierałtowice Municipality (Przyszowice) with 126PV on the roof [1].*
Further step was to identify possible investments and available regional and national sources of financing. Important activities during roadmap process were meetings with citizens to explain them all the benefits they may achieve. One of such activities was organisation of one day information campaign with use of energy bus equipped with brochures for dissemination. On the board of the bus there were experts from KAPE that explained all the issues to the visitors – municipality’s citizens. 

![Pic.4. Energy bus visit in Gieraltowice](image)

The final concept was presented to Ministry of Energy and received the certification.

8) Impact of the roadmap and replicability:

The activities conducted during roadmap process were focused also on replicability possibilities. The Municipality of Gieraltowice has joined to district energy cluster "Friendly Energy in Gliwice District" where they share their ideas and possibilities with other eight municipalities engaged in the district energy cluster. Additionally important market actor
such as JSW – the largest coking coal producer was engaged in developing energy cluster Gierałtowice. JSW plays significant role from the point of view of electricity demand and as a waste energy producer. They joined the energy cluster Gierałtowice as a member of cluster and further developed their strategy with regards of cluster activities, what also affects other energy consumers/ other municipalities. Apart from improving corporate image as company supporting local energy policy development their engagement in local energy cluster will bring economic and environmental (air quality improvement) benefits. They also started activities aiming at the development of an innovative at national level the Regional Energy Cluster "Green JSW", where the planned utilisation of methane and excess electricity will be used, for example, to develop electromobility in the area that goes beyond the energy cluster.

To promote the activities taken under PUBLEnEf project to support developing energy cluster Gierałtowice, KAPE joined the energy Clusters Association "Klasgrid". As a member of Klasgrid KAPE had the opportunity to discuss the ideas, the problems etc. with members of other energy cluster initiatives.

9) Policy lessons and practical recommendations:

What worked well?
• cooperation with local authorities, their engagement in all steps of PUBLEnEf roadmap;
• the events organised to support energy cluster development, high level of participation;

What were the main challenges?
• unstable law; amendment of the RES Act for the duration of the project; it was not clear what direction of the changes the Polish government would take regarding the financing of RES;
• the process of certification by Ministry of Energy – not very clear rules;
• engaging all the possible energy cluster members,

To mobilise all the stakeholders KAPE organised events for a wide audience and small meetings face-to-face with interested parties; one-day information campaign in Gierałtowice Municipality; meetings with representatives of Ministry of Energy and National Fund of Environmental Protection and Water Management;

Where certain tools or best practices particularly helpful?
The tools and best practices gathered within project PUBLEnEf were very useful for roadmap development. Some of them were used directly as Energy Bus other as an inspiration for further activities e.g.: Installation of renewable energy systems in the public and residential buildings or Establishing a team responsible for the implementation and monitoring of Low Carbon Economy Plan for the City of Opole.

Main lessons learnt and practical recommendations for other public authorities
• There is a need to monitor and review the status quo of municipality resources and renewable energy and develop local energy efficiency strategy according to this;
• If there is a strong commitment of local stakeholders and important local market actors it is highly probable that even if local authorities will be changed after elections the efficient energy policy will be continued;
• It is necessary to raise awareness of citizens on local energy policy;
• As there is lack of staff and knowledge on energy efficiency subject it is also recommended to cooperate or employ such experts in municipalities.

10) For more information:
   Video: www.youtube.com/watch?v=iyCkEQmiZyo
   Contact person/organisation: Anna Mazur, KAPE, amazur@kape.gov.pl

2.5  City of Valladolid, Spain

1) **Title of the roadmap:** Supporting the implementation of Sustainable Energy Action Plans (SEAP) in the city of Valladolid, Spain.

2) **Level of the roadmap:** local

3) **Roadmap developed by:** Research Centre for Energy, Environment and Technology (CIEMAT), Spain

4) **Summary of the roadmap and key impacts:**

   The City Council of Valladolid set the objective of reducing emissions of the city by 20% in 2020, compared to the emissions of 2010. The first step was the implementation of an Inventory of Greenhouse Gases (GHG) emission. The main objective of the roadmap was to support the implementation of a Sustainable Energy Action Plan (SEAP) in the city. They city made good progress on the delivery of energy savings for the council activities, but some measures proposed in the SEAP had not yet been accomplished as some sectors and stakeholders were difficult to reach by the municipality.

   The main achievement consisted of the development of an active webpage with the collaboration of the Local Energy Agency (AEMVA) in order to support SMEs from the city of Valladolid to adopt measures to reduce the energy consumption and to be more energy efficient: [http://projects.ciemat.es/web/publenefhelpdesk](http://projects.ciemat.es/web/publenefhelpdesk).

5) **Background, initial context and selection of the roadmap:**

   Valladolid is the administrative capital of the region of Castilla y León, with a population around 300,000 inhabitants. Nevertheless, its metropolitan area is formed by several surrounding municipalities that represent more than 400,000 inhabitants. Valladolid, is located at a height of 690 meters under a Mediterranean climate, occupies a strategic position in northern Spain, and for this reason it’s been a centre for industrial development since the 50s.

   ![Location of Valladolid within Spain](image)
Valladolid set the objective of reducing the emissions of the city by 20% in 2020, compared to the emissions of 2010, to realize its commitment to the Covenant of Mayors. The first step was the implementation of an Inventory of Greenhouse Gas Emissions. Then, the Sustainable Energy Action Plan was drawn up. According to the inventory, the city had an energy consumption of 26.6 MWh per capita and the consequent CO₂ emissions were around 5.6 tonnes CO₂ equivalent per capita. The biggest part of this energy consumption and CO₂ emissions were produced by residential buildings and private transport. Actions envisaged to tackle the energy efficiency needs in residential buildings were mainly related to the incentive of the use of biomass fuelled district heating systems and installation of solar thermal support in centralized heating systems. However, other retrofitting actions were also available that could reduce energy consumption by residential sector in Valladolid. Other energy efficiency needs in the municipality were related to the reduction of electricity consumption by the commercial sector in the municipality and the improvement of energy efficiency in the small and medium industries in the municipality. These specific needs were related to the Energy Efficiency (EE) directive articles:

- Art. 17. Information and Training.

6) Roadmap objectives and main targets:

The main objective of this roadmap was to support implementation of SEAP in the city of Valladolid. They city made good progress on the delivery of energy savings for the council activities, but some measures proposed in the SEAP had not yet been accomplished as some sectors and stakeholders are difficult to reach by the municipality. In concrete, the identified objectives were the following:

- Reduction of electricity consumption in commercial lighting by 50% compared to 2010.
- Improvement of energy efficiency in the small and medium enterprises (SMEs).

The main objective has been achieved by means of the development and maintenance of a webpage about a help desk for supporting SMEs to adopt energy saving measures to reduce the energy consumption and to be more energy efficient.

The attainment of the two identified objectives could be evaluated in the next one or two years after the adoption of different measures by the relevant stakeholders.

7) Roadmap development and implementation:

During the first months of 2016, relevant national, regional and local stakeholders were contacted in order to present the project and to identify possible roadmap candidates. In a special workshop held in CIEMAT premises on Dec 17th 2016, first contacts with the Valladolid Energy Agency took place and we started discussing possible topics of interest and identifying the needs that were mainly related to the difficulties in reaching commercial and industrial stakeholders (many diffuse stakeholders difficult to reach and convince) and the lack of available time for staff (only two people works in the SEAP implementation).
A first event were held in Valladolid in November 2017, entitled 'JORNADA-TALLER DE EFICIENCIA ENERGÉTICA EN PYMES INDUSTRIALES Y COMERCIOS', whose main objective was to inform stakeholders from the commerce and small industry sector of Valladolid about energy efficiency measures specially tailored for these sectors. Participants were very interested in the workshop and raised specific questions that were considered in the development of the roadmap.

The main action developed was the creation of the webpage in Spanish entitled 'Portal de ayuda a la eficiencia y ahorro energético para pequeñas y medianas empresas y comercios de Valladolid – Hoja de ruta del Proyecto PUBLEEnEf' (http://projects.ciemat.es/web/publenefhelpdesk). It has 6 main sections:

- The first section provide information about the key measures to be adopted on lighting, electrical equipment, facilities and self-consumption, architectural elements, optimisation of electricity bills, ventilation, air conditioning, transportation and sanitary hot water.
- A second section includes a template for data collection about the adoption of measures by SMES in order to allow the monitoring of the implementation of this roadmap.
- The third section is a map of Valladolid that shows the location and information of the SMEs that have adopted key measures and the savings achieved.
- A forth section provides information on public grants and subsidies on energy efficiency and savings.
- The fifth section provides some references and bibliography and there is a final section with Contact details for more information and help.

The web page developed has been reviewed by experts in energy efficiency from the municipality and from consultancy companies that provided their feedback and contributed to improve it.
A final event entitled 'JORNADA DE EFICIENCIA ENERGÉTICA EN PYMES INDUSTRIALES Y COMERCIOS' is planned on January 16th 2019 in order to present the webpage to the SMEs and will have the participation of CIEMAT, technicians from the municipality of Valladolid and expert consultants.

8) Impact of the roadmap and replicability:

The webpage is directly linked in the AEMVA section of the main webpage if the municipality of Valladolid (https://www.valladolid.es/es/temas/hacemos/agencia-energetica-municipal-aemva). Actions developed by SMEs will be monitored by both AEMVA technicians and CIEMAT researchers for updating the map included in the webpage.

With the implementation of this roadmap it is considered that a reduction of around 2800 MWh in electricity consumption in the commercial sector and of 899t CO₂ emissions can be attained (1% SEAP target).

Other municipalities in the region face similar challenges than Valladolid does. These municipalities are the following: Avila, Burgos, León, Palencia, Salamanca, Segovia, Soria and Zamora. Representatives from those municipalities have been approached and the experience gained in the municipality shared and discussed with them during the workshop.

9) Policy lessons and practical recommendations:

The road map counted from the beginning with a good support on the part of the local authorities that showed interest and were very supportive in the identification of the roadmap topic. However, we had to break their initial reluctance to increase their work load by providing feedback to our request for information and to overcome the limitation of scarce resources to implement the proposed actions.

Several good practices and tools were used for inspiration in the development of this roadmap. Specifically the best practices used were GP47: Establishing a team responsible for the implementation and monitoring of the "low carbon economy plan for the city of Opole", GP53: Creation and management of the energy desk of the municipality of Messina, and GP30: RES heating plan in Rhodope region to 2030.

The main lessons learnt from this roadmap that can serve as practical recommendations for other public authorities are:
- It is important to align the proposed actions with the targets agreed at the local, regional and national level
- Providing information on efficiency measures is important but the feedback from the stakeholders is key to address the main barriers and opportunities related to the proposed measures and to increase its implementation.
10) For more information:

Video: www.youtube.com/watch?v=3IvY4eFJR0s

Contact person/organisation:
Yolanda Lechón, CIEMAT, yolanda.lechon@ciemat.es
Daniel Garraín, CIEMAT, daniel.garrain@ciemat.es
2.6 Municipality of Burgas, Bulgaria

1) Title of the roadmap: Municipality Burgas (BG) reduction of energy consumption in residential buildings

2) Level of the roadmap: local

3) Roadmap developed by: Association of Bulgarian Energy Agencies, Plovdiv (ABEA), Bulgaria

4) Summary of the roadmap and key impacts:

The roadmap describes how Burgas Municipality can achieve the target of a 21% reduction in energy consumption by 2020. After analysing the municipal Monitoring Report of the Sustainable Energy Development Plan for the period 2011-2015, it was clear that there was a 7% decrease in the final energy consumption of the municipality. By keeping this pace, the municipality could not meet its energy goals. In view of the fact that the housing sector has the highest energy consumption and no major energy efficiency measures have been taken place so far, the potential for savings from it was considered the greatest.

In 2015, the final energy consumption (FEC) of Burgas Municipality was 1.31 TWh. The largest share is the residential sector – 657.4 GWh (50%), followed by Industry – 409.8 GWh (31%). The contribution of Municipal Buildings and Facilities (2%) and Municipal Lighting (0.6%) was relatively small. For implementation of sound energy efficiency policies, the Buildings sector had to be with the highest priority. The roadmap development improved the knowledge of the municipal experts about the amount of energy consumption and fuel types, how to collect and process energy data. The capacity developed may serve the Municipality of Burgas for better planning of measures and policies and the implementation of additional ones for specific groups of buildings. The roadmap shows that energy efficiency measures were realised in more than 18 000 dwellings.

The staff of the municipality of Burgas is well-prepared and motivated for the future programmes for renovation of dwellings. Even more – the municipality will try to prepare and sign the SECAP by 2020.

5) Background, initial context and selection of the roadmap:

The municipality of Burgas is the largest in southeastern Bulgaria, bordered on the Black Sea coast. The city of Burgas is the fourth largest in the country with a population of 202 766 people (as of 31.12.2016, National Statistical Institute). Burgas is an important industrial, commercial, transport and tourist centre. The Municipality Burgas develops and implements large-scale projects aimed at building innovative economic, social and technical
infrastructure. Municipality of Burgas participates in the initiatives: Covenant of Mayors, Mayors Adapt and Green Digital Charter, member of EUROCITIES network.

The Municipality of Burgas has set the following energy goals:

- Reduction of CO₂ emissions in Burgas Municipality - 25% by 2020
- Reduction of the energy consumption in Burgas Municipality - 21% by 2020
- Share of RES in the energy mix of Burgas Municipality - 26% by 2020
During the period 2007 – 2015, two programmes for renovation of the residential buildings took place and only six buildings were renovated in the municipality of Burgas. In 2016, the Energy Efficiency of Multi-Family Residential Buildings National Programme started.

In the framework of the National programme for renovation the municipalities accept applications, evaluate and approve applicants, provide funding schemes, and conduct monitoring of the implementation of the measures for energy efficiency in the applicant buildings. Each municipality is responsible for carrying out the whole process for the renovation of its residential buildings and for the selection of contractors under the public procurement act for implementing the separate EE activities. The identified gaps are:

- Lack of communication - municipal experts have difficulty communicating effectively with citizens and motivating them to apply for renovation;
- Lack of training - municipal experts' trainings on planning and management of local EE policies; Insufficient capacity and knowledge on energy technologies, technical tools, good practices, training, innovative financial mechanisms - both on the part of the administration and on the part of the citizens;
- Lack of awareness - poor awareness of the citizens about the benefits of energy renovation;
- Lack of tradition to establish Owners Associations which is required for the applicants to be eligible for funding from the National programme for renovation. Also, 97% of the dwellings in Bulgaria are private and occupied by the owners, and a 100% of the owners must agree to apply for energy renovation of the building. The role of the municipal experts is to convince people to apply for renovation of the dwellings.

The energy consumption in the buildings sector – taking into account the whole life cycle – is responsible for 40% of total EU energy consumption and is the main contributor to greenhouse gas emissions. Bearing in mind that the housing sector has the highest energy consumption and no major energy efficiency measures have been realised, the potential for savings from it is the greatest. For implementation of sound energy efficiency policies, the buildings sector had to be with the highest priority. So the municipality of Burgas chose to follow up the renovation activities through the roadmap development.

6) Roadmap objectives and main targets:

The main objective of the road map is to describe how Burgas Municipality can achieve the target of a 21% reduction in energy consumption, namely 302 GWh by 2020.

The Energy Efficiency of Multi-Family Residential Buildings National Programme envisages a projected reduction in the energy consumption of 4 MWh per household after the implementation of the energy efficiency measures. To meet the 170 GWh reduction target for this sector, it means to renovate 42,500 dwellings - 40% of the dwellings in the municipality of Burgas. However, this scenario will be difficult to implement. A more realistic scenario to achieve its objectives will be for the Municipality of Burgas to renovate 23,800 (23%) dwellings and implement some additional measures.
The summary of the scenarios are show in the table below:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Measures</th>
<th>Dwellings</th>
<th>MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>Renovated dwellings (40%)</td>
<td>42 500</td>
<td>170 000</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>Renovated dwellings (23%)</td>
<td>23 800</td>
<td>95 200</td>
</tr>
<tr>
<td></td>
<td>Citizens undertake an action for renovation</td>
<td>10 200</td>
<td>40 800</td>
</tr>
<tr>
<td></td>
<td>(10%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other measures (26%)</td>
<td></td>
<td>27 373</td>
<td>22 605</td>
</tr>
<tr>
<td>Reduction of energy poverty (10%, 600 kWh/household)</td>
<td></td>
<td>8 830</td>
<td>529.8</td>
</tr>
<tr>
<td>Encouraging individual RES installations</td>
<td></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>...solar thermal installations (5%)</td>
<td></td>
<td>4 415</td>
<td>6 625.5</td>
</tr>
<tr>
<td>...PV installations (1%)</td>
<td></td>
<td>883</td>
<td>4 415</td>
</tr>
<tr>
<td>Changing behaviour (5%)</td>
<td></td>
<td>4 415</td>
<td>2 207.5</td>
</tr>
<tr>
<td>Replacement of old appliances (10%)</td>
<td></td>
<td>8 830</td>
<td>8 830</td>
</tr>
<tr>
<td>Additional needs for renovation</td>
<td></td>
<td>3 000</td>
<td>12 000</td>
</tr>
</tbody>
</table>

All measures are grouped according to their implementation period. Based on this planning, calculations have been made for the realization of energy savings by years by 2020.

7) Roadmap development and implementation:

ABEA prepared detailed review of the Monitoring Report of the Sustainable Energy Development Plan (2011-2020). For the period 2011 - 2015 there is a reduction of 99 GWh of the final energy consumption of Burgas Municipality, which represents 7%. The biggest decrease was in the Industry sector - 85 GWh, while the decrease in the sector "Municipal Buildings and Facilities" and "Transport" was respectively 6 GWh and 4 GWh. Industry and municipal buildings have the largest percentage decrease in consumption - 17% and 19%. Estimated final consumption for 2020 is based on a 5% reduction in consumption in all sectors, and for the Residential Buildings sector implementation of the National programme for renovation of the residential buildings as well as other measures.

The potential for energy savings from the residential building sector was discussed with the experts from municipality of Burgas and they wanted to know how to realise these savings. The energy consumption of more than 18 000 households was analysed.

After discussions and meetings with the experts from the municipality Burgas, a list of additional measures was created. For each measure deadlines and costs for implementation were determined. All measures are grouped according to their implementation period. Based on this planning, calculations were for the realization of energy savings by years until 2020.
The figure below shows the step-by-step achievement of the energy efficiency targets of municipality Burgas with the number of renovated dwellings.

The main target groups are municipal experts and citizens.

The Municipality of Burgas faced the challenge to convince citizens to apply for renovation (participate in the National renovation programme) and undertake energy efficiency measures in another 19 000 dwellings. Basically, this had to be realized through strong communication with citizens, conducting large-scale campaigns among the population, and regular awareness raising by showing good practices (already renovated buildings).

The municipality of Burgas shows strong political will to reach the SEAP targets. ABEA developed the road map at the same time as the monitoring report of the municipal SEAP and the road map is integrated into the SEAP.

8) Impact of the roadmap and replicability:

The roadmap was integrated in the Monitoring report of the municipal SEAP. The renovation of buildings is following the roadmap projections.

Energy audits in more than 23 800 dwellings were conducted and more than 18 000 dwellings were renovated.
The expected energy savings for the period 2015-2020 are 170 GWh from the final energy consumption (34 GWh per year till 2020), or 370 GWh from the primary energy consumption (or 74 GWh per year till 2020).

The expected CO₂ emissions savings are 85 t from the final energy consumption (17 t per year till 2020), or 237 t from the primary energy consumption (or 47 t per year till 2020).

The foreseen impacts are:
- Achieving energy consumption decrease of the households and realization of cost savings through implementation of energy efficiency measures;
- Cleaner environment – saved green gas emissions (CO₂, etc.);
- Heat costs reduction for the households
- Improved residential infrastructure and change of the urban appearance;
- Extending the life of the buildings
- Creating warmer, cosy and nice homes and renovated common areas of the buildings.

The analysis of the households’ energy consumption and its reduction could be integrated into different municipal programmes and strategies - for EE and RES, for improvement of the ambient air quality, SEAP and monitoring of the SEAP, SECAP. The roadmap has been replicated in the city of Smolyan and will be replicated in the city of Vidin through its SECAP.

9) Policy lessons and practical recommendations:

The ABEA and municipality of Burgas has a strong partnership, the municipal staff were well-motivated and participate actively during the meetings, phone conference and e-mails exchange.

In the framework of the National programme for renovation the municipalities are obliged to organise the implementation of a communication campaign for the National Energy Efficiency Programme, but there were no methodological guidelines or funding for this. On the territory of the Municipality of Burgas there are 413 panel buildings (according to NSI data). Typically, blocks of flats are 5 or more floors with 50 to 120 apartments. The responsible experts analysed eligible buildings and structure a communication plan. By giving priority to these buildings, the results were achieved faster. The municipality organised info campaign for the citizen in these buildings.

The good practices that we used is: Training workshop (GP12) - (http://publenef-project.eu/wp-content/uploads/2017/01/GP12-ARENE-GPSOe-Eng.pdf)

The main goal is to highlight the subject of energy efficiency and energy management, and integrate new targets in local policies, on the basis of the programme below:
- Provide the technical support on energy subjects to local stakeholders (citizens, local authorities, private companies);
- Awareness and training campaigns;
• Targets in terms of reduction of greenhouse gases and energy savings;
• Practical application in community policies and decisions

The municipality Burgas could use this good practice to train the municipal experts and raising citizen awareness.


The Municipality of Burgas can use the Energy Audit Manual and the Household Monitoring Tool developed in the frame of the project REACH to implement measures to support energy poor households set out in the Roadmap. Also could search for companies that will sponsored such kind of activities as an addition to the Municipal Fund for Supporting Energy Poor Households.


One of the measures set out in the Roadmap provides for the creation of a Municipal Fund for Supporting Energy Poor Households.


The municipality of Burgas has already implemented a pilot project and has introduced systems for emergency monitoring of public buildings. Following the good example and the energy savings achieved through a series of information campaigns will raise the awareness of the population about the benefits of energy management at the building and home level. Bulgarian partner also participated in the project consortium. All the materials are available in Bulgarian language.

The tools that we used are:

• **Data4action** ([https://www.publenef-toolbox.eu/tools/ghidul-de-acces-la-date-pentru-seap](https://www.publenef-toolbox.eu/tools/ghidul-de-acces-la-date-pentru-seap)) this tool was suggested by the AEEPM, Bulgarian partner also participated in the project consortium. All the materials are available in Bulgarian language. This tool could be used for covering the following needs: no energy modelling of future public sector energy trends has been undertaken at national level; insufficient information on technical tools, regional and local monitoring and reporting isn’t undertaken to demonstrate process achieved towards regional or local energy efficiency targets

• **MESHARTILITY** ([https://www.publenef-toolbox.eu/tools/energy-data-collection-good-practices-meshartility-eu](https://www.publenef-toolbox.eu/tools/energy-data-collection-good-practices-meshartility-eu)) this tool was suggested by the AEEPM and could be used for information on training possibilities, guidelines & handbooks supporting energy efficiency measures development support organisations in your territory addressing energy efficiency matters, rising competency and knowledge, rising information on best
energy efficiency practices. Bulgarian partner also participated in the project consortium. All the materials are available in Bulgarian language.

- CO₂ calculator ([https://www.publenef-toolbox.eu/tools/co2-calculator-bulgaria](https://www.publenef-toolbox.eu/tools/co2-calculator-bulgaria))- tool to support local authorities and citizens in translating the types of fuel used by the local authorities into energy and CO₂ units. It covers hard and liquid fuels. Its emission factors are based on the national requirements

- Covenant capaCITY SEAP training tool ([https://www.publenef-toolbox.eu/tools/covenant-capacity-seap-training-tool](https://www.publenef-toolbox.eu/tools/covenant-capacity-seap-training-tool))- this tool could be used to provide information on training possibilities, on energy technologies, best energy efficiency practices; for rising in-house expertise about training, in-house expertise about energy technologies, competency and knowledge as guidelines & handbooks supporting energy efficiency measures development

Main lessons learnt:

- Data collection – it took significant amount of time to find the right person, the source of information, and validate the quality of the information provided

- Analysis of the data - the proper analysis plays a key role. The high energy consumption of residential buildings presents a great opportunity for energy savings, providing significant potentials to reduce CO₂ emissions. A wide variety of measures for energy savings can be implemented in existing residential buildings to reduce significantly their energy consumption. The knowledge about potential for energy saving from residential buildings sector is very important. The municipalities could integrate this information in their future programmes/ strategy, SEAP etc.

- Communication - The effect of increasing energy-efficiency on improvement of indoor environment quality needs to be clearly presented. The best practices, lessons learned from successful renovation cases and good examples should be wide disseminated to all stakeholders. Municipalities and other public actors and owners of buildings should show example and disseminate transparent information about the achieved energy-efficiency levels and other benefits related to buildings renovation.

10) For more information:

**Video:** [www.youtube.com/watch?v=Pmy_Qe8z9oA](http://www.youtube.com/watch?v=Pmy_Qe8z9oA)

**Contact person/organisation:** Milena Agopyan, Association of the Bulgarian Energy Agencies, e-mail: milena.agopyan@eap-save.eu
2.7 City of Catania, Italy

1) **Title of the roadmap:** Identification of the regulatory and financial framework for EPC contracts for buildings, aimed at their valorisation, dissemination and market development in Italy

2) **Level of the roadmap:** local

3) **Roadmap developed by:** Italian National Agency for New Technologies, Energy, and Sustainable Economic Development (ENEA), Italy

4) **Summary of the roadmap and key impacts:**

The adoption of the Energy Performance Contract (EPC) scheme for the public administration of Catania could be very useful to improve energy efficiency (EE) in public buildings, not only at local level. Indeed, the main roadmap objective is the implementation of one of the very first applications in Italy of the new national EPC guidelines, currently under review by the Ministry of Economic Development, and consistent with the Energy Efficiency Directive (2012/27/EU - EED). Showing the role of the EPC as an effective implementation tool for the energy renovation of (public) buildings, the more general goal is to boost its application, stimulating this way the foreseen exemplary role of the public sector, and facilitating the reach of the 2020 energy saving targets as well.

In order to better understand the main obstacles to be overcome and to find possible solutions for a rapid application of the EPC model, from the legal perspective ENEA and the University of Catania have identified the barriers and the regulatory framework needed for an effective adoption of EPC in Italy for public buildings. A particular attention is focalized on the study of the minimum elements to be included in contracts in public sector as well as their feasibility.

5) **Background, initial context and selection of the roadmap:**

Catania is an Italian municipality on the east coast of Sicily, facing the Ionian Sea. It is the capital city of the Province of Catania, one of the ten biggest cities in Italy and the seventh largest metropolitan area in Italy. The population of the city urban area is 315,601, while the population of the conurbation is estimated to be 767,003. The whole metropolitan area has 1,115,310 inhabitants.

The municipality of Catania is characterized by a significant number of public and private buildings to be renovated in order to achieve more efficiency in terms of energy performance. The adoption of EPC scheme could be very useful for the public administrations to improve energy efficiency in public buildings.
The main barriers identified for this municipality are the following:

- necessity of administrative procedures simplification,
- lack of financial tools to support the energy efficiency actions planned,
- not adequate information & training,
- insufficient budget,
- the stakeholders' lack of available time,
- necessity of improving decision making process,
- more cooperation of the stakeholders involved.

The roadmap is inspired by the Messina Good Practice (GP53) "Creation and management of the Energy Desk of the municipality of Messina".

Catania municipality has taken part in the European initiative 'Covenant of Mayors' since 2013, developing a Sustainable Energy Action Plans (SEAP), with a number of energy efficiency actions also, through which the town could achieve at least a 21.7% reduction (compared to 2005) of its total CO₂ emissions by 2020. In particular, the SEAP has identified:

- short-term measures, some of them already in progress;
- medium and long-term measures to achieve the goals of energy policy by 2020, with specific addresses in the following areas: buildings (public buildings included), public lighting, transportation, (green) energy local production.

In April 2015 a Memorandum of Understanding has been signed between ENEA and the Municipality of Catania in the field of eco-sustainability, and specifically for studies, research and applications in the view of the implementation and monitoring of the measures foreseen in the SEAP (forthcoming at that moment).

On 19 June 2015 the Municipal Council of Catania approved, with resolution no. 18/2015, the "Action Plan for Sustainable Energy" of Catania, available on the official website of the "Covenant of Mayors".

The major needs identified in the initial assessment and addressed by the Catania Roadmaps are:

- lack of practical means of implementation of energy use reduction in several sectors, including households;
- need for improvement of awareness engagement of stakeholders such as ESCOs, Municipalities offices and technician, and citizens;
- lack of staff dedicated and experienced about legal, administrative, technical aspects related to EPC;
- no standardized tools on EPC available in Italy, in particular for the public sector;
- uncertainty in the regulatory framework for the EPC applicability in the Public Sector in Italy;
- lack of information and expertise about EPC topic in public sector, especially in local municipalities;
- New Italian national EPC guidelines developed and drafted by ENEA are under review by the Ministry of Economic Development.
The proposal roadmap is inspired by the Messina Good Practice (GP53) "Creation and management of the Energy Desk of the municipality of Messina" and one of the objectives is the replication of the same practice in Catania Municipality.

In this contest the municipality of Catania was the ideal context for the realization of Energy desk, essential for the implementation of a pilot case of EPC adoption and its dissemination both at local and (at least) regional level, acting as a catalyst of a wide and high-level network of stakeholders, most of them already involved thanks to the aforementioned initiatives in place.

An executive agreement, based on the previously mentioned Memorandum of Understanding between ENEA and the University of Catania – Law Department, was signed and it contributes to the realization of both the SEAP objectives and the uptake of the EPC national guidelines in the public sector.

6) Roadmap objectives and main targets:

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Time</th>
<th>Impact</th>
<th>Targets</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Desk in Catania</td>
<td>1 year</td>
<td>Together with all the relevant local stakeholders, ENEA resources also contributed to the establishment of the Energy Desk in Catania for the implementation and monitoring of the SEAP</td>
<td>Creation of the Energy Desk</td>
<td>Energy Desk within the Municipality of Catania</td>
</tr>
<tr>
<td>Analysis of the barriers for the application of EPC model in Public Buildings</td>
<td>1 year</td>
<td>Dedicated resources from ENEA and University of Catania were involved to carry out the research project on Energy Performance Contracts entitled &quot;Identifying Energy Performance Contract (EPC) regulatory framework in Italy&quot;.</td>
<td>Deliver of the research project on Energy Performance Contracts</td>
<td>Research studies have helped to identify the technical, legal and economic barriers for the adoption of EPC models addressed to public buildings in Italy. Thanks to this work also, a proposal for the amendment of the National...</td>
</tr>
</tbody>
</table>
Facilitate the governance of a quick application of EPC in the public sector | 2 years | Involvement of the main stakeholders: ESCOs, public Officers and technician from the municipality of Catania and citizens through specific dissemination and training events. Provided in synergy with H2020 project GuarantEE, training programmes for the qualification of EPC facilitator in order to facilitate both necessary availability of experts and to increase the adoption of EPC in the public sector. | Synergy with H2020 project GuarantEE, | Raise awareness about the benefits of EPC as key instrument to renovate public buildings. |

The main objectives of Catania roadmap are:

- identification of the barriers for the application of the EPC model in public buildings and how to overseas these barriers. Facilitate the governance of a quick application of EPC in public sector;
- identification of the technical legal requirements on how integrate the EPC into Italian legal framework.

To achieve the mentioned objectives encouraging EPC’s valorisation, dissemination and market development in Italy, with particular reference to EPCs for buildings (including public building) ENEA and the University of Catania have developed a joint research project on Energy Performance Contracts entitled "Identifying Energy Performance Contract (EPC) regulatory framework in Italy".

Guidelines and Public Procurement Code was drawn, and it is currently under the consultation of the Italy’s Ministry of Economic Development.
A particular attention will be focused on the study of the minimum elements to be included in contracts in public sector: the rational of EPC application as well as their applicability, indicating the differences of their applicability between public and private sectors.

The purpose of the research project is to contribute to diffuse the application of EPCs for buildings in Italy and to facilitate the fulfilment of energy efficiency requirements set by the European Directive (2012/27/EU). This joint research study will help to understand better the main obstacles to be overcome and to find possible solutions for a quick application of the EPC model. Currently, the main existing regulatory barriers for the diffusion of EPCs in Italy are:

- absence of EPC as a contract type in the new Italian Public Procurement Code;
- unequivocal application of its service contract characterization;
- application of the current law (new public procurement code) banning the integrated scheme contract;
- difficult access to EPCs for small to medium-sized municipalities and for P.A., who does not have technical officers.

7) Roadmap development and implementation:

Several meetings took place between Messina municipality and ENEA Catania office in order to verify the replicability of Messina Good Practice. A technical panel between ENEA, Messina and Catania was formed for the replicability actions of the Messina Good Practice in Catania.

Meetings between ENEA Catania office and technical and legal managers of Catania municipality for the involvement in the pilot study foreseen in the Memorandum of Understanding between ENEA and Municipality of Catania, signed in April 2015.

Foreseen by a Memorandum of Understanding officially signed by ENEA and the University of Catania, an in-depth study on the identification of the national regulatory and financial framework for the adoption of EPC contracts for public buildings has been carried out. In particular, the study provides a reference state of the art for all the involved stakeholders, as a basis for the adoption of EPC in pilot projects at local level.

Realization of Energy desk in Catania will be essential for EPC dissemination/adoption at local level as a catalyst of a wide and high-level network of involved stakeholders.

Several dissemination events provided to main stakeholders: local ESCOs, officers and technicians of Catania municipality, citizens, etc. Provided in synergy with H2020 project "guarantee", ENEA had made training courses for the qualification of EPC facilitators in order to facilitate both necessary availability of experts and to increase the adoption of EPC in the public sector.

List the main user and stakeholder groups and how you have engaged them:
• Local Authorities (Municipality of Catania): a memorandum of understanding between Municipality of Catania and ENEA for collaboration on energy efficiency initiatives was signed.

• University of Catania – Law Department: a memorandum of understanding between University of Catania and ENEA for a joint study on the "Identification of the regulatory and financial framework for EPC contracts for buildings, aimed at their valorisation, dissemination and market development in Italy" was signed.

• Local network of energy managers, ESCOs and citizens: involved in the development of roadmap through PUBLEnEf dissemination events in Messina, Catania and Castelbuono, in synergy with the other roadmap of Castelbuono.

• European project "guarantEE" team: training courses for the certification of EPC facilitators.

The level of commitment of the Municipality of Catania has been very high. The renovation of public buildings is one of the key points foreseen in the local SEAP and the development of the roadmap. Liability of the Environment Department of Catania has been an opportunity to accelerate the EPC market uptake in the public sector. During the roadmap implementation, a "waiting time" phase of six months, due to the reorganisation of the Catania municipality offices with a turnover of the personnel, brought a delay of the roadmap realization.

The rise awareness was due to specific training courses delivered to the municipality technicians, local energy managers and local ESCOs, some of these in collaboration with the H2020 guarantEE project, in relation to the figure of the "EPC facilitators".

8) Impact of the roadmap and replicability:

The impact of the roadmap is very deep. The adoption of the EPC for the public buildings is the key challenge and a big opportunity. Several public building renovations needed by the municipality of Catania could now be realized through the EPC model, contributing to the SEAP achievements too. The replicability of this pilot study in the municipality of Catania, in Sicily Region and in other Italian regions will stimulate a nationwide EPC market uptake in the public sector.

The estimated energy saving for the public building identified in Catania after the renovation in estimated in primary energy is 123,538 kWh.

9) Policy lessons and practical recommendations:

The application of EPC contracts for the public sector is a very wide and complex topic: to date, the consultation process is still ongoing in Italy, with a forthcoming official release of the new National EPC guidelines by the Italy’s Ministry of Economic Development. More specifically, EPC guidelines for public buildings have been developed to guide the implementation process, and to set the required regulatory framework. Under PUBLEnEf, some challenges have been identified for its implementation in Italy. Firstly, EPC has not
been included as a contract type in the new Italian public procurement code, which makes weak the legal basis of this tool. Secondly, in the past it there has been no uniform application of the tool, thus amplifying the difficulty for a shared and acknowledged approach. A third problem is that there is a difficult access to EPCs for the smaller-sized municipalities, as they usually have no dedicated technical offices, and relative staff then lacks the required technical skills. Furthermore, in the banking system there is a lack of specific expertise about technical assessment of energy efficiency projects. The proposed solution in Italy was an amendment to the regulations to allow specifically for EPC in the new Italian code of contracts.

10) For more information:
   Video: www.youtube.com/watch?v=7qi2GEzV.Ct4
   Contact person/organisation:
   Pietro Falconi, ENEA, pietro.falconi@enea.it
   Alessandro Federici, ENEA, alessandro.federici@enea.it
2.8 City of Castelbuono, Italy

1) **Title of the roadmap:** Monitoring of energy consumption and identification of energy efficiency measures in public buildings in Castelbuono (Italy, province of Palermo)

2) **Level of the roadmap:** local

3) **Roadmap developed by:** Italian National Agency for New Technologies, Energy, and Sustainable Economic Development (ENEA), Italy

4) **Summary of the roadmap and key impacts:**

   The final roadmap objective is the monitoring of energy consumption and identification of energy efficiency measures in public buildings. To this end, the impact of a heating/cooling system with heat pumps, on energy performance of the secondary public school 'Minà Palumbo' at Castelbuono has been evaluated. Main stakeholders and technical staff have been involved and trained. The energy performances of the plant and of the heat pump during actual operation have been measured and the effect of subsoil recharge via geothermal probes analysed. The experimental data, gathered both in winter and summer time, allowed to proceed with the technical-economic analysis and carry out evaluations on possible energy optimisation scenarios. The economic benefit of the geothermal heat pump technologies will have to be evaluated according to the climatic installation area.

5) **Background, initial context and selection of the roadmap:**

   The Castelbuono territory mostly consists of agricultural land (85%) and forestry (15%). The local economy is mainly based on manufacturing activities (13%), commerce (31%) and tourism (25%). Many activities related to the tertiary sector are also present (i.e. public and social services (13%) and real estate, renting, information technology, research and other professional and business activities (12%)).

   Since December 2009, Castelbuono town took part in the European initiative 'Covenant of Mayors', developing its Sustainable Energy Action Plans (SEAP); various actions have been identified through which the town could reduce at least 20% of its total CO₂ emissions by 2020, comparing to 2005:

   - **Public sector:** the main actions include the promotion and implementation of the energy efficiency of public buildings through geothermal, photovoltaic solar thermal systems and the implementation of a biomass boiler at slaughterhouse, the requalification of public lighting and the purchasing of certified green energy, the management of a purification plant for waste water, the replacement of votive lamps.
   - **Residential sector:** the main actions include the creation of purchasing groups of: a) photovoltaic, b) of solar thermal and efficient boilers and c) of certified green energy.
- **Transport sector**: the main actions include the introduction of "zone 30", where the maximum speed admitted is 30 km/h and the requalification of the municipal fleet.

Needs identified in the needs assessment phase are the following:
- Understanding the effectiveness of the installed technology in terms of energy saving by the Municipality of Castelbuono
- Acquiring the skills to independently manage the technology installed by the technicians of the municipality of Castelbuono;
- Understanding the potential replicability of the technology in other public buildings in Castelbuono; all the needs identified elsewhere could potentially support the municipality of Castelbuono.

The secondary public school 'Minà Palumbo' is the pilot study about energy efficiency improvement of public buildings in the Municipality of Castelbuono. The roadmap involves three other municipal buildings (Ex Convento San Francesco, Scuola Elementare San Paolo, Castello Comunale) in which similar geothermal plants have been installed.

This roadmap offers a case study and a guide to the development of the entire buildings renovation project.

**6) Roadmap objectives and main targets:**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Time</th>
<th>Impact</th>
<th>Targets</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring of energy consumption of the ground source heat pump for space heating and cooling in the secondary school 'Minà Palumbo' of Castelbuono,</td>
<td>1 year</td>
<td>Increase of community awareness on issues of energy efficiency and the specific technology</td>
<td>3 training courses</td>
<td>Provided 4 training courses (classroom and on-the-job) to the technicians of the municipality of Castelbuono.</td>
</tr>
<tr>
<td>Appropriate knowledge of the technologies for an autonomous implementation of the monitoring process</td>
<td>1 year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replicability of the installation / monitoring of the technologies</td>
<td>1 year</td>
<td>Involvement of neighbour municipalities through the dissemination of results</td>
<td>3 dissemi- nations events</td>
<td>Provided 3 dissemination and networking events in Catania (2) and Castelbuono (1) to stimulate the roadmap implementation.</td>
</tr>
</tbody>
</table>
The key achievements of the roadmap are the following:

- Monitoring of energy consumption of the ground source heat pump for space heating and cooling in the secondary school 'Minà Palumbo' of Castelbuono, with an energy saving target of 20%, and economic saving target in the public energy bill of 23%;
- Raising awareness of Castelbuono citizens through local disseminations activities;
- Training of the technical staff of the municipality's office and of other main local actors provided by the local ENEA office;
- Benchmarking through the comparison of conventional heating and cooling systems with the application of geothermal technology and evaluation of key performance indicators for other public buildings in the city;
- Dissemination of the monitoring and evaluation procedure to other neighbouring municipalities.

7) Roadmap development and implementation:

The 'Minà Palumbo' school of Castelbuono was chosen because it was considered of particular scientific interest as recently subject to energy efficiency improvement through the installation of heat pumps by the Municipality of Castelbuono. This action is part of a project involving three other municipal buildings (Ex Convento San Francesco, Scuola Elementare San Paolo, Castello Comunale) in which similar geothermal plants have been installed.

The main activities carried out for the roadmap implementation are the followings:

- ENEA’s PUBLEnEf team had preliminary contacts with the mayor of Castelbuono for the definition of the roadmap, and his personal involvement in the project.
- Castelbuono municipality technicians take part in specific training courses on geothermal technology.
- Campaign of on-site measures, carried out from September 2017 to February 2018 (both in summer and winter to evaluate the performance of the plant in different seasons), by the municipality of Castelbuono supported by the University of Palermo and ENEA Palermo local office.
- Data analysis through dynamic simulation software (TRNSYS), to perform technical-economic evaluations on possible energy optimisation scenarios in order to evaluate potential replicability in other sites.

The key stakeholders identified are the following:

- Mayor of Castelbuono: engaged directly by the ENEA local office in Palermo
- City council representatives: engaged through the mayor of Castelbuono by the ENEA local office in Palermo
- City council representatives of neighbour municipalities: engaged through the dissemination event in Castelbuono
- Industry associations: engaged through specific ad hoc meetings in Castelbuono
- ESCOs and Energy Managers: engaged through specific ad hoc meetings in Castelbuono
The involvement of relevant public authorities and stakeholders has been very high. In the starting phase, thanks to the ENEA local office of Palermo, the Mayor of Castelbuono was made aware of the potential benefits of the energy efficiency on the energy bill of the Municipality, prospecting the possibility of the availability of the ENEA staff in the case of the adoption of the roadmap, for both the analysis of the heating systems, and the training of the local public technicians.

Once on board, the collaboration of the public technicians was ensured through their direct involvement on the on-site measures of the monitored heating system, together with some ad hoc training sessions. Besides, the interest of local stakeholders has grown thanks to dissemination events for the presentation of the results of the analysis.

8) Impact of the roadmap and replicability:

The project was adopted by the city council; and after the implementation of the roadmap, the monitoring results needed to bridge the gap in the efficient use of this technology are now available.

The roadmap implementation has stimulated a correct balancing of the probes and the achievement of nominal operating conditions results in an improvement in energy performance of 20% compared to the previous use of technology.

The cost of technology is very high and payback period is rather long, effectiveness of the investment cost depends on several factors, climate zone, typology of building, etc.

The outcomes of this study could be potentially replicated in other neighbour municipalities. The aim of the roadmap is to identify, inform, involve, and train the interested stakeholders and professional profiles. The final strategic goal is to make them able to autonomously govern the whole process, from the identification of the most suitable energy efficiency solution and the management of the related call for tender for the assignment of public funds for both the O&M procedures and the monitoring and evaluation of energy savings achieved.

9) Policy lessons and practical recommendations:

Thanks to a non-repayable public funding, the geothermal heat pumps were recently installed, and the lack of expertise of the municipal technical staff concerning the technology paved the way for a proactive and effective involvement of the municipality in all the steps of the roadmap.

Castelbuono is a small municipality with no staff dedicated to energy efficiency technologies. The biggest challenge was to provide them the appropriate skills in order to make them autonomously manage the technology. The University of Palermo also, in collaboration with ENEA, provided training to the technicians of the municipality.
Helpful tools and best practices:

- The GP30 (RES Heating and Cooling - Strategic Actions Development). Effectively utilization of the biomass potential in some municipalities. The GP describes the development of renewable energies in heating and cooling through regional pilot schemes and strategic actions, these have been found suitable for the specific context of the Municipality of Castelbuono.

- The GP46 (Improving the energy efficiency of the Functional Area of the City of Slupsk through building thermo-modernization) describes how to improve the energy efficient technologies in all public buildings. In particular the GP46 is related to the heating and cooling technologies and, for this reason, has been adapted for this roadmap.

Main lessons learnt and practical recommendations for other public authorities

- Strong commitment of the Mayor was fundamental to ensure the implementation of the whole roadmap, especially for the motivation of the technical staff to the participation and cooperation in the on-site monitoring activities.

- For a small-size town, lack of technical staff may be a big barrier for the deployment of energy efficiency actions: training is necessary, through initiatives such as this roadmap, more general training programmes for public employees at higher territorial level, such as those financed within Structural Funds.

- Monitored technology may provide significant energy and economic savings: best conditions for an optimal calibration of heat pumps were derived, for both winter and summer season.

10) For more information:

   Video: [www.youtube.com/watch?v=XRzfV8u8l_4](http://www.youtube.com/watch?v=XRzfV8u8l_4)

   Contact person/organisation:
   Pietro Falconi, ENEA, [pietro.falconi@enea.it](mailto:pietro.falconi@enea.it)
   Alessandro Federici, ENEA, [alessandro.federici@enea.it](mailto:alessandro.federici@enea.it)
2.9 City of Bucharest Sector 1, Romania

1) **Title of the roadmap:** Supporting the improvement of the energy action plan in Bucharest Sector 1 – SEAP 2.0

2) **Level of the roadmap:** local

3) **Roadmap developed by:** Local Energy Agency Bucharest (AEEPM), Romania (AEEPM)

4) **Summary of the roadmap and key impacts:**
   - **Next steps identified true Energy Roadmap is focus on replacing energy inefficient elevators for all thermal insulated buildings.**
   - **Impacts of the AEEPM roadmaps as energy savings By Energy Roadmap for Bucharest Sector 1 (estimated)**
     - Annual saving 36700 MWh/year primary energy
     - Considering as PUBLEnEf project contribution 1%: 367 MWh/year result
   - **This new action Plan has been voted in 2018. The new investments were approved by City Council and will start in 2019.**

5) **Background, initial context and selection of the roadmap:**

   Bucharest Sector 1 is a 250 000 inhabitant community, part of Bucharest Romania Capital with administrative role of the community shared with the Capital administration.
Bucharest Sector 1 is founding member of AEEPM Bucharest Local Energy Agency. Bucharest Sector 1 joined the Covenant of Mayors European initiative in January 2009 and approved its SEAP in 2011 September. The target of the SEAP approved in 2011 is to reduce the energy consumption by 26% by 2020.

Areas of action in Bucharest Sector 1 SEAP:

- Buildings (public and private)
- Integration of Renewable energy sources in buildings
- Public Lighting

Thousands of Bucharest residents have benefitted from a programme to improve the energy efficiency of apartments and public buildings in the Romanian capital. Extensive insulation work has been carried out on 839 residential blocks containing 42,359 apartments in total. The scheme is expected to cut the energy consumption of buildings by about half, help families and local authorities to reduce their energy costs and in doing so make a valuable contribution towards Romania’s environmental commitments.

The work involved insulating walls and roofs and installing double glazed windows in the residential blocks, leading them to be upgraded from building energy efficiency class G to class B or A. The renovation work has also improved the overall appearance of buildings and inspired ongoing urban regeneration efforts in the capital. For example, the rehabilitation programme, which has been carried out in one sector of the city, has since been rolled out to four others. The project brought further economic benefits through contracting out construction work to local SMEs. But the more ambitious targets will be assumed by Bucharest Sector 1 by 2030 SEAP 2.0 so they need AEEPM support (true PUBLEEnEf project) in order to identify new sector of actions in order to reach those targets.
The main issues in the applications of European energy efficiency directive, also identified toward the first interviews in the project, are:

- The lack of time available to be dedicated to these issues, associated with the administrative or social cultural issues and obstacles
- The lack of awareness for elected officials on these issues
- The weak participation and support of technical and financial partners, and more broadly the lack of permanent structures specialised in energy efficiency
- The lack of knowledge and strategy for public real estate (building uses, low energy standard)

6) Roadmap objectives and main targets:

The AEEPM energy agency is supporting the authority in the planning, development and monitoring of the energy saving plan. AEEPM works closely with the local authority, acting as a facilitator-interlocutor with all municipality staff and local stakeholders in the delivery of the updated energy plan.

The new objectives of the SEAP 2.0:

- To reduce energy consumption up to 33% until year 2030.
- To stand out the local energy potentials, especially by promoting the use of solar thermal and photovoltaic energy.
- To improve energy efficiency in public buildings and municipal facilities.
- To increase the citizens’ information level regarding energy saving practices, as well as of the national and European regulations on the rational use of energy.
- To disseminate its advantages, help to implement renewable energy installations and apply actions to improve energy efficiency in buildings.
- To increase the awareness of developers, entrepreneurs and hotel industry and residential agents to cleaner technologies and the use of sustainable energies.
- To establish systems of experience transfer through the collaboration with other Energy Agencies, at local, national and international.

7) Roadmap development and implementation:

In order to exploit the experience of the PUBLEnEf partners participating in this roadmap, the actions will be oriented to reduce the consumption of city buildings (public and private) incrementing the penetration of renewable energies. Discover new area of actions with potential of energy saving and promote new SEAP with more ambitious targets since 2030

The opportunities and challenges envisaged are the following:

- The Energy Saving Plan is quite successful, and the stakeholders of the whole value chain are identified, well-coordinated and highly committed
- There is the opportunity to undertake actions in sectors not addressed currently
• There is great multiplication potential (all the others Sector of Bucharest try to replicate Sector 1 energy actions)

8) Impact of the roadmap and replicability:

Bucharest Sector 1 is considered a forerunner: thousands of Bucharest’s residents have benefitted from a programme to improve the energy efficiency of apartments and public buildings in the Romanian capital. Extensive insulation work has been carried out on 839 residential blocks containing 42,359 apartments in total.

Next steps identified true Energy Roadmap is focus on replacing energy inefficient elevators for all thermal insulated buildings.

Impacts of the AEEPM roadmaps as energy savings
By Energy Roadmap for Bucharest Sector 1 we estimate
• Annual saving 36,700 MWh/year primary energy
• Considering as PUBLEnEf project contribution 1%: 367 MWh/year result

The roadmap has been useful for the elaboration of the energy and climate strategy and mainly in the chapters dealing with energy efficiency in buildings. This new action plan has been voted in 2018. The new investments were approved by the City Council and will start in 2019.

Along the project we have carried out documents as guidelines, studies and recommendations, general information or documents targeted to our pilot municipalities. There is great multiplication potential (all the others Sector of Bucharest try to replicate Sector 1 energy actions) – Bucharest Sector 4, Bucharest Sector 2 and Bucharest Sector 6 start to.

9) Policy lessons and practical recommendations:

The Energy Saving Plan (Bucharest Sector 1 Thermal Rehabilitation Programme) is quite successful, and the stakeholders of the whole value chain are identified, well-coordinated and highly committed. Involvement of all stakeholders was very good and the approach with regular meetings and working groups work very well. The main challenge was to identify and prioritized in realistic way the new actions and the most appropriate contracting procedures.

Project tools and best practices that were particularly helpful to the roadmap were:
• MuLTEE - The SMIV platform was presented during the regional workshop
• ISO50001 - The introduction of this tool to the Municipality, raised awareness and inspiration to follow certain required step before starting the energy management.
- **Database for consumption of public buildings** - It was promoted to the municipal staff in order to change the energy behaviour of the staff working in municipal buildings, adopt a monitoring system for energy consumption and achieve energy and financial savings.

- **EMPOWERING** This project tool was presented as Knowledge transfer, Lessons learned and provision of tools and information that supports municipal staff.

- **Covenant capaCITY SEAP training tool.** We registered to the platform as trainers to gain wider knowledge and guidelines to help municipality and region in achieving the SEAP completion.

**Main lessons:**

- There is a strong need of awareness raising and of training of elected people and technicians.

- The turnover of elected people is a real problem for the decision-making process.

- When good practice and tools are identified and suitable to the needs, it enhances the projects. And finally, a strong political support is a crucial issue for the success of projects.

10) For more information:

   Video: [www.youtube.com/watch?v=VXYA1yQcAE0](http://www.youtube.com/watch?v=VXYA1yQcAE0)

   Contact person/organisation: Ion Dogeanu, AEEP, [ion.dogeanu@managenergy.ro](mailto:ion.dogeanu@managenergy.ro)
2.10 City of Bucharest Sector 4, Romania

1) **Title of the roadmap:** Supporting the improvement of the energy action plan in Bucharest Sector 4

![Bucharest Sector 4 City Hall](image)

2) **Level of the roadmap:** local

3) **Roadmap developed by:** Local Energy Agency Bucharest (AEEPM), Romania

4) **Summary of the roadmap and key impacts:**

The Municipality of Bucharest Sector 4 has been selected for the implementation of the PUBLEnEf roadmap based on the findings of the data collection phase of the project. The project roadmap aims to support the Municipality to develop and adapt the SEAP to the current situation and implement the actions foreseen according to the present priorities and financing opportunities using the PUBLEnEf methodology.

5) **Background, initial context and selection of the roadmap:**

Bucharest Sector 4 is a 320 000 inhabitant community, part of Bucharest Romanian Capital with administrative role of the community shared with the Capital administration.
During the PUBLEnEf project support, Bucharest Sector 4 expressed its interest to join the Covenant of Mayors European Initiative. Inspired by successful actions of the SEAP of Bucharest Sector 1, the political establishment of Bucharest Sector 4 expressed the interest to replicate.

Thousands of Bucharest’s Sector 1 residents have benefitted from a programme to improve the energy efficiency of apartments and public buildings in the Romanian capital. Extensive insulation work has been carried out on 839 residential blocks containing 42,359 apartments in total. The scheme is expected to cut the energy consumption of buildings by about half, help families and local authorities to reduce their energy costs and, in doing so, make a valuable contribution towards Romania’s environmental commitments.

The work involved insulating walls and roofs and installing double glazed windows in the residential blocks, leading them to be upgraded from building energy efficiency class G to class B or A. The renovation work has also improved the overall appearance of buildings and inspired ongoing urban regeneration efforts in the capital. For example, the rehabilitation programme, which has been carried out in one sector of the city, has since been rolled out to four others. The project brought further economic benefits through contracting out construction work to local SMEs.

March 2017: Bucharest Sector 4, supported by AEEPM, approved his first local Energy Action Plan with a focus on private buildings (as a replication of the Thermal Rehabilitation Programme of Bucharest Sector 1). AEEPM energy agency is supporting the authority in the planning, development and monitoring of the energy saving plan.

The main needs of the Municipality as these have been initially identified were:
- lack of training opportunities for Municipal staff in energy sector
- lack of experienced staff in energy efficiency issues
- lack of in-house expertise about financial tools
• lack of time of key stakeholders
• absence of an Energy Efficiency National Fund

6) Roadmap objectives and main targets:

AEEPM works closely with the local authority, acting as a facilitator-interlocutor with all municipality staff and local stakeholders in the delivery of the updated energy plan.

The objectives of the Bucharest Sector 4 energy efficiency action plan are to:
• reduce energy consumption up to 20% until year 2030.
• stand out the local energy potentials, especially by promoting the use of solar thermal and photovoltaic energy.
• improve energy efficiency in public buildings and facilities.
• increase the citizens’ information level regarding energy saving practices, as well as of the national and European regulations on the rational use of energy.
• disseminate its advantages, help to implement renewable energy installations and apply actions to improve energy efficiency in buildings.
• establish systems of experience transfer through the collaboration with other Bucharest Sectors and Energy Agencies, at local, national and international scope.

7) Roadmap development and implementation:

In order to exploit the experience of the PUBLEnEf partners participating in this roadmap, the actions will be oriented to reduce the consumption of city buildings (public and private) incrementing the penetration of renewable energies.

The opportunities and challenges envisaged are the following:
• The Energy Saving Plan is quite successful, and the stakeholders of the whole value chain are identified, well-coordinated and highly committed
• There is the opportunity to undertake actions in public and private buildings sector
• There is great multiplication potential (Sector 2, Sector 6 and Sector 3 of Bucharest try to replicate this energy actions plan)

The ways to implement the roadmap are:
• Capacity building workshops targeted to elected people and capacity building workshops targeted to technicians (people in charge of energy projects in the local authorities as well as people in charge of finance, administration and so on)
• Support to the Bucharest Sector 4 Council with specific meetings to facilitate the construction of the action plan
• Support local communities in developing projects and precisely, on the local common energy strategy and the experimentation of local clusters involving local authorities, companies and institutions (assistance to their creation, to their implementation and finally to the dissemination at the regional scale).
8) Impact of the roadmap and replicability:

Bucharest Sector 4 wants to replicate on large scale the very successful Thermal Insulation Programme on private and public buildings developed by Bucharest Sector 1.

Over 2000 multi-story apartment blocks will be thermally renovated and upgraded from Energy class G to Energy Class B and A (over 371 500 MWh/year energy saving expected). Considering as PUBLEnEf project contribution 1%: primary energy savings 3 715 MWh/year

During the development of the Energy Roadmaps capacity building for municipal staff was the core problem.

Bucharest Sector 4 signed the Covenant of Mayors Energy and Climate initiative on 2018 and integrated PUBLEnEf Energy Roadmap in their action plan. Along the project, we have carried out documents as guidelines, studies and recommendations, general information or documents targeted to our pilot municipalities. There is great multiplication potential (all the others Sector of Bucharest try to replicate Sector 4 energy efficiency actions) – Bucharest Sector 2 and Bucharest Sector 6 start to.

9) Policy lessons and practical recommendations:

During the development and implementation of the Energy Roadmaps, some of the challenges encountered were:

- Changes to the priorities of the elected Municipal representatives
- Lack of time of municipal staff, due to other daily responsibilities and duties.
- The energy data collection and analysis is a time consuming process.
- Lack of national open calls for financing the interventions of interest for the municipality

Main lessons learnt and practical recommendations for other public authorities

- Energy efficiency interventions depend very much on political will of the Municipal Council and the skills of technical staff
- The knowledge and the experience of energy agencies is valuable to provide technical support, platform for exchange of experience and opportunities for networking to Local Authorities
- The financing framework is also crucial, not only the funding from programmes but also market uptake and existence of strong banks to improve the general feeling for investments the core problem.

Project tools and best practices that were particularly helpful to the roadmap were:

- **PUBLEnEf GP21**: Facilitation of energy project investment in local authorities
- **PUBLEnEf GP36**: Installation of renewable energy systems in the public and residential buildings
- **PUBLEnEf GP54**: Marathon 2020 – Community of Bucharest District 1 to be the first energy efficient community in Romania by 2020
• **MuLTEE** - The SMIV platform was presented during the regional workshop
• **Database for consumption of public buildings** - It was promoted to the municipal staff in order to change the energy behaviour of the staff working in municipal buildings, adopt a monitoring system for energy consumption and achieve energy and financial savings.
• **Covenant capaCITY SEAP training tool.** We registered to the platform as trainers to gain wider knowledge and guidelines to help municipality and region in achieving the SEAP completion.

**Main lessons:**
• There is a strong need of awareness raising and of training of elected people and technicians.
• The turnover of elected people is a real problem for the decision-making process.
• When good practice and tools are identified and suitable to the needs, it enhances the projects. And finally, a strong political support is a crucial issue for the success of projects.

10) For more information:
   Video: [www.youtube.com/watch?v=an8KFSmTBaE&t=20s](http://www.youtube.com/watch?v=an8KFSmTBaE&t=20s)
   Contact person/organisation: Ion Dogeanu, AEEP, [ion.dogeanu@managenergy.ro](mailto:ion.dogeanu@managenergy.ro)
3 Regional level roadmaps

3.1 Alicante, Spain

1) **Title of the roadmap:** Supporting the implementation of the Regional Energy Action plan in Alicante

2) **Level of the roadmap:** regional

3) **Roadmap developed by:** Research Centre for Energy, Environment and Technology (CIEMAT), Spain

4) **Summary of the roadmap and key impacts:**

The objective of this roadmap is to support the Energy Agency of the Alicante province in the implementation of a plan for the exploitation of the coastal wind resource using small wind turbines. The development of this plan was considered a Technological Innovation System at the provincial level with potential to be replicated at regional and national level.

During an initial phase we identified the relevant actors and the main barriers and opportunities. In order for this action plan to be carried out, it is necessary that these stakeholders consider this technology as desirable in the face of other possible alternatives. We also analysed the main rules in terms of Directives, laws, plans and regulations as well the relevant technical aspects. The next step was to identify the main critical aspects for each of the relevant actors that could contribute to the legitimization of this action plan and its acceptance by the relevant stakeholders. After the identification of these critical aspects, some actions were proposed to be included in the action plan for the short, medium and long term.

The final document of the action plan can serve as a guideline document that can be used by the Alicante energy agency and the regional government to put in place and ambitious small wind deployment plan. Once implemented in its totality the plant will deliver annually an amount of 42 - 494 MWh of wind electricity that will avoid the emission of 12 – 143 tonnes CO₂ equivalent per year.

5) **Background, initial context and selection of the roadmap:**

Alicante, or Alacant (Valencian), is a province of eastern Spain, in the southern part of the Valencian Community. Alicante ranks as the 5th most populous province in Spain (after Madrid, Barcelona, Valencia and Seville), with 1.85 million inhabitants that represent the 4.1% of the Spanish population. The main industries in Alicante province are intensive
agriculture and vineyards, fishing and some industries such as textile, footwear sector and toys industries but what the province is known for is its massive tourism sector.

Energy intensity in the region is well below the average energy intensity of Spain and with a market decreasing trend. Transport is the sector with the highest energy consumption, followed by the residential, industrial, services and agriculture sectors. The final energy sources most consumed in the province are petroleum products, electricity, natural gas and renewables. From the electricity consumption, the public sector is responsible for a 12% which highlights the responsibility that public administration have when applying measures to reduce energy consumption. After a period of high energy demand growth (6% per year) until the year 2006, energy consumption started to decrease as a consequence of the deep economic crisis suffered by the country and the current energy consumption is below 2002 levels.

Alicante is a net energy importer region only producing 5.8% of its energy consumption and 2.5% of its electricity consumption. Main power generation technologies in the province are combined heat and power (CHP) and photovoltaic (PV) installations. There is no single wind energy farm in the Alicante province.

The province government is very active when it comes to its energy savings targets and commitments. Among its targets (1) there is the intention to adapt the energy products supply prioritizing the real possibilities of exploiting own energy resources. As for the public sector energy targets it is included the increase in the use of renewable energy sources. As a way to attain these objectives, the Province of Alicante is a Territorial Coordinator within the Covenant of Mayors since 2009. The province helps the signatory municipalities within its territory to fulfil their Covenant commitments, in the context of the global economic crisis and budget restrictions. More than 88% of the province’s municipalities have adhered, of which 78% have submitted their Baseline Emissions Inventories (BEIs) and Sustainable Energy Action Plans (SEAPs), making it be among the top five provinces at the European level in terms of number of committed municipalities.

Under the "Provincial Energy Savings Plan" 5 annual calls (since 2010) have been organised in order to finance signatory municipalities’ development of their BEIs and SEAPs, and 3 annual calls (since 2012) to finance the actual implementation of measures defined in these SEAPs. The calls are jointly managed out by the Environmental Office of the Alicante Province and the Provincial Energy Agency, which acts as the technical support structure who helps select approved projects within each Call. The Energy Agency also then supports the municipalities in implementing the projects and monitoring the resulting energy savings for continuous improvement.

The Alicante Energy Agency, which is the main contact for this roadmap, is supporting the provincial authority in the planning, development and monitoring of the "Provincial Energy Savings Plan". Alicante Energy Agency works closely with the provincial authority, acting as a facilitator-interlocutor with all municipalities in the delivery of the plan.
In accordance with the agency objectives and plans, this roadmap objective is to support the Agency in implementing some of the measures for which they are experiencing more problems. The needs assessment performed revealed that the main needs that they have are related to *Insufficient information on energy technologies* and *Lack of in-house expertise about energy technologies*. The agency manifested a great interest in developing the idea of exploiting the coastal wind resource that is very abundant in the region.

In order to exploit the experience of the PUBLEnEf partners participating in this roadmap, the actions have been oriented to implement a plan for small wind installation in the city council buildings of coastal municipalities. Funding opportunities specifically tailored for this plan are to be included in the next call of the Provincial Energy Savings Plan.

6) **Roadmap objectives and main targets:**

The objective of this roadmap is to support the Energy Agency of the Alicante province in the implementation of a plan for the exploitation of the coastal wind resource using small wind turbines.

Small wind turbines have a number of advantages over conventional centralized generation such as attaining CO$_2$ emissions and fossil resources savings, providing a green image of the municipality and reducing the energy bills.

The main target is to install one small power wind turbine in a municipal building of each of the coastal municipalities of the Alicante province. There are 20 such coastal municipalities in the province. All these municipalities are signatories of the Covenant of Mayors and have Sustainable Energy Action Plans (SEAP) with concrete objectives of reducing energy consumption and emissions of greenhouse gases. The implementation of this technology helps reduce the energy bills and achieve the decarbonisation goals.

Additionally, there is a strong local small wind turbine manufacturing industry in the province of Alicante that would be consolidated if this plan is implemented.

Initially, the Plan will apply to municipal facilities, but later on the proposed actions can be extended to residential buildings or agricultural or livestock applications and can be replicated in other coastal provinces of similar characteristics.
7) **Roadmap development and implementation:**

During the first months of 2016, relevant national, regional and local stakeholders were contacted in order to present the project and to identify possible roadmap candidates. In a special workshop held in CIEMAT premises on Dec 17th 2016, first contacts with the Alicante Energy Agency took place and we started discussing possible topics of interest and identifying the needs that were mainly related to their lack of information and in-house expertise about energy technologies and specifically small wind energy.

Once selected the province of Alicante as a possible roadmap recipient, we started the roadmap development. The methodological framework for developing this roadmap is based on the analytical framework of the Technological Innovation System (TIS). A TIS can be defined as "a dynamic network of agents that interact in a specific economic / industrial area under a particular institutional infrastructure and involved in the generation, diffusion and use of technology" (2).

The development of a plan for the installation of small power wind turbines in the coastal municipalities of the province of Alicante was considered as then a Technological Innovation System at the provincial level but with potential to be replicated at regional and national level.

The components or structures of the TIS were three: i) actors, ii) rules and iii) technological factors. In a real system, these components or structures are all linked together. An analysis of these structures gave us an idea of the systemic characteristics (complementarities and conflicts) that constitute the drivers and barriers for the diffusion of technology at a specific time or within a certain period of time.

During an initial phase we identified the relevant actors and the main barriers and opportunities.
In order for this action plan to be carried out, it is necessary that these stakeholders who have been identified consider this technology as desirable in the face of other possible alternatives. Only in this way the demand will be created and the necessary resources can be mobilized. Next we analysed the main rules in terms of Directives, laws, plans and regulations as well the relevant technical aspects. The next step was to identify the main critical aspects for each of the relevant actors that could contribute to the legitimization of this action plan and its acceptance by the relevant stakeholders. After the identification of these critical aspects, some actions were proposed to be included in the action plan for the short, medium and long term.

The initial idea of this action plan was presented to the city mayors of the involved municipalities at the regional workshop held in Alicante in September 20th 2017. A first draft version of the roadmap document was sent to the Alicante Energy Agency in August 2018 to receive their feedback. In January 2019 an in person meeting in Alicante with the Energy Agency is scheduled.

8) Impact of the roadmap and replicability:

The final document of the action plan can serve as a guideline document that can be used by the Alicante energy agency and the regional government to put in place and ambitious small wind deployment plan. The same document can be useful for other coastal provinces or regions as, for example, Valencia or Castellon, although it would need to be adapted to the specific wind resource.
Once implemented in its totality the plant will deliver annually an amount of 42 - 494 MWh of wind electricity that will avoid the emission of 12 - 143 tonnes CO$_2$ equivalent per year.

Initially, the Plan will apply to municipal facilities of Alicante, but later on the proposed actions can be extended to residential buildings or agricultural or livestock applications and can be replicated in other coastal provinces of similar characteristics with a much higher potential impact.

Additionally, there is a strong local small wind turbine manufacturing industry in the province of Alicante that would be consolidated if this plan is implemented with the consequent positive socioeconomic implications.

9) **Policy lessons and practical recommendations:**

The road map counted from the beginning with a great support on the part of the regional authorities. However, the change in the person in charge of the provincial Energy Agency during the roadmap development made it necessary to awaken the interest in the roadmap again and delayed its implementation phase beyond the end of the project.

The TIS framework revealed very useful in the identification of the relevant aspects and in the planning of the actions needed to successfully attain the objectives.

The three main lessons learnt from this roadmap that can serve as practical recommendations for other public authorities are:

- It is important to align the proposed actions with the targets agreed at the regional and national level
- The analysis of the stakeholder’s main barriers and opportunities related to the proposed measure is key and helps identify the necessary steps to succeed in its implementation.

10) **For more information:**

Video: [www.youtube.com/watch?v=IRWZ-R5RISU](http://www.youtube.com/watch?v=IRWZ-R5RISU)

Contact person/organisation: Yolanda Lechón, CIEMAT, yolanda.lechon@ciemat.es

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### 3.2 Upper Austria, Austria

1) **Title of Roadmap:** From strategy to implementation: Upper Austria’s GEP programme

2) **Level of the roadmap:** regional

3) **Roadmap developed by:** OÖ Energiesparverband (ESV), Upper Austria/Austria

4) **Summary of the roadmap and key impacts:**

The roadmap consisted of the development and successful implementation of the 'Gemeinde-Energie-Programm' (GEP). The programme, specifically designed to trigger energy-related investments in Upper Austrian municipalities, was developed following an assessment of needs carried out by the ESV in the context of the PUBLEnEf project and discussions with regional funding bodies. It supports municipalities in preparing concrete investments in line with their local energy actions plans. It is based on the principles of activation, motivation and provision of technical advice. In addition to offering extensive facilitation services, the programme funds the technical and financial planning of energy efficiency and renewable energy investments, information activities supporting project implementation and the optimisation of installations. Approval for financial support is conditional to a mandatory energy advice visit by the ESV. During this visit, energy saving potentials in the municipality are assessed and concrete projects are discussed.

The GEP programme was launched on 1 March 2017. The take-up by municipalities was very positive. At the time of writing (January 2019), GEP programme activities have already supported projects totalling investments of over 6 million Euro.

**GEP impacts so far - key numbers:**

(January 2019)
- Total investments triggered: over 6 million Euro
- Total Primary Energy Savings: over 7.3 GWh/year (over 1,400 t CO₂/year)
- 121 municipalities supported with personalised advice for their concrete projects (28 % of all Upper Austrian municipalities)
- Over 100 on-site visits to municipalities with comprehensive, tailored advice
- 65 projects triggered
- 34 projects already implemented

By helping increase energy-related investments, the GEP programme is positively contributing to the local energy transition in the region of Upper Austria.
5) Background, initial context and selection of the roadmap:

Upper Austria is one of Austria’s 9 regions. It covers a surface of 12,000 m$^2$. It is home to 1.45 million inhabitants living in 440 municipalities, the majority of which are very small.

70% of the population live in (very) small municipalities:
- 13% in municipalities with > 50,000 inhabitants
- 18% in municipalities with 10-50,000 inhabitants
- 33% in municipalities with 3-10,000 inhabitants
- 36% in municipalities with < 3,000 inhabitants

Since the mid-90s, the government of Upper Austria has been committed to the clean energy transition and has prioritised energy efficiency and renewable energy. Today, renewable energy supplies more than 30% of the total energy demand in the region. This was achieved through the region’s comprehensive regional energy action plans. In 2017, building upon the success of its policies to date, Upper Austria adopted a new energy strategy with ambitious energy efficiency and renewable targets called 'Energie-Leitregion OÖ 2050'.

To achieve its goals, Upper Austria has developed policy packages for different target groups known as the "carrots, sticks & tambourines" approach. These consist of financial incentives (mostly investment grants) ("carrots"), legislation to mandate installation obligations ("sticks"), and promotional activities (i.e. energy advice, outreach campaigns, training etc.) ("tambourines").
The ESV, the energy agency of Upper Austria, is a key actor in the energy transition. Among others, it supports the regional government by proposing and implementing programmes as well as providing related services.

Municipalities play a crucial role in furthering the regional energy transition.

**Municipalities - key actors in the energy transition**

- **Why?**
  - Own public buildings and installations
  - First contact point for citizens and local business
  - Authority (e.g., building permits)
  - "lead by example"

- **Support already available:**
  - EGEM programme (development of municipal energy strategies, > 180 municipalities took part)
  - Facilitation services for energy investments
  - Subsidies for EE and RES
  - Information and training for mayors and municipality staff

Based on an assessment of needs carried out by the ESV in the context of the PUBLEnEf project, and following discussion with regional funding bodies, the ‘Gemeinde-Energie-Programm’ (GEP) was developed. This energy programme for municipalities is specifically designed to trigger energy-related investments in Upper Austrian municipalities.

Within a previous programme, 180 municipalities in Upper Austria have adopted energy action plans with clear targets, many of which require investments. There is also a range of funding and financing instruments for these investments, both on regional and national levels. However, there is a "gap" which needs to be closed: many municipalities require support for the detailed planning of these investments as they would go significantly beyond the minimum requirements in energy efficiency and renewable energy sources. Municipalities in Upper Austria are quite small. Due to their limited number of staff, they do...
not have the time resources to specialise in many different fields. Their needs for support relate both to the technical planning of buildings and installations and to the use of innovative financing mechanisms and funding schemes.

The GEP programme was developed in the framework of PUBLEnEf in order to close this gap by supporting the technical and financial planning of energy efficiency and renewable energy investments in municipalities.

6) **Roadmap objectives and main targets:**

The objective of the GEP programme is to support Upper Austrian municipalities in planning and implementing concrete energy-related investments in line with their local energy actions plans. It is based on the principles of activation, motivation and provision of technical advice.

The successful roll-out of the GEP programme focuses on the "carrots & tambourines" pillars of the "carrots, sticks & tambourines" approach that has shown to be very successful in Upper Austria. Relevant target groups are reached through a mix of roll-out activities tailored to their needs. By the end of the PUBLEnEf project (January 2019), the programme aimed for 50 personal visits to municipalities and over 100 face-to-face contacts with municipalities through various GEP activities (information events, trainings, workshops, etc).

7) **Roadmap development and implementation:**

The regional government recognises that municipalities are key actors in achieving the objectives of Upper Austria’s energy strategy. There was an interest in supporting them with targeted measures that would enhance the success of an earlier programme for municipalities (the EGEM programme), in the context of which over 180 municipalities adopted local energy action plans.

An assessment of needs was carried out by the ESV in the context of the PUBLEnEf project. Among others, the results highlighted how the large number and small size of Upper Austrian municipalities is simultaneously a weakness and strength for the implementation of energy efficiency policy. On the one hand, small municipalities tend to lack the capacities and resources (i.e. time, financial) to design and implement energy-related projects. On the other hand, they often benefit from the "power of community" (i.e. energy groups, school groups, fire-brigades, active farmers) and short decision making routes. As a result, committed individual staff members and well-targeted facilitation services can more easily have a big impact.

Based on this assessment of needs, and following discussion with regional funding bodies, the GEP programme was developed and launched on 1 March 2017.
It finances:
- planning costs for investments in energy efficiency and renewable energy in public buildings and installations (max. 10,000 Euro),
- information activities supporting the implementation of these projects (max. 2,000 Euro),
- the optimisation of installations (i.e. control system, pumps, LEDs) (max. 3,000 Euro)

In addition to financial support, extensive facilitation services are a central element of the GEP programme. Each municipality’s participation in the programme (approval for funding) is conditional to an obligatory energy advice visit by the ESV. During these visits, energy saving potentials in the municipalities are assessed and concrete projects are discussed.

The programme is available to all 440 municipalities in Upper Austria. All municipalities were proactively contacted and solicited according to a structured roll-out scheme aiming to maximise the number of participating municipalities. In the conceptualisation of the scheme, the ESV carried-out a segmentation analysis of Upper Austrian municipalities. A number of aspects were considered such as the size of the municipalities, whether they have already adopted a local energy action plan, their participation in previous support programmes and events organised by the ESV as well as their overall level of involvement in clean energy transition. In addition to reaching out to all municipalities in the region, specific efforts were put into targeting municipalities that have been less active in the implementation of energy-related projects. Other relevant stakeholders (i.e. technology providers, financing bodies, ESCOs, energy consultants and planners, relevant associations and networks) were also targeted.

Among others, roll-out measures include:
- information to all Upper Austrian municipalities and other relevant stakeholders
- personal contacts: site visits, tailored advice on-site by an energy consultant
- information events
- interactive workshops with leading municipalities
- information folders (about the programme and possible measures, subsidies, etc)
- website, social media, newsletters

The programme was initially launched with a limited duration (around 1.5 years). As the programme was so well received by municipalities and had substantial positive impact, it was extended by the regional government to the end of 2019.

8) Impact of the roadmap and replicability:

Municipalities’ response to the programme was very positive. Between its launch on 1 March 2017 and January 2019, GEP programme activities supported projects totalling investments of more than 6 million Euro (65 projects triggered, 34 already implemented). 121 municipalities (28 % of all Upper Austrian municipalities) received comprehensive, personalised advice from the ESV. More than 100 on-site visits to municipalities were
carried-out by the ESV team. This is more than double the target set at the starting of the roadmap. Even more municipalities and many relevant stakeholders were reached through the range of roll-out measures employed.

**GEP impacts so far - key numbers:**
(January 2019)
- Total investments triggered: over 6 million Euro
- Total Primary Energy Savings: over 7.3 GWh/year (over 1,400 t CO₂/year)
- 121 municipalities supported with personalised advice for their concrete projects (28 % of all Upper Austrian municipalities)
- Over 100 on-site visits to municipalities with comprehensive, tailored advice
- 65 projects triggered
- 34 projects already implemented

By helping increase energy-related investments, the GEP programme is positively contributing to the local energy transition in the region of Upper Austria. The programme was initially launched with a limited duration (around 1.5 years). Since it was so well received and showed to have significant positive impact, it was extended by the regional government and will run until at least the end of 2019.

Similar programmes could also be implemented in other regions of Austria or even at national or EU levels provided that the required funds and human resources are available. Communication channels and platforms (i.e. the CoM network via FEDARENE) have permitted to increase the visibility of the programme and could potentially lead to replications in other European regions.

9) **Policy lessons and practical recommendations:**

"**Carrot, sticks & tambourines**"
- The "carrot, sticks & tambourines" approach to energy efficiency policy has shown to be very effective in Upper Austria. Based on this experience, the GEP programme and its roll-out were intentionally developed with a focus on the "carrots & tambourines" pillars, known to be a synergetic combination in the region.

**Effective roll-out is key**
- Effective roll-out measures are key to the programme’s impact as they assure the link between the energy goals of the regional government, the financial resources made available and the implementation of concrete projects in the municipalities. Target groups were reached through a mix of activities tailored to their needs. The most important were personal visits to municipalities to discuss their specific measures on-site, providing advice for their investment projects as well as information events and workshops. Specifically targeting municipalities that have shown to be less active in implementing energy-related projects permitted to "activate" these municipalities. This
increases the contribution of the GEP programme on the region’s energy transition by ensuring its uptake throughout the entire region.

No "one-fits-all" financing solution
- In Upper Austria, we have seen many benefits in using a variety of financing models. There is no one-fits-all solution. Flexibility permits adapting to specific economic and social contexts of each municipality and project. It enables developing the best business model for each project. The approach adopted by the GEP programme is to support municipalities in finding the solution that is best for them. An advantage of this is that GEP can trigger small and large projects alike.

Case studies work best
- Municipalities in Upper Austria are quite small. Due to their limited number of staff, they do not have the time resources to specialise in many different fields such as keeping up-to-date on innovative financing mechanisms and funding schemes. Therefore, case studies offering concise, concrete information on how projects can be financed and implemented are very helpful. To support the roll-out and up-take of the GEP programme, a series of case studies were developed under the form of an attractive and easy to read brochure. The brochure is targeted to municipalities and presents financing options, the subsidy programmes available to municipalities in Upper Austria and 25 case studies of implemented projects in the region. It was distributed to all municipalities in printed and electronic form and was very well received.

10) For more information:
   Video: [www.youtube.com/watch?v=WUvS4wS4gpM](http://www.youtube.com/watch?v=WUvS4wS4gpM)
   Contact person/organisation: OÖ Energiesparverband, office@esv.or.at
3.3 Tipperary, Ireland

1) Title of the roadmap: TEA Energy Efficiency Policy Roadmap

2) Level of the roadmap: regional and national

3) Roadmap developed by: Tipperary Energy Agency (TEA), Ireland

4) Summary of the roadmap and key impacts:

TEA developed a regional roadmap in the Tipperary region of Ireland oriented at overcoming barriers and facilitating progress on the national and local public lighting strategy, improving knowledge and information and implementing demonstrated solutions. The objective of this Roadmap was to facilitate progress on the national public lighting (PL) strategy through engagement with key stakeholders, preparation of national strategy position papers, expansion of knowledge on both technical and financial instruments to assist national strategy, bringing together the full community of stakeholders at national level to communicate strategic requirements and identifying key action points to be addressed. Alongside overcoming the local barriers to implementation this roadmap also actively engaged with the local authority to make step change progress towards implementation, presenting technical and financial solutions to the identified barriers, engaged with best practice experts in this field from across EU to replicate existing good practices, facilitated specific trial retrofitting projects within the local authority as a demonstration of opportunities and prepared a strategy to address the Public Lighting solutions for Tipperary County Council to 2020 and beyond.

5) Background, initial context and selection of the roadmap:

Arising from the Local Needs Assessment of Tipperary County Council the Strategic Energy Management Plan gives an overarching account of how Tipperary County Council (TCC) will meet the requirements of the National Energy Efficiency Action Plan (NEEAP) and the European Communities (Energy End-Use Efficiency and Energy Services) Regulations 2009.

The following existing constraints were identified towards the implementation of the Strategic Energy Management Plan:

- There was a Lack of legal framework for an energy strategy on a local level. The original disconnection identified between Energy and Climate Change at a local and national level has changed significantly through the approach taken during the PUBLEnEf project in bringing the stakeholders together (Sustainable Tipp steering committee formed), which helped bridge this gap.
- We identified at the outset that Legislation was required with regard to Public Lighting Retrofitting to force LED only options. However, during the project, it became clear that
many manufacturers were phasing out most Non-LED lighting and it is now the standard lighting choice.

- From an information and training perspective TCC identified the need for training sessions & model contracts, information on relevant national & EU funding streams, and they identified that best practice sessions from Ireland and abroad to upskill would be useful. Following this, a number of sessions were had, including the Best practice seminar hosted by PUBLEnEf with the Croatian NEWLIGHT ELENA presentation and the local sustainable Tipp steering committee attended a number of workshops.

- Budget constraints were identified specifically: A significant funding deficit to deliver the whole action programme was highlighted. In particular extensive investment in the public lighting network is needed and local authorities only have enough internal resources to complete very small upgrade schemes per annum. A solution is required to financing a total LED retrofit programme for the whole county of Tipperary (~12,000 lights). Initially a process of ringfencing revenue savings arising from upgrades and energy cost reductions during the project have been used for additional investment increasing up to 800,000 Euro in 2018. Additional finance is proposed to be made available at a national level in Q4 2019.

- National EPC model contracts are hugely complex, have not delivered any proven solutions to date in Ireland in the public lighting area. While a number of workshops have been held, the Local and national PL management have continued to steer clear of EPC projects for lighting.

- At national level the drive towards finding a solution to the public lighting problem was lacking at the beginning of the project, with every local region is left to solve this themselves. Independent to, but also along with the PUBLEnEf process there have been some recent actions to support this transition. Progress has been slow. Issues with regard to the national electricity network and public lighting were outstanding for > 5 years before the project started. As part of the national PL project, which PUBLEnEf supported some events and workshops, the barriers have been overcome allowing progress to continue.

- There was and continues to be a need for training of the elected representatives regarding energy efficiency issues – whilst it is recognised that they are generally well informed there is always a need to improve and build on existing knowledge base.

- The primary needs identified in the Tipperary locality are a solution to the public lighting retrofit proposal. TCC were keen to start this process completed a detailed public lighting inventory assessment. TCC needed to find a solution to the financing of a county wide retrofit programme. Initially, ringfenced revenue savings has supported some investment, with TCC planning to retrofit the remainder within the national PL renovation project. The National PL project learned from other EU countries who have successfully implemented a similar programme.

The following steps were implemented to address the specific needs identified above:

- The PUBLEnEf project prepared Public Lighting Strategy (detailing the local context, baseline inventory assessment, current programme of works, funding programme and develop a business case).
• The PUBLENef project engaged with the national public lighting project and hosted a number of events.
• PUBLENef identified the barriers and opportunities in the specific national, regional or local situation and prepared proposals to address each of them in turn:
  – Technical Barriers
  – Financing Barriers
  – Knowledge/Best Practice Barriers

6) Roadmap objectives and main targets:

There are 5 key objectives which this roadmap aims to address:

**National Public Lighting Strategy**
Following on from SEAI and CCMA reports which identified the barriers to retrofit programmes in 2011-2012 (i.e. Public Lighting in Ireland – Review of Public Lighting Services, and Energy Efficiency & Public Lighting Report – Public Lighting Special Working Group), new national structures were put in place to support progress. The objective of this Roadmap is to facilitate progress on the national public lighting strategy through engagement with key stakeholders, supporting the national project through stakeholder engagement and collaborating with the European experiences via national workshops and stakeholder engagement. In addition, the PUBLENef project also supported the national project in terms of supporting the development of their strategy.

**Local Public Lighting Strategy**
Following on from the Tipperary Strategic Energy Management Plan and the Tipperary Sustainable Energy Action Plan under the Covenant of Mayors, specific actions have been identified to retrofit the public lighting stock of Tipperary County Council. The objective of this roadmap is to overcome the barriers to implementation of these objectives, actively engage with the local authority to make step change progress towards implementation, present technical and financial solutions to the identified barriers, engage with best practice experts in this field from across EU to replicate existing good practices, facilitate specific trial retrofitting projects within the local authority as a demonstration of opportunities and prepare a strategy to address the Public Lighting solutions for Tipperary County Council to 2020 and beyond.

**Address Barriers**
Provide solutions to the current barriers identified to lack of implementation at local and national levels, specifically:

• Training, Skills Competency, Career Opportunities for Public Lighting Designers. The PUBLENef project engaged with the national energy agency and Institute of Professional Lighting to improve training and development opportunities in this area. It hosed a number of workshops and training events.
• Unmetered Supply, Central Management Systems – given the lack of metered public lighting in Ireland there was a requirement for a number of solutions. In general EU best
practice indicates central management systems are appropriate for urban applications but not feasible for rural applications. The National public lighting rollout includes for a number of specific items:

- A completed detailed inventory assessment
- The provision of a data base (currently private) on a public basis.

- **Procurement** – The PUBLEnEf project did not specifically engage on the procurement part of the national project. The Project has tendered for a technical and procurement advisor and they commenced work in late 2018.

- **Lighting Design** – The PUBLEnEf project advised on a number of workshops and technical support to develop a national public lighting technical standard. A number of the specific issues was included as part of the national workshop with input from EU organisations. PUBLEnEf supported and fed into the strategy to develop the design standard. EU best practices examined as part of the project were fed into specific documents/ papers on specific issues (dimming, light colour). The road map recommended that the contract would be design build with a third party to assess each design for adherence to standards. This method has been tested and is now used at a local level as part of the PUBLEnEf project.

- **Total Asset Management** – it was recognised that energy performance alone is not be an appropriate basis for a retrofitting business case and total asset management needed to be considered. This is addressed as part of the national public lighting project with proposed solutions following best practice examples from EU Sources. Managing and integrating the upgrade of the poles, brackets and networks is central to the overall investment plan. The lack of a current condition survey for the Irish public lighting stock was acknowledged as a barrier to process on an asset management approach, and the National retrofit will include a survey as part of its rollout.

- **Financial barriers** currently exist towards large scale retrofitting projects in Ireland, with many local authorities stalled for action due to lack of direction and clarity on potential funding mechanisms. The roadmap proposed ringfencing revenue savings (from upgrades made and from energy/ maintenance savings) in addition to identifying the national funding schemes. In line with other EU countries, The National Public lighting project prepared a cost benefit analysis (which included input from PUBLEnEf and EU best practices (particularly around the ELENA opportunity). This CBA was submitted for review in April 2018 and approved in October 2018.

- **Future Proofing** of new installations is being addressed in terms of both appropriate design requirements for new residential developments and consideration towards Wi-Fi Enabled/Smart Communications/ EV charging through a number of pilots nationally and locally including the Interreg Smart Space project.

**Improve knowledge and information**

There was a clear need for Ireland to learn from best practice case studies across Europe who have successfully overcome the barriers towards large scale public lighting retrofitting. The National PUBLEnEf event which included a number of EU speakers brought together a large number of stakeholders and outlined how other cities and countries completed similar
renovations. This roadmap facilitated the sharing of experiences and learnings through information sharing, events, meetings, workshops etc.

**Implement demonstrated solutions**

In order to prove the theoretical roadmap actually functions to deliver the results required it was tested at local level in Tipperary County Council region. A number of lighting schemes were progressed under the PUBLEnEf project to enhance the design and delivery of lighting projects. This is still continuing within the Sustainable Tipp ELENA project which commenced during the PUBLEnEf project. This was a key part of the Tipperary SEAP and PUBLEnEf roadmap. This ELENA (a small portion is Public lighting) was a direct copy of the EU best practice from Croatia.

7) Roadmap development and implementation:

The development of the roadmap utilised input and inspiration from the NEWLIGHT project, which was submitted as a best practice under PUBLEnEf. It also involved engagement with City of Venlo Holland, Scottish Futures Trust and Streetlight EPC.

The main user and stakeholder groups were identified and engage with as follows:

- **Road Management Office** – are now responsible for the management of the public lighting programme at a national level (since October 2016). To date we have engaged with the RMO through progress updates on PUBLEnEf, sharing of relevant best practices, participating in the Energy Show PUBLEnEf Street lighting workshop on 6th April 2017. Significant further engagements in 2017 and 2018 helped the National PL project proceed including
  - Planning a series of workshops for technical engagement with stakeholders (initially in Summer 2018 but postponed till summer of 2019).
  - Detailed analysis of the consultants workplan for roll out, addition of specific communications work packages.
  - Engage by further information sharing, facilitated discussions at national Public sector energy conferences in 2018 and 2019.
  - Submission of position papers on lighting colour etc.

- **County council representatives** – Extensive and active engagement with the executive team with responsibility for Roads and Public Lighting Tipperary County Council was undertaken throughout the project. Following on from initial discussions we have presented a Public Lighting Strategy to the Local Authority which was accepted. A number of Trial’s have been undertaken throughout the project were completed. A replacement strategy for failed lights with LED is also now in place. A new development lighting standard is now underway.

- We have also received the local authorities support towards a successful ELENA application to assist in the project development costs for large scale public lighting retrofitting in the county. We will continue to engage with the project specifics, addressing the barriers as they arise, ongoing strategy development, upskilling of the relevant staff members in this area (including the facilitation of a specific LED lighting
course, which was completed in May 2017). Approximately 800,000 Euro has been invested locally in 2017 and 2018. The 2019 investment plan is underway also.

- Local and Regional Energy Agencies. During the project we engaged heavily with all local authorities and energy agencies through their participation in the PUBLEnEf Energy Show Street lighting Workshop on 6th April and the national Public Sector energy conferences in January of 2017, 2018 and 2019.

- National authorities - Sustainable Energy Authority of Ireland. We engaged actively with SEAI on the PUBLEnEf project in general since its conception and specifically in the preparation of the Energy Show and national Public sector energy efficiency conferences.

- ESCOs and wider Public Lighting market – We have engaged with the ESCO and supplier market via the PUBLEnEf Energy Show event on the 6th April 2017.

- Funding bodies – we have made an application to ELENA which was successful and will provide technical assistance towards the implementation of this roadmap. We hosted 1:1 meeting with the Roads management offices and the NEWlight project to ensure we supported them to develop their ELENA which is under application.

- European projects identified which offer replication and learning potential include—NEWLIGHT, the City of Venlo, Scottish Futures Trust, and Streetlight EPC on their best practices on this topic over the course of the project.

8) Impact of the roadmap and replicability:

The key impacts of the PUBLEnEf project are as follows:

Local:

- 2018 investment of 800,000 Euro in public lighting investment, focussing on high wattage lighting first.

- ELENA "Sustainable Tipp" PDA underway to support Public Lighting (and other items in Tipperary.

- Pilots planned for smart street-lighting in rural and urban areas with public input (SMART SPACE INTERREG NWE)

- New development lighting standards.

- Number of low wattage pilots underway.

National:

- National Public Lighting renovation programme will assist from 2020

- Appointment of Engineering consultant with specific workshops for development of design standards commenced in late 2018.

- National public lighting application to the national climate action fund (awarded Jan 2019)

This roadmap can be replicated by each of the local authorities in Ireland (no. 31).
9) **Policy lessons and practical recommendations:**

What worked well?
- Identifying a national energy efficiency challenge that had commenced working to solutions allowed PUBLEnEf bring EU best practice added value to support this.
- Relationships existed that allowed PUBLEnEf to become a source of support and guidance to the main project. (without this, it would have been very difficult to form relationships in a timely manner).
- Identification of specific barriers and solutions from EU best practice and supporting the learning of those solutions in the Irish context.

What were the main challenges, how were these overcome, what would you do differently?
- There were no significant challenges other than the challenge to engage with specific people at the right time.

Where certain tools or best practices particularly helpful?
- The Sharing of EU best practices was really helpful, particularly with the wider stakeholders. Having a peer to peer learning from several EU states show casing their projects and how they accessed and maximised the value of EU funding.

3 main lessons learnt and practical recommendations for other public authorities
- National scale projects with a large number of authorities, where there is no direct management is really challenging. In advance of projects like this, key engagement with all stakeholders (no matter how many stakeholders – they all need to be brought along). Regular communications updates need to be done to ensure stakeholders are brought on board.
- EU best practice is really useful. Seminars and workshops are of significant benefit to both project teams and wider stakeholders. Perhaps large projects should have some form of strategic relationships with advisory boards from experts who have completed projects of this nature.
- Learn by doing. Small pilot projects provide useful learnings that can be integrated into larger projects. Too often project groups debate solutions rather than implementing them. Mistakes should be allowed and celebrated.

10) **For more information:**

   Video: [www.youtube.com/watch?v=UyRBITE8ZyQ](http://www.youtube.com/watch?v=UyRBITE8ZyQ)

   Contact person/organisation: Tipperary Energy Agency, Erasmus Smith House, Church St. Cahir, Co. Tipperary, +353 7443090 info@tippenergy.ie Contact person: Paul Kenny
3.4 Ile-de-France, France

1) **Title of the roadmap:** Acting locally for energy efficiency in Ile-de-France region

2) **Level of the roadmap:** regional

3) **Roadmap developed by:** ARENE IdF, France

4) **Summary of the roadmap and key impacts:**

The objective of the roadmap is to improve the implementation of European energy efficiency directive in Ile-de-France Region. The roadmap is targeted to local authorities (from municipalities to Regional Council) and focuses on renovation of public buildings and lighting.

The roadmap supports both the Regional Council in the elaboration of its regional strategy and municipalities through a local pilot experimentation.

It aims at raising knowledge, integrating energy efficiency objectives of the Directive in the regional energy and climate strategy, implementing a pilot project replicable to a large majority of the 1300 cities and identifying success factors and obstacles and proposes recommendations though workshops and study.

Therefore, the Paris Region roadmap is currently implemented through 4 actions: train and inform on the new technical and financial solutions, through capacity building workshops targeted to elected people and capacity building workshops targeted to technicians, active participation to the regional energy efficiency action plan elaborated by Regional Council - with a large participation of stakeholders - to integrate the energy efficiency like a main target and to encourage the energy efficiency projects on the public real estate, support the implementation of a pilot energy project in order to replicate to all the municipalities of the region, and lift the barriers and increase the success factors: an important study based upon many interviews of stakeholders is carried out from the standpoint of the sociology.

5) **Background, initial context and selection of the roadmap:**

Energy consumption in Île-de-France amounts to 225 TWh. The building sector (both residential and tertiary) represents 62% of the consumption, followed by the transport sector (27%).
The energy sources are natural gas, electricity and fuels (30% each). District heating is important (5%) for France. The energy profile of the region illustrates the urban feature of the territory and its economy tended toward tertiary sector activities.

Background and initial context:
Energy policy in France is under State. France has voted in August 2015 the energy transition for green growth Act. This law sets medium and long term goals:

- Reduce greenhouse gas emissions by 40% between 1990 and 2030 and divide by four greenhouse gas emissions between 1990 and 2050 (factor 4);
- Reduce the final energy consumption by 50% in 2050 compared to 2012 with an intermediate target of 20% in 2030;
- Reduce the primary energy consumption of fossil fuels by 30% in 2030 compared to the 2012 reference;
- Increase the production of renewable energies to 23% of final energy consumption in 2020 and 32% of final energy consumption in 2030;
- Reduce the nuclear power in electricity production to 50% by 2025;
- Achieve a level of energy performance ("low energy building" standards) for the entire housing park at 2050;
- Fight against energy poverty.

The Energy Transition for Green growth Act completes different energy and climate French laws in particular Grenelle 1 and Grenelle 2 laws voted in 2009 and 2010.

Local authorities have a new leadership role in energy issues: the territorial public action modernization act (MAPTAM law) promulgated in January 2014 attributes responsibilities to regions for transport, biodiversity, energy transition and agenda21 issues and to cities for sustainable mobility and air quality issues.

The roadmap will be lead at a regional scale with focus at local levels. This project will have to be linked to:
- The energy air and climate regional plan (SRCAE) of Paris Region
• The implementation of the national Sustainable Building Plan in the region.
• The implementation of the new regional energy and climate strategy voted in July 2018.

**Short summary of the needs:**
The main issues in the applications of European energy efficiency directive, also identified toward the first interviews in the project, are:
• Low or inadequate budgets mostly in local communities, and difficulties to identify and to access to funding or contracting with specific actors
• The lack of time available to be dedicated to these issues, associated with the administrative or social cultural issues and obstacles
• The lack of awareness for elected officials on these issues
• The weak participation and support of technical and financial partners, and more broadly the lack of permanent structures specialised in energy efficiency
• The lack of knowledge and strategy for public real estate (building uses, low energy standard)

The roadmap suited the regional works in progress during the three years: the Regional Council was elaborating a regional energy and climate strategy and one important issue in the territory is the energy refurbishment of buildings. So, we have chosen to work close to the Regional council to help them in the elaboration of the strategy and in the same time to launch a local pilot experimentation that was useful for recommendations. This allowed accelerating the implementation of the energy efficiency directive in the region.

6) **Roadmap objectives and main targets:**

The objective of the roadmap is to improve the implementation of European energy efficiency directive in the Ile-de-France Region through an action targeted to the local stakeholders and an action targeted to the Regional Council. The roadmap is targeted to local authorities and focuses on renovation of public buildings and lighting. It aims at:
• Raising knowledge of elected people and civil servants on energy efficiency through the organisation of events and the elaboration of guidelines
• Integrating energy efficiency objectives of the Directive in the regional energy and climate strategy by an involvement in the elaboration of the regional energy and climate strategy
• Implementing a pilot project replicable to a large majority of the 1300 cities in the region through a joint project of energy renovation of public buildings in 4 municipalities
• Identifying success factors and obstacles and propose recommendations though workshops and study.
7) **Roadmap development and implementation:**

This action plan will be implemented in the following steps:

1. Follow and support the national Sustainable Building Plan in the region and create a synergy with this state actor to amplify the message
2. Present the new technical and financial solutions, to spread good practices and to raise the awareness of elected officials, support structures and local communities
3. Active participation to the new energy policy constructed by Regional Council - construction with a large participation of stakeholders - to integrate the energy efficiency like a principal target and to encourage the energy efficiency projects on the public real estate and the creation of local advisory structures on this topic
4. Support the implementation of a pilot energy project.
   - A project involving four municipalities (Ermont, Eaubonne, St Gratien, Enghien-les-Bains). Objective: definition of a strategy for the management and renovation of public buildings, for the optimisation of consumption, and for the creation of clusters in order to work together to pool tools and / or actions of management / optimisation / renovation.
   - The roadmap will provide support in project management, in finding new funding opportunities, in mobilisation and communication issues and in technical matters.
   - The ways to implement our roadmap are:
     - Capacity building workshops targeted to elected people and capacity building workshops targeted to technicians (people in charge of energy projects in the local authorities as well as people in charge of finance, administration and so on)
     - Support to the Regional Council with specific meetings to facilitate the construction of the regional plan
     - Support local communities in the pilot project and precisely, on the local common energy strategy and the experimentation of local clusters involving local authorities, companies and institutions (assistance to their creation, to their implementation and finally to the dissemination at the regional scale).

**The main users and stakeholders groups** have been identified and mobilised as follows:

Local authorities and representative groups:

- SDESM, SIPPEREc and SIGEIF: the main local authorities "associations" in the Paris region dealing with the distribution of energy. Bilateral and global meetings have been held with those actors.
- Local authorities: We to mobilise them through events, communication and meetings. We have also engaged actively 4 towns in one of our local experimentations (Ermont, Eaubonne, Saint-Gratien, Enghien). We have engaged the executive teams and elected people in order to work together in the implementation of this experimentation.
- ADEME, the national energy and the environment agency and the Ile-de-France Regional Council, National Sustainable Building Plan (department of the Ministry of Building): we have engaged discussions to facilitate the integration and dissemination of energy efficiency measures in regional or national plans.
Companies: GRDF, ENEDIS, ATEE (national association of energy and building companies), Energies Posit’if; GCCP (the HVAC companies federation); Caisse des dépôts: To date, technical or financial actors have been integrated in PUBLEnEf workshops

Associations: Local energy and climate agencies.

Therefore, the Paris Region roadmap is currently implemented through 4 actions:

1. Train and inform on the new technical and financial solutions, to spread good practices and to raise the awareness of elected officials, support structures and local communities. This action is mainly implemented through capacity building workshops targeted to elected people and capacity building workshops targeted to technicians.

2. Active participation to the regional energy efficiency action plan elaborated by Regional Council - currently under construction with a large participation of stakeholders - to integrate the energy efficiency like a main target and to encourage the energy efficiency projects on the public real estate

3. Support the implementation of a pilot energy project in order to replicate to all the municipalities of the region: the first step of this action is a pilot project focussed on 4 municipalities willing to work together on the definition and the implementation of a strategy for the management and renovation of public buildings, for the optimisation of consumption, and for the creation of clusters. To support this action, 12 energy audits of public buildings were undertaken so far as an audit of energy contracts. This will be the basis of the next steps: the elaboration of a collective strategy, the effective creation of a local cluster regarding this strategy and the finding of new funding opportunities.

4. Lift the barriers and increase the success factors: an important study based upon many interviews of stakeholders is carried out from the standpoint of the sociology.

8) Impact of the roadmap and replicability:

The roadmap has been useful for the elaboration of the energy and climate strategy and mainly in the chapters dealing with energy efficiency in buildings. This strategy has been voted in 2018.

Along the project we have carried out documents as guidelines, studies and recommendations, general information or documents targeted to our pilot municipalities. The roadmap also leads to the signature of a charter between the Regional Council and the Sustainable buildings Plan (Ministry of buildings) focussed on renovation of the tertiary buildings.

Replication of the pilot project is a crucial issue of our roadmap. There are more than 1300 municipalities in Paris Region.

The most important replication potential concerns the methodology used in our experimentation to create local energy strategies for public buildings. It can be defined as:

- The creation and animation of clusters involving public actors and companies around the project defined with the municipalities
The support to the municipalities in the definition and implementation of their energy efficiency policies (work at the level of elected representatives in particular)

Co-drafting of the various specifications according to the options selected (wealth management tool, energy pre-diagnosis, audits, creation of a strategy for property management and renovation, purchasing grouping)

Follow-up and support in the actions dissemination

Capitalization for replication of the project

9) Policy lessons and practical recommendations:

What worked well?
The cooperation with local and regional stakeholders, the attendance to the events (workshops and conferences) and the dissemination of the projects deliverables like roadmap, results, events.

Many challenges exist in the Ile-de-France Region:

- Complex structure at local-regional-national level: cross competences, political complexity
- Important turnover of the stakeholders
- Difficult long-term mobilization to guarantee actions over the time

Opportunities in the region are the following:

- Regional and local strategies are created/in progress
- Stakeholders are highly committed
- Funding opportunities exist

Former European projects, PUBLEnEf best practices and tools have been useful for the definition and the implementation of the project. As examples: Infinite Solutions, Citinvest, EPC Streetlighting, Energy efficiency Watch 3. Concerning best practices: Municipality of The Hague The Netherlands): Overall sustainability strategy or Opole Low carbon economy plan for the City of Opole (Poland) were a good basis.

Tools identified in the project like Shared energy advisor, Citergie, Streetlight EPC, OPEPA, Ile-de-France energy bill, PlanETer helped us to define the strategy.

Main lessons:

- There is a strong need of awareness raising and of training of elected people and technicians.
- The turnover of elected people in France is a real problem for the decision-making process.
- When good practice and tools are identified and suitable to the needs, it enhances the projects. And finally, a strong political support is a crucial issue for the success of projects.
10) For more information:

**Video:** [www.youtube.com/watch?v=3KSSyZ-YQYg](http://www.youtube.com/watch?v=3KSSyZ-YQYg)

**Contact person/organisation:** Marie-Laure Falque Masset, Energy and Climate Department / IAU Ile-de-France, marie-laure.falque-masset@iau-idf.fr
4 National level roadmaps

4.1 Croatia

1) Title of the roadmap: System for monitoring, measurement and verification of energy savings Approach & Tool (SMiV)

2) Level of the roadmap: national, with influence on local level governance

3) Roadmap developed by: Institute for European Energy and Climate Policy (IEECP), Croatia

4) Summary of the roadmap and key impacts:

Roadmap topic is the improvement of the planning approach on the national level by introducing unified planning. Main objectives are to improve the dialogue between national, regional and local levels and the quality and results of overall energy efficiency planning. The needs this roadmap will help address respond to several articles of the Energy Efficiency Directive. The most important are to help set EE policy public sector’s strategic goals with defined targets on a national level (Articles 3 and 7 of the EED); help monitor energy efficiency actions of public bodies’ buildings (Article 5 of the EED) and upscale the implementation of EE measures through developing guidelines & handbooks as well as providing support to local administration and organisations, thus building their competencies for EE planning (Article 17 of the EED). Method of roadmap implementation included organisation of training events and workshops with relevant stakeholders in order to develop capacities and improve current EE planning methodology. Based on the feedback from organised events, a new EE planning manual with additional inputs was developed. The overall planning approach improvement was observed through Annual Energy Efficiency Plans which are being submitted by the obligated cities and counties in the Republic of Croatia. Additionally, the public sector, energy service companies, and subsidy providers are all obliged to enter data about their implemented energy efficiency measures. This kind of monitoring is a prerequisite for systematic and consistent bottom-up measurement of savings achieved at the national level.

5) Background, initial context and selection of the roadmap:

For purposes of unified monitoring of the achieved savings, National Energy Efficiency Authority of Croatia, in cooperation with the German Society for International Cooperation - GIZ, developed a System for measurement, monitoring and verification of energy savings (SMiV) into which all planned as well as implemented energy efficiency measures are entered. Powerful institutional capacities and coordination of activities are an important prerequisite for the timely execution of all the obligations defined by EU directives, national
legislation, and NEEAPs. The establishment of a monitoring system, measurement and verification have enabled a continuous performance evaluation of energy efficiency policy regarding the achievement of the set objectives. It is also required, on an annual basis, to redefine the measures in case it is determined that they are not generating the desired savings. SMiV – System for monitoring, measurement and verification Approach & Tool enables the systematic management of the EE policies that provide feedback to the national level. SMiV is based on three-year and annual basis Energy Efficiency Plans which are being submitted by the obligated parties. According to the Energy Efficiency Act (Official Gazette 127/14) for 20 Croatian counties and 17 cities (>35,000 inhabitants) EE planning is obligatory, yet there are parties included on a voluntary basis. In this manner, the local and regional government is encouraged to systematically manage their energy efficiency policies and provide feedback to the national level. Plans are made on a three-year and annual basis. In June 2014, the web application of SMiV system was first put into operation. Energy Efficiency Act also defines SMiV as the national tool for calculation and verification of energy savings on the national, regional and local level. A simplified EE planning approach applied in SMiV is shown in the figure below.

In the context of the Republic of Croatia, Energy Efficiency Plans present a systematic illustration of energy efficiency measures developed in accordance with the Energy Development Strategy of the Republic of Croatia, the National Energy Efficiency Action Plan, the Energy Efficiency Act and the Bylaw on Monitoring, Measurement, and Verification of Energy Savings. Both Action Plan and the Annual Energy Efficiency Plan include energy efficiency measures and list the obligated parties who are responsible for their implementation and are planning to implement them during the duration of the Plan. The main need this roadmap addressed was the necessary implementation of an improved and unified approach to planning on the local, regional and national level. Additionally, roadmap helped in addressing needs that refer to several articles of the EED. The most important are
to help set EE policy public sector’s strategic goals with defined targets on a national level (Articles 3 and 7 of the EED); help monitor energy efficiency actions of public bodies’ buildings (Article 5 of the EED) and upscale the implementation of EE measures through developing guidelines & handbooks as well as providing support to local administration and organisations, thus building their competencies for EE planning (Article 17 of the EED).

6) **Roadmap objectives and main targets:**

Before the start of the roadmap, three main objectives were defined. The first objective was to implement a unified approach to planning on the local, regional and national level, which was to be observed through the improved quality of submitted and future implemented Energy Efficiency Plans. The second objective was to improve the overall EE planning and monitoring approach in Croatia through an increased number of submitted and implemented EE plans of better quality, i.e. increased energy savings arising from obligated parties planning EE measures that they can implement more easily. Additionally, promotion of the increased EE monitoring awareness, capacity building and training related to the use of SMiV monitoring software was also taken into account. The third objective focused on addressing necessary changes on the regulatory level i.e. possible changes of the Croatian Energy Efficiency Act, so it better reflects the above-mentioned objectives and addresses recognized needs. To monitor the implementation impacts, the roadmap baseline was set at 112 Energy Efficiency Action Plans that had already been adopted by the local governments (annual plans and three-year plans from the period 2014-2016) out of which 24 Energy Efficiency Action Plans were entered in the System for monitoring, measurement and verification of energy at the time the roadmap started. Expected results were to be observed in the number of newly submitted plans after the completion of training events as a part of the roadmap activities and the quality of those improved plans. In terms of results, based on the feedback from the participant at these events, a new EE planning manual was to be developed.

7) **Roadmap development and implementation:**

In the first part of roadmap implementation, in order to create dynamics and to activate the stakeholder network, an information letter on planned roadmap activities was sent to all stakeholders. The second part focused on activities related to the organisation of three training events in regional centres of Croatia. Preparations of materials and presentations for those events were used to promote synergy with the WP4 which focused on event and WP2 and WPS whose main objective was to promote best practices and different EE-related tool available worldwide. Prior to the events, EE plans delivered and submitted to the National Energy Efficiency Authority were analysed in order to ensure that key obstacles in the EE planning and implementation of the EE measures are taken into account in event’s agenda.

The method of roadmap implementation and main activities included organisation of regional training events and workshops (Zagreb, Osijek, and Split) with relevant stakeholders
in order to develop capacities and improve current planning methodology. Main user and stakeholder groups include: administrative staff from obligated parties (cities and counties), City Council representatives, local and regional energy agencies, national authorities, etc. As funding and financial aspect were recognized as essential for implanting an improved EE planning approach, representatives from the Croatian Environmental Protection and Energy Efficiency Fund (FZOEU) covered the financial engineering context of the training. Stakeholder engagement was ensured through ongoing cooperation of National Energy Efficiency Authority with representatives from obligated cities and counties. Based on the feedback from the events, a new planning manual "Croatian experience: planning instructions for the developed of annual and energy efficiency action plans" with new insight was developed to help improve the capacities and support public bodies in their EE planning and implementation (see the following figure).

**Key roadmap results – new EE planning manual**

Due to their applicability, training events were used to introduce best practice collection (resulting from WP2), and following the completion of PUBLEnEf toolbox, to present both best practice and tools that address previously recognized roadmap needs. This was also included in the EE planning manual as a final chapter. Best practices and tools were selected with an idea to strengthen the capacities and support public bodies in their EE planning and implementation, to inspire them and to promote cooperation. The best practice examples presented in the manual are grouped into categories based on the needs for improvement related to Croatian existing energy efficiency planning approach, and were tailored specifically for Croatian context and focused on both local and regional levels of EE planning. Best practiced presented addressing needs such as the absence of guidelines & handbooks supporting EE measures development and helping set EE policy public sector’s strategic goals with defined targets on a national level. The EE-related tools focused on capacity building in EE planning by presenting examples of monitoring software used in the other Member States, by introducing guidelines for EE planning and presenting examples of tools related to methods of estimation of energy needs/dynamics.
8) Impact of the roadmap and replicability:

The planning approach improvement was observed through Annual Energy Efficiency Plans which are being submitted by the obligated cities and counties. Key quantitative impacts can be observed through expected savings arising from the implementation of the roadmap. As agreed by the project consortium, for actions/investments which have been influenced directly by the roadmap actions, 1% of the expected saving can be attributed to the PUBLEnEf project. According to this methodology and based on the data available from SMiV, from 19 delivered EE plans during the duration of the project but following the completion of training events (in 2018) the total amount of energy savings expected is 128,6 GWh out of which 1% or 1,28 GWh, can be attributed to the roadmap implemented through PUBLEnEf.

The planning approach and method could be replicated widely in all EU member states. System for monitoring, measurement, and verification of energy savings could be replicated with the necessary modifications of the language, "bottom-up" methodology, and organisational hierarchy. There should be a national institution with technical capabilities for implementing and administrating the system (for example a national EE agency). The estimated timeframe for replication is up to two years. As currently there are 37 obligated parties participating in the EE planning in Croatia, in the national context the EE approach and methodology used could be replicated with future energy savings impacts by other 428 non-obligated cities and municipalities in Croatia. With the training events, capacity building and new EE planning manual, other cities and municipalities are encouraged to use this roadmap results.

9) Policy lessons and practical recommendations:

The main challenges and potential barriers in the implementation of the roadmap mostly relate to the receptiveness of the public administration i.e. the fact that future annual plans might not include all the wanted improvements due to the necessary time for the capacity building activities to take full effect. Also, parallel changes on the regulatory level i.e. the EE Act update were considered to possibly be delayed, which after the completion of roadmap proved correct. Policy lessons resulting from this roadmap show that besides the importance of adequate dialogue between national, regional and local levels in the context of energy efficiency planning, the cooperation across levels is also essential for a functional bottom-up monitoring of energy savings. Additionally, this energy efficiency planning approach, as well as the use of monitoring and verification software, have their practical application related to the implementation of different aspects of the EED. In Croatia, SMiV is an official tool for reporting on the implementation of Article 3, 5 and 7.

Practical recommendations and main lessons would include firstly developing a coherent energy efficiency planning approach; taking into account the local and regional needs and
establishing a constructive dialogue back to the national levels. In this roadmap, this was accomplished through the energy efficiency action plans. Another key aspect is the training and capacity building of the local and regional levels in order to ensure that energy efficiency planning on these levels is of good quality and is aligned with national goals. A third practical recommendation would be to continuously work on establishing a strong stakeholder network. In this roadmap, this was achieved building on the existing contact network of the National Energy Efficiency Authority and all the local and regional actors.

10) For more information:
   Video: www.youtube.com/watch?v=La5ijM_up8Q
   Contact person/organisation: Ministry of Environment and Energy, Radnička cesta 80, 10000 Zagreb, Croatia
4.2 Ireland

The Irish roadmap developed by TEA also includes national level components. The summary of this roadmap is presented in Section 3: Regional roadmap – Summary reports.