Building the Transition to Clean Energy in Small and Rural Communities: Lessons from the LIFE LOCAL GoGREEN Project

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Abstract. Contributing to the ambitious European goal of becoming the first carbon-neutral continent by 2050 requires coordinated efforts across all levels of governance. However, small and rural communities often struggle to keep pace and are disadvantaged by a number of factors including limited access to financial resources, technical expertise, and the use of planning tools such as decision support systems (DSTs), datasets, and geographic information systems (GIS).

This study presents findings from the LIFE22-CET LOCAL GoGREEN project (2024–2026), which supports six small municipalities located in Bulgaria, Croatia, Slovenia, Italy, Germany, and Spain in their clean energy transition. A common methodological framework was co-designed and shared with the municipalities to guide the development of local case study profiles through structured Self-Assessment Reports (SARs).

The SARs provided valuable insights into local energy and climate planning, enabling the identification of key challenges and opportunities. The final comparative analysis revealed a generally fragmented planning framework, a widespread absence of long-term strategic vision, and limited multi-level cooperation. Moreover, the adoption of DSTs, GIS, and structured data analysis in local planning remains minimal.

Despite focusing on a limited number of cases, the study offers relevant considerations for policy-makers and stakeholders aiming to support the energy transition in rural and small communities across Europe in a more inclusive and effective way.

Keywords: Clean energy transition · LIFE LOCAL GoGREEN · Small municipalities · Local energy planning · Key indicators · SECAP

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1 Introduction

Europe aims to become the first carbon-neutral continent by 2050. This ambitious objective is at the heart of the European Green Deal, a comprehensive strategy designed to transform the EU's economy into a sustainable and climate-resilient model. To stay on track, the EU has set interim greenhouse gas (GHG) reduction targets of −40% by 2030 and −90% by 2040, relative to 1990 levels [1].

Meeting these unprecedented challenges will require bold decisions and coordinated action at all levels of governance. In particular, it calls for a radical shift in energy production and consumption, through accelerated deployment of renewable energy, the promotion of energy efficiency measures, and a profound change in consumption patterns.

However, this ambitious roadmap poses significant challenges, especially for small and rural communities, which often face structural and institutional barriers to engaging in the clean energy transition [2]. These communities typically lack the necessary financial resources, technical expertise, and infrastructure [3]. Furthermore, small and rural municipalities are often unfamiliar with the use of decision support tools (DSTs), datasets, and geographic information systems (GIS) in planning processes. All these tools are essential for informed and strategic policy making.

Bridging this gap is essential to ensure that the green transition is both inclusive and effective across Europe [4].

This study aims to contribute to addressing this gap by enhancing the capacity of rural communities to develop and implement policies and strategies that promote sustainability and clean energy. In particular, it presents the results of an analysis carried out within the framework of the European LIFE22-CET LOCAL GoGREEN (LGG) project (https://localgogreen.eu/) on 6 small and rural European municipalities. The LIFE LGG project (2024–2026) supports these communities in their transition to clean energy by providing knowledge, tools, and strategic guidance [5].

This paper focuses on the methodological framework specifically developed within the project to support municipalities in developing their case study profiles based on a common template of a Self-Assessment Report (SAR). It also provides insights into the current situation of small and rural municipalities from a variety of perspectives, highlighting the challenges and opportunities they face in the transition to clean energy.

2 Methodological Framework

To describe the state of play of the pilot cities on energy and climate issues, a common methodological framework was developed to support the pilot municipalities in increasing knowledge and awareness of current and future local energy and waste management systems and related climate and environmental impacts.

This common framework consisted of a Word template developed ad hoc on the basis of the LGG objectives, shared with the partners and refined according to their input. Once finalized, this template was distributed to the 6 pilot municipalities, together with detailed instructions on how to fill it in. It served as the basis for completing a Self-Assessment Report (SAR), defining the initial case study profile, which was extremely useful for all subsequent project activities.

As shown in Fig. 1, the SAR template consisted of six main sections, completed by final conclusions, references and optional annexes. First, an introduction describing and justifying the choice of three priority areas on which all the cities' activities will focus throughout the LGG project. These were selected from the following 5 common priority areas individuate within the project as being of strategic importance for the realization of the clean energy transition:

1. Sustainable transportation and e-mobility (TRA)
2. Energy efficiency of buildings (EEB)
3. Expansion of renewable energy generation (RES)
4. Land use planning for increased carbon absorption (LUC)
5. Waste-to-energy (WTE)

Second, a section focused on the multi-level governance system in each country, in order to present the overall context and drivers of policies and strategies at the municipal level. Third, a focus on the pilot municipality, in terms of general description (geography, climate, demographic and socio-economic data) and in terms of commitments made on climate change mitigation and adaptation issues. This section also focused on the management structures in place in the municipality to plan, implement and monitor the strategies and actions, and on the use of data and decision support tools in current planning practices. A fourth section aimed to describe urban planning instruments as well as current and future climate change mitigation (and adaptation) plans, strategies and actions. To provide a more comprehensive overview of the municipality's activities, initiatives and networking with other cities, a list of current and past national and international projects of possible interest to the LGG objectives was also requested. The fifth section aimed to characterise the three selected priority areas in terms of infrastructure, describing both their current state and the planned new infrastructures. A reflection on the most pressing critical issues, but also on the opportunities for the pilot city to implement actions and measures in each of the selected priority areas, concludes the main part of the SAR document.

Once the pilot cities had developed a draft version of their case study profile based on the common SAR, these documents were reviewed internally in order to improve the



Fig. 1. Structure of the SAR template

quality of the study, but more importantly to assist the cities in completing the missing data and information and to help them with the most complex sections.

Despite this, considerable difficulties were encountered by cities in compiling their case study profiles as will be highlighted in the following section on results.

3 Critical Review of the SARs Contents

The SARs were compiled by each municipality and the level of completeness of the data submitted in each section is shown in Fig. 2. Generally, all sections were fullfilled, although section II and VI did not address all parts completely. The detailed contents of each SAR section will be analysed in the following paragraphs.



Fig. 2. Completeness of SAR sections

I. *Section 1: Introduction*
In Fig. 3 the selection of the 3 (out of 5) priority areas is shown by each municipality. Regarding the choice of each pilot, three main results emerged: i) a preponderance of the Transport – TRA, Energy Efficiency of Buildings – EEB and Residential – RES priority areas in the case studies demonstrating or showing a "traditional" approach to the selection of sectors closely related to energy; (ii) a reluctance to plan mitigation actions not strictly related to energy or transport, such as the land use and agriculture sector (only one municipality selected the LUC sector); and (iii) a total lack of interest in the waste-to-energy sector, although energy production from waste is increasing at European level and has reached 6.3% according to EUROSTAT data [6].

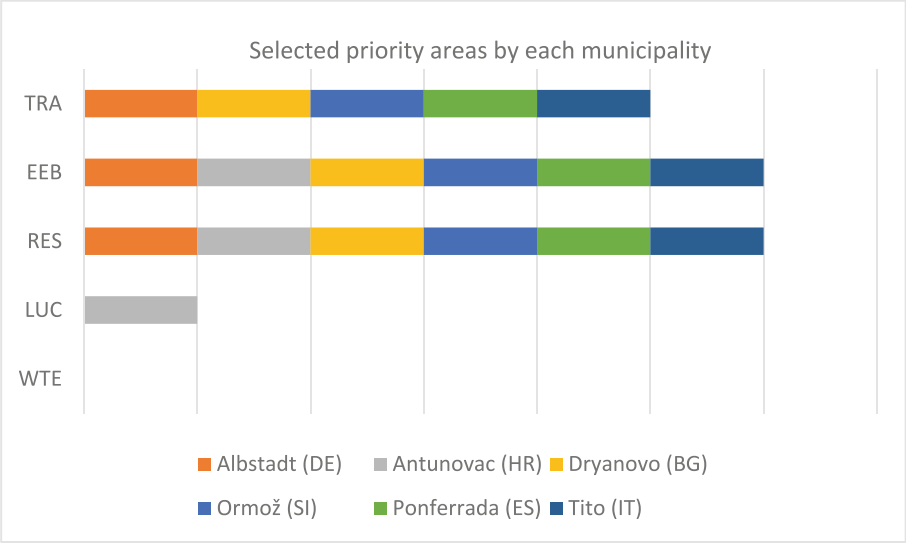

Fig. 3. Selected priority areas by each municipality. The acronyms in the legend are the following: Sustainable transportation and e-mobility (TRA), Energy efficiency of buildings (EEB), Expansion of renewable energy generation (RES), Land use planning for increased carbon absorption (LUC), Waste-to-energy (WTE)

In terms of actions envisaged for aech priority area (Fig. 4) the EEB sector is the first with a total of 30 actions, while TRA and RES sectors have an average of 3 actions declared per municipality. Among the municipalities, Albstadt has the highest overall number of actions planned. However, looking at the status implementation submitted by each municipality, most of the actions are in place and a small number of them could benefit from the support and implementation of the LGG project activities.

II. *Section 2: Multi-Level Governance System*
All municipalities have completed the multi-level governance section; however, its concept is generally lacking/misunderstood. Indeed, all municipalities have only detailed their legislative framework related to each priority area. Only Ormož municipality has specific energy and climate legislation at municipal level, while the other municipalities refer to a broader energy and climate legislation implemented at regional/national level. It is worth noting that, in all cases except for Ormož, national and subnational authorities are key players in driving energy and climate local policies.

III. *Section 3: The Pilot Municipality*
In terms of commitment to mitigation and adaptation, the entire totality of municipalities has made a commitment to mitigation and is fully aligned with the LGG project pillars.

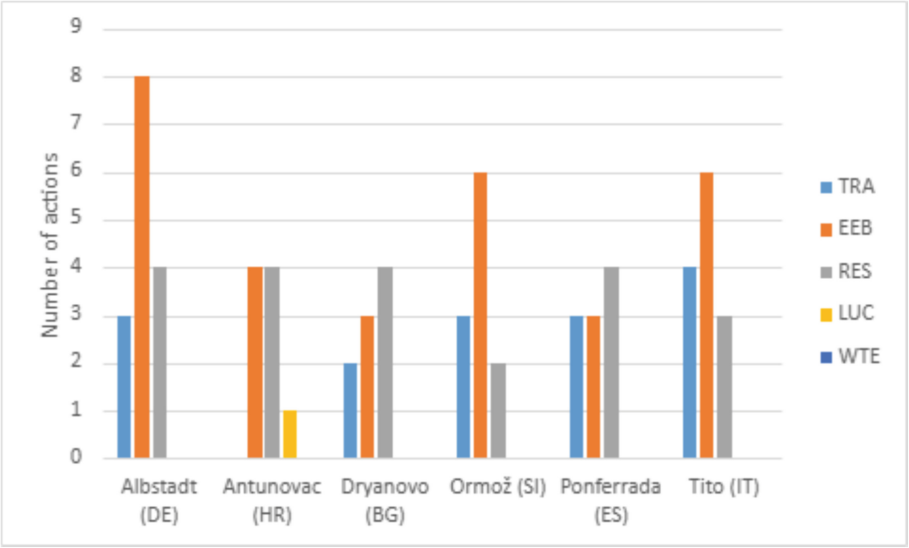

Fig. 4. Number of actions per priority area envisaged. The acronyms in the legend are the following: Sustainable transportation and e-mobility (TRA), Energy efficiency of buildings (EEB), Expansion of renewable energy generation (RES), Land use planning for increased carbon absorption (LUC), Waste-to-energy (WTE)

Specifically, 4 out of 6 municipalities have also declared an adaptation commitment, but for 2 municipalities (Ponferrada and Ormož) this commitment was not linked to a legislative framework but to a voluntary membership of the Global Covenant of Mayors for Climate and Energy initiative.

In terms of coordination and organisational structures, it is important to note that all municipalities have an energy and environmental office, and in some cases (e.g. Albstadt) an urban planning office, including a climate and energy manager, is being set up.

However, when it comes to the use of Decision Support Tools and datasets, only half of the municipalities addressed this aspect in detail. This highlights a general lack of awareness about the value of tools and datasets in supporting a comprehensive design of effective climate actions.

IV. *Section 4: Plans, strategies and actions*

In this section of the SAR, pilot cities were first asked to articulate their vision statement. Of the 6 pilot cities, only 3 have defined a clear vision for the future, among these, Albstadt has a holistic municipal vision (which includes improving the quality of life for citizens), while Ormož and Dryanovo define their vision in the context of developing a plan (the SECAP and the Integrated Development Plan of the Municipality of Dryanovo, respectively). A vision could establish a comprehensive and holistic framework of the impacts and effectiveness of the actions/projects planned. Moreover, it can also be represented by objectives or outcomes that lead to the achievement of the goals expected. This boost for the implementation of the

actions is clearly stated in three SARs while the others did not respond either because of a lack of it or because they are aware of it.

In terms of plans and strategies, the 6 pilot cities introduced a total of 18 documents. More detailed information on the current planning situation in the LGG pilot cities is provided in Sect. 3.

V. S*ection 5: Existing Infrastructures*
This section described the current state of the infrastructure in each municipality according to the selected priority areas. Existing infrastructure includes, for example, the sustainable transport infrastructure sector, the private/public and commercial building stock (condition, estimated consumption, type of energy sources) or the types of energy efficiency technologies installed, estimated energy savings/revenues.

Obviously, the highest share of actions related to existing infrastructure among municipalities was directed to the EEB sector. However, it is worth noting the detailed description of Albstadt's transport infrastructure, especially for public transport; the Antunovac's current practices on land use planning to increase the green belt area, as well as the established policy to minimize urban/suburban sprawl and the design of additional green zones in urban areas.

VI. *Section 6: Challenges and opportunities*
all municipalities highlighted in this section their drivers and barriers in implementing the actions planned in their priority areas towards the clean energy transition. Most of them provided a direct comparison between challenges and opportunities while Albstadt municipality carried out a SWOT analysis to give an overview of all challenges and opportunities, but also weaknesses and threads. In this perspective, the SWOT analysis can support municipalities in identifying better solutions in designing/improving their actions within the priority areas [7–9].

4 Discussions and Conclusions

The transition to clean energy and carbon neutrality is an ambitious but necessary goal for all European cities. It will help make Europe the world's first carbon-neutral continent, as set out in the EU Green Deal and committed to in the EU Climate Change Law. This strong will of the European Union comes up against strong operational difficulties, especially among small and rural municipalities, for which the lack of dedicated and highly experienced staff, as well as limited economic resources, are common problems. Supporting these municipalities on this challenging transition path is one of the main objectives of the LIFE Local GoGreen project, which recognizes the need to have to base future visions, policies and strategies on solid roots provided by a thorough and holistic knowledge of the local reference system.

The study focuses on the joint efforts made to establish this baseline scenario, on which medium- to long-term transition scenarios are built for each of the six pilot cities. The study reports and critically compares the experience gained in designing, transferring and applying a common methodological framework to enable cities to develop their case study profiles. This framework, based on a Self-Assessment Report (SAR), was shared with the cities in the design phase, transferred to them, completed with section-by-section guidelines, filled in by each city, reviewed internally and then finalized by each city, taking into account the suggested improvements and additional clarifications.

A critical comparison of the six SARs obtained at the end of this process, allowed to highlight the light and dark sides of a comprehensive approach to energy and climate issues in small and rural towns. First, in most cases the planning framework is very fragmented and seems to lack a common long-term vision. Second, the effectiveness of multi-level cooperation still seems to be limited. Third, the use of decision support tools (DST), GIS and data sets in common planning practices is also quite limited.

Although limited to only six municipalities in different European countries, these findings could be of relevant interest to policy planners and decision-makers at all levels of government in assessing the actual state of the art in many municipalities across Europe and in outlining effective support to make their ambitions for a clean energy and carbon neutral pathway a reality.

The next steps of the LIFE Local GoGreen project are aimed at carrying out a GAP analysis to identify the barriers to the implementation of energy transition measures and to provide practical recommendations for the design of policy interventions in each of the priority areas selected by the pilot municipalities.

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