Energy transition frameworks in the four target areas

CITIZENS4PED

Deliverable No.	5.1
Deliverable Name	Report on energy transition frameworks in the four target areas
Version	2.0
Release date	31/10/2024
Dissemination level	
Status	Final
Work Package Leaders	Alessandro Bonifazi and Laura Grassini (Polytechnic University of Bari)
Authors	Alessandro Bonifazi, Marco Degaetano, Dario Esposito, Laura Grassini (Polytechnic University of Bari); Alessandra Ricciardelli (Comune di Bari); Martine Mvengou (Bruxelles Environment); Julia Jesella and Gernot Tschertau (Realitylab) ; Gerhard Hofer (e7 energy innovation & engineering) ; Svitlana Alyokhina (FH Technikum Wien).

Document history:

Version	Date of issue	Content and changes	Edited by
1.0	31/10/2024	First version	Alessandro Bonifazi, Marco Degaetano, Laura Grassini and Alessandra Ricciardelli
2.0	31/10/2025	Second version	Laura Grassini

Peer reviewed by:

Partner	Reviewer
FHTW	Svitlana Alyokhina

Table of contents

List of Figures

List of Tables

Executive summary

This Report summarizes the activities conducted under Work Package 5 (WP5) of the Citizens4PED project, which aims to foster the development of Positive Energy Districts (PEDs) in four pilot neighborhoods in Bari, Brussels, and Vienna. The Citizens4PED project seeks to develop PED transition pathways by integrating technological, socio-cultural, and institutional/regulatory dimensions. Central to the project is the promotion of just energy transitions through the engagement of local communities and stakeholders through living labs and participatory action plans.

WP5 focuses on identifying mechanisms that enable or hinder the development of PEDs. Specifically, it examines how regulatory and policy frameworks, as well as stakeholder dynamics, influence the planning and implementation of PEDs. The ultimate goal is to design tools and frameworks that can guide just energy transitions at the neighborhood scale and how they can be linked with city-wide strategies and planning. The four pilot areas include challenging features for PED development and just energy transitions. They are:

- **San Paolo (Bari)**: A public housing neighbourhood facing physical decay and socio-economic marginalization.
- **La Roue (Brussels)**: A garden city with heritage buildings under protection and a large number of social housing.
- **Usquare (Brussels)**: Former barracks being transformed into a mixed-use campus.
- **Kahlenbergerdorf (Vienna)**: A diverse area with heritage buildings under protection and mixed ownership structure.

The work performed under WP5 includes two main components:

Regulatory and Policy Analysis: This component encompasses the examination of the policy frameworks impacting PED development, such as regulations on renewable energy communities, energy performance of buildings and urban regeneration strategies. Key findings are synthesized into a PED Policy Canvas for each city, outlining the opportunities and constraints of the regulatory and policy environment.

Stakeholder Analysis: This component includes the evaluation of the roles, relationships, and influences of various stakeholders involved in PED development. Working with participatory methodologies, it highlights power dynamics, motivations, and potential for collaboration. A PED Community Map is created for each target neighbourhood to support local network-building.

By integrating insights from policy and stakeholder analyses, an Enabling Framework is then developed to guide PED action plans. This framework focuses on four core processes: transforming energy demand, promoting community-led initiatives, fostering innovation in energy systems, and supporting place-based ecological transitions.

The findings will inform future project activities, including detailed action plans for just energy transition and PED development in the four pilot neighbourhoods, and contribute to creating guidelines for promoting innovative and inclusive practices for PED transition in other cities.

Introduction

Citizens4PED has been funded under the JPI-Urban Europe Call 2021 for Positive Energy Districts and Neighbourhoods for Climate Neutrality. The project aims to contribute to the development of PEDs in four existing neighbourhoods in Belgium, Austria, and Italy by integrating several dimensions: techno-energetic, socio-cultural, and institutional/regulatory. It adopts a holistic approach, including sufficiency as a core dimension to achieve zero-emission cities alongside efficiency, production, and flexibility. It envisages the development of living labs to facilitate co-creation of PED action plans by a wide range of actors in each neighbourhood and foresees the involvement of users and stakeholders at all stages of the PED development (planning, implementation, and operation) as a key success factor in a long-term perspective.

Citizens4PED specifically explores synergies with renewable energy communities as key enabling mechanisms for just transitions. Equity stands out as an implication of transitions, as not only is energy poverty unevenly distributed across the EU – both socially and spatially – but transition policies may unexpectedly create further inequalities, including shifting the financial burden to low-income and low adaptive capacity groups and areas. Thus, the four target areas of the project include challenging contexts for just transitions, such as social housing estates, while the overall research design aims to increase knowledge about what processes can promote just transitions in positive energy districts in very different urban contexts.

To ensure replicability of good practices, in the last phase of the project specific guidelines and process-based roadmaps for PED planning, design, implementation, and monitoring will be developed through a proposal for a CEN Workshop Agreement (CWA).

Objectives and structure of the report

This report constitutes a core deliverable of Work Package 5 “Institutional/policy analysis and spatial strategy making for just energy & climate transitions”. The WP5 aims at the identification of key enabling and disabling mechanisms for the development of Positive Energy Districts in the four pilot neighbourhoods in Bari, Brussels and Vienna, with specific attention to those related to the policy and regulatory framework, as well as to the institutional and relational dynamics. Those mechanisms may effectively foster or hamper the development of a PED and may be determinant for the integration of PED processes with wider spatial strategy making for just energy & climate transitions at both district and urban/region level.

This report includes the outcomes of the research activities undertaken within task 5.1 “Analysis of institutional, regulatory, policy and relational frameworks influencing PED development in the four target neighbourhoods”, and of Task 5.2 “Analysis of current energy practices in the four target neighbourhoods”.

As for Task 5.1, it has been carried out through two main Activities:

- Activity 5.1.1. Regulatory & Policy Analysis: this activity has dealt with the Regulatory & Policy framework influencing PED development. The results of this activity are summarized in a *PED Policy Canvas* for each partner city (Bari, Brussels and Vienna);
- Activity 5.1.2. Stakeholder Analysis: this activity has dealt with the analysis of the Institutional and Relational framework influencing PED development. The results of this activity are summarized in a *PED Community Map* for the four neighbourhoods in the three partner cities.

There is, nevertheless, a close link between the Community Map and the PED Policy Canvas, as both aim to facilitate the self-organization of local networks with the final aim to foster PED Action planning (which will be done in WP6). Thanks to the combination of inputs from both frameworks, for each selected neighbourhood a PED enabling framework has, thus, been developed.

The following **Fig.1** summarizes the Research design for the activities carried out under Task 5.1. The detailed description of the methodology for the Regulatory and Policy Analysis (Activity 5.1.1) and for the Stakeholder Analysis (Activity 5.1.2) is included in the respective Chapters. The methodology for the reconstruction of the PED Enabling Framework in the three cities is included in concluding Chapter.

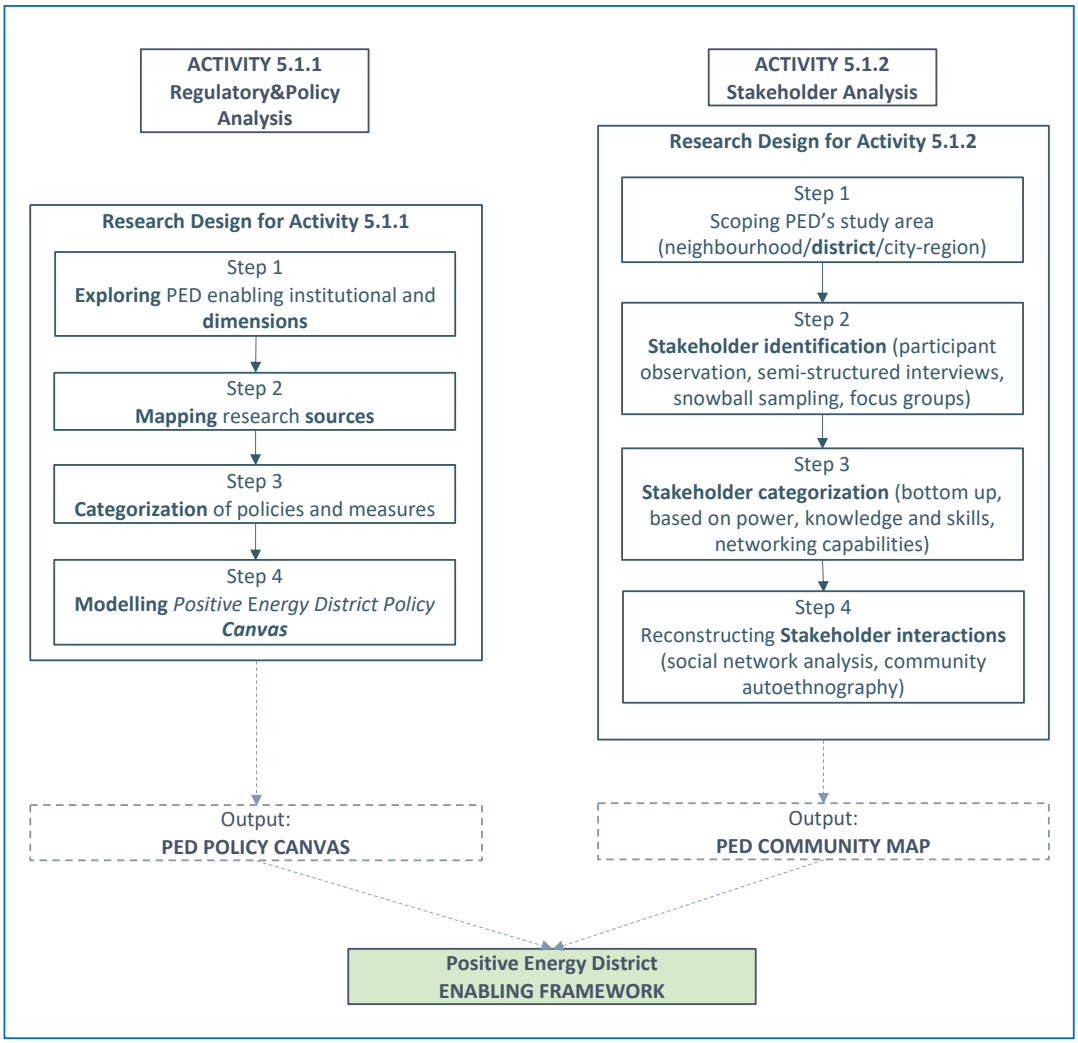


Figure 1. *Research design for Task 5.1.*

As for Task 5.2, it originally envisaged two Activities: an analysis of relevant energy uses and the specific ways they are performed in the target neighbourhoods; the identification of key stakeholders and regulatory/policy mechanisms hampering or enabling PED development. This report encompasses the result of the second activity (identification of key stakeholders and regulatory/policy mechanisms hampering or enabling PED development), which has been performed jointly with Activity 5.1.2.

Overview of the four target areas

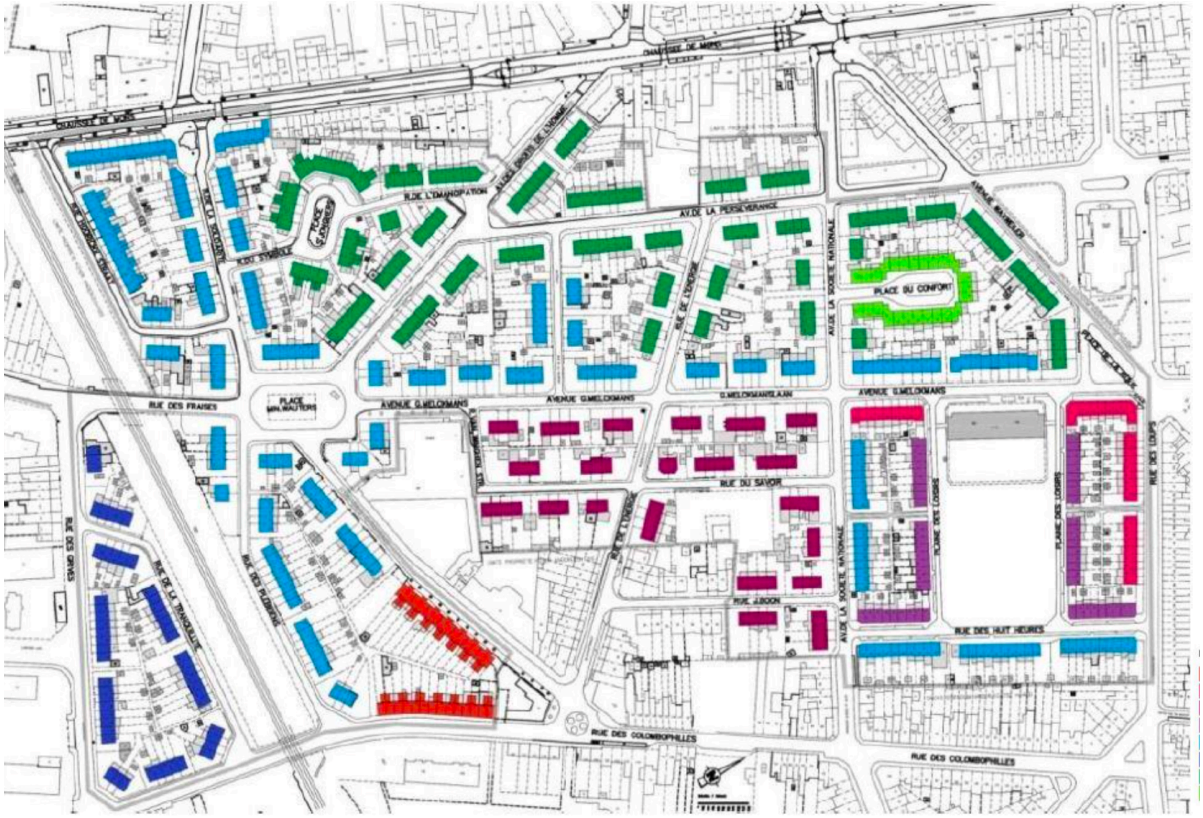
The four neighbourhoods used as case studies by the Citizens4PED project have been selected in very challenging contexts for just transitions. They have ranged from existing neighbourhoods with large social housing settlements and low-income communities, to renovation sites with heritage buildings under protection, to area with mixed use. They encompass one neighbourhood located in Bari, which is the capital city of the Apulia region, Southern Italy; two neighbourhoods in Brussels Capital region, Belgium; one neighbourhood in the district of Vienna, Austria. Whenever the neighbourhood dimensions were too large, only a small area has been selected as target area for the project. Below there is a brief overview of the four neighbourhoods/target areas. Key challenges for PED transitions are outlined for each of them.

San Paolo (Bari)

San Paolo is a neighbourhood of about 30,000 inhabitants in the outskirts of Bari. It is made of public housing and cooperative blocks. It shows a mix of problems resulting from physical degradation, low accessibility, socio-economic marginalization. In the last decade, it has been targeted by several rehabilitation projects, focused on either urban design, slow mobility or cultural revitalization. The target area hosts about 2,000 inhabitants and is made of public housing and a few multi-purposes buildings.

Key challenges for PED transition include the involvement of the low-income community and the link to broader urban strategies for urban regeneration and just energy transitions.

La Roue (Brussels)



The Garden City of La Roue is a neighbourhood situated on the Commune of Anderlecht and consists of around 2000 individual houses, including 40% of social housing.

Within that, the target area for the project includes CERIA (Teaching and research centre for the food and chemical industries) buildings, a local school, crèches and shops.

Inhabitants and social housing companies are already developing activities to retrofit houses, but they are willing to develop a district heating network and install local sources of energy. Key challenges for PED transition faced by this neighbourhood are the inclusion of residential houses within heritage buildings under protection, citizens' ownership of the renewable energy networks and co-financing.

Usquare (Brussels)

Usquare is a block of 4 hectares that in the past was used to be as police barracks. This area with heritage buildings is under renovation to become an open campus for the Universities of ULB and VUB. The campus will have around 20,000 sqm public housing (including 70% social housing), housing units for 600 students, public facilities (such as shops, a park) and a sustainable food court.

Key challenges for PED transition faced by this area are the inclusion of heritage buildings, mixed use, mixed energy sources (including geothermal energy and photovoltaics on most rooftops).

Kahlenbergerdorf (Vienna)

Kahlenbergerdorf was an independent municipality until 1892. Today it is part of the 19th district of Vienna. The area features a diverse blend of heritage-protected buildings, structures from the 1960s to the 1980s, and modern developments. It is home to approximately 500 households, with a mixed property structure that includes private ownership on land managed by neighbouring foundations, as well as municipal buildings providing social housing.

The key challenges of this area include: decarbonisation of heat, together with PV to a smaller extent; historic buildings under protection. Key challenges for PED transition faced by this neighbourhood are the inclusion of residential houses within heritage buildings, citizens' ownership of the renewable energy networks, co-financing.

Regulatory and policy analysis

Methodology

The Regulatory and Policy analysis aims to summarise the main constraints to, and opportunities for, PED development deriving from the regulatory&policy framework relevant to each target area as reconstructed mainly through a policy mapping exercise (Steps 1-3 in Activity 5.1.1). The activity is ultimately meant to help local stakeholders crossing the relevant regulatory&policy framework when embarking on PED development processes, as a key component (together with the Stakeholder Analysis, Activity 5.1.2) of the overall PED Enabling Framework. This analysis does not aim to be comprehensive but rather to provide an overview of the background of rules, conditions and guidelines within which PEDs are supposed to develop.

Four policy domains have been selected as the most relevant for PED development. They are as set below:

1. **Renewable energy communities**
   Renewable energy communities (RECs) may be a powerful driver for just energy transition; they may help contrasting the risk that PED development may favour better-off social groups while increasing energy poverty of more disadvantaged groups. This recognizes that multi-stakeholder coalitions driving Renewable Energy Communities (RECs) primarily focus on delivering environmental, economic, and social benefits to their communities or the local areas they serve, rather than prioritizing financial profits, as is typical in technocratic and market-based models. Moreover, RECs have significant potential to define place-based and community-based strategies rooted in local energy potential (Bonifazi et al., 2022; Bonifazi & Grassini, 2024). This is achieved through their support in designing energy production systems tailored to local resources and aligned with the conditions needed to regenerate territorial heritage and identity. Additionally, RECs contribute to reducing the distance between energy production and consumption. They also promote a more proactive role for local inhabitants in governance systems and community management. Finally, RECs foster the creation of new opportunities for local development.

2. **Energy performance of buildings**
   The energy performance of buildings represents a critical domain for addressing the challenges of climate change and energy consumption. Buildings account for a significant portion of energy use and greenhouse gas emissions globally, making them a key target for energy transition policies. Improving the energy performance of buildings not only contributes to the reduction of emissions but also enhances energy security and promotes cost savings for consumers. This domain has been selected due to its crucial role in meeting both national and international energy and climate objectives, such as those outlined in the European Green Deal and the Energy Performance of Buildings Directive (EPBD).
   The policy boundaries of this domain are defined at a multilevel governance system, involving international, national, and local regulations. The Energy Performance of Buildings Directive (EPBD) sets the overarching framework within the European Union, requiring that all new buildings must be nearly zero-energy buildings (NZEB) by a specific target date. It also sets minimum energy performance standards for renovations and introduces energy certification

systems to classify buildings based on their efficiency. Each EU member state, then, transposes the EPBD into national legislation, establishing detailed regulations for improving building energy performance. These include long-term renovation strategies, financial incentives and technical standards which, although in line with the European requirements, are adapted to the specific needs of each country. At the municipal and regional levels, governments have the authority to implement local action plans, such as the Sustainable Energy Action Plans (SEAPs), which apply energy efficiency standards and promote energy savings at the community level. In cities like Bari, Brussels, and Vienna, local regulations complement national laws by providing additional guidance on how to achieve energy efficiency in the context of urban planning and development.

By setting clear performance standards, introducing financial mechanisms, and supporting the use of energy-efficient technologies, this policy domain defines the rules for transitioning to more energy-efficient building stock across different governance levels.

3. **Urban regeneration**

Urban regeneration initiatives can be powerful tools for PED development and building blocks for climate-neutral cities (EU, 2015), as their focus on the neighbourhood scale may help bridging the gap between energy transition initiatives focused on single buildings and those targeting the city as a whole (see e.g. the Horizon Mission on climate-neutral and smart cities). At the same time, the integrated and place-based approach, widely used in urban regeneration initiatives, may support the development of synergies between bottom-up social innovation dynamics and wider urban transition strategies (Moulaert et al., 2010).

For this potential to unfold, it is necessary that urban regeneration strategies include energy transition objectives within their scopes and support their implementation in different fields ranging from sustainable mobility to climate adaptation. Thus, in the analysis of urban regeneration framework, attention will be given also to policy instrument tools developed in the fields of urban mobility and climate change adaptation as far as they have an urban focus and may support PED-oriented urban regeneration initiatives.

Criteria used to analyse each policy domain are outlined in **Fig. 2**. The PED Policy Canvas represents a synthesis of the main features of the regulatory&policy framework (with respect to the investigated domains) for each partner city (Bari, Brussels and Vienna).

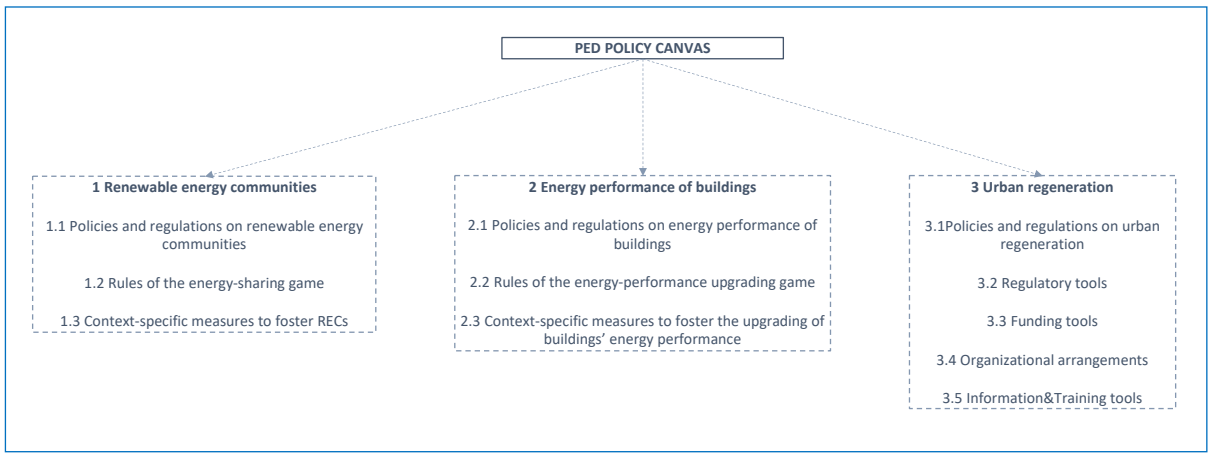


***Figure 2**. Criteria used to analyse each policy domain.*

PED Policy Canvas in Bari

Renewable energy communities

The development of renewable energy communities (RECs) in Italy has been spurred by Directive 2018/2001/EU. However, its implementation has experienced delays and raised questions about alignment with EU state aid regulations. No list of officially established RECs has been published, yet. As of October 2024, an estimate based on a combination of official press releases and crowdsourced data suggests that there are approximately 500 renewable energy communities (RECs) in Italy.
However, local energy cooperation in Italy has a long tradition. It dates back to the electrification of the Alps by hydroelectric cooperatives at the turn of the last century. Over time, this tradition has diversified into at least two key streams: 1) Agroforestry supply chains and small district heating networks (Carrosio, 2013; Carrosio & Scotti, 2019; Scarlat et al., 2013; Wirth, 2014). 2) The emergence of the first organizations of prosumers and purchasing groups (Becker et al., 2017; Magnani & Osti, 2016). The following sections outline the legal and policy framework for RECs in Italy, before going on to describe in more detail the recently revised rules for the sharing of renewable energy.
This dimension of the PED policy canvas concludes with a discussion of how the context-specific, sub-national policies to promote RECs available to local stakeholders in the San Paolo neighbourhood might strengthen - or fall short of - the overall enabling framework.

Policies and regulations on renewable energy communities

The implementation of Directive 2018/2001/EU in Italy began in 2019 with an initial, limited framework. This early phase imposed restrictions, including a maximum generation capacity of 200 kW and the requirement that renewable power plants and associated consumers be located under the same medium/low voltage transformer station. A more comprehensive implementation followed in 2021 with Legislative Decree 2021/199. However, the process was only finalised in early 2024.
At that point, a coordinated set of technical, economic, and operational rules governing energy-sharing services came into effect.
While most regions had enthusiastically embarked on legislative initiatives in parallel with the adoption of Directive 2018/2001/EU, and some (including Apulia) had envisaged a more articulated multi-level governance model for RECs, these differences have faded over time or have even been smoothed out by the competent administrative or legislative courts. The regulatory framework for RECs in Italy has become largely homogeneous as of October 2024. Regional or local differences relate mainly to the availability and orientation of funding and capacity building programmes, as well as to the persistent geographical differences in terms of energy infrastructure and environmental and landscape protection regimes - both of which have an influence on the development of renewable energy installations.

LEVEL/ASPECT	Italy | Apulia | Bari
National/Federal transposition of Directive 2018/2001/EU	Legislative decree 2021/199, articles 31-33
Regional/State complementary transposition of Directive 2018/2001/EU	Regional law 2019/45 Regional Government decree 2020/1346

Provisions on incentive schemes	Decree of the Ministry for the Environment and Energy Security No. 414 of 07/12/2023, including both specific subsidies and tariff rebates (transmission, distribution and system charges) for shared energy
Energy system regulations (technical rules)	Deliberation of the Italian Regulatory Authority for Energy, Networks and Environment (ARERA) No. 727/2022/R/EEL of 27/12/2022 "Distributed Self-consumption Code"
Economic and operational rules on access to energy sharing services and subsidies	GSE (Energy Service Management Company) operational rules for renewable energy sharing, approved by resolution of the Head of the Energy Department of the Ministry of the Environment and Energy Security No. 22 of 23/02/2024

***Table 1**. Overview of the policies and regulations on renewable energy communities.*

Rules of the energy-sharing game

Under the Italian interpretation of the provisions of Directive 2018/2001/EU, a REC is non-profit legal entity, set up by two or more members, citizens, public or non-profit organisations, while for business actors to participate in RECs they shall be SMEs and they shall not specialise in the energy sector (Leg. Dec. 2021/199, art. 31). The distinctive feature of energy sharing in Italy is twofold. 1) It follows a virtual model (energy is not physically shared but rather all members are connected to the national grid and the attribution is based on the simultaneous - within hourly intervals - flows of production and consumption) (di Somma et al., 2024). 2) A sliding feed-in premium tariff is applied to all energy that is fed into grid, on top of the revenues generated by selling it on the market or to the national energy services agency. The rate of the feed-in tariff is contingent upon: the generation capacity (with a fixed component that is higher for a capacity lower than 200 kW and decreases up to 1 MW for each plant, beyond which no subsidy is granted) and the electricity price dynamics within the relevant market zone out of the seven total identified in the country. Moreover, photovoltaic electricity shared by RECs located in central or northern Italy enjoys a higher premium, respectively, of 3.3% and 8.3%, to account for reduced efficiency at higher latitudes. The prominence of the social and environmental goals in local energy cooperation has been strengthened by establishing a 55% threshold, above which the revenue stream originating from the feed-in tariff must be either distributed to non-business members of the REC or invested to benefit the local community at large.

ITEM/ISSUE	Italy | Apulia | Bari
Legal arrangement/structure	Any non-profit legal entity, set up by two or more members Source: Leg. Dec. 2021/199
Eligible members	1) Natural persons; SMEs; registered associations; local authorities; research, education, and training organizations; confessional organizations; non-profit organizations; environmental protection organizations; local branches of other public bodies (based in the municipalities where the energy assets are located) 2) any other consumer may join the REC with no controlling power 3) for business actors, participation in RECs shall not represent the main industrial or commercial activity Source: Leg. Dec. 2021/199
Entitlement of REC on energy assets	Energy assets must be in the availability of, and under control of, the REC (but may be owned or managed by a third party) Source: Leg. Dec. 2021/199
Geographical/Network scope for community building	Members to be located in the same electricity market zone (7 zones in Italy); to qualify for subsidies and rebates, both power plants and

	PODs must be included under the same high/medium voltage sub-network (2.000 such networks in Italy).
Forms of energy	Electrical energy is fully regulated, other forms (thermal) only mentioned Source: Leg. Dec. 2021/199
Technologies	All renewable sources and technologies Source: Leg. Dec. 2021/199
Limitations to renewable power generation capacity	1 MW (it applies to the single plant and it is relevant for subsidy eligibility only) Source: Leg. Dec. 2021/199
Consumer protection	Each consumer retains their rights and duties towards energy providers Source: Leg. Dec. 2021/199
Energy sharing model (Virtual or Physical)	Virtual (physical energy sharing is allowed in specific self-consumption configurations that may be relevant to PEDs) Source: ARERA Resolution 2022-727
Shared electrical energy definition	For every hour, the least value (in kWh) between the electricity fed into the grid and the electricity drawn from the grid, by all members of the REC (producers, consumers, prosumers) Source: ARERA Resolution 2022-727
Subsidy schemes	Sliding feed-in premium scheme, limited to shared electrical energy between REC's members (no more than 120 €/MWh, depending on the current price of electricity in the relevant market zone, for 20 years). Revenue from the feed-in tariff above the 55% threshold must either be distributed to non-business members of the REC or invested to benefit the local community at large. Sources: Legislative Decree N0. 199/2021 (artt. 8-9); Decree of the Ministry for the Environment and Energy Security No. 414 of 07/12/2023
Network charges, levies and taxes	About 10.57 €/MWh of transmission tariff rebates (as collected in bills) for electrical energy shared between REC's members Source: ARERA Resolution 2022-727
Electricity prices for household consumers (source: Eurostat NRG_PC_204, all taxes and levies included)	262,56 €/MWh (2020-2022, average) 311,50 €/MWh (2nd semester 2022)
Electricity prices for non-household consumers (source: Eurostat NRG_PC_205, all taxes and levies included)	239,06 €/MWh (2020-2022, average) 392,50 €/MWh (2nd semester 2022)
Net metering	Incompatible Source: ARERA Resolution 2022-727
Export tariff	PPAs or special commercial agreements with the state-owned company in charge of disbursing incentives to beneficiaries and managing other energy services (GSE) Sources: Leg. Dec. 2021/199 and ARERA Resolution 2022-727

Energy storage	Allowed Source: Leg. Dec. 2021/199
Other activities	Energy flexibility and ancillary services, domotics, energy efficiency, electrical vehicles charging services – also acting as a retailer Source: Leg. Dec. 2021/199

***Table 2**. Overview of the rules of the energy-sharing game.*

Context-specific measures to foster RECs

Rather than turning to the local or metropolitan level, it is more likely that a PED development oriented partnership in the City of Bari would leverage on the regional policy framework to promote RECs within a broader support for decarbonisation. Against the background of a diversified set of policies and relatively similar to those implemented in other Italian regions (Bonifazi et al., 2022; Candelise&Ruggieri, 2020; de Vidovich et al., 2023), three features are worth mentioning. The specific definition of "RECs of high social and territorial relevance" was introduced by Regional Law 45/2019: they are defined as those involving, among others, low-income groups and social housing management bodies, two actors that are expected to play a prominent role in the development of the PED in the San Paolo neighbourhood.

The Apulia regional programme for the 2021-27 cycle of the European Structural and Investment Funds has taken a complementary approach. Instead of reinforcing the primary financial instrument for the development of renewable energy communities (RECs) in towns with fewer than 5,000 inhabitants, it aims to enhance its impact. The main instrument, Investment M2C2-1.2 of the Italian Recovery and Resilience Plan, has allocated up to 2.2 billion euros for this purpose. In addition to this, the Apulia programme will distribute 33 million euros specifically to support newly created RECs. Finally, a subsidy (up to 6,000 euros per household or 8.5,000 euros per building/block) will be granted to chartered renewable energy installers under the name of "regional energy income" if: customers benefiting from the investment through self-consumption opt for net metering and transfer the revenues from the export tariff to a regional revolving credit account (to finance further installations).

POLICY MEASURE CATEGORY	**Italy | Apulia | Bari**
Additional qualification criteria	RECs of "high social and territorial relevance" have been introduced under regional law (r.l.) 45/2019: they are defined as those involving, among others: low-income groups; social housing management bodies; local authorities willing to make renewable power plants or at least free public-building lease available to RECs
Grants (public or private)	1) Grants offered by a banking foundation to non-profit organizations in six Southern regions (1,5 M€ total funding, max 150 k€/project) 2) Funding provided directly by the regional law on RECs (200 k€ total) 3) Funding available under the ERDF/ESF+ 2021-27 programming cycle (33 M€ total) 4) Regional energy income, a grant given to chartered renewable energy installers (up to 6 k€ per household or 8,5 k€ per building/block) on condition that the customers who enjoy self-consumption opt for net metering and transfer export tariff's revenues to a regional revolving credit account (to fund further installations).
Expert committees and technical assistance or coordination bodies	Regional technical&scientific committee, established under r.l. 45/2019 to assist the regional administration in RECs' monitoring and evaluation activities

Data infrastructures and information systems	1) Regional Geoportal – including maps of zoned out areas for renewable power plants 2) Geo-dataset of publicly owned buildings and other artificial areas, to be made available to RECs for renewable power plants 3) Registry of RECs established in the Region
Goals, targets, thresholds, scenarios	40 RECs are expected to be supported by 2029, under the ERDF/ESF+ 2021-27 programming cycle
Monitoring programmes	
Education and training programmes	Technical High School "Green Energy Apulia" (newly established)
Spatial schemes and land use provisions	Areas zoned out for renewable power plants under multilevel (state/regional) regulations
Sociotechnical imaginaries and policy narratives on energy transition	RECs as pillars of a decentralized, low-carbon, resilient and solidaristic local energy system, focussed on intergenerational accountability (responsibility) and social acceptability of renewable energy developments;
Multistakeholder partnerships and territorial cooperation initiatives	Industrial&Commercial District on renewable energy "La Nuova Energia", mainly involving business enterprises and research organizations
Awards, contests, or challenges	
Guidelines and best practices	Design guidelines for energy facilities, included in the 2015 Regional Landscape Plan, along with spatially differentiated analysis of the interlinkages between socioecological processes and heritage.
Awareness-raising campaigns	
Communities of practice	
Coordination mechanisms for governance networks	Regional Council for renewable energy – involving local authorities and their associations, energy companies, trade unions, environmental NGOs and research organizations (provided for under r.l. 25/2012, yet not established yet)
Flagship projects	
Research&Innovation activities: prototypes, demonstrations, pilots, tests and validations	
Technical norms, standards, conformity assessment and accreditation systems	Official regional registry of renewable energy installers – only accredited installers may be contracted under the regional energy income funding scheme.

***Table 3**. Overview of context-specific measures to foster RECs.*

Energy performance of buildings

This chapter provides a detailed overview of the main regulations and policy measures related to the energy performance of buildings in the City of Bari.

Policies and regulations on energy performance of buildings

The regulatory framework for energy performance of buildings involves multiple levels of governance: national, regional, and municipal. At the national level, jurisdiction lies with the state, supported by regional programmes for specific implementations, while at the regional level, the Apulia Government has adopted various laws to promote energy efficiency in buildings. At the municipal level, local councils have the ability to adopt specific action plans for energy sustainability. This regulatory system provides a comprehensive structure for energy efficiency, which applies to both new buildings and renovation projects, as outlined in Table 4.

Level /Aspect	Italy | Apulia | Bari
National/Federal transposition of Directive 2010/31/UE	Under the Italian Constitution, energy efficiency falls under a system of shared (concurrent) legislative powers between the State and regional governments. The State is responsible for setting the fundamental principles, especially in the areas of national energy production, transport, and distribution, while regional governments contribute to the pursuit of energy efficiency objectives. Regions can adopt laws and specific measures on energy efficiency in buildings, in line with the overarching principles established by the State and European Union directives (following the amendment to Title V of the Constitution and under Article 117). Law Decree 4 June 2013, n. 63 and Legislative Decree 10 June 2020, n. 48. The former transposed Dir. 2010/31/EU and the latter updated it through the transposition of Dir. 2018/844/EU, which also updated Dir. 2012/27/EU on energy efficiency Revised in December 2023, the EPBD sets stricter standards for building renovations and introduces requirements for nearly zero-energy buildings (NZEB). These updates aim to reduce emissions and energy use in buildings, with new obligations for member states to implement renovation strategies and ensure all new buildings are zero-emission by a specific date. The Energy Decree (Decreto Energia) n.181/2023, converted into law in February 2024, introduces new measures to promote renewable energy adoption and improve energy security in Italy. This decree includes provisions for enhancing energy efficiency in buildings and updating energy performance certificates (EPCs).
Regional/State complementary transposition of Directive 2010/31/UE	Several regions have adopted regional laws for energy efficiency in buildings and developed regional plans for energy and the environment. Apulia Regional Law 36/2016 that explicitly refers to the transposition of Directive 2010/31.
Implementation programme in municipalities/ districts scale	At city level municipalities can adopt 1) "Sustainable Energy and (Climate) Action Plan" (SECAP/SEAP) from Covenant of Majors which implement EPBD principles, 2) Master plans and Land Use municipal regulations which serve as general urban planning tools but do not specifically include rules for implementing energy efficiency measures in buildings. At district scale, no implementation programme of EPBD is possible. The Municipality of Bari adopted its SEAP in 2011.
Data infrastructures and information systems	At district level, it is not possible to adopt any complementary energy efficiency in buildings regulations.

Table 4. *Overview of Policies and Regulations on Energy Performance of Buildings.*

Rules of the energy-performance upgrading game

The rules governing the upgrading of energy performance in buildings in the City of Bari include general criteria for calculating performance and for the implementation of construction work. These criteria apply not only to new constructions but also to significant renovations and minor maintenance work that directly affect the energy performance of buildings. Key actors involved include designers, builders, and maintenance professionals, who play a crucial role in implementing these rules. The distinction between new construction and renovation is essential in determining the technical requirements that must be met during the building intervention. More details can be found in Table 5.

Level /Aspect	Italy | Apulia | Bari
Main axes of EPB (Energetic Performance of Buildings) regulation	1) Adoption of general criteria, a calculation methodology and energy performance requirements) 2) long term renovation strategy 3) financial incentives 4) energy performance certificate 5) technical report, checks and controls 6) Operation, management, control, inspection and maintenance of heating technical report, checks and inspection
Area of application for the regulation of building work	1) New construction, 2) important renovation 3) simple renovation 3) energy redevelopment
Actors of EPB procedure	Designers, building builders, plants maintainers, municipalities
Nature and categories of Building work	The type of renovation is defined by the percentage of the surface area of the entire building envelope affected by interventions, categories: 1) New construction, demolition and reconstruction, extension and above elevation, 2) important renovation, simple renovation, energy redevelopment
Case of Derogation	a) Buildings belonging to cultural heritage and landscape code; b) industrial and handicraft buildings when the rooms are heated due to production process needs or by using energy waste from the production process that cannot otherwise be used; c) rural non-residential buildings without air conditioning systems; c -bis) buildings declared unfit for use or collapsing; d) isolated buildings with a total usable area of less than 50 square metres; e) garages, cellars, garages, multi-storey car parks, warehouses, seasonal structures to protect sports facilities, the standard use of which does not require the installation and use of technical air conditioning systems, the provisions on the matter remain unchanged in any case the integration of electric vehicle recharging infrastructures f) buildings used as places of worship and religious purposes.
Indicators of the Energy Performance of Buildings	Specific parameters of the building, in terms of thermal performance indexes and transmittances, and overall parameters, in terms of global energy performance indexes, expressed both in total primary energy and in non-renewable primary energy
Content of the EPB Certificate	1) The overall energy performance of the building both in terms of total primary energy and non-renewable primary energy, through the respective indexes; 2) the energy class determined through the global energy performance index of the building, expressed in non-renewable primary energy; 3) the energy quality of the building to contain energy consumption for heating and cooling, through the

	thermal performance indexes useful for winter and summer air conditioning of the building; 4) the reference values, such as the minimum energy efficiency requirements in force by law; 5) carbon dioxide emissions; 6) exported energy; 7) the recommendations for improving the energy efficiency of the building with the proposals of the most significant and economically convenient interventions, separating the forecast of major renovation interventions from those of energy requalification; 8) information related to the improvement of energy performance, such as diagnoses and financial incentives; 8-bis) the date of the compulsory inspection and the relative report signed by the owner of the property or his delegate;
Threshold of the energetic classes of EPB Certificate	Class A4 ≤ 0,40 EPgl,nren,rif,standard (2019/21) Class A3 0,40 EPgl,nren,rif,standard (2019/21) -0,60 EPgl,nren,rif,standard (2019/21) CLass A2 0,60 EPgl,nren,rif,standard (2019/21) -0,80 EPgl,nren,rif,standard (2019/21) Class A1 0,80 EPgl,nren,rif,standard (2019/21) -≤ 1,00 EPgl,nren,rif,standard (2019/21) Class B 1,00 EPgl,nren,rif,standard (2019/21) -≤ 1,20 EPgl,nren,rif,standard (2019/21) Class C 1,20 EPgl,nren,rif,standard (2019/21) - ≤ 1,50 EPgl,nren,rif,standard (2019/21) Class D 1,50 EPgl,nren,rif,standard (2019/21)- ≤ 2,00 EPgl,nren,rif,standard (2019/21) Class E 2,00 EPgl,nren,rif,standard (2019/21) - ≤ 2,60 EPgl,nren,rif,standard (2019/21) Class F 2,60 EPgl,nren,rif,standard (2019/21) - ≤ 3,50 EPgl,nren,rif,standard (2019/21) Class G > 3,50 EPgl,nren,rif,standard (2019/21)
Activities where the EPB certificate is mandatory (residential sector)	The energy performance certificate for buildings is issued for buildings or real estate units built, sold or leased to a new tenant and for the buildings. New buildings and those undergoing major renovations are equipped with an energy performance certificate before issuing the usability certificate
Calculation Methods	The energy performance of buildings is determined in compliance with the UNI and CTI technical standards, aligned with the standards prepared by the CEN in support of the 2010 directive (UNI/TS 11300 series), the global annual energy requirement is calculated for each energy service, expressed in primary energy, on a monthly basis. The renewable energy produced within the boundary of the system is determined in the same way
Protocols	
Programme for the exemplarity of public service	
Sustainability evaluation Tools for urban regeneration/development	Sustainability protocols ITACA

Table 5. *Summary of Energy-Performance Upgrading Rules and Key Actors.*

Context-specific measures to foster the upgrading of buildings' energy performance

Several local policy measures have been adopted to promote the improvement of energy performance in Bari. Amongst these, state incentives such as the Superbonus 110% have played a crucial role, enabling a wide range of renovation projects aimed at improving energy efficiency. At the private level, energy audits play an important role in monitoring building performance, while the local training system offers seminars and workshops to inform and raise awareness among citizens and professionals on the use of state incentives. Digital tools, such as the national portal dedicated to energy efficiency, also support these initiatives. See Table 6 for a comprehensive overview.

Policy measure category	Italy | Apulia | Bari
Public subsides/ Financial incentives	Between 2020 and 2022, extraordinary state incentives covered 110% of private investment costs for energy efficiency improvement projects. After 2022 those incentives were reduced up to 65% of investment costs for expenses incurred in 2025.
Monitoring	At private level energy audits. Private energy audits are primarily conducted in two circumstances: 1. Regulatory obligations: Some companies, particularly those considered "energy-intensive" (for example, those with high energy consumption) or those subject to specific legal requirements, are mandated to carry out regular energy audits to comply with national or European regulations (such as the Energy Efficiency Directive 2012/27/EU). In these cases, the audit is required to monitor energy efficiency and demonstrate the adoption of corrective measures, if necessary. 2. Voluntary improvement: Outside of regulatory obligations, many businesses or building owners choose to conduct energy audits to identify opportunities for energy savings and cost reductions. These audits provide recommendations on how to improve energy performance through efficiency measures, At the national level, the Ministry of Economic Development supports monitoring initiatives in collaboration with the regions and the autonomous provinces of Trento and Bolzano, respecting their respective areas of competence. These efforts involve partnerships with technical-scientific bodies and public and private agencies. The aim is to assess the degree of implementation of the decree, evaluate the results achieved, and propose any necessary regulatory adjustments to ensure its effectiveness.
Education - training programme - Workshop	Seminar and workshop on State incentives, training for EPB certificators organized by professionals councils and private societies
Digitals tools	1.Toolkit "TEESCHOOLS" 2. National portal for building energy performance (ENEA)
Programme for Citizen Participation	Life EASIER project
Innovative projects	RenOnBill Horizon 2020 project
Local public actors involved in the implementation and monitoring of energetic performance of Buildings	Municipalities, regions

Table 6. *Overview of Local Measures Supporting Energy Performance Improvements.*

Urban regeneration

Policies and regulations

Spatial planning in Italy is based on traditional physical land use planning, the so-called 'urbanism' approach, with its 'strong architectural flavour and concern with urban design, town-scape and building control' through rigid zoning and codes' (CEC, 1997, p. 37). This system has evolved into a complex constellation of highly heterogeneous frameworks at regional levels, all based on similar approaches, after the attribution of competences in urban planning to Regions in 1970s.

This 'conformative' and prescriptive 'urbanism tradition' of spatial planning has strongly influenced the Italian approach to urban regeneration (Cotella & Janin Rivolin, 2011), whose evolution is marked by the experimentation of several initiatives inspired by the evolving European policy paradigms in the urban regeneration field (Allulli & Tortorella, 2013). Following a few pilot experiences in urban regeneration made by regional governments in the 1980s, the first initiative promoted at the national level dates back to the early 1990s, when the Italian Ministry of Public Works launched the so-called 'complex programmes'. Several other programmes at both national and regional levels were introduced. These initiatives often had piecemeal characteristics, reflecting a lack of coherence. This issue was compounded by the persistent absence of an "explicit urban policy." Such a policy, as defined by Urban@it (2016), refers to a systematic set of actions developed by the national government and intentionally directed at cities or specific urban areas. The absence of this overarching framework contributed to the fragmented nature of urban regeneration policies in Italy. As a result, numerous disconnected initiatives emerged across the country, lacking integration or a unified strategic vision.

POLICIES	Italy | Apulia | Bari
National regulatory framework on urban regeneration	No comprehensive National law/regulatory framework on urban regeneration.
Regional (Apulia) regulatory framework on urban regeneration	Apulia Regional Law 21/2008 on urban regeneration
National Urban Agenda	Italy has no National Urban Agenda in accordance with the Urban Agenda for the EU/Pact of Amsterdam (2016). A National Urban Agenda was drafted to direct the implementation of the Cohesion Policy 2014-2020. At the end of 2022, the Ministry of Infrastructures and Sustainable Mobility passed a National Urban Agenda to orient its own policies in urban areas and to contribute to the forthcoming National Urban Agenda for Sustainable Development, which is to be made by the Interministerial Committee for Urban Policies (CIPU). This has not been finalized, yet.
Regional (Apulia) or Municipal (Bari) Urban Agenda	The Metropolitan City of Bari drafted its urban strategy (Strategy for the sustainable urban development of the city of Bari) for the period 2014-2020 as part of the requirements of the National Programme for Metropolitan Cities 2014-2020. An updated strategy is underlying the implementation of the new National Programme for Metropolitan Cities (PON Metro City Plus 2021-2027). The Metropolitan City of Bari has a Metropolitan Strategic Plan according to Law 56/2014.

***Table 7**. Overview of the regulatory and policy framework at different governance levels.*

Regulatory tools

In Italy, national and regional laws as indicated in the table below foresee statutory plans for urban regeneration. In the case of the City of Bari, no statutory plan for urban regeneration is in place in San Paolo neighbourhood. The strategic directions for urban regeneration for the whole municipality of Bari are set in the Programmatic Document for Urban Regeneration (DPRU), which has been approved in 2009 in accordance with the requirements of the regional Law 21/2008 on urban regeneration. DPRU includes specific directions for the regeneration of the San Paolo neighbourhoods. In addition, the Urban Plan for Sustainable Mobility (PUMS) made by the Metropolitan City of Bari and the Sustainable Energy Action Plan (SEAP) of the Municipality of Bari give some strategic (not binding) directions for sustainable mobility and energy transition in all urban neighbourhoods, including San Paolo.

TOOLS	Italy | Apulia | Bari
Urban masterplan	The urban masterplan may include urban regeneration within its objectives and envisage specific implementation plans at district level. A Programmatic Document for Urban Regeneration (DPRU) has been introduced by the Regional Law 21/2008, which may be part of urban masterplans. Bari has approved its DPRU in 2009.
Urban Regeneration Plan	The old law 457/78 envisaged an implementation plan for urban regeneration, to be made for specific urban districts as defined in the masterplans. The regional law 21/2008 envisages a new plan (PIRU) for that purpose.
Urban plan for sustainable mobility	The Urban Plan for Sustainable Mobility (PUMS) is the sector plan for sustainable mobility (contents and procedures are included in the regional guidelines approved with Regional Deliberation n. 1645/2018). The Metropolitan City of Bari has approved the Metropolitan PUMS in 2024.
Sustainable Energy and Climate	The Sustainable Energy (and Climate) Action Plan (SECAP/SEAP) is a Local Action Plan made on voluntary basis by those cities adhering to the Covenant of Mayors. It is a strategic document with limited impact on urban masterplans. Bari has approved its SEAP in 2011.
Climate Change Adaptation Plan	Climate Change Adaptation Plans are strategic documents for adaptation strategies made on voluntary basis. They have limited impact on urban masterplans. So far, the municipality of Bari has no Climate Change Adaptation Plan.
Urban masterplan	The urban masterplan may include urban regeneration within its objectives and envisage specific implementation plans at district level. A Programmatic Document for Urban Regeneration (DPRU) has been introduced by the regional Law 21/2008, which may be part of urban masterplans. Bari has approved its DPRU in 2009.

Table 8*. Overview of the regulatory tools for urban regeneration as applicable in Bari.*

Funding tools

In the last thirty years, urban regeneration received scattered funding from several sources, with limited coordination and a lack of a broader strategy at the urban, regional and national level. The Apulia Region assumed a proactive role in urban regeneration only in 2006, with the launch of the 'Integrated programmes for the rehabilitation of peripheral neighbourhoods' ('PIRP') based on integrated, participative and place-based approach. After that, several other regional programmes for

urban regeneration were launched with the use of European Structural Funds starting from the period 2007–2013.

Today, the main funding sources for urban regeneration in the City of Bari come from: the National Plan for Recovery and Resilience (PNRR) (funds from the Next Generation EU Programme and co-funding from the Complementary National Programme); the National Operational Programme Metro Plus for Metro Cities and medium cities in Southern Italy; the ERDF-ESF Regional Operational Programme 2021-27.

FUNDING PROGRAMMES	Italy | Apulia | Bari
National programs for urban regeneration and sustainable mobility to be funded under the Next Generation EU Program	The National Plan for Recovery and Resilience (PNRR) is funded by the Next Generation EU Programme and co-funded by the Complementary National Programme (PNC). It is made of 6 Missions, further divided into 16 Components for 187 measures/intervention lines. Specific Interventions are identified for urban regeneration and sustainable mobility: - Innovative Programme for the Housing Quality (PINQUA), under the competencies of MIMS, for municipalities with more than 60.000 inhabitants and Metropolitan Cities, aimed to social housing, urban regeneration of degraded neighbourhoods, for a total of 2,8 Billion Euro. The Bari Municipality received funding for three projects for a total of 130 Million Euro. - Integrated Urban Plans (PUI), under the competencies of the Ministry of Internal, for Metropolitan Cities, aimed to the improvement of services and infrastructures in peripheral neighbourhoods, for a total of 2,49 Billion Euro. Bari Metropolitan City received funding for 2 projects (envisaging 48 interventions in its 41 municipalities), for a total of 183 Million Euro. - Urban Regeneration, under the competencies of the Ministry of Internal, for municipalities with more than 15.000 inhabitants, for rehabilitation of public areas and buildings, development of public services and green mobility, for a total of 3,4 Billion Euro. - Rapid transit public transport, under the competencies of MIMS, for metropolitan cities, aimed to divert transportation from private cars to rapid public transport, for a total of 4,4 Billion Euro. Bari received funding for a total of 160 Million Euro. - Renovation of buses and trains, under the competencies of MIMS, for metropolitan cities and province's capitals, for a total of 4,2 Billion Euro. Bari received funding for a total of 95 Million Euro. - Social housing, under the competencies of MIMS, aimed to the improvement of energy performance and seismic resilience of social housing buildings and for the socio-economic regeneration of the social housing neighbourhoods, for a total of 2 Billion Euro. Apulia region received funding for a total of 100 Million Euro.
National/Regional/City programmes for urban regeneration and sustainable mobility with ERDF-ESF funding 2021-2027	The National Operational Programme 2021-27 Metro Plus for Metro Cities and medium cities in Southern Italy envisages specific actions for the Metropolitan City of Bari and, more specifically, for its Capital City (the Municipality of Bari). Funding for the Metro City of Bari is 86,230 Million euro. Its Priority Objective 5 is devoted to urban regeneration. Besides that, the Policy Objective 2 is specifically devoted to sustainable mobility (including the transition to clean and just energy,

	green and blue investments, circular economy, climate change adaptation and mitigation). The Regional Operational Programme ERDF-ESF for the period 2021-2027 encompasses several Policy Objectives with relevance for PED-oriented urban regeneration, namely: - Policy Objective 2, which aims to achieve a net-zero carbon economy, through the promotion of a clean and fair energy transition, green and blue investments, the circular economy, climate change adaptation and mitigation, risk management and prevention, and sustainable urban mobility. Within this, see in particular the Priority Axis II "Green Economy" (and its Objectives RSO2.1 Promote energy efficiency and reduce greenhouse gas emissions; RSO2.2 Promote renewable energy in accordance with Directive (EU) 2018/2001 on energy from renewable sources; RSO2.4 Promote climate change adaptation, disaster risk prevention and resilience) and the Priority Axis III "Sustainable Urban Mobility" (see its Objective RSO2.8: To improve sustainable multi-modal urban transport systems towards economies at zero net carbon emission) - Policy Objective 5 for the promotion of sustainable and integrated development of all types of territories and local initiatives – see in particular the Priority Axis IX "Territorial and Urban Development" and its Objective RSO5.1: To improve integrated urban regeneration: Tailored to medium cities only, including Bari Municipality.
Other National/Regional/City funding Programmes for Urban Regeneration	
National programmes for urban regeneration and sustainable mobility to be funded under the Next Generation EU Programme	

Table 9*. Overview of the regulatory and policy framework at different governance levels.*

Organisational arrangements

The enduring lack of an 'explicit urban policy' in Italy has severely influenced the fragmentation of competencies in urban planning at all governance scales. At the national level, the Ministry of Urban Affairs was active only between 1987 and 1993. After that, urban policies passed under the Presidency of the Council of Ministers and are now mainly under the competencies of the Ministry of Infrastructures and Transportation, although a key role is also played, especially in the case of Southern Italian cities, by the Ministry for European Affairs, the South, Cohesion Policy and the PNRR. An Interministerial Committee for Urban Policies (CIPU) was set up in 2012 with the ambition to coordinate and innovate urban policies, although it did not produce any significant results so far (Armondi, 2018). Fragmentation in the competencies is also found at the Regional and Municipal levels as indicated in the table below.

BODIES	Italy | Apulia | Bari
National/Federal Departments for Urban Regeneration	The Ministry of Infrastructures and Transportation (MIT) has competencies for: i) infrastructure and transport networks of national relevance; ii) housing; iii) national public works. Within MIMS, the Higher Council of Public Works (Consiglio Superiore dei Lavori Pubblici) has competencies on public interventions of national relevance (including in the housing sector) and gives technical advice to the ministry in relation to spatial planning maters.
Regional Depts for Urban Regeneration	The Ministry for European Affairs, the South, Cohesion Policy and the PNRR has competencies on regional development policy and territorial cohesion, EU cohesion policy programming and management. It has absorbed also the competencies of the previous Agency for Territorial Cohesion, suppressed in 2023.
City Depts for Urban Regeneration	An Interministerial Committee for Urban Policies (CIPU) was set up in 2012 (by Law n.134 of 7 August 2012).
Ad-hoc Regional/Municipal Commitees for Urban Regeneration	The Sustainable Energy (and Climate) Action Plan (SECAP/SEAP) is a Local Action Plan made on voluntary basis by those cities adhering to the Covenant of Mayors. It is a strategic document with limited impact on urban masterplans. Bari has approved its SEAP in 2011.
Stakeholders' committee/partnership/ territorial cooperation at Regional/Municipal level	Climate Change Adaptation Plans are strategic documents for adaptation strategies made on voluntary basis. They have limited impact on urban masterplans. So far, the municipality of Bari has no Climate Change Adaptation Plan.

***Table 10**. Organizational arrangements for urban regeneration at different governance levels.*

Information&Training tools

Observatories for Housing Conditions have been created within National and Regional governments in accordance to law 431/1998. Besides them, a National Observatory on Housing Policies and Urban Regeneration has been created in 2022 as a bottom-up process promoted by the Inequalities and Diversity Forum and several other associations (including the Polytechnic University of Bari) to systematically address housing and urban regeneration issues.

Given the scattered features of urban regeneration policies, information&training tools have been mainly developed together with specific programmes as a means to foster their appropriate and timely implementation. No specific initiatives are currently ongoing.

TOOLS	Italy | Apulia | Bari
Forums	At the National Level, the Inequality and Diversity Forum was created in 2018 with the aim to build a place for reflection to inform, discuss, and design public policies and collective actions to reduce economic and social inequalities and support the full development of people. This Forum also deals with urban policies.
Observatories/ Monitoring bodies	A National Observatory on Housing Conditions (OSCA) has established in 2022 under the Ministry of Infrastructure and Transportation, in accordance to law 431/1998. It should carry out data collection as well as permanent monitoring of the housing situation – especially with reference to public and social housing – to inform public policies.

	At the National Level, a National Observatory on Housing Policies and Urban Regeneration has also been created in 2022 as a bottom-up process promoted by the Inequalities and Diversity Forum and several other associations (including the Polytechnic University of Bari) to systematically address housing and urban regeneration issues. It has produced a first policy paper on how to relaunch housing public policies. The Regional Observatory on Housing Conditions (ORCA) (established by the Apulia Government under Regional Law 20/2005) is part of the network of regional observatories created in accordance to law 431/1998. Its competencies include the analysis and evaluation of housing conditions to support regional and local policies, and the facilitation of multi-stakeholders' cooperation on housing policies.
Information&Training Programmes	No specific information&training initiative is currently ongoing

***Table 11**. Overview of information&training tools on urban regeneration as applicable in Bari.*

PED Policy Canvas in Brussels

Renewable energy communities

Policies and regulations on renewable energy communities

The first part of the table lists the main texts governing renewable energy communities in the Brussels-Capital region. Indeed, the two texts provide for the creation of renewable energy communities: the ordinance on the "organization of the electricity market" of March 2022, for energy communities and the ordinance "on energy thermal network "of May 2021, for the case of thermal communities.

In addition, in terms of energy system regulations, for electricity sharing, the Brussels regulator has set different discounts on the distribution fee depending on the load on the distribution system.

So far, 13 energy communities have been created in the Brussels Capital Region. A study was carried out to analyse the potential for the development and functioning of energy communities, possible obstacles and unjustified restrictions on their development. This study was completed in October 2024 and will be available to all over the next few weeks.

LEVEL/ASPECT	Brussels |B-CR | Belgium
National/Federal transposition of Directive 2018/2001/EU	
Regional/State complementary transposition of Directive 2018/2001/EU	Ordonnance on the organization of electricity market in Brussels Capital Region OELEC 17/03/22; Ordonnance 06/05/2021 on the organization of thermal energy network in BRC
Provisions on incentive schemes	Draft of the New PACE (Regional Plan Air-Climate-Energy) for 2030, which introduces 4 axes to reduce 47% of regional greenhouse gases.

Energy system regulations	Energy communities and active customers are obliged to pay a distribution fee for electricity sharing. However, the Ordinance stipulates that when setting the amount of the distribution charges, the Brussels energy Regulatory authority must take into account the costs and the benefits of energy communities and electricity sharing to reach a balance between solidarity in the payment of the total costs of the distribution system and encouraging participation in energy communities and electricity sharing. For electricity sharing, the Brussels regulator has set the following discounts on the distribution fee depending on the load on the distribution system: → 51% discount for sharing within a single building (e.g. a residential building), → 26% discount when sharing in the same low-voltage network, → 8% discount when sharing in the same high voltage network.
Technical rules on access to energy sharing services	Technical temporary regulation on shared energy which should be integrated within a global technical regulation

Table 12. *Overview of policies and regulations on renewable energy communities.*

Rules of the energy-sharing game

The creation of a renewable energy community in the Brussels-Capital Region is organised by different rules. Several mandatory criteria are listed, such as the creation of a legal entity, the drafting of an agreement between participants, eligibility criteria for community members and ownership of the means of production. Other aspects are also covered, such as the net metering, the energy storage and the activities allowed for the renewable energy communities.

A notable feature introduced by the March 2022 ordinance amending the organization of electricity markets is the establishment of a third type of Energy Community: the Local Energy Community. This model differs from Renewable Energy Communities in that the production facilities used for energy sharing can be owned by one or more members or even a third party. However, it requires that either the Community itself or one or more of its members hold a right of use over these facilities.

ITEM/ISSUE	Brussels |B-CR | Belgium
Legal arrangement/structure	Creation of a legal entity, Agreement must be signed between all members of the EC, another agreement must be signed with the grid operator. Source: 17/03/2022 Ordinance amending the ordinance of July 19, 2001 on the organization of the electricity market in the Brussels-Capital Region: https://etaamb.openjustice.be/fr/ordonnance-du-17-mars-2022_n2022020646.html
Eligible members	1) REC: Natural persons, local authorities, SME (not the main commercial activity and without any profit 2) Local Energy Community: Natural persons, public authorities: federal, regional, local authorities, public interest organization, international or European institutions. Source: 17/03/2022 Ordinance amending the ordinance of July 19, 2001 on the organization of the electricity market in the Brussels-Capital Region: https://etaamb.openjustice.be/fr/ordonnance-du-17-mars-2022_n2022020646.html

Entitlement of REC on energy assets	1) REC: The community must be the owner of the installations 2) Local Energy Community: The community can be the owner one or some members can be the owner or have a right of use of the installations. Source: https://etaamb.openjustice.be/fr/ordonnance-du-17-mars-2022_n2022020646.html
Geographical/Network scope for community building	There is no geographical scope for the community, but the members should at least be located in Brussels Capital Region.
Forms of energy	Electrical energy and thermal energy are regulated. Sources: Ordonnance 2021/05/06 Organization of thermal energy network https://etaamb.openjustice.be/fr/ordonnance-du-06-mai-2021_n2021031475 ; Ordonnance Electricity https://etaamb.openjustice.be/fr/ordonnance-du-17-mars-2022_n2022020646.html
Technologies	All renewable sources and technologies
Limitations to renewable power generation capacity	No legal regulation, but each installation should be certified by the grid regulator (Brugel).
Consumer protection	Each consumer retains their rights and duties towards energy providers. Moreover, the Convention signed by the members of the EC should contain data management, rights and duties of the members, governance modalities, procedures in case of non-payment.
Energy sharing model (Virtual or Physical)	Virtual sharing
Shared electrical energy definition	The smart meters count every 15 minutes the consumption, the production, and the data is centralized by the grid operator. Each Community defined its own key distribution which identifies the priority for the repartition between members
Subsidy schemes	Green certificate for the owner of photovoltaic panels. Members sell electricity to each other (prosumers and those who have no means of production), and this is found in the Agreement that they determine the selling price of electricity. They can decide that it is free, but network costs must be included.
Network charges, levies and taxes	Depending on the distance between the members, the taxes for the use of the grid installation change. For electricity sharing, the Brussels regulator has set the following discounts on the distribution fee depending on the load on the distribution system: → 51% discount for sharing within a single building (e.g. a residential building), → 26% discount when sharing in the same low-voltage network, → 8% discount when sharing in the same high voltage network
Electricity prices for household consumers (source: Eurostat NRG_PC_204, all taxes and levies included)	318,60 €/MWh (2020-2022, average) 448,90 €/MWh (2nd semester 2022)

Electricity prices for non-household consumers (source: Eurostat NRG_PC_205, all taxes and levies included)	187,36 €/MWh (2020-2022, average) 286,30 €/MWh (2nd semester 2022)
Net metering	Since 2020 the net metering is not applicable in Brussels Capital Region
Export tariff	There is injection tariff that is the financial compensation you receive from your energy supplier for the electricity you feed into the grid. This rate varies according to the supplier and the contract.
Energy storage	Allowed as other activities for EC
Other activities	Participating in services of aggregation, energy storage, flexibility services, electrical vehicles recharging services

Table 13. *Overview of the rules of the energy-sharing game.*

Context-specific measures to foster RECs

The third part of the table presents measures specific to the Brussels context, including support services (the free one-stop-shop of the *Facilitateur Partage et Communauté d'énergie*), the data infrastructures, the flagship projects and the technical norms (as the obligation to install smart meters).

POLICY MEASURE CATEGORY	Brussels |B-CR | Belgium
Additional qualification criteria	1) REC 2) Local energy Community 3) CEC
Grants (public or private)	
Expert committees and technical assistance or coordination bodies	
Data infrastructures and information systems	1) Regional grid plans are in demand to identify to which voltage cabin each Community is linked. As mentioned above, within the Brussels-Capital Region, community members can be located on three levels: same building, same low voltage or high voltage network. 2) Through the smart meters the grid operator centralizes the data for each EC
Goals, targets, thresholds, scenarios	There is no quantified objective, but the PACE provides the implementation of a strategy and specific tools for the electricity sharing within public, social and collective housing.
Monitoring programmes	None
Education and training programmes	free workshop on shared energy organized by Brussel Environment
Spatial schemes and land use provisions	

Sociotechnical imaginaries and policy narratives on energy transition	REC as a way to improve citizens to be actors in the electricity market and to reach the local approach with districts scale.
Multistakeholder partnerships and territorial cooperation initiatives	Greenbiz Project https://greenbizz.brussels/fr/2022/09/06/le-projet-greenbizz-energy-fete-ses-1-an-3/
Awards, contests, or challenges	
Guidelines and best practice	https://nosbambins.be/ https://foyerdusud.be/sunsud_vlogaert/
Awareness-raising campaigns	
Communities of practice	
Coordination mechanisms for governance networks	There are no mechanisms for governance networks, however the national grid regulator (Brugel) gives the authorization for each EC after verifying the governance model and the right and duties in the statutes of the Convention signed by the members of the EC
Flagship projects	Nos bambins ; https://nosbambins.be/ , SunSud : https://foyerdusud.be/sunsud_vlogaert/sunsud_vlo_pilote/ ,
Research&Innovation activities: prototypes, demonstrations, pilots, tests and validations	Project "Voisins d'énergie" 2020-2022 https://voisinsenergie.agorakit.org/
Technical norms, standards, conformity assessment and accreditation systems	The members of the energy community may have a smart meter, the community have to receive the authorisation from the regulator of the grid

Table 14. *Overview of Context-specific measures to foster RECs.*

Energy performance of buildings

In Brussels Capital Region, the “Renolution” strategy focuses on building renovations with the goal of reducing average energy consumption in housing by two-thirds and achieving carbon neutrality in the tertiary sector by 2050. This strategy covers private housing, public authorities and the tertiary sector and facilities. Several legal texts frame and set the objectives and actions of the “Renolution” strategy, such as the Cobrace (Brussels Air-Climate and Energy Management Code) and the PACE (Air, Climate and Energy Plan).

Policies and regulations on energy performance of buildings

This first part of the table presents the legal framework that regulate the energy performance of building in Brussels Capital Region, but also the legal implementation programme in municipalities. In 2024, a new version of the Cobrace (Brussels Code for Air, Climate, and Energy Management) was introduced, setting updated objectives for building renovations. These include mandatory energy performance certificates for all housing, a requirement for housing to achieve at least an E or D energy

performance rating by 2033, and stricter standards for public authorities, emphasizing their exemplary role with more stringent requirements than those applied to private housing.

Level /Aspect	Brussels I C-CR - Belgium
National/Federal transposition of Directive 2010/31/UE	The region is competent
Regional/State complementary transposition of Directive 2010/31/UE	Ordonnance PEB 07/06/2007 and Ordonnance 02/05/2013 Brussels Air-Climate and Energy Management Code (Cobrace), modified by the Ordinance of 07/03/2024. Source : https://etaamb.openjustice.be/fr/ordonnance-du-07-mars-2024_n2024002045.html
Implementation programme in municipalities/ districts scale	1.PLAGE: Local Action Plan for Energetic management for all major public or private owners of buildings in Brussels Capital Region, 2. Sustainable District Contract, 3. Urban Renovation Contract.
Complementary Reglementation applied for district scale	Cobat 2004 Brussels Code of Urbanism-Environment and Land use Planning

Table 15. *Overview of policies and regulations on energy performance of buildings.*

Rules of the energy-performance upgrading game

This part describes the main axes of Energy Building Performance regulations, the area of application, the actors involved in the EPB procedure, the cases of derogation, the content of EPB Certificate and the activities when the EPB is mandatory (case of property transaction, specific technical installation and in case of building work).

Item / Issue	Brussels I B-CR
Main axes of EPB (Energetic Performance of Buildings) regulation	3 axes: 1) Building work: includes renovation and construction of buildings. 2) Heating and Air Conditioning. 3) Certification: energetic certificate of the existent building
Area of application for the regulation of building work	1. Renovation work which has an impact on the energetic performance of the building (house front, roof, ground floor), 2. Renovation that should introduce an urban planning permit; 3. All new constructions except from some cases.
Actors of EPB procedure	The applicant, the registrant, the architect and the adviser.
Nature and categories of Building work	The nature of building work is defined by the percentage of heat loss surface concerned by the building work that influences the energetic performance, and the work realized for technical installations. Four natures: ***New, Related to New***, ***Important renovation***, ***Simple Renovation***.
Case of Derogation	2 cases: 1) technical-functional or economic incapacity. 2) "Heritage derogation" if the regulatory requirements can cause damage.
Indicators of the Energy Performance of Buildings	Certificate of Energy Performance of the Building: New "individual house" and "residential housing" and, since 2017, this also applies to building related to New.

Content of the EPB Certificate	Identification of the unit, Number and date of issue and validity of the certificate, Energetic performance indicators: Energetic class from A to G (based on primary energy), presence of renewable energies, Co2 emissions per year/m2, Primary energy consumption per year in kWh/m2; Respect of requirements on the quality of indoor climate; Identity card of the property; Informations about heating requirements.
Threshold of the energetic classes of EPB Certificate	**Class A** : < or = 45 kWh/(m2/.year) **Class B**: 46 - 95 kWh/(m2/.year) , **Class C** : 96 - 150 kWh/(m2/.year), **Class D** : 151- 210 kWh/(m2/.year) **Class E**: 211-275kWh/(m2/.year) **Class F**: 276-345kWh/(m2/.year) **Class G** : > 345 kWh/(m2/.year).
Activities where the EPB certificate is mandatory (residential sector)	In case of property transaction; in case of specific technical installations, in case of building work.
Calculation Methods	Theoretical calculation, there is two methods: PER determine the primary energy of the unit for individual house, and PEN determine the primary energy for unit for non-residential housing
Protocols	
Programme for the exemplarity of public service	In order to achieve the objectif of carbon neutrality by 2040 for public service in Brussel Capital Region, there are 2 programmes: 1. Renoclick Programm (https://renoclick.be/) 2. subsides Renoclick
Sustainability evaluation Tools for urban regeneration/development	

Table 16. *Summary of Energy-Performance Upgrading Rules and Key Actors.*

Context-specific measures to foster the upgrading of buildings' energy performance

This section outlines the range of regional measures available, including subsidies, support provided by the EPB Facilitator's one-stop shop, various training programmes, digital tools designed to assist citizens and construction professionals, and examples of innovative projects.

Policy measure category	Brussels I B-CR I Belgium
Public subsides/ Financial incentives	Subsides for the installation of new boiler, heat pump, solar boiler. Renovation and construction. https://environnement.brussels/pro/services-et-demandes/primes-et-aides-financieres/primes-energie-2021-introduction At Regional level, "Renoclick" is funded by the Next Generation EU Programme and aims to support public administration for the renovation of their buildings.

Monitoring	1. Sustainable Building Facilitator helpdesk (free service) 2. Energy Audit of Building
Education - training programme - Workshop	Formation Center for EPB Certificator , Seminars and Workshop on Sustainable Building
Digitals tools	TOTEM: evaluation tool on the environnement impact on materials used. And Online single desk https://renolution.brussels/
Programme for Citizen Participation	1. Renolab.ID, 2. Contract d'Axe et contrat d'ilot (CACI), 3. Assemblée citoyenne pour le climat
Innovative projects	Collective renovation of front side in La roue (Living lab Brussels)
Local public actors involved in the implementation and monitoring of energetic performance of Buildings	Bruxelles Environnment, Urban Brussels, Urban Retrofitting Society of Brussels Region Capital (SACU), Municipalities of Brussels, Perspective Brussels..

Table 17. *Overview of Local Measures Supporting Energy Performance Improvements.*

Urban regeneration

In Brussels, urban regeneration is regulated and implemented by several regional administrations and municipalities. The two Livings Labs located in Brussels, Usquare and la Roue are in two different municipalities, each of which has its own Climate Plan. Despite this fact, those two Living Labs are subject to the same administrative procedures (as for example the urban permit) and can benefit to the same subsidies or programme as it shown in the following sections.

Policies and regulations

This first part presents the legal framework governing land use planning in the Brussels-Capital Region. It mainly concerns the CobaT 2004 (Brussels territory planning), the RRU 2006 (Regional Planning Regulation) and the PPRD 2018 (Regional Plan for Sustainable Development). It includes also municipal agenda.

LEVEL/ASPECT	Brussels |B-CR | Belgium
National/Federal regulatory framework on urban regeneration	
Regional/State regulatory framework on urban regeneration	The Brussels territory planning Code (CoBAT 2004), the Regional Planning Regulation (RRU 2006), Regional Plan for sustainable development (PRDD 2018)
National/Federal Urban Agenda (following the EU urban agenda set in the pact of Amsterdam)	Regions are competent for the urban agenda, each has its own urban agenda
Regional/State and/or Municipal Urban Agenda	At municipal level there is for Anderlecht the Action Plan for Climat "Climat 1070" and for the Municipality of Ixelles where is located Usquare there is also a "Climat Plan".

	Sources : https://www.ixelles.be/uploads/misc/plan-climat-rapport-fr.pdf, https://www.anderlecht.be/sites/default/files/medias/Files/planClimat/PAC%201070%20Fiches%20actions%202020 23-2030%20mars23_FR.pdf At the regional level, other actors are involved: Urban Brussels with the Urban Revitalization and others public entity as Citydev (is a development company for the Brussels-Capital Region, is involved in urban renewal), Bruxelles Environnment, Perspective Brussels.

Table 18. *Overview of the regulatory and policy framework at different governance levels.*

Regulatory tools

This section deals with the legal texts that regulate the Urban master plan, the Urban Regeneration, the Sustainable mobility, the Sustainable Energy and Climate Plan, and the Climate Change Adaptation Plan.

ITEM/ISSUE	Brussels |B-CR | Belgium
Urban masterplan	At the Municipal Level there is: 1. Particular Plan of Land use (PPAS) which is a municipal tool, which defines the urbanistic rules for district scale. 2. Development Municipalities Plan (PCD). At the Regional level there is: 1. Brussels Spatial Planning Code. (CoBaT) 2. Regional Plan of Land Use (PRAS).
Urban Regeneration Plan	At the regional Level: 1. Master Development Plan (Plan d'Aménagement directeur PAD) 2. Regional Development Plan (PRD) 3. Regional Sustainable Development Plan (PRDD)
Urban plan for sustainable mobility	Good Moov : Regional Plan for mobility At the municipal Level : each municipality has a municipality plan for mobility and manages with the region the tool called "local contract for mobility" which includes among the mobility aspect the management of public space
Sustainable Energy and Climate	PNEC- Plan Energy Climate 2030 for Brussels Capital Region
Climate Change Adaptation Plan	The National Plan for adaptation was established in 2017. And there are measures for adaptation at the regional level in the Regional Plan Air-Clima-Energie (PACE) of Brussels.

Table 19. *Overview of the regulatory tools for urban regeneration as applicable in Brussels.*

Funding tools

This section lists the different types of financing available. At European level, these are ERDF funds, Next generation EU programme funds. At regional level, for regional planning, funds in the form of subsidies are available to citizens: Sustainable Districts Contracts, Urban Renovation Contract, Urban blocs and street contracts.

LEVEL/ASPECT	Brussels |B-CR | Belgium
National programmes for urban regeneration and sustainable mobility to be funded under the Next Generation EU Programme	
National/Federal/Regional/City programmes for urban regeneration and sustainable mobility to be funded under the ERDF_ESF Programmes 2021-2027	FEDER's call of project in Brussels Capital Region. FEDER is the European Fund for regional development. It supports projects in research and innovation, entrepreneurship, the development of the circular economy and the improvement of neighbourhood living conditions, among others.
Other National/Federal/Regional/City funding Programmes for Urban Regeneration	Regional level: 1. Sustainable District Contracts. It is an Action Plan limited in time and space signed by the Region of Brussels Capital, the municipality and the citizens. The aims are to improve the living environment of a precarious neighbourhood. It includes public space projects (e.g. redevelopment of public space), real estate projects (construction of housing and local infrastructure) and socio-economic projects (in collaboration with local associations). 2. Urban Renovation Contract. It is a programme that concentrates resources, energies and projects on a multi-communal perimeter to create infrastructure and housing, and to enhance environmental and economic quality. 3. Urban blocks and street contract (Contrat d'Axe et ilots). It is a 4-year action plan designed to improve the quality of life of residents living in one or more blocks or along an axis.
Other funding programmes by public/private bodies	

Table 20. *Overview of the funding tools at different governance levels.*

Organisational arrangements

As a regional responsibility, urban planning is the sole responsibility of each of Belgium's three regions. In Brussels region Capital, the municipalities, Bruxelles Environnment, Urban Brussels and Perspectives are involved in the development and implementation of urban planning.

ITEM/ISSUE	Brussels |B-CR | Belgium
National/Federal Departments for Urban Regeneration	Competence at regional level
Regional Depts for Urban Regeneration	Each public actors have its own focus: Bruxelles Environnment with environmental perspective, Urban Brussel with an urban regeneration and architectural approach, and Perspectives with legal and planning approach.
City Depts for Urban Regeneration	Each municipality in Brussels Region interacts with Bruxelles Environnment and Urban Brussels, Perspectives (specially for the elaboration of the PAD for a new urban project), and Citydev(for the

	implementation of different projects linked with the construction of housing buildings).
Ad-hoc Regional/Municipal Commitees for Urban Regeneration	Thematic year on "districts" through meeting and workshop organised by Perspective Brussels with different public actors and civil society.
Stakeholders' committee/partnership/ territorial cooperation at Regional/Municipal level	Within the "Renolution Alliance"(*The Renolution Alliance brings together around a hundred public, private and community organizations involved in the Brussels-Capital Region's building renovation strategy. A forum for collaboration and consultation organized around 7 thematic workshops and 4 cross-cutting areas, the Alliance develops coherent, innovative solutions to achieve the ambitious objectives set by the Renolution strategy*.) there are two workshops focused on: Urbanism and heritage, and the second one on urban renovation

Table 21. *Organizational arrangements for urban regeneration at different governance levels.*

Information&Training tools

This section introduces the monitoring bodies (the Sustainable District Facilitator, “Be sustainable” programme) and the training programmes available for citizens.

ITEM/ISSUE	Brussels |B-CR | Belgium
Forums	
Observatory	Observatory for housing permit (Urban Brussels and Perspectives Brussels)
Monitoring Bodies	Each project which benefits from any regional subsides is monitoring by a special service of Bruxelles Environnment.
Training Programmes	website and training on urban renovation and sustainable district contract: https://besustainable.brussels/fr/blog Free Service of "Sustainable District Facilitator " who provides support, advice and proposes a specific approach "Be sustainable" for all the citizens local initiatives.

Table 22. *Overview of information&training tools on urban regeneration as applicable in Brussels.*

PED Policy Canvas in Vienna

Renewable energy communities

Policies and regulations on renewable energy communities

In Vienna, the capital of Austria, the transposition of Directive 2018/2001/EU (European Commission, 2019) has been carried out at both the national and federal levels. This national implementation is further reinforced by a complementary transposition of the directive at the regional or state level (Federal Chancellery of the Republic of Austria, 2022). In addition to these legal frameworks, the regulation of energy systems is governed by the "Kleine Ökostromnovelle" (Österreichisches Parlament, 2017), which introduces reforms specific to renewable energy policies. Moreover, the

federal law “ElWOG2010” consolidates rules pertaining to energy markets and includes provisions on the technical aspects of accessing energy-sharing services, ensuring an organized regulatory environment for these services (Bundeskanzleramt der Republik Österreich, 2024a). Collectively, these legislative frameworks create a robust regulatory foundation for Austria's energy sector, designed to advance sustainable energy practices in accordance with European directives.

LEVEL/ASPECT	Austria | Vienna
National/Federal transposition of Directive 2018/2001/EU	Recommendations of the commission 2019/C 297/20 Federal law consolidated: Renewable Energy Expansion Act § 0, version of 17.01.2024 (BGBl. I Nr. 198/2023)
Regional/State complementary transposition of Directive 2018/2001/EU	Vienna Energy and Climateright-Law WERUG 2020
Provisions on incentive schemes	Federal Act on the Expansion of Energy from Renewable Sources (Renewable Energy Expansion Act) Original text: BGBl. (Federal Law Gazette, FLG) I no 150/2021
Energy system regulations (technical rules)	Small Electricity Act Amendment 288/ME
Economic and operational rules on access to energy sharing services and subsidies	Private and commercial Community Self-Consumption (CSC) (in e.g., multi-apartment buildings), including electricity sharing Federal law consolidated (ElWOG2010)

***Table 23**. Overview of policies and regulations on renewable energy communities.*

Rules of the energy-sharing game

In Vienna the main characteristic by law for RECs are their composition of two or more members, it is mandatory that they create a legal entity and they must provide ecological, economic or social benefits for the members. Either private or legal entities, municipalities, local authorities or SMEs can participate as eligible members. Furthermore, the REC’s energy assets must be in the availability of and under control of the REC, although they may be owned by a third party or even large energy companies. Therefore, RECs can maintain lease agreements and they do not necessarily have to provide energy produced by their members.

Regarding the geographical and network scope, RECs in Vienna are limited to local or regional organization, defined by the available electricity grid by the grid levels. For local RECs the grid-level 6 and 7 are required till the next transformer. Regional RECs must maintain grid level 4 and 5 until the next substation. Therefore, all participants must have a network access contract with the same network operator. This requirement ensures that all members of the Renewable Energy Community (REC) are connected under a unified operational framework within the defined grid levels (as specified in Article 2, point (29) of Directive (EU) 2019/944).

Considering different renewable technologies there are no limitations for RECs in Vienna. There is also no regulation limitation for the capacity of power generation.

Consumer protection regulations are more stringent: RECs are required to establish agreements that explicitly address data management and data processing of energy data related to generating installations, generation plants, and consumption facilities of participating grid users, as managed by the grid operator. In addition, the operation, maintenance and servicing of the generation systems as

well as the assumption of costs, liability and any insurance policies must be part of an agreement (Klima- und Energiefonds, 2024).

In Vienna, the "virtual energy sharing" model allows Renewable Energy Communities (RECs) to distribute electricity among members without direct physical exchanges. Instead, energy is generated by the community, typically from renewable sources like solar or wind, and fed into the local electricity grid. Hence, members virtually "share" this energy through credits, tracked and balanced using smart meters that measure both consumption and generation every 15 minutes. This approach allows for a fair allocation of shared energy resources among members based on predefined distribution keys, which specify how much energy each participant receives according to their needs or investments. The grid operator oversees data management and net metering, providing annual balancing that offsets the energy consumed from the grid against the renewable energy generated by the REC (Klima- und Energiefonds, 2024). E-Control Austria, which oversees national energy market regulation, provides guidelines on feed-in tariffs and grid usage relevant to RECs (E-Control, 2024).

-LEVEL/ASPECT	Austria | Vienna
Legal arrangement/structure	Must consist of at least two members, establish a legal entity, and deliver ecological, economic, or social benefits to its members.
Eligible members	Private or legal entities, municipalities, local authorities or SMEs
Entitlement of REC on energy assets	Energy assets must be in the availability of, and under control of, the REC (but may be owned by a third party, even larger companies -> e.g. lease agreement with the REC)
Geographical/Network scope for community building	Limited to local or regional, which is defined in the electricity grid by the grid levels. Local: Grid-Level 6&7 - until the next transformer. At the Regional level: Grid Level 4&5 – until the next substation. All participants must have, therefore, a network access contract with the same network operator. No Network cost deductions, but possible from 2024: national energy communities or REC sharing with each other over network borders Graphic.
Forms of energy	Electrical energy and thermal energy are regulated (Energiegemeinschaften, 2024)
Technologies	All renewable sources and technologies
Limitations to renewable power generation capacity	no legal regulation limitations based on grid operator and funding
Consumer protection	The Energy Community shall conclude agreements that shall include at least the following contents: 1. the management and processing of energy data from generating installations, as well as the management and processing of energy data from generation and consumption facilities of participating grid users, carried out by the grid operator; 2. operation, maintenance and servicing of the generation facilities as well as the bearing of costs; 3. liability; 4. any insurance policies.
Energy sharing model (Virtual or Physical)	Virtual sharing

Shared electrical energy definition	The smart meters count every 15 minutes the consumption and the production and the data is centralised by the grid operator. Each Community defined its own key distribution which identifies the priority for the repartition between members
Subsidy schemes	RECs do not need to be economically viable. Tariffs are defined by the members CECs have to bring economic, ecological, or social benefits for members
Network charges, levies and taxes	Reduction of 28-64% depending on network level. by-law; explanations and examples of calculation by the Austrian e-control agency
Electricity prices for household consumers (source: Eurostat NRG_PC_204, all taxes and levies included)	220,56 €/MWh (2020-2022-S1, average) 224,90 €/MWh (1st semester 2022)
Electricity prices for non-household consumers (source: Eurostat NRG_PC_205, all taxes and levies included)	165,68 €/MWh (2020-2022, average) 214,30 €/MWh (2nd semester 2022)
Net metering	The grid operator is responsible for providing annual balancing of feed-in, shared electricity, and grid electricity, along with the associated data.
Export tariff	Defined by the electricity provider
Energy storage	allowed
Other activities	Participating in services of aggregation, energy storage, flexibility services, electrical vehicles recharging services

Table 24*. Overview of rules of the energy-sharing game.*

Context-specific measures to foster RECs

In order to support Vienna's RECs, there exist several concessions. When it comes to network charges, levies and taxes, RECs can expect a reduction of 28 to 64 %, depending on the network level. There are as well by-laws, explanations and examples of calculations by the Austrian e-control agency (Bundeskanzleramt der Republik Österreich, 2024b).

The pricing for electricity for household consumers was fixed between 2020 and 2022 at 220,56 €/MWh (2020-2022, average) and 224,90 €/MWh (1st term 2022), all taxes and levies included (Eurostat, 2024a). For non-household consumers the fixed price was 165,68 €/MWh (2020-2022, average) and 214,30 €/MWh (2nd term 2022), all taxes and levies included (Eurostat, 2024b).

Furthermore, RECs must get data about the annual balancing of feed-in, shared electricity and grid electricity by their grid operator. The electricity provider determines the export tariff for energy, and energy storage is permitted.

There are initiatives designed to inform and engage local communities about the benefits and opportunities of participating in RECs (Energiegemeinschaften, 2024). These campaigns aim to educate citizens and businesses about renewable energy technologies, the financial and environmental advantages of collective energy production and sharing, and how to participate in or form a REC. By increasing public knowledge, these efforts help to build support and trust, driving greater community involvement and investment in renewable energy projects at the local level.

Moreover, RECs can consume services of aggregation, flexibility services, electrical vehicles and recharging services.

POLICY MEASURE CATEGORY	Austria | Vienna
Additional qualification criteria	Renewable or Citizen Energy Community
Grants (public or private)	Grants are available from the national Climate- & Energy Fund (€15.000/community to get started) Additional Grants are available on local, regional and national level for building renewable energy production facilities
Expert committees and technical assistance or coordination bodies	Technical and social coordination hub on energy communities (https://energiegemeinschaften.gv.at/grundlagen/)
Data infrastructures and information systems	Geo Information Service (GIS) with information about local potentials and existing energy communities
Goals, targets, thresholds, scenarios	100% renewable Energy in Austria until 2040 (annual balance) about 325 REC already in operation, another 400 in the process of starting up
Monitoring programmes	It is made by the national climate- & energy fund (KLIEN)
Education and training programmes	Renewable energy at universities or school programmes Workshops and webinars for interested Special Webinars and Conferences on RECs by the KLIEN / REC-Agency
Spatial schemes and land use provisions	Zones with high potential marked in the GIS
Sociotechnical imaginaries and policy narratives on energy transition	With RECs more focus on the need of renewables and more awareness for fluctuating production
Awards, contests, or challenges	Geblergasse: price for architecture and sustainability (Staatspreis, 2021)
Guidelines and best practice	Best practice: Smart Block Geblergasse (Pilzgasse 33, Wien)
Awareness-raising campaigns	energiegemeinschaften.gv.at
Communities of practice	energiegemeinschaften.gv.at
Coordination mechanisms for governance networks	energiegemeinschaften.gv.at (national) and 9 more for each federal state
Flagship projects	https://energiegemeinschaften.gv.at/energiegemeinschaften-in-oesterreich/ (incl. Videos) all in German
Research&Innovation activities: prototypes, demonstrations, pilots, tests and validations	funded by KLIEN https://energiegemeinschaften.gv.at/forschung-zum-thema/

***Table 25**. Overview of context-specific measures to foster RECs.*

Energy performance of buildings

Policies and regulations on energy performance of buildings

For the transposition of Directive 2010/31/EU regarding the energy performance of buildings in Austria, you can refer to the following key legal documents and regulations:

- Energy Performance Certificate Act (Energieausweis-Vorlage-Gesetz, EAVG 2012). This law requires the provision of an energy performance certificate when selling or renting a building.
- OIB Guidelines (Österreichisches Institut für Bautechnik): These are technical building standards in line with the directive, particularly for energy efficiency and nearly zero-energy buildings (NZEB).
- Austrian Building Code (Bauordnung). Regional building codes in Austria implement the EU directive with specific energy performance requirements for new and renovated buildings.
- Federal Energy Efficiency Act (Bundes-Energieeffizienzgesetz). It supports energy-saving measures in buildings and is part of the broader federal framework for energy efficiency.

For the regional/state-level transposition of Directive 2010/31/EU in Vienna, which focuses on the energy performance of buildings:

- Bauordnung für Wien (Vienna Building Code) (Bauordnung, 2024). This regional law governs construction regulations in Vienna, including energy performance requirements for new and renovated buildings. It implements several energy efficiency measures aligned with Directive 2010/31/EU
- Wiener Energieeffizienzgesetz (Vienna Energy Efficiency Act) (Energieeffizienzgesetz, 2023). This law complements federal regulations by focusing on energy efficiency in buildings within the region of Vienna, promoting energy-saving measures in both private and public sectors.
- Wiener Klimaschutzprogramm (KLiP Wien, 2021). Although not legally binding, this climate protection programme sets strategic goals for reducing greenhouse gas emissions, including improvements in energy performance for buildings. It supports the implementation of the directive through regional initiatives.

RECs in Vienna have several public subsidies and financial incentives at their disposal. They are ranging from partial and full cover for energy related measures (insulation, fenestration change, exchange of boiler, switch to heat pumps, PV and solar thermal installation) to small grants for planning services, etc. Regarding education and training programmes, there are training centres for EPB certifiers. This wide framework of subsidies and training does not include mandatory monitoring of EPB certificates.

For several activities like sale, lease, rent and major (re)construction work an EPB certificate is mandatory. Regarding calculation methods for the certificate, energy indicators must be calculated in accordance with the OIB guidelines “Energy-related behaviour of buildings”.

LEVEL/ASPECT	Austria | Vienna
National/Federal transposition of Directive 2010/31/UE	The legislative framework encourages the integration of renewable energy systems and provides guidelines for improving the energy performance of existing structures (Bundeskanzleramt der Republik Österreich, 2024): EAVG 2012 on RIS, OIB Guidelines, Bauordnung für Wien, Energy Efficiency Act on RIS

Regional/State complementary transposition of Directive 2010/31/UE	Bauordnung für Wien (Vienna Building Code) Wiener Energieeffizienzgesetz Wiener Klimaschutzprogramm (KLiP Wien)

Table 26. *Overview of Policies and Regulations on Energy Performance of Buildings.*

Rules of the energy-performance upgrading game

The basic actors of EPB procedure in Vienna are the applicant, the registrant, the architect and the adviser. Relevant for the building work are the new buildings and refurbishments. Several exceptions exist, such as buildings with room temperatures not exceeding +5°C, unconditioned buildings, temporary structures used for only two to three years, industrial plants, workshops, and agricultural utility buildings where the majority of heating and cooling energy is supplied by waste heat generated directly within the building.

Key indicators of the energy performance of buildings in Vienna include heating demand, cooling demand, nonrenewable primary energy demand, and total primary energy demand. These KPIs are assessed for both local and reference climates, as well as for the thermal envelope with a reference HVAC system.

ITEM/ISSUE	Austria | Vienna
Actors of EPB procedure	The applicant, the registrant, the architect and the adviser.
Nature and categories of Building work	New buildings, refurbishments
Case of Derogation	a. Buildings that are only kept frost-free, i.e. with a room temperature not exceeding +5° C, as well as unconditioned buildings; b. Temporary buildings with a useful life of up to and including two years; c. Residential buildings, depending on their type only for use during a limited period calendar year and whose probable energy requirement is less than a quarter of the energy requirement for year-round use due to this limited period of use. This requirement is deemed fulfilled for residential buildings used for no more than 31 days during the period from November 1st to March 31st. d. Buildings for industrial plants and workshops as well as agricultural utility buildings, in which the majority of the energy for space heating and space cooling is covered by waste heat that is produced directly in the building. e. Buildings used for worship and religious purposes.
Indicators of the Energy Perfomance of Buildings	Heating demand, cooling demand, non-renewable primary energy demand, and total primary energy demand (all KPIs evaluated for both local and reference climates, as well as for the thermal envelope with a reference HVAC system).
Content of the EPB Certificate	The energy certificate consists of the first two pages as laid out in this Policy and an appendix according to point 13.1.2. The following must be specified in detail in the appendix: - the standards and guidelines used; - the applied standard simplifications; - the other aids used; - comprehensible determination of the geometric, building physics and building technology input data, as well;

	- recommendation of measures - with the exception of new buildings; - the implementation of which reduces the final energy demand of the building and is technically and economically appropriate. The heating requirement for residential buildings must be specified for both the reference climate (RK) and the site climate (SK). The heating requirement for non-residential buildings must be specified for both the reference climate and the site climate (SK). The class should be defined for the graphical representation of the annual heating requirement HWBBGF,SK per m² of conditioned gross floor area in relation to the site climate (SK). The primary energy requirement PEB BGF,SK is to be specified for the site climate (SK). The carbon dioxide emissions CO 2 BGF,SK are to be specified for the site climate (SK). The overall energy efficiency factor (fGEE) must be calculated for both the reference climate and the site climate. For the site climate, it must be displayed on the energy efficiency scale on the first page of the energy certificate. For other buildings, the energy efficiency scale is not shown on the first page; instead, U-values are provided in place of energy indicators. Geometry information is not required.
Threshold of the energetic classes of EPB Certificate	Annual primary energy requirement PEB BGF,SK per m² conditioned gross floor area based on the site climate (SK): - Klasse A++: PEBBGF,SK ≤ 60 kWh/m²y - Klasse A+: PEBBGF,SK ≤ 70 kWh/m²y - Klasse A: PEBBGF,SK ≤ 80 kWh/m²y - Klasse B: PEBBGF,SK ≤ 160 kWh/m²y - Klasse C: PEBBGF,SK ≤ 220 kWh/m²y - Klasse D: PEBBGF,SK ≤ 280 kWh/m²y - Klasse E: PEBBGF,SK ≤ 340 kWh/m²y - Klasse F: PEBBGF,SK ≤ 400 kWh/m²y - Klasse G: PEBBGF,SK > 400 kWh/m²y
Activities where the EPB certificate is mandatory (residential sector)	Sale, Lease, Rent, major (re)construction work
Calculation Methods	The energy indicators must be calculated in accordance with the OIB guidelines “Energy-related behaviour of buildings”. All specific requirements and result values must be rounded to one decimal place and compared. The energy performance factor shall be rounded to two decimal places.
Programme for the exemplarity of public service	Individual lighthouse projects, but no explicit energy / climate goals for public buildings

Table 27*. Summary of Energy-Performance Upgrading Rules and Key Actors.*

Context-specific measures to foster the upgrading of buildings’ energy performance

Various digital tools are available to further enhance the energy performance of buildings. RECs can select from certified tools for EPD calculation and certification.

Furthermore, the city of Vienna maintains many programmes and activities for citizen participation.

POLICY MEASURE CATEGORY	Austria | Vienna
Public subsidies/ Financial incentives	There is a jungle of subsidies and financial incentives ranging from partial and full cover for energy-related measures (insulation, fenestration change, exchange of boiler, switch to heat pumps, PV and solar thermal installation) to small grants for planning services, etc.
Monitoring	No mandatory monitoring of EPB certificates
Education - training programme - Workshop	Training centres for EPB certifiers.
Digitals tools	A number of certified tools for EPD calculation and certification
Programme for Citizen Participation	Countless activities and programmes

***Table 28**. Overview of Local Measures Supporting Energy Performance Improvements.*

Urban regeneration

Policies and regulations

Vienna's urban regeneration follows a national and federal regulatory framework, according to the Organisation for Economic Co-operation and Development (OECD). It supports strategic land use planning to revitalize urban areas, improve environmental sustainability, and enhance economic resilience. The framework involves coordination between federal and regional authorities, aligning with the EU's broader climate and energy goals.

At the regional or state level, the regulatory framework is guided by the Academy for Territorial Development in the Leibniz Association (Neugebauer & Stroissnig, 2021). Each state implements its own planning laws, emphasizing sustainable urban development, land use management, and environmental protection. Regional planning seeks to balance economic growth with environmental sustainability, often prioritizing urban densification and the rehabilitation of existing structures over new developments to reduce land consumption and infrastructure expenses. Effective collaboration between municipalities and states is critical for ensuring coordinated and successful regeneration efforts.

The national/federal urban development agenda based on the EU urban development agenda of the Amsterdam Pact is also being pursued (Bundeskanzleramt der Republik Österreich, 2020).

POLICIES	Austria | Vienna
National regulatory framework on urban regeneration	The framework involves coordination between federal and regional authorities, aligning with the EU's broader climate and energy goals (Österreichisches Raumordnungsgesetz).
State (XXXX) regulatory framework on urban regeneration	Spatial planning responsibilities are primarily assigned to the nine federal states (BO für Wien, 2024), (Stadtentwicklungsplan 2035)
National Urban Agenda	It prioritizes sustainable urban development, aligning with the EU's broader goals of social inclusion, energy efficiency, and climate resilience
State or Municipal (Vienna) Urban Agenda	No specific agenda for Vienna

***Table 29**. Overview of the regulatory and policy framework at different governance levels.*

Regulatory tools

All regulatory instruments are based on the "Austrian Strategy for Adaption to Climate Change" of 2012, adopted by the Council of Ministers and the Conference of Provincial Governors in 2017 (BMK, 2017).

The City of Vienna offers a land use plan on its website, detailing which areas are designated for urbanization (Stadt Wien). Furthermore, Vienna follows "Austria's 2030 Mobility Master Plan" (BMK, 2021). The Viennese "Climate Roadmap" for energy supply, energy use, mobility and urban structure, procurement, waste management, agriculture and forestry, nature conservation, and public relations is also a ground-breaking regulatory tool of the City (Stadt Wien, 2022).

TOOLS	Austria | Vienna
Urban masterplan	A land use plan indicating areas designated for urbanization.
Urban Regeneration Plan	Urban Development Plan Vienna 2025
Urban plan for sustainable mobility	Austria's 2030 Mobility Master Plan & Viennese Mobility Masterplan
Sustainable Energy and Climate	Vienna Climate Roadmap - Energy supply; - Use of energy; - Mobility and town-structure; - Procurement, waste management, agriculture and forestry, nature conservation; - Public relations.
Climate Change Adaptation Plan	"The Austrian Strategy for Adaption to Climate Change"(ASACC, 2017). Established in 2012. The revised strategy was adopted by the Council of Ministers in August 2017 and acknowledged by the Conference of the Provincial Governors on 10 November 2017

***Table 30**. Overview of the regulatory tools for urban regeneration as applicable in Vienna.*

Funding tools

There are different national programmes for urban regeneration and sustainable mobility to be funded under the Next Generation EU Programme, e.g. Der Klima- und Energiefonds (KLIEN), Housing Development Act (Wohnbauförderungsgesetz) and research projects like "Renowave" or "Grünstattgrau" (Renowave, 2024 & Grünstattgrau, 2024). Other funding programmes from public/private institutions are also worth mentioning: Funding programmes at district level such as "WieNeu+" from funds of the Ministry for Vienna (Stadt Wien, 2024).

Austria's urban regeneration and sustainable mobility programmes, under the European Regional Development Fund (ERDF) and European Social Fund (ESF) for 2021-2027, aim to support energy-efficient urban development and low-carbon transport solutions, especially in cities like Vienna. These programmes focus on enhancing public transport, promoting cycling infrastructure, and rehabilitating urban areas to increase sustainability and resilience. They are co-financed by EU funds and tailored to regional needs, fostering collaboration between national, regional, and local authorities (ESF, 2024).

FUNDING PROGRAMMES	Austria | Vienna
National programmes for urban regeneration and sustainable mobility to be funded under the	Der Klima- und Energiefonds (KLIEN), Housing Development Act (Wohnbauförderungsgesetz)

Next Generation EU Programme	
National/Regional/City programmes for urban regeneration and sustainable mobility with ERDF-ESF funding 2021-2027	Austrian ESF+/JTF programme 2021-2027 (Green Infrastructure and Urban Renewal, Sustainable Mobility and Public Transport Enhancements, Digitalization for Sustainable Urban Planning, etc.)
Other National/Regional/City funding Programmes for Urban Regeneration	Funding based on district level like WieNeu+ funded by the Ministry of Vienna (Green and Open Space Enhancement, Affordable Housing and Building Upgrades, Sustainable Mobility and Traffic Calming, etc.)

***Table 31**. Overview of funding tools at different governance levels.*

Organisational arrangements

Responsibilities for Vienna's urban regeneration is on national/federal level the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) as well as the City Depts for Urban Regeneration, the Municipal Department for Technical Urban Renewal (MA 25) (BMK, 2024 & Stadt Wien).

BODIES	**Austria | Vienna**
National/Federal Departments for Urban Regeneration	The Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
City Depts for Urban Regeneration	Municipal Department for Technical Urban Renewal (MA 25)

***Table 32**. Organizational arrangements for urban regeneration at different governance levels.*

Information&Training tools

Different initiatives and organizations offer workshops, events, and information campaigns to support education, networking and dissemination (Renowave, 2024; Grünstattgrau, 2024 & Magistrat der Stadt Wien, 2024).

Stakeholder analysis

Methodology

Stakeholder analysis (SA) is a well-established set of methods for studying socio-ecological systems by focusing on key actors and by assessing their respective interests and ability to influence actual or potential change (Grimble&Wellard, 1997). Stakeholder analysis is an approach that generates insights into individuals and organizations by examining their intentions, relationships, and the resources and capabilities they contribute to decision-making or implementation processes (Varvasovszky & Brugha, 2000). In practical terms, SA aims to (Billgren&Holmén, 2008):

a) identify, characterise or categorise the stakeholders who can influence and possibly change an organisation, process or system;
b) develop an understanding of why change occurs in that organisation, process or system;
c) understand who can make changes happen (both in terms of individual actors and networks), and
d) discuss how best to manage, for example, the local energy transition in a particular district.

Stakeholder analysis has been widely used in environmental and sustainability research, including energy transition studies (Putra & van der Knaap, 2019). Many scholars and practitioners caution against the risks of stakeholder analysis (SA) reinforcing oversimplified, manipulative, or patronizing perspectives on social networks. This concern is heightened by the ongoing debate over the definition of a stakeholder itself (Billgren & Holmén, 2008; Reed et al., 2009). In this context, we emphasize the importance of engaging unrepresented groups (non-stakeholders) while remaining mindful of the potential danger of further empowering already dominant stakeholders (Junker et al., 2007; Luyet et al., 2012).

Despite its limitations, and provided that appropriate methodological checks and balances are fully implemented, SA can help advance the living lab activities in each target area in three important directions (Sovacool, 2010):

1) SA can initiate dialogue and facilitate discussions between previously unconnected actors, while revealing power asymmetries between stakeholders;
2) when interests are explicitly addressed, SA can facilitate common understanding of key issues and help strengthen cooperation, while also highlighting incommensurable or irreconcilable views;
3) in particular, critical SA can enhance social responsibility and encourage organisations and individuals to change their practices in response to public participation.

The stakeholder analysis undertaken Activity 5.1.2 proceeds in five successive steps. In carrying out those tasks, different methods and tools have been used according to local expertise and the specificities of the study contexts; nevertheless, partners have prioritised critical approaches to SA, based on participatory action-research methods.

Scoping the PED study area

To fully capture the interactions between energy practices and PED-relevant policies and regulations in a specific target area/neighbourhood, it may be necessary to expand the analysis outside the neighbourhoods to reach other parts of the district/municipality or, for some aspects, even the city or the region. In this analysis, we have focused on social networks centred on the people living in, and

on the organizations located in, the target area, but we have then included actors at different levels (e.g., metropolitan government, distribution network operator, etc.) following relevant socio-spatial relationships.

Stakeholder identification

The identification of relevant stakeholders has been carried out using a mix of possible methods (including document analysis and participant observation, as well as semi-structured interviews, focus groups and other intersubjective research methods that allow for snowball sampling). The outcome is mapped on a matrix which connects a tentative list of 16 types of stakeholders (local authorities, social housing management agencies, residents, energy providers, *etc*.) with 15 potential roles in PED development (producer, consumer, prosumer, facilitator, investor, *etc*.) while also providing a tentative description of motivations and interests for each stakeholder (Selman, 2004). In line with the methodological assumptions adopted in this study, motivations and interests have been used, inductively, to reach out to uninvolved, underrepresented stakeholders, starting with those who may be at risk of energy poverty or who lack a voice in decision-making processes or suffer from social exclusion dynamics (Grossman, 2019; Hills, 2011).

Stakeholder characterisation&categorisation

Stakeholder characterization and categorization build on the previous step. In this step, each issue was analyzed in terms of organizational type, potential role in PED development, and motivations and interests. This process further explores key dimensions likely to influence each stakeholder's role in the PED-development process. More importantly, it examines the current and future dynamics of social networking around local energy transitions.

Luyet and co-workers (2012) reviewed alternative approaches to stakeholder characterisation, according to:

- attitudes towards or interest in, a project or process
- potential conflicts and coalitions between stakeholders and objectives
- access to resources
- political influence on the project
- degree of implication or commitment
- power, urgency, proximity and legitimacy.

Based on the literature, stakeholder characterization can be approached in two ways. It can be conducted analytically (top-down) by researchers alone, or through a reconstructive (bottom-up) categorization that involves stakeholders themselves (Reed et al., 2009). When choosing the methodology, it is important to note a key distinction. Unlike the primary research streams in traditional stakeholder theory (Butterfield et al., 2004), Citizens4PED does not focus on studying local actors and networks to help public authorities or private companies manage their relationships or moral obligations. Instead, the aim is to empower innovative, multi-actor PED coalitions being developed in the Living Labs.

Consequently, the research protocol used for this research step has the following features:

1) Stakeholder Characterisation&Categorisation has been carried out in a collaborative manner by researchers, involving as much as possible the stakeholder themselves (through questionnaires, interviews, *etc*.);

2) Stakeholders have been provisionally characterised, at the time the research is carried out and taking into account the dependency of the exercise on the actual participants and contextual conditions, according to three dimensions:
   a) Resources (material, financial, *etc*.)
   b) Capabilities (management, technological, relational, cultural, *etc*.)
   c) level of Engagement in PED development;
3) A preliminary categorisation has been performed according to the categories presented in **Fig. 3** for the sole purpose of triggering further investigation (Mitchell, Agle&Wood, 1997), while a revised categorisation model may emerge in subsequent project activities.

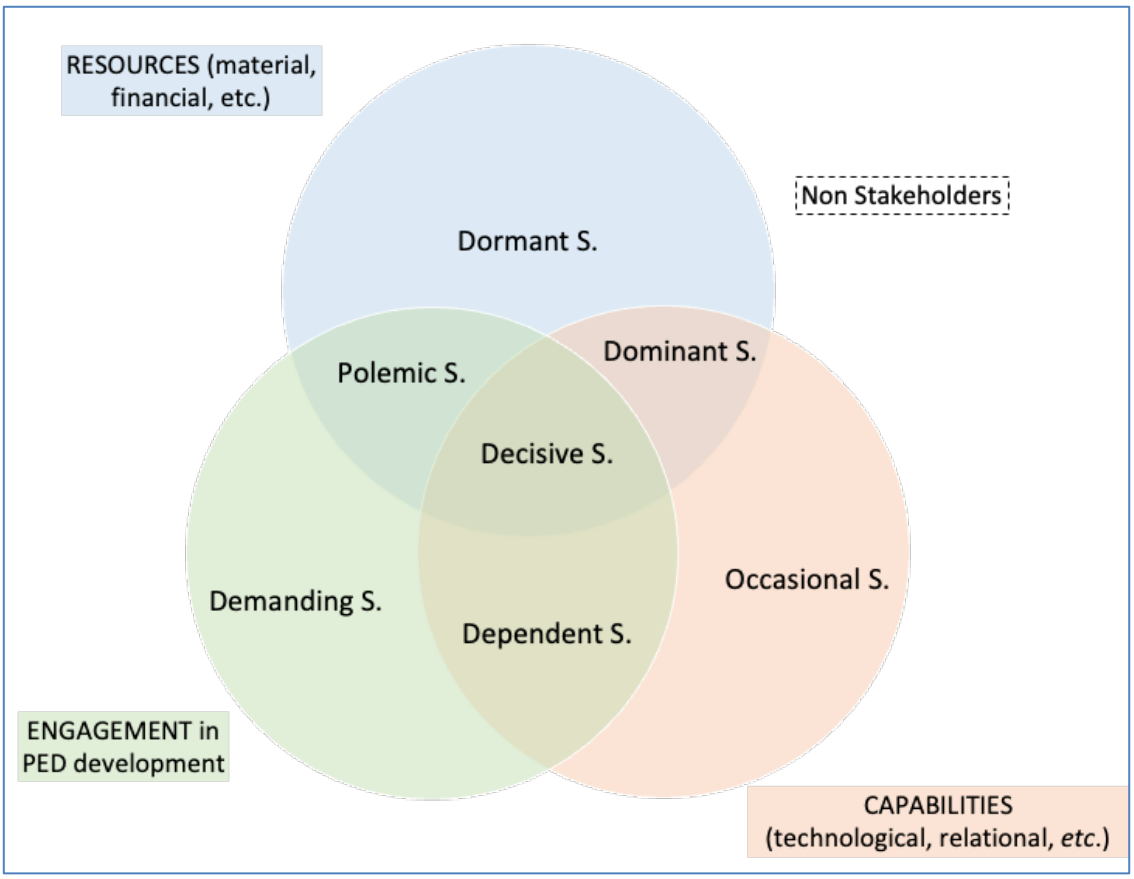


Figure 3. *A tentative model for stakeholder characterisation&categorisation. Adapted from Mitchell, Agle&Wood (1997).*

The terms in the characterization and categorization model have varied meanings. In this research, they align with the *capabilities framework* by Sen and Nussbaum (Day et al., 2016) and the resource-based view of socioeconomic innovation (Kharna et al., 2022).

Reconstructing Stakeholder networks

One mandatory and three optional methods have been discussed within the project consortium to reconstruct stakeholder interactions. The Actor Linkage Matrix (ALM) is the basic tool used in all target areas to collect data on relationships between local stakeholders. It has been used to map the existing situation and to highlight key linkages, but also to provide a rationale for transformative action (Biggs&Matsaert, 1999; 2004; Suchiradipta&Raj, 2015).

The ALM is a square matrix with the same stakeholders in both rows and columns. The cells represent the interactions between each pair of stakeholders: in the framework of the Citizens4PED project, we have used the cell to summarise the degree of interaction according to a 7-class ordinal scale ranging from “high conflict” to “high cooperation”, through the corresponding medium and low classes and the "no interaction" case, as shown in Tab. 1. Building on the bottom-up approach adopted, the Actor Linkage Matrix has been filled in directly by the stakeholders or by the researchers on the basis of interviews or mini-questionnaires. In this case, ‘stated measures’ of stakeholder interaction are used, but ‘derived measures’ may also be used, in the form of participant observation, document analysis or various primary or secondary data collection (Greenland et al., 2016). Researchers also have the opportunity to mix different analytical techniques and research designs (bottom-up vs. top-down).

Table xxx simulates an application of ALM based on a research design in which the reported measures also cover the directionality of the interaction, i.e. two stated measures of conflict or cooperation according to each stakeholder in a pair are shown in a different cell. For example, the third cell in the second row shows how the representatives of the local authority perceive their level of cooperation with the community enterprise. While the second cell, in the fourth row, shows how the members of the community enterprise perceive their level of cooperation with the local authority (and in this case they are assumed to be different).

	A) Local authority	**B) Energy provider**	**C) Community enterprise**	**D) Residents**
A) Local authority		Low cooperation	Medium cooperation	Low conflict
B) Energy provider	Low cooperation		No interaction	Low conflict
C) Community enterprise	High cooperation	No interaction		Medium cooperation
D) Residents	High conflict	Low conflict	High cooperation	

Table 33. *An example of an Actor Linkage Matrix for a PED development process, adapted from Biggs& Matsaert (1999; 2004) and Suchiradipta & Raj (2015).*

However, the discussion of reciprocity should be limited to varying degrees of either conflict or cooperation, as ambivalent relationships would require more sophisticated analytical tools (Ruggiero *et al*., 2014). A simplified version of the ALM would omit the examination of reciprocity and only fill in the lower half of the matrix, below the diagonal.

ALM can be used either as a stand-alone tool or to feed primary data to more sophisticated research methods, such as **Social Network Analysis** (SNA). The latter aims to describe the composition of, and interaction in, a network, by measuring the web of connections between agents or entities, and the importance of each relative to the network as a whole or to any grouping of entities (Enger&Gulbrandsen, 2020). Accordingly, PED networks are defined by organisations or stakeholders (“nodes”) connected by links (“edges”), based on existing (secondary) datasets on any kind of interaction (including previous collaborative sustainability or local development projects), or drawing from the ALM alone. In the latter case, the most meaningful information would come from the mere occurrence of links between certain stakeholders, although the strength of the cooperation could be

used to weight the edges. A set of indicators on the intensity of links and the configuration of the network can be calculated to identify the nodes or edges that play a more strategic role (Scott, 2012).

Fig. 4 represents one application of SNA, where the *degree centrality* and the *betweenness centrality* indicators were applied to the nodes and the edges were weighted according to the number of projects on which each pair of organisations collaborated (Persia *et al*., 2020). The open-source software package Gephi Tools[1] has been used both to measure the indicators and to draw the network diagrams (Bastian *et al*., 2020).

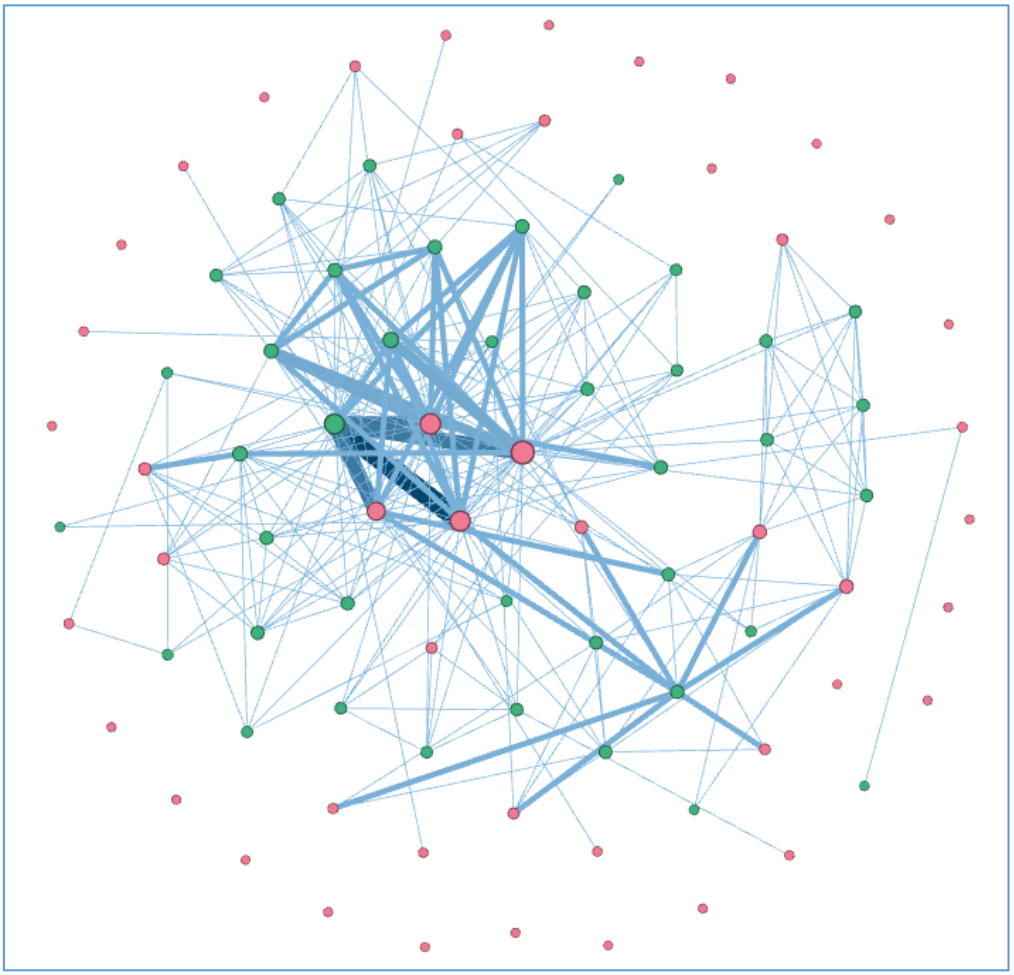


Figure 4. *Social Network diagram based on the degree centrality indicator, weighted edges and Fruchterman-Reingold layout algorithms. Adapted after Persia et al. (2020).*

Another application of SNA showing the output of Gephi and focusing on energy transition projects is shown in **Fig. 5**.

[1] https://gephi.org.

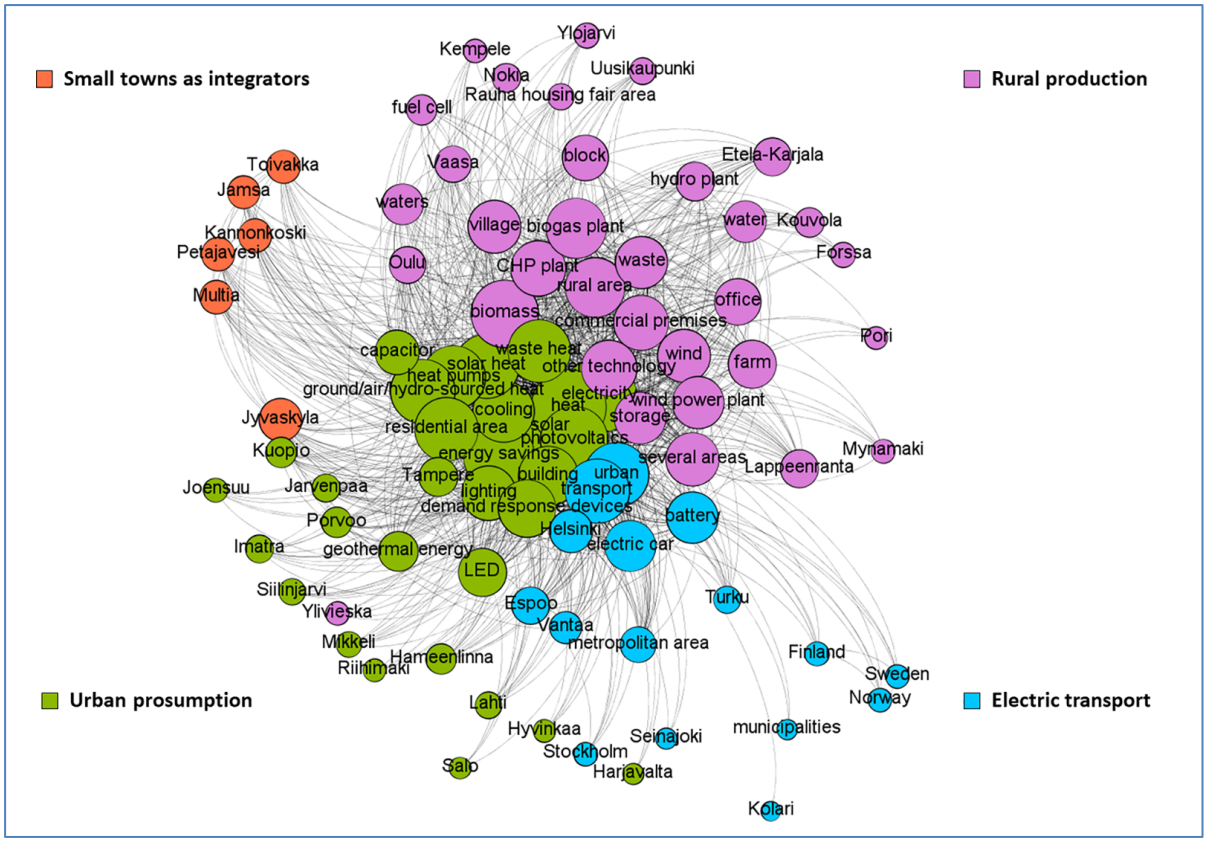


Figure 5. *Clusters of innovation niches for energy transitions, in a diagram based on social network analysis and created with the Gephi software (Matschoss&Repo, 2020).*

Although they could complement formal SNA, concept mapping software such as Obsidian[2] or other knowledge management tools, such as Kumu[3], could also be the main stakeholder network mapping tools to track contacts and sketch networks, while linking notes, images, documents, videos, audio, and web pages to the different stakeholders. This could prove useful for both research management objectives and local dissemination and engagement efforts. **Fig. 6** shows one of the views created by RealityLab to describe stakeholder interaction in the Kahlenbergerdorf district (Vienna).

[2] https://obsidian.md.
[3] https://kumu.io, see https://embed.kumu.io/ebcd39c318a26e579861ae0e52dc673e?settings=0#ssc1-projects-stakeholders-map in particular.

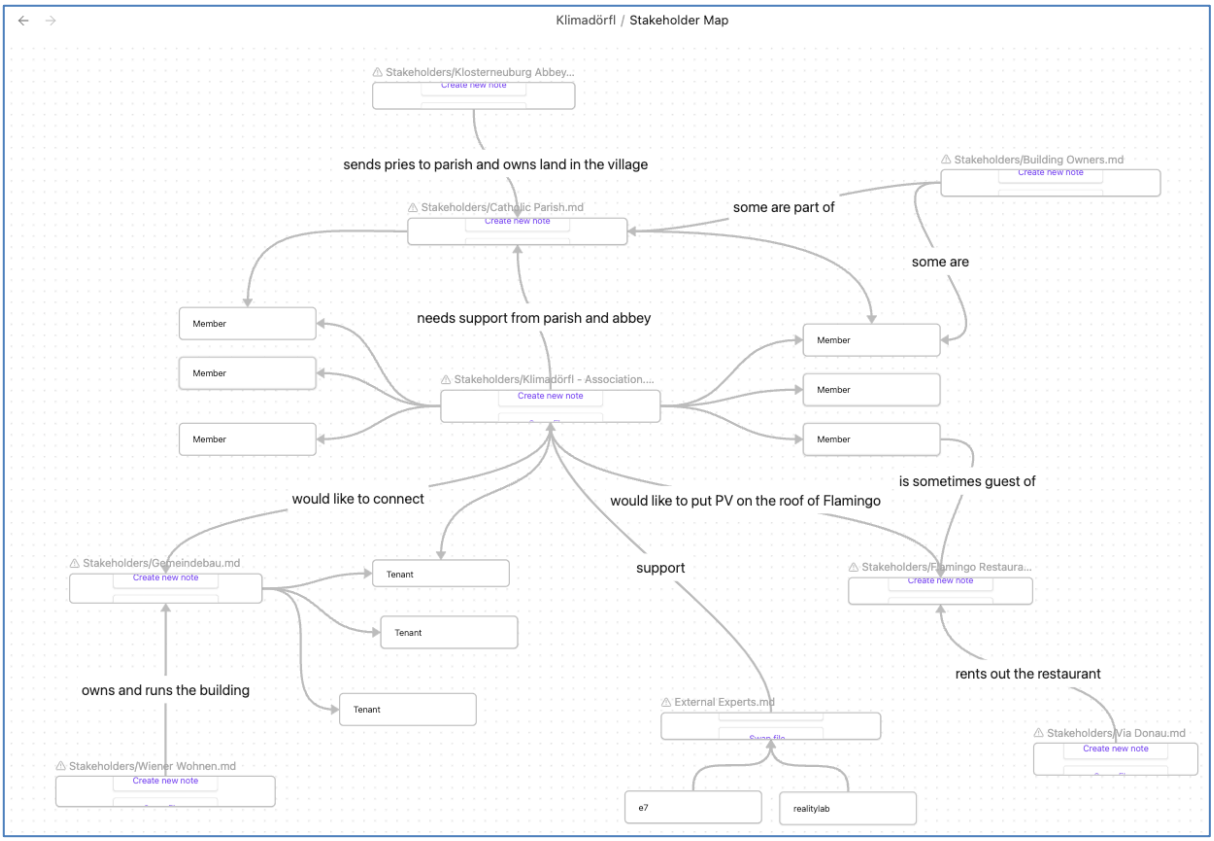


Figure 6. *A Stakeholder map about the Kahlenbergerdorf district in Vienna, created by RealityLab with the Obsidian application.*

Networking and PED-community building

Stakeholder analysis in the Citizens4PED project has been conducted in an open and transparent process, with the primary aim of empowering local stakeholders to build just local energy transition partnerships. To this end, the SNA could be informed by different conceptual approaches and research designs (Marcon Nora *et al.*, 2023). Always, the dynamic role of stakeholders must be carefully taken into account, as they may hinder or promote PED development processes, also depending on the expected distribution of benefits over time, while they seem to respond to stable policy support frameworks (Ruggiero *et al.*, 2014).

To reflect the importance of context in shaping the research activities in each target area, the partnership agreed to adopt different approaches to community mapping, that is, the closing activity summarising the outcomes of the SA methods illustrated above. As project activities progress, other methodologies that identify social networks as units of analysis and are sensitive to the sharing of resources, the building of collective capabilities and the dynamics of mutual engagement may become necessary. However, this further development will be addressed in the following tasks of WP5 or in WP6.

Community Map in San Paolo (Bari)

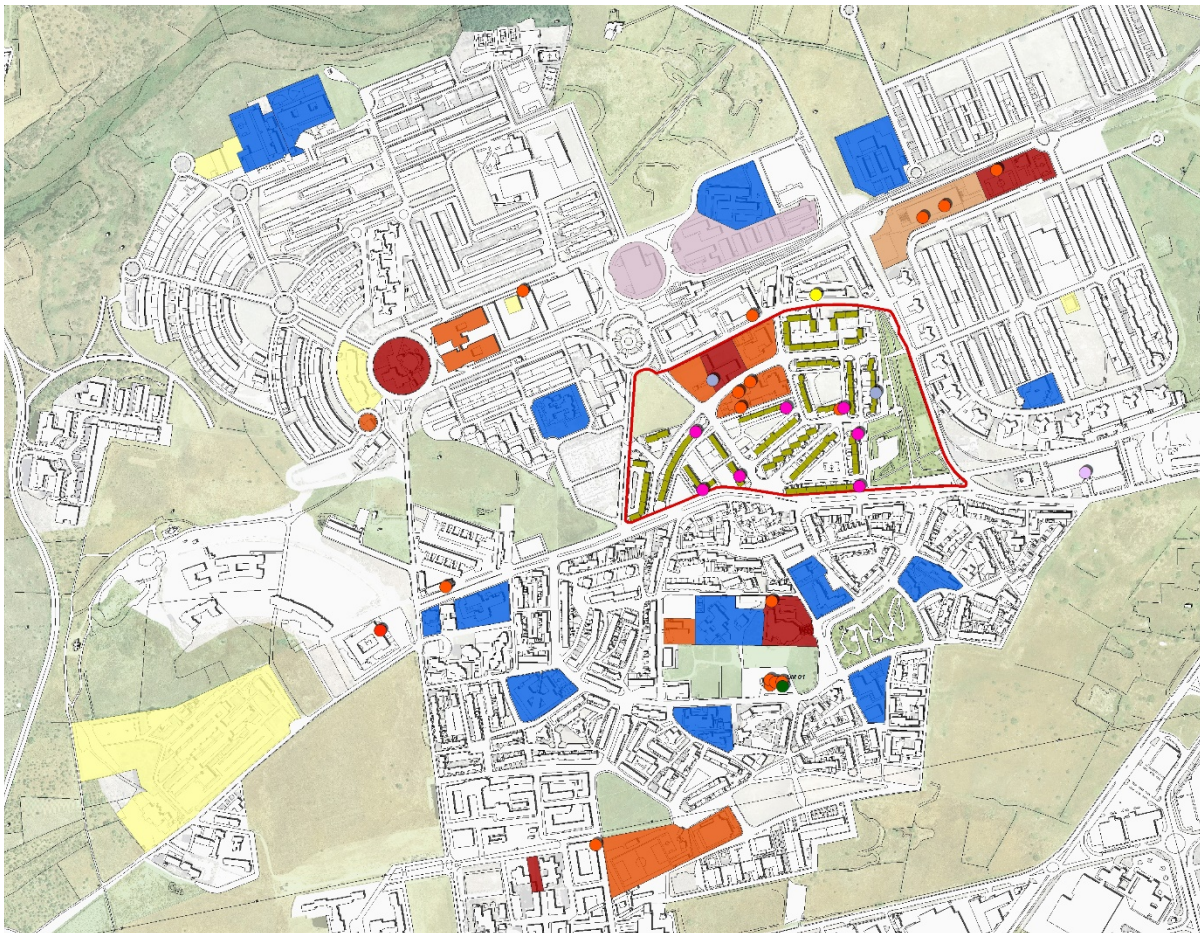
Stakeholder identification

For the identification of stakeholders, was used a criterion that did not refer exclusively to their geographical location, but took into consideration the identity of the target area in relation to the rest of the San Paolo neighbourhood.

Indeed, the area identified as the 'target' has very precise characteristics, especially in terms of the type of building that characterises it, but it is necessary to consider the relations that this area and its residents maintain with the entire neighbourhood. For example, schools are all located outside the target area but maintain strong ties with the community of the entire neighbourhood. Even the voluntary associations that provide their services to the entire community have established important relationships with the residents of the target area. For this reason, numerous stakeholders in the rest of the San Paolo neighbourhood were also considered, also in anticipation of a possible expansion of the project's target area.

The large number of stakeholders made it necessary to divide them into 'types' as shown in the following figure.

Location of stakeholders



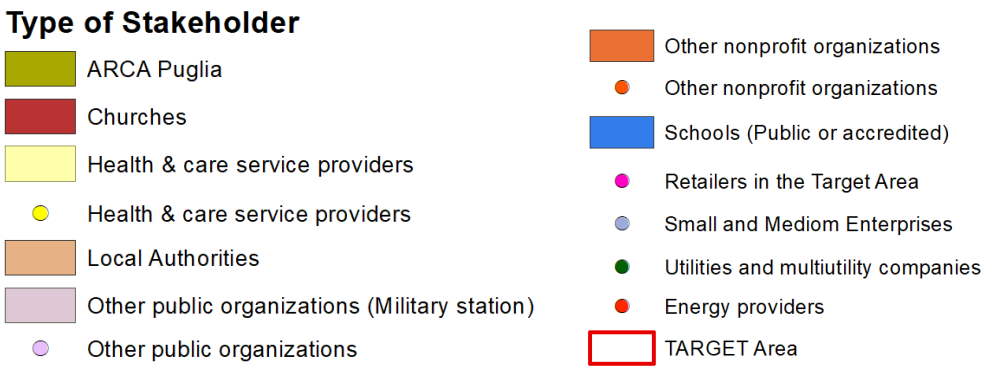


Figure 7. *Map of the San Paolo neighbourhood, showing the location of the stakeholders, classified by typology. Retailers and SMEs are shown only within the target area (red polygon).*

Ownership of buildings in the target area

The residential buildings in the target area are mostly owned by ARCA Puglia (the local branch of the Social housing management agencies, controlled by the regional government), and only in a few cases some dwellings have been redeemed by the assignees (former tenants). Even in those cases, the building remains under mixed ARCA/private ownership and management.

The non-residential buildings and their outbuildings are all owned by the Municipality of Bari and managed independently by other organisations including the Don Bosco Church.

The land in the target area is also owned by the Municipality of Bari, including public equipped parks, vacant lots, parking lots, and roads.

There are no fully private buildings in the target area as shown on the following map (**Fig. 8**).

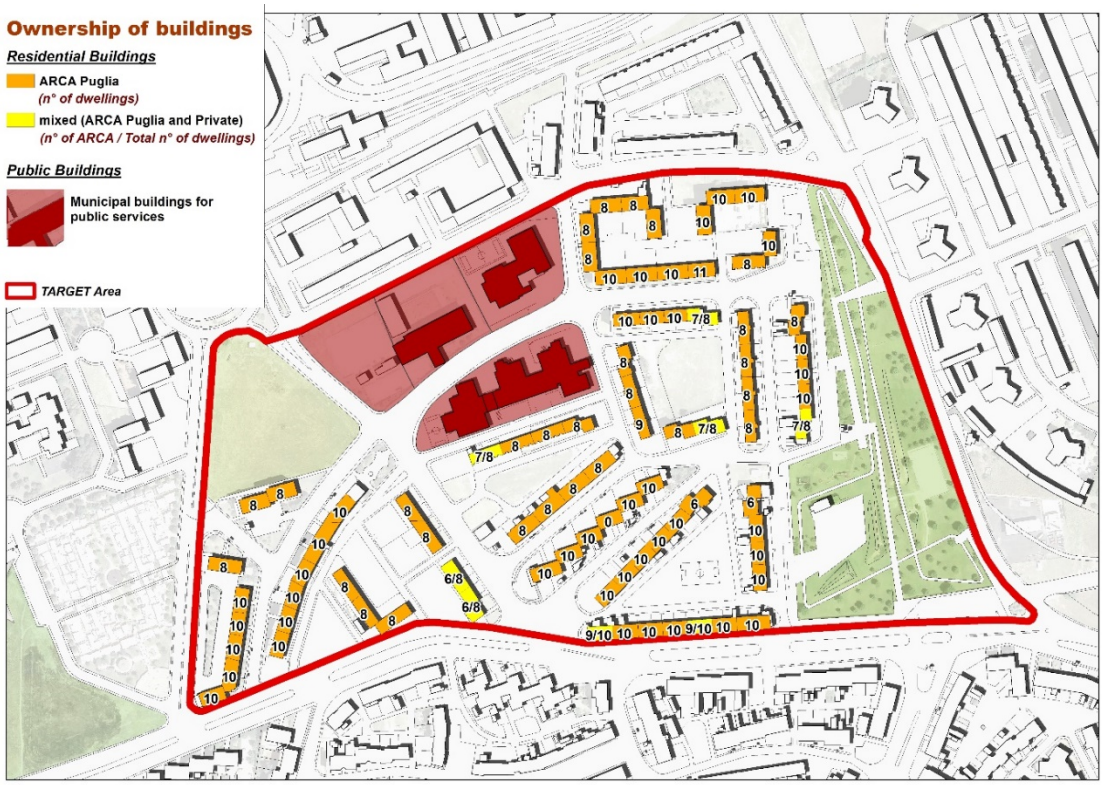


Figure 8*. Map of the Target area showing the ownership of the buildings.*

The identified stakeholders have been mapped in **Fig. 9**, according to the location of their main activity.

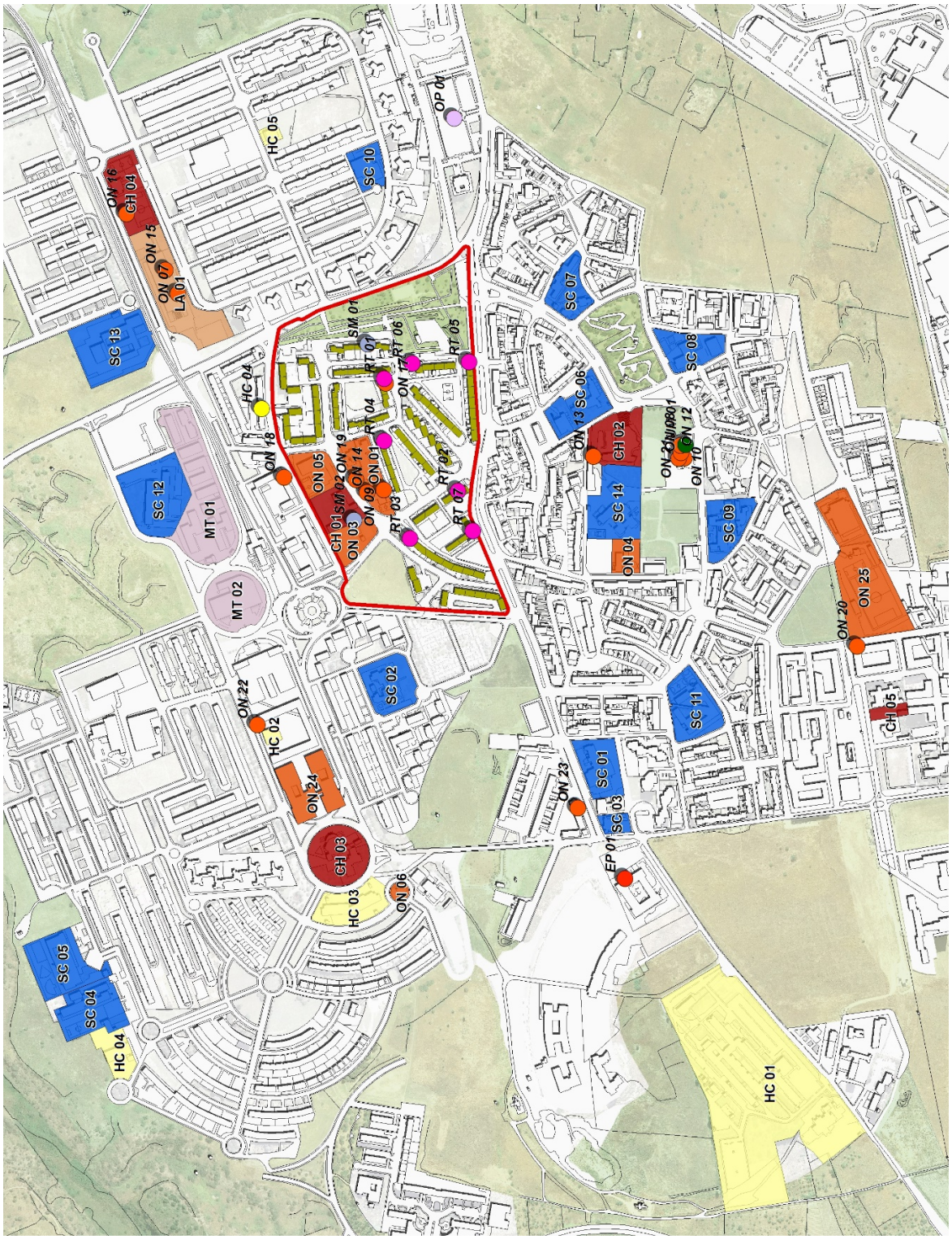


***Figure 9**. Map of stakeholders located in the San Paolo neighbourhood.*

Local Authorities and Regional Government

- LA 01, Bari Municipality

Schools (Public or accredited)

- SC 01, I.C. "Don L. Milani" – Don Milani 25 CD Bari
- SC 02, I.C. "Don L. Milani" – Via Lanave
- SC 03, I.C. "Don L. Milani" – Via Trentino
- SC 04, I.C. "Don L. Milani" – Vito De Fano 25 CD
- SC 05, I.C. "Don L. Milani" Azzarita De Filippo Ungar
- SC 06, I.C. "Falcone-Borsellino" - Cirielli 13 CD Bar
- SC 07, I.C. "Falcone-Borsellino" – Chiaia
- SC 08, I.C. "Falcone-Borsellino" – Petrignani
- SC 09, I.C. "Falcone-Borsellino" – plesso "Lopopolo
- SC 10, I.C. "Grimaldi-Lombardi" - Atrid Lindgren
- SC 11, I.C. "Grimaldi-Lombardi" - SMS Lombardi
- SC 12, I.C. "Grimaldi-Lombardi" – Grimaldi & Breda
- SC 13, I.P. "E. MAJORANA"
- SC 14, Scuola Paritaria - Pietro Alberotanza - Primaria

Health & care service providers

- HC 01, Ospedale San Paolo
- HC 02, ASL Casa della Salute Distr SS 6 Ba Ovest
- HC 03, Eliadomus srl / Centro Diurno l'Altra casa / RSSA
- HC 04, Centro diurno Cunegonda ASL
- HC 04, Farmacia Lozupone

Other public organizations

- MT 01, Polizia di Stato
- MT 02, Polizia di Stato
- OP 01, Giudice di Pace

Utilities and multiutility companies *(public, private or mixed)*

- UM 01, Poste Italiane

Social housing management agencies (ARCA Puglia)

- **MISTO**
- **LOCAZIONE**

Energy providersvelopment

- EP 01, Enel energia

Churches

- CH 01, Chiesa di Don Bosco
- CH 02, Chiesa di San Paolo
- CH 03, Parrocchia di San Gabriele dell'Addolorata
- CH 04, Chiesa Madre della Divina Provvidenza
- CH 05, Chiesa Parrocchiale di San Pietro Apostolo

Other nonprofit organizations

- ON 01, Casa delle Culture
- ON 03, Centro Multifunzionale della Parrocchia Don Bosco
- ON 04, Fondazione Giovanni Paolo II
- ON 05, CAPS Comunità Terapeutica "Tonio Signorile"
- ON 06, Patronato ACLI
- ON 07, Cooperativa Sociale C.A.P.S.
- ON 08, C.A.P.S. Centro Aiuto Psico Sociale Coop. A.R.L.
- ON 09, Ass. InConTra
- ON 10, Cooperativa Sociale I Bambini di Truffaut
- ON 11, Cooperativa Sociale Tracce verdi
- ON 12, Gruppo Fratres BARI "Madre Divina Provvidenza" ODV
- ON 13, Gruppo Fratres BARI San Paolo ODV
- ON 14, Gruppo Fratres BARI "Ala Azzurra"
- ON 15, A.S.D. Scuola di Ciclismo Franco Ballerini
- ON 16, Centro Estivo SAN PAOLO CAMP A.S.D. Playsport Time
- ON 17, Compagnia Teatrale LA PARANZA aps
- ON 18, Partito dei Pensionati
- ON 19, Associazione Operatori Barlettta Soccorso Onlus
- ON 20, CAAF CGIL Puglia
- ON 21, Patronato Anmil
- ON 22, CIA Puglia - Confederazione Italiana Agricoltori
- ON 23, C.I.S.L.Confeder. Ita. Sinda.Lav.
- ON 24, Sport Project "Piscina pubblica"
- ON 25, Campo Sportivo Diomede e Palazzetto PalaLaforgia

Retailers located in the target area

- RT 01, Passi da Ciclope - shoes shop
- RT 02, MAXI SIDIS
- RT 03, Pizzeria Parco San Pio
- RT 04, Pizza Sprint
- RT 05, Bar Angelo 2
- RT 06, Borgia Rosa
- RT 07, Linea giovane

SME located in the target area

- SM 01, Erre Gi Multiservice
- SM 02, Edil Caradonna

Aims and areas of interests of Stakeholders

Types of stakeholders	Organization	Aims and areas of interests	Location		
			Target area	Neighborhood	outside
Local Authorities and Regional Government	Bari Municipality	Administration centre. It owns public areas and structures		x	x
	Municipio III	Municipio III is one of the 5 Municipal districts of Bari. It is an articulation of the Municipality of Bari encompassing the San Paolo neighbourhood and three additional neighbourhoods (Stanic, Fesca, San Girolamo neighbourhoods). Each Municipio has its own council made of elected members (political body) and a very small administrative structure. Very limited budget. Mainly consultative responsibilities for the Bari Municipality and ordinary administrative management at the district level.		x	
	Apulia Regional Government	Regional authority; it coordinates various sectors, including social inclusion, public health, tourism, and energy accessibility. Leverages a range of resources to advance sustainability, innovation and economic resilience			x
Schools (Public or accredited)	I.C. “Grimaldi-Lombardi” – Biagio Grimaldi	Primary school		x	
	I.C. “Grimaldi-Lombardi” - Atrid Lindgren	Nursery school		x	
	I.C. “Grimaldi-Lombardi” - SMS Lombardi	Lower secondary school		x	
	I.C. “Grimaldi-Lombardi” - Plesso Lombardi	Primary school		x	
	I.C. “Grimaldi-Lombardi” - Breda I	Nursery school		x	
	I.C. “Don L. Milani” – Don Milani	Nursery school		x	
	I.C. “Don L. Milani” – Don Milani 25 CD Bari	Primary school		x	

Types of stakeholders	Organization	Aims and areas of interests	Location		
	I.C. “Don L. Milani” - Azzarita - De Filippo - Ungaretti	Lower secondary school		x	
	I.C. “Don L. Milani” – Via Lanave	Nursery school		x	
	I.C. “Don L. Milani” – Vito De Fano 25 CD	Nursery school		x	
	I.C. “Don L. Milani” – Vito De Fano 25 CD	Primary school		x	
	I.C. “Don L. Milani” – Via Trentino	Nursery school		x	
	Scuola Primaria Paritaria - Pietro Alberotanza	Primary school		x	
	I.C. “Falcone-Borsellino” – 18 Circolo	Nursery school		x	
	I.C. “Falcone-Borsellino” – plesso "Lopopolo" - 18 Circolo	Nursery school		x	
	I.C. “Falcone-Borsellino” – Chiaia	Nursery school		x	
	I.C. “Falcone-Borsellino” – Petrignani	Primary school		x	
	I.C. “Falcone-Borsellino” – G. Falcone 18 CD Bari	Primary school		x	
	I.C. “Falcone-Borsellino” - Cirielli 13 CD Bari	Primary school		x	
	I.C. “Falcone-Borsellino” – Chiaia 13 CD Bari	Primary school		x	
	I.C. “Falcone-Borsellino” – Falcone . Borsellino	Lower secondary school		x	
	I.P. "E. MAJORANA"	High school		x	
Health & care service providers	Ospedale San Paolo	public hospital		x	
	Servizi di assistenza per anziani: - San Gabriele RSA - Centro Diurno "L'altra casa"	private hospital and assistance for elderly people		x	
	ASL CASA DELLA SALUTE -DISTRETTO SOCIO SANITARIO N. 6 BARI OVEST	public healthcare facility		x	
	Centro diurno Cunegonda ASL	Psychiatric rehabilitation and socio-economic inclusion		x	
	Farmacia Lozupone	pharmacy shop		x	
Other public organi	Ufficio Giudice di Pace	key judicial office that deals with civil and minor criminal cases		x	

Types of stakeholders	Organization	Aims and areas of interests	Location		
	Military area - IX Reparto Mobile polizia di stato	crucial unit within the national police force, specializing in maintaining public order and managing large-scale security operations		x	
Utilities and multiutility companies (public, private or mixed)	AMGAS spa	Municipal company for the sale of natural gas and electricity			x
	Retegas Bari Azienda Municipale Gas Spa	Municipal company which provides the energy grid for natural GAS			x
	Poste Italiane	provides essential postal and financial services to the local community		x	
Social housing managers	ARCA Puglia Centrale	Social Housing Company - interested in the energy efficiency of social housing buildings	x		
Energy grid operators	TERNA	Energy grid provider			x
Energy providers	Enel	energy provider		x	
	Illumia	energy provider			x
	ENI	energy provider			x
	IREN	energy provider			x
	Edison	energy provider			x
ESCOs	Alkimia Energie srls	Impresa per l'erogazione di servizi energetici. Sede a Bitonto (BA)			x
	C.N. Costruzioni generali spa	Impresa per l'erogazione di servizi energetici. Sede a Modugno (BA)			x
	& Co-Società Cooperativa	Impresa per l'erogazione di servizi energetici. Sede a Bari			x
	C.S.F. Costruzioni e Servizi s.r.l.	Impresa per l'erogazione di servizi energetici. Sede a Bari			x
	Energetic Puglia s.r.l.	Impresa per l'erogazione di servizi energetici. Sede a Molfetta (BA)			x
	Gadaleta Building s.r.l.	Impresa per l'erogazione di servizi energetici. Sede a Molfetta (BA)			x
	Giannelli Impianti s.r.l.	Impresa per l'erogazione di servizi energetici. Sede a Gravina in Puglia (BA)			x
	Idea 75 s.r.l.	Impresa per l'erogazione di servizi energetici. Sede a Bari			x
	Il Faro Società Cooperativa per azioni	Impresa per l'erogazione di servizi energetici. Sede a Bari			x

Types of stakeholders	Organization	Aims and areas of interests	Location		
	La Fluidotecnica del Geom. Spinelli	Impresa per l'erogazione di servizi energetici. Sede a Cassano delle Murge (BA)			x
	LFM s.r.l.	Impresa per l'erogazione di servizi energetici. Sede a Modugno (BA)			x
	LM Impianti s.r.l.	Impresa per l'erogazione di servizi energetici. Sede a Altamura (BA)			x
	Lorusso Impianti s.r.l.	Company for the provision of energy services, including the optional activity of exploiting renewable energy sources, always with the aim of improving energy efficiency. Based in Conversano (BA)			x
	Maggi Michele s.r.l.	Energy services contractor. Based in Altamura (BA)			x
	Meit Multiservices s.r.l.	Enterprise for the supply of energy services, including the activity of financing energy efficiency improvement interventions, the purchase of energy vectors necessary for the supply of energy efficiency services, the exploitation of renewable energy sources aimed at improving energy efficiency the economic optimisation of supply contracts. Head office in Modugno (BA)			x
	New Euroart s.r.l.	Enterprise for the provision of energy services. Based in Grumo Appula (BA)			x
	EcoBioService	Enterprise for the provision of energy services, including the exploitation of renewable energy sources always aimed at improving energy efficiency. Head office in Massafra (TA) and presence in Bari.			x
	SIMET s.p.a.	Private company for the provision of services in the construction field, from design to the realisation of structures and plants			x
	SET Impianti Elettrici	Private company operating in the construction of A.T. (high voltage) electrical and electromechanical systems			x
BINGOs, Bank Foundations, ... potentially	Fondazione per il Sud	Not-for-profit Foundation funding initiatives for local development in Southern Italy			x
	Fondazione Puglia (ex Fondazione Cassa di Risparmio di Puglia)	Local development with particular focus on cultural development and social cohesion			x

Types of stakeholders	Organization	Aims and areas of interests	Location		
Churches	Don Bosco Church	church for Catholic worship	x		
	San Gabriele dell'Addolorata Church	church for Catholic worship		x	
	San Paolo Church	church for Catholic worship		x	
	San Pietro Apostolo Parish	church for Catholic worship		x	
	Madre della Divina Provvidenza Church	church for Catholic worship		x	
Other nonprofit organizations	Centro Polifunzionale Casa delle culture	Social inclusion of migrants and intercultural education	x		
	Associazione InConTra	Contrast to poverty and social assistance	x		
	Cooperativa sociale C.A.P.S.	Assistance to people in situations of severe marginalization	x		
				x	
				x	
	Fondazione Giovanni Paolo II	Promotion of social cohesion and welfare in marginalized neighbourhoods		x	
	Cooperativa Sociale I Bambini di Truffaut	Social inclusion of disadvantaged people through cultural activities		x	
	Centro Multifunzionale della Parrocchia don Bosco	Multipurpose Centre managed by the Don Bosco Parish organization	x		
	A.S.D. Scuola di Ciclismo Franco Ballerini	promotion and dissemination of cycling at a youth and social level		x	
	Cooperativa Sociale Tracce verdi	Protection and enhancement of local natural heritage through environmental education			x
	Compagnia Teatrale LA PARANZA aps	Association that operates in the world of entertainment	x		
	Patronato ACLI	Fiscal assistance		x	
	CAAF CGIL Puglia	Fiscal assistance		x	
	Patronato Anmil	Fiscal assistance		x	
	CIA Puglia - Confederazione Italiana Agricoltori	Political rights assistance		x	
	C.I.S.L.Confeder. Ita. Sinda.Lav.	Political rights assistance		x	
	Partito dei Pensionati	Political rights assistance		x	
	Operatori Barlettta Soccorso Onlus	ambulance service	x		
	Associazione Fratres - Gruppo Fratres BARI "Ala Azzurra"	ambulance service and blood donation	x		

Types of stakeholders	Organization	Aims and areas of interests	Location		
	Associazione Fratres - Gruppo Fratres BARI "Madre Divina Provvidenza" ODV	Association for blood donation		x	
	Associazione Fratres - Gruppo Fratres BARI San Paolo ODV	Association for blood donation		x	
	S.S.D. Sport Project s.r.l.	Sports club that manages the municipal swimming pool		x	
	ATI CSI - Centro Sportivo Italiano	Sports club that manages the Palalaforgia public gym		x	
	ASD Bari Quartieri Uniti	Sports club that manages the municipal sports field Palalaforgia		x	
Building managers	Building managers (most building are totally owned by ARCA)	Management and supervision of the building limited to the common areas			x
Residents	Residents in the target area	In the target area (in 2021): total population: 2.184 total number of families: 783	x		
Retailers located in the target area	Passi da ciclope	Shoes shop	x		
	Maxi Sidis	Supermarket	x		
	Pizzeria Parco San Pio	Restaurant	x		
	Pizza Sprint	Small restaurant and take-away	x		
	Bar Angelo 2	Coffee shop	x		
	Borgia Rosa	Food and grocery shop	x		
	Linea Giovane	Hairdresser shop	x		
SMEs located in the	Erre.Gi.Multiservice	cleaning company	x		
	EdilCaradonna	building company	x		

Table 34. *Aims and areas of interests of Stakeholders.*

Stakeholder characterization & categorisation

Local Authorities and Regional Government

1. **The Municipality of Bari**

The Municipality of Bari has positioned itself as a key actor in the region's energy transition, leveraging both its financial and institutional resources to drive decarbonisation at the neighbourhood level. As part of its broader urban development strategy, Bari leverages on regional, national and EU funds to implement initiatives that enhance energy efficiency and sustainability across its territory. These resources allow the city to promote innovative projects such as the development of positive energy districts, aiming to create neighbourhoods that produce more energy than they consume.

As a local government, Bari is well-placed to integrate environmental regulations with social programs targeting critical issues like housing, energy poverty, and social inclusion. This intersection of environmental policy with social policy ensures that the energy transition is inclusive and beneficial to all citizens.

The Municipality's human capital is one of its greatest strengths: a team of experts across various fields (energy management, urban planning, and social policy) has been engaged over the years allowing it to take a holistic approach to energy challenges. These experts are involved in the planning and deployment of energy renovation programmes, creation of social capital and public awareness, community engagement, particularly in vulnerable areas such as the Libertà and San Paolo neighbourhoods. Their expertise is crucial for managing the multiple dimensions of creating positive energy districts and for ensuring that the technical, social, and economic aspects of these projects are aligned.

The City of Bari's public building stock also plays a critical role in its sustainability agenda. The Municipality manages several municipal buildings that are undergoing energy retrofitting. These buildings serve as key test cases for energy performance improvements and the integration of renewable energy systems. The lessons learned from these projects are not only applied to municipal operations but also shared with the broader community as models for private-sector renovation projects.

On the issue of collective renovations, the Municipality is deeply involved in ongoing efforts to define frameworks that enable more streamlined and effective group energy renovations. Bari's participation in national and EU-funded projects, such as "POCITYF-Leading the smart evolution of historical cities" (a European Union's Horizon 2020 project, https://pocityf.eu), demonstrates its proactive stance in promoting energy cooperatives and collective action among residents.

The Sustainable Energy Action Plan (SEAP) was approved by the Municipality of Bari in 2011, followed in 2024 by the decision to draft an updated Sustainable Energy and Climate Action Plan, with ambitious targets for energy efficiency, renewable energy generation, and the creation of Energy Communities. These Energy Communities should enable citizens to collectively produce, store, and share energy, fostering both economic savings and a more resilient local energy system. By promoting shared renewable energy solutions, Bari also aims at tackling energy poverty while empowering residents to actively participate in the energy transition.

Efforts to streamline climate change mitigation and adaptation processes are underway, as the Municipality seeks to enhance collaboration between departments, shorten project approval timelines, and encourage more agile decision-making in relation to sustainability projects. Despite these challenges, the city of Bari's clear commitment to fostering a sustainable urban future, through both policy and on-the-ground action, positions it as a leader in the region's transition towards a more energy-efficient and low-carbon society.

From all the above, by mobilizing the characterization model adapted from Mitchell, Agle & Wood (1997) and illustrated in the previous Par. (Stakeholder characterisation&categorisation), we can therefore establish this table.

Resources	Capabilities	Level of Engagement
High (financial, administrative)	***High*** (relational, technical, management, community building)	***High***

2. **Municipio III**

Municipio III is one of the 5 Municipal districts of Bari. It is as an articulation of the City of Bari with limited decision-making power, is a key focus area for the city's energy transition and decarbonisation efforts. Municipio III covers a large area encompassing 5 neighbourhoods of Bari: San Paolo, Stanic, Fesca, and San Girolamo. As one of Bari's most socially and economically disadvantaged neighbourhoods, San Paolo has been identified as a priority for urban renewal and energy efficiency improvements. The Municipality of Bari, in collaboration with local stakeholders, has launched several initiatives aimed at addressing energy poverty and improving the quality of housing in the neighbourhood.

Through targeted retrofitting projects, public buildings and residential complexes in the neighbourhood of San Paolo are being upgraded to not only achieve the goal of lower energy consumption but also to create more comfortable and affordable living environments for residents.

San Paolo's inclusion in the Citizens4PED project highlights its role as a pilot site for collective energy renovation efforts, where residents are encouraged to form Energy Communities and take collective ownership of their energy consumption and production.

The neighbourhood's transformation is also guided by the Sustainable Energy Action Plan (SEAP) of the City of Bari (2011), which was followed by the Sustainable Energy and Climate Action Plans in 2024. They place a strong emphasis on inclusive development, ensuring that the energy transition benefits all citizens, particularly in historically underserved areas like San Paolo. However, challenges related to the socio-economic complexities of the neighbourhood require a tailored approach, with close collaboration between the Municipality, local associations, and residents to ensure the success of these initiatives.

Based on the information discussed above, we can utilize the characterization model developed by Mitchell, Agle, and Wood (1997) to construct this table:

Resources	Capabilities	Level of Engagement
Low	***High***	***High***

(administrative, financial)	(relational, technical, management of community building)	

3. **Apulia Region**

The Apulia region leverages on a range of resources to advance sustainability, innovation and economic resilience. The region benefits from its own financial resources, as well as substantial funding from national and European initiatives aimed at supporting projects in decarbonisation, sustainable agriculture, and renewable energy. Apulia is particularly well-positioned to develop renewable energy projects due to its abundant natural resources, such as sunlight and wind, which facilitate solar and wind energy initiatives. In terms of legal authority, the region has the capacity to implement and enforce regulations related to environmental protection, urban planning, and land use, ensuring that development aligns with sustainability goals. As a regional authority, it coordinates various sectors, including social inclusion, public health, tourism, and energy accessibility, fostering a more sustainable and resilient community that is both socially and economically inclusive.

The Apulia Region also benefits from a strong human capital basis which includes not only regional employees but also regional experts in renewable energy, smart agriculture, and technological innovation, who are crucial for the successful implementation of sustainable initiatives. Additionally, the region manages a significant number of public buildings and heritage sites, which it can leverage for pilot projects focused on improving energy efficiency and integrating green technologies, potentially serving as models for broader deployment across the region. The region's strong agricultural sector, particularly in olive oil and wine production, also presents opportunities to innovate in sustainable farming and supply chain practices, further enhancing its commitment to green transformation.

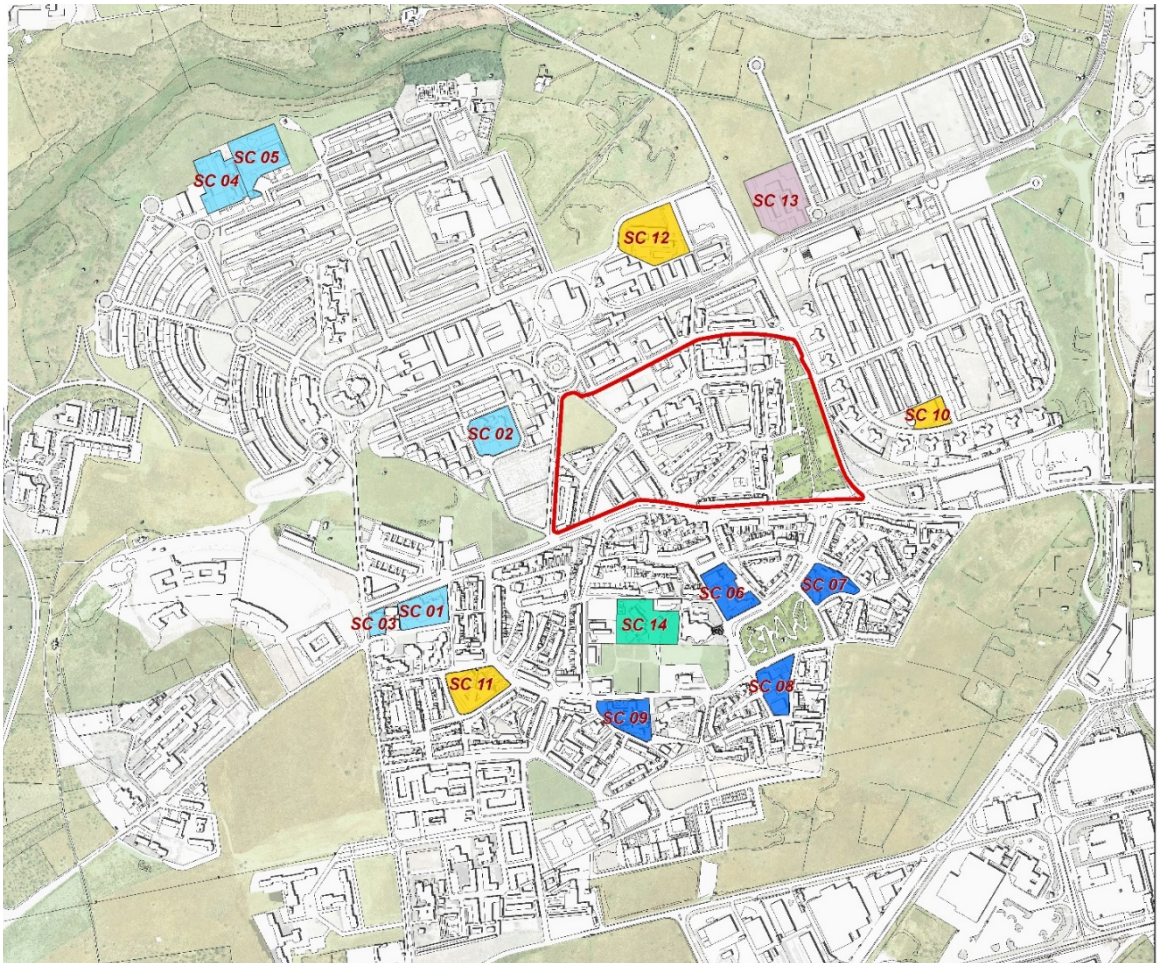
The commitment of Apulia to sustainability is reflected in its long-term planning, including regional climate strategies and the development of energy communities that promote collective energy solutions and local renewable energy production. Moreover, the region has invested in smart infrastructure projects and circular economy initiatives, designed to reduce waste and increase resource efficiency. However, like many public administrations, the Apulian regional government faces challenges related to procedural, administrative and bureaucratic hindrances, which may occasionally impede the pace of transformation. Nonetheless, the regional of Apulia remains a key player in Italy's energy transition efforts, with a growing emphasis on collaboration, community-driven projects, and the development of a green economy that can benefit both urban and rural areas across the region.

Drawing from the information outlined above, we can apply the characterization model proposed by Mitchell, Agle, and Wood (1997) to create this table:

Resources	Capabilities	Level of Engagement
High (financial, administrative)	***High*** (technical relational)	***Medium***

Schools (Public or accredited)

Here a map that shows the spatial distribution of schools in the neighbourhood.



TARGET Area

Scuole

num_progr, NOME

- SC 01, I.C. "Don L. Milani" – Don Milani 25 CD Bari
- SC 02, I.C. "Don L. Milani" – Via Lanave
- SC 03, I.C. "Don L. Milani" – Via Trentino
- SC 04, I.C. "Don L. Milani" – Vito De Fano 25 CD
- SC 05, I.C. "Don L. Milani" Azzarita De Filippo Ungar
- SC 06, I.C. "Falcone-Borsellino" - Cirielli 13 CD Bar
- SC 07, I.C. "Falcone-Borsellino" – Chiaia
- SC 08, I.C. "Falcone-Borsellino" – Petrignani
- SC 09, I.C. "Falcone-Borsellino" – plesso "Lopopolo
- SC 10, I.C. "Grimaldi-Lombardi" - Atrid Lindgren
- SC 11, I.C. "Grimaldi-Lombardi" - SMS Lombardi
- SC 12, I.C. "Grimaldi-Lombardi" – Grimaldi & Breda
- SC 13, I.P. "E. MAJORANA"
- SC 14, Scuola Paritaria - Pietro Alberotanza - Primaria

4. **I.C. “Grimaldi-Lombardi”**

The I.C. “Grimaldi-Lombardi” is a primary and secondary school located in the San Paolo neighbourhood, playing an important role in fostering both educational and social development within the community. The school is structured into several branches:

- I.C. “Grimaldi-Lombardi” – Biagio Grimaldi
- I.C. “Grimaldi-Lombardi” - Atrid Lindgren
- I.C. “Grimaldi-Lombardi” - SMS Lombardi
- I.C. “Grimaldi-Lombardi” - Plesso Lombardi
- I.C. “Grimaldi-Lombardi” - Breda I

Each of them serves different areas of the neighbourhood, including Biagio Grimaldi, Astrid Lindgren, SMS Lombardi, Plesso Lombardi, and Breda I.

This network of branches allows the school to cover a diverse student population, ensuring that educational services are accessible across various parts of the neighbourhood.

As part of its broader mission, I.C. “Grimaldi-Lombardi” not only focuses on educational achievement but also emphasizes the importance of sustainability and community engagement. By participating in neighbourhood -wide initiatives, the school plays a pivotal role as a partner in local projects, such as energy efficiency programmes and environmental awareness campaigns.

This collaborative approach is essential in aligning with the Municipality of Bari’s 2023-2030 Climate Action Plan, which seeks to involve local institutions, such as schools, in fostering sustainable development.

Drawing from the information presented above, we can apply the characterization model formulated by Mitchell, Agle, and Wood (1997) to create the following table:

Resources	Capabilities	Level of Engagement
High (administrative, financial, material-rooftop and public library)	***High*** (technical and relational)	***Medium***

5. **The Istituto Comprensivo (I.C.) “Don L. Milani”**

The Istituto Comprensivo “Don Milani” is located in the San Paolo neighbourhood along Viale delle Regioni and provides foundational educational services for primary and lower secondary levels. As a key part of the community, the school serves a diverse population of young students and focuses on fostering inclusivity, social integration, and foundational learning. It is split in the following branches:

- I.C. “Don L. Milani” – Don Milani
- I.C. “Don L. Milani” – Don Milani 25 CD Bari
- I.C. “Don L. Milani” - Azzarita - De Filippo - Ungaretti
- I.C. “Don L. Milani” – Via Lanave
- I.C. “Don L. Milani” – Vito De Fano 25 CD
- I.C. “Don L. Milani” – Vito De Fano 25 CD

- I.C. “Don L. Milani” – Via Trentino

In line with the broader objectives of San Paolo neighbourhood and according to the values advocated by its namesake, being Don Milani, advocating for equal educational opportunities for all children, regardless of their socio-economic background, this school puts a strong emphasis on inclusivity. It is actively involved in promoting civic responsibility and community engagement through its educational programmes.

While the school’s main mission revolves around providing quality foundation education, it also participates in neighbourhood-level initiatives of all types to increase students and their families’ awareness on sensitive social issues. Though there is no formal alignment with the Municipality of Bari’s 2023-2030 Climate Action Plan, the school encourages socio-economic responsibility through classroom activities and projects, contributing to the long-term goals of creating a more sustainable community.

By instilling these values in its students, I.C. “Don L. Milani” plays a crucial role in shaping future generations in the San Paolo neighbourhood, supporting both educational growth and the social and environmental development of the area.

Given the information provided above, we can apply the characterization model designed by Mitchell, Agle, and Wood (1997) necessary to formulate the table below:

Resources	Capabilities	Level of Engagement
Medium (administrative, financial, material-rooftop)	***High*** (technical and relational)	***Medium***

6. **Scuola Primaria Paritaria “Pietro Alberotanza”**

Scuola Primaria Paritaria “Pietro Alberotanza” is a private primary school located in the San Paolo neighbourhood of Bari. As an accredited school, hence, it is a type of private school that, in line with the national regulations, it operates with public funding and adheres to national educational standards. Unlike public schools, which are fully funded and managed by the government, this school receives some financial support from the state while maintaining independence in their administration and educational approach.

As a private institution, this school offers more flexibility in terms of curriculum, teaching methods, and school culture, allowing for a tailored educational experience. While it is recognised by the national government so to meet certain regulations, it operates independently, often emphasising specific values or pedagogical approaches that align with its mission. This status allows it to serve the community while providing alternatives to the public education system.

This private school has a strong commitment to inclusivity and emphasises values such as respect, responsibility, and environmental awareness, integrating sustainability into its educational programmes. Through collaborative projects and partnerships with local organizations, the school aims to instil a sense of civic duty and social responsibility in its students.

Based on the information provided above, we can utilize the characterization model developed by Mitchell, Agle, and Wood (1997) to construct the following table:

Resources	Capabilities	Level of Engagement
Medium (administrative, financial, material-rooftop)	***High*** (technical and relational)	***Medium***

7. **I.C. "Falcone-Borsellino"**

The Istituto Comprensivo "Falcone-Borsellino" is a public school that includes primary and lower secondary schools and offers free education and serving the local community of San Paolo Neighbourhood. It has a decentralized structure since it includes the following branches that serve:

- I.C. "Falcone-Borsellino" – 18 Circolo
- I.C. "Falcone-Borsellino" – plesso "Lopopolo" - 18 Circolo
- I.C. "Falcone-Borsellino" – Chiaia
- I.C. "Falcone-Borsellino" – Petrignani
- I.C. "Falcone-Borsellino" – G. Falcone 18 CD Bari
- I.C. "Falcone-Borsellino" - Cirielli 13 CD Bari
- I.C. "Falcone-Borsellino" – Chiaia 13 CD Bari
- I.C. "Falcone-Borsellino" – Falcone Borsellino

This school benefits from its organizational and human resources, including a dedicated team of educators and administrators, all of whom are committed to addressing the diverse educational needs of their students. Leveraging its extensive network, the school also facilitates coordination between various stakeholders, such as families, local communities, and educational authorities, to ensure a holistic and inclusive approach to learning. This decentralised structure allows the school to support different local contexts, adapting educational strategies to best serve each branch's unique student population, while remaining united under a common educational philosophy.

Using the information outlined above, we can apply the characterization model developed by Mitchell, Agle, and Wood (1997) to create the following table:

Resources	Capabilities	Level of Engagement
Medium (administrative, financial, material-rooftop)	***High*** (technical and relational)	***Medium***

8. **I.P. "E. MAJORANA"**

The Istituto Professionale "E. Majorana" is a public vocational high school located in the neighbourhood of San Paolo, and it focuses on providing technical and professional education to students. The school specialises in areas such as technology, electronics, and industrial engineering, equipping students with the skills needed for careers in industry and applied sciences. It actively engages with the local community by offering practical, applied educational programmes designed to

meet the needs of the modern workforce. This school's commitment to fostering innovation and professional growth makes it a key player in the region's educational landscape.

In terms of resources, this school benefits from a skilled teaching staff and advanced facilities that represent essential assets in delivering a quality vocational education and providing students with both theoretical knowledge and technical skills.

The school coordinates with various educational and social actors to create a supportive learning environment that fosters both academic and professional growth. Its commitment to innovation is reflected in the development of curricula that align with industry standards and workforce demands, ensuring that students are well-prepared to access the job market or higher education.

Furthermore, the school's dedication to continuous improvement is evident in its participation in local educational initiatives aimed at enhancing vocational training and career readiness.

However, there can be institutional challenges that occasionally limit the full realisation of its educational objectives, but, overall, this vocational school plays a crucial role in empowering students through relevant practical and applied skills.

By utilizing the information presented above, we can implement the characterization model formulated by Mitchell, Agle, and Wood (1997) to construct the following table:

Resources	Capabilities	Level of Engagement
Medium (administrative, financial, material-rooftop)	***High*** (technical and relational)	***Medium***

Health & care service providers

9. **San Paolo Hospital**

San Paolo Hospital is a key healthcare institution in the Apulia Region, more specifically in the Municipality of Bari, hence, in the neighbourhood of San Paolo. The hospital benefits from a variety of resources to enhance its services and operations. The San Paolo Hospital in Bari operates under the jurisdiction of the ASL - Azienda Sanitaria Locale (Local Health Authority). This means that it is part of the regional public health system, which is managed and coordinated by the ASL to ensure healthcare services are efficiently provided to the local population. The ASL oversees the hospital's administration, staff, and medical services, aligning them with regional and national healthcare regulations.

In terms of resources, San Paolo Hospital benefits from its own financial support, as well as funding from regional health authorities, to enhance healthcare services in the San Paolo neighbourhood of Bari. The hospital operates under a legal framework that establishes health and safety regulations, ensuring high standards of patient care. As a public health organization, San Paolo Hospital is active in creating partnerships with various social actors, including local health agencies and community organizations to address healthcare access, social inclusion, and public health initiatives.

The hospital's skilled medical staff represents a significant asset in addressing the complex healthcare needs of the community.

In terms of commitment, the hospital actively participates in local activities related to health and welfare initiatives attempting to improving community health outcomes. Additionally, it engages in projects that focus on preventive care and wellness, contributing to the overall health landscape of Bari.

However, like many public organizations, San Paolo Hospital sometimes faces bureaucratic and administrative procedural challenges that can limit its responsiveness to emerging health needs.

Drawing from the characterization model developed by Mitchell, Agle, and Wood (1997), we can therefore establish this table:

Resources	Capabilities	Level of Engagement
High (financial, material spaces)	***High*** (technical, management and relational)	***Low***

10. **Care services for the elderly**

The following facilities are present in the San Paolo neighbourhood:

- 'San Gabriele' RSA rest home
- 'L'altra casa' Day Care Centre

The facilities share the same building complex and are both managed by the 'Korian' group, which has been working for 25 years to provide health and care services with hundreds of specialised facilities in France, Italy, Belgium, Germany, Spain and the Netherlands.

Resources	Capabilities	Level of Engagement
Medium (administrative, financial, material-rooftop)	***High*** (technical, management, and relational)	***Low***

11. **ASL CASA DELLA SALUTE -DISTRETTO SOCIO SANITARIO N. 6 BARI OVEST**

ASL Casa della Salute (Social and Health district N. 6 Bari Ovest) is a public healthcare facility located in the Bari Ovest area of Italy, hence in the neighbourhood of San Paolo. It serves as a key point of access for community health services, providing a range of medical and preventive care.

The facility emphasizes social inclusion and aims to address the diverse healthcare needs of the local population through coordination with various health agencies and community organizations.

In terms of resources, ASL Casa della Salute benefits from its own funding, supplemented by financial support from regional health authorities to enhance healthcare services within the community. The organization operates under a legal framework that mandates adherence to health and safety regulations, ensuring the delivery of high-quality care. As a local healthcare provider, ASL Casa della

Salute coordinates with various social actors, including health agencies and community organizations, to address crucial areas such as healthcare access, social inclusion, and preventive health initiatives.

ASL Casa della Salute leverages its human capital, comprising skilled healthcare professionals, to tackle the diverse health needs of the population effectively.

In terms of energy management, it is committed to implementing energy-efficient practices and renovations in its facilities, aiming to reduce consumption and promote sustainability. This includes upgrading infrastructure to enhance energy performance, exploring renewable energy options, and participating in local sustainability initiatives.

ASL Casa della Salute actively engages in collaborative projects aimed at improving community health outcomes while also addressing potential challenges that may arise from bureaucratic constraints.

Overall, its dedication to integrating sustainable practices into healthcare delivery reflects a commitment to both public health and environmental responsibility.

Using the characterization model created by Mitchell, Agle, and Wood (1997), we can thus create the following table:

Resources	Capabilities	Level of Engagement
Medium (financial, material spaces)	***Medium*** (management and relational)	***Low***

12. **"Cunegonda ASL" (local health authority) day care centre**

The 'Cunegonda' public day centre of the ASL BA Mental Health Department is located in the former covered market in Via Gnocchi, made available by the municipality and renovated at its own expense by the ASL.

The centre is equipped for artistic, educational and recreational activities, operating from Monday to Friday from 8 a.m. to 4 p.m., for rehabilitation activities, and on Saturdays and every day after 4 p.m., for socialisation activities, courses, and conferences.

The centre's activities include psycho-education treatments (Social Skills Training, Cognitive Remediation Therapy, Illness Managment and Recovery, Cognitive Remediation 'Paper and Pen').

Resources

The centre is directly managed by the ASL and is therefore thought to be directly funded by the public through the Local Health Authority.

It therefore has public resources and also its own public facility owned by the Municipality of Bari and therefore potentially ready for the installation of photovoltaic panels useful for activating the project.

However, the facility is far outside the target area, on the edge of the San Paolo neighbourhood.

Capabilities

The centre provides care services as a Local Health Authority and is therefore perceived by the community as a public body to be trusted and relied upon.

The relationship with the community is therefore very strong, even though the services are aimed at a very specific catchment area with special needs. In any case, however, the activities are run by a staff of a public company and therefore can hardly make decisions independently.

Level of engagement

As managed by the staff of a public health company, interest in the project is relatively low and therefore relations should be built directly with the public and the municipality of Bari, which owns the building.

The fact remains that the facility is far outside the target area and therefore relations could be activated at a later stage of the project.

Resources	Capabilities	Level of Engagement
Medium (material: large rooftop out of the target area)	***Medium*** (relational - ties with the local community)	***Low*** (not directly interested)

13. **Farmacia Lozupone**

Farmacia Lozupone, located in the San Paolo neighbourhood of Bari, is a well-established pharmacy providing primarily retail services. The pharmacy often participates in health promotion initiatives, offering screenings, vaccinations, and educational programmes to raise awareness about various health issues. It is a trusted resource for residents living in the neighbourhood, especially for those seeking reliable pharmaceutical care and health-related support.

By applying the characterization model developed by Mitchell, Agle, and Wood (1997), we can therefore construct the following table:

Resources	Capabilities	Level of Engagement
Low	***Medium***	***Low***

Other public organizations

14. **Ufficio Giudice di Pace**

The Ufficio Giudice di Pace located in San Paolo (Bari) plays an essential role in the local administrative framework and serves as a key judicial office that deals with civil and minor criminal cases, providing local residents with access to justice for disputes that do not require involvement from higher courts. Its position in the San Paolo neighbourhood places it in a strategic location to ensure that legal services are easily accessible to those living in the area. The Ufficio Giudice di Pace in San Paolo serves as a key judicial office that deals with civil and minor criminal cases, providing local residents with access to justice for disputes that do not require involvement from higher courts.

While its primary focus is on legal and judicial functions, the office operates in a context influenced by the Municipality of Bari's commitment to energy efficiency and environmental sustainability. Hence, although it may not itself directly engage in energy projects, it benefits from the city'

s regulatory framework that encourages sustainable practices within public buildings and facilities.

The city's strategic approach includes ongoing efforts to upgrade the energy performance of public buildings, which may eventually encompass improvements at the Ufficio Giudice di Pace, enhancing its operational efficiency and sustainability.

Utilizing the characterization model developed by Mitchell, Agle, and Wood (1997), we can proceed to construct the following table:

Resources	Capabilities	Level of Engagement
Low	***Low***	***Low***

15. **Military Area - IX Reparto Mobile Polizia di Stato**

The Military Area - IX Reparto Mobile Polizia di Stato in San Paolo (Bari) serves as a crucial unit within the national police force, specializing in maintaining public order and managing large-scale security operations. Its presence in the San Paolo neighbourhood strategically positions it to respond efficiently to incidents and support public safety efforts in the area. As a key operational hub for the Polizia di Stato, this unit plays a significant role in ensuring law enforcement capabilities are readily available to manage both routine and extraordinary security needs.

While the IX Reparto Mobile's primary focus is on law enforcement and public order, it operates within the broader context of the Municipality of Bari's initiatives aimed at energy efficiency and environmental sustainability. Although the unit itself may not be directly involved in specific energy-saving projects, it benefits from the municipality's regulatory efforts to promote sustainable practices across public institutions. The city's strategic approach includes ongoing upgrades to improve the energy performance of public buildings, which could eventually extend to facilities within the IX Reparto Mobile, enhancing their operational efficiency and reducing their environmental impact.

By applying the characterization model developed by Mitchell, Agle, and Wood (1997), we can therefore construct the following table:

Resources	Capabilities	Level of Engagement
High *(financial, administrative)*	***Medium*** *(management, relational)*	***Low***

Utilities and multiutility companies (public, private or mixed)

16. **AMGAS SpA**

The AMGAS office located in the San Paolo neighbourhood of Bari serves as an important hub for the company's operations, focusing on the distribution and supply of natural gas to the local community. Positioned strategically within this neighbourhood, the office ensures that residents and businesses

in San Paolo have reliable access to energy services, supporting both everyday needs and broader economic activities in the area. The presence of AMGAS in San Paolo highlights its commitment to meeting the energy demands of the community while maintaining high standards of service and efficiency.

Although the office's primary role revolves around the management of natural gas supply, it also operates within a framework that aligns with the city of Bari's dedication to energy efficiency and sustainability. The AMGAS office in San Paolo benefits from the city's regulatory environment, which promotes sustainable practices in public buildings and infrastructure. While it might not directly lead energy efficiency initiatives, its operations are shaped by the broader municipal efforts to optimize energy consumption and implement greener practices throughout the neighbourhood.

As Bari continues to focus on enhancing the energy performance of public buildings, these efforts may eventually influence the infrastructure of the AMGAS office in San Paolo, contributing to improved operational efficiency and a reduced environmental footprint.

Leveraging the characterization model proposed by Mitchell, Agle, and Wood (1997), we can create the following table:

Resources	Capabilities	Level of Engagement
High *(financial, administrative, technical)*	***Medium*** *(management, relational)*	***Low***

17. **Retegas Bari Azienda Municipale Gas S.p.A.**

Retegas Bari Azienda Municipale Gas SpA is located in the San Paolo neighbourhood of Bari and, as a player in the local infrastructure, it manages the distribution of natural gas to residents and businesses in the area. Its strategic position in San Paolo ensures that essential gas services are readily accessible, contributing to the energy needs of the community. While the primary focus of Retegas Bari is on providing reliable energy supply, the company operates within a broader framework shaped by the Municipality of Bari's dedication to energy efficiency and environmental sustainability. Though its core operations revolve around the supply and distribution of natural gas, Retegas Bari benefits from the city's regulatory initiatives that promote sustainable energy practices across public and private sectors. These initiatives include efforts to optimize energy consumption and enhance the efficiency of utility services within the community.

As the Municipality of Bari continues its efforts to upgrade the energy performance of public infrastructure, Retegas Bari may also be influenced by these advancements, further contributing to the overall goal of creating a more sustainable and energy-efficient urban environment.

Building on the characterization model established by Mitchell, Agle, and Wood (1997), we can develop the following table:

Resources	Capabilities	Level of Engagement
High	***High*** *(management, relational)*	***Low***

(financial, administrative, technical)		

18. **Poste Italiane**

The office of Poste Italiane located in San Paolo (Bari) plays a crucial role in providing essential postal and financial services to the local community. It serves as a central hub where residents can access a variety of services, including mail delivery, bill payments, banking, and parcel shipping, ensuring that these services are conveniently available to those living in the San Paolo neighbourhood. The strategic location of this office within the San Paolo area enhances its accessibility, making it easier for residents to handle their postal and financial needs locally.

While its primary focus is on delivering postal and financial services, the office operates within a broader framework influenced by the Municipality of Bari's commitment to energy efficiency and sustainability. Although the Poste Italiane office may not directly engage in specific energy-saving projects, it benefits from the city's regulations promoting sustainable practices within public buildings. The Municipality of Bari's strategic initiatives to improve the energy performance of public facilities could eventually lead to upgrades at the Poste Italiane office, contributing to its overall operational efficiency and environmental responsibility.

Based on the characterization model outlined by Mitchell, Agle, and Wood (1997), we can proceed to develop the following table:

Resources	Capabilities	Level of Engagement
Medium *(management, financial, administrative)*	***Medium*** *(management, relational, technical**)***	***Low***

<u>Social housing management agencies</u>

19. **ARCA Puglia Centrale**

ARCA Puglia Centrale has established itself as a pivotal actor in the region's energy transition, leveraging its extensive portfolio of residential buildings.

Drawing on regional, national, and European funds, ARCA Puglia Centrale implements energy efficiency and sustainability projects that align with its mission to improve the living standards of its tenants while reducing the carbon footprint of its properties. These resources enable the organization to support innovative efforts like the creation of positive energy districts, which aim to transform neighbourhoods into areas that generate more energy than they consume.

In terms of regulatory capabilities, ARCA Puglia Centrale benefits from a framework that allows it to integrate energy-saving measures within its housing units, promoting practices such as energy-

efficient renovations, waste reduction, and the adoption of renewable energy solutions across its building stock. This regulatory environment is critical for implementing sustainable upgrades that directly benefit residents, especially in socio-economically challenged areas like San Paolo where, given its role as a partner in the PED4 Citizens project, it can be very crucial in driving de-carbonization initiatives.

As a key stakeholder in the community, ARCA Puglia Centrale not only focuses on physical infrastructure improvements but also aligns these efforts with broader social objectives, such as combating energy poverty and enhancing social inclusion. This approach ensures that its initiatives are inclusive, providing support to vulnerable residents while fostering community engagement in the energy transition process.

The organization's human capital is one of its strongest assets, with a dedicated team of experts actively involved in the planning and execution of energy renovation projects. These specialists play a crucial role in aligning technical solutions with the needs of residents, ensuring a comprehensive approach to creating positive energy districts in the San Paolo neighbourhood.

ARCA Puglia Centrale's building stock serves as a critical component of its sustainability strategy. The ongoing energy retrofitting of its residential properties provides valuable insights into good practices for improving energy performance and integrating renewable energy systems. These retrofitted buildings act as prototypes that demonstrate the potential for energy savings and sustainability, offering a blueprint for similar upgrades in both public and private sectors.

Furthermore, ARCA Puglia Centrale's interest in collective energy renovation initiatives reflects its commitment to fostering a culture of energy cooperation. Through projects like Citizens4PED, the organization supports the development of Energy Communities, enabling residents to collaboratively produce, store, and share energy. This not only drives economic savings but also builds a more resilient local energy system, empowering tenants to take an active role in the energy transition.

However, ARCA Puglia Centrale also faces challenges related to administrative and procedural complexities. These bureaucratic hurdles can sometimes slow down the implementation of energy efficiency projects, despite the organization's commitment to sustainability goals. Efforts are ongoing to streamline these processes, improve internal coordination, and enhance agility in decision-making to better adapt to new opportunities and overcome any obstacles that arise.

Despite these challenges, ARCA Puglia Centrale's active role in both policy and practical measures for sustainable development positions it as a leader in the region's transition towards a more energy-efficient and low-carbon future, especially within the San Paolo neighbourhood and beyond.

Leveraging the characterization model proposed by Mitchell, Agle, and Wood (1997), we can create the following table:

Resources	Capabilities	Level of Engagement
High (administrative, financial, material-rooftop)	***High*** (relational, technical, management of community building)	***High***

Energy Grid operators

20. **Terna**

Resources	Capabilities	Level of Engagement
High (financial, administrative, technical)	***High*** (management, relational)	***Low***

Energy providers

21. **Enel & other energy providers**

Resources	Capabilities	Level of Engagement
High (financial, administrative, technical)	***High*** (management, relational)	***Low***

ESCOs

22. **ESCOs out of the target area**

An Energy Service Company (ESCO) is a company that specialises in providing energy services, offering energy efficiency and energy management solutions. ESCOs are committed to delivering energy services to their customers in an efficient, sustainable, and cost-effective manner.

Resources

ESCOs are potential financiers who can provide all the technical, commercial, and financial services needed to implement an energy efficiency project. However, their support is closely linked to an actual economic return of their own.

Capabilities

ESCOs are seen as having the right skills to manage the energy transition in the neighbourhood, although people are still very sceptical about energy companies.

Level of engagement

The involvement of ESCOs is probably a very important step that is currently being implemented. Several ESCOs are currently being contacted, including:

- *ALKIMIA ENERGIE SRLS*
- *C.N. COSTRUZIONI GENERALI SPA*
- *&CO SOCIETA' COOPERATIVA*
- *C.S.F. COSTRUZIONI E SERVIZI S.R.L.*
- *ENERGETIC PUGLIA SRL*
- ✓ ***GADALETA BUILDING SRL***
- ✓ ***GIANNELLI IMPIANTI***
- *IDEA75 SRL*
- *IL FARO SOCIETÀ COOPERATIVA PER AZIONI*
- ✓ ***LA FLUIDOTECNICA DEL GEOM. SPINELLI PIETRO SRL***
- *LFM S.R.L*
- *LM IMPIANTI S.R.L*
- *LORUSSO IMPIANTI S.R.L.*
- *MAGGI MICHELE S.R.L*
- *MEIT MULTISERVICES SRL*
- *NEW EUROART S.R.L*
- *ECO BIO SERVICE*
- *PATANO IMPIANTI E COSTRUZIONI*
- ✓ ***SIMET SPA***
- *SETI IMPIANTI ELETTRICI*

of which those marked with ✓ have shown interest in the project, while those marked with □ are to be contacted again at a later stage. Future interest from other ESCOs is not excluded.

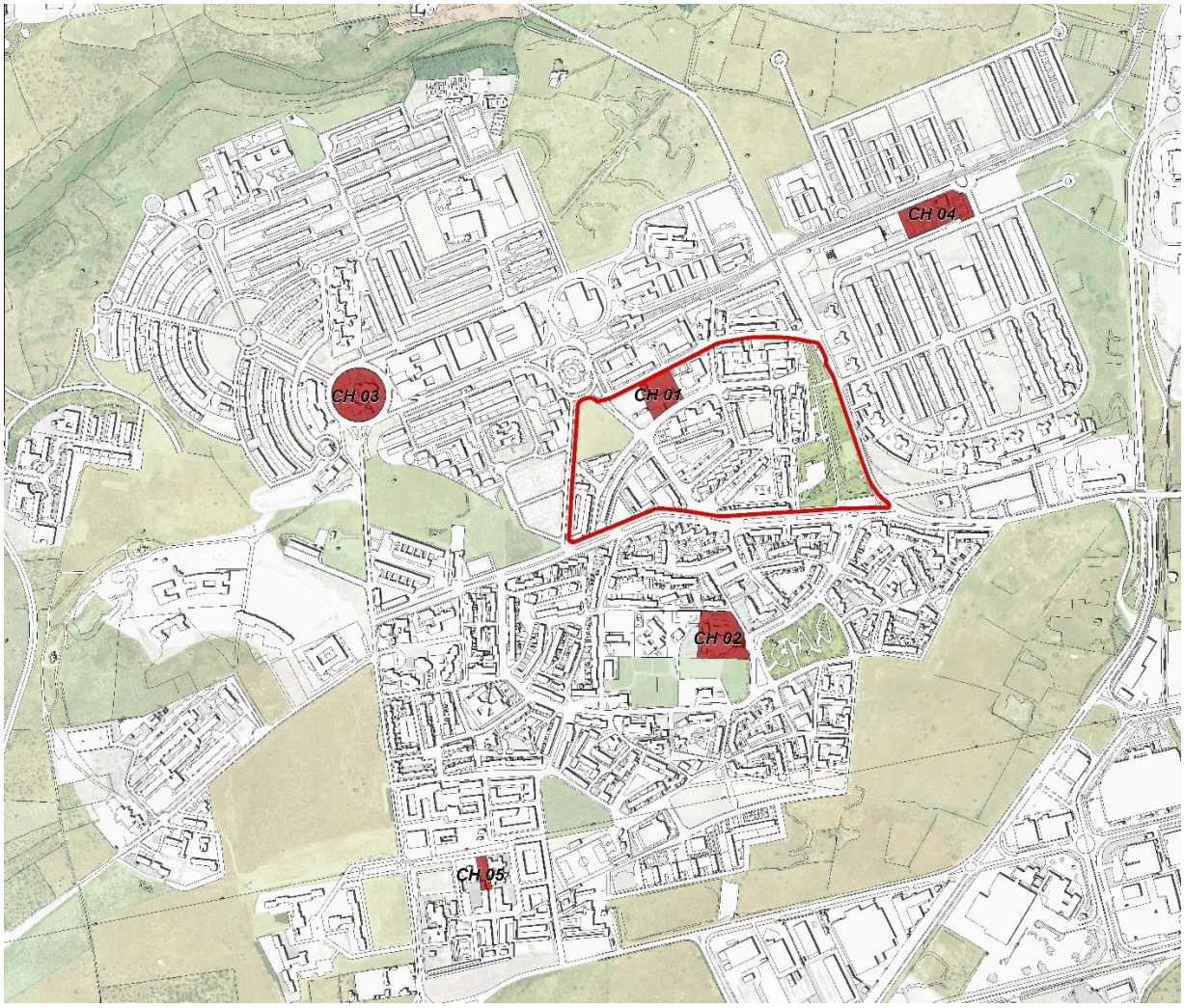
Resources	Capabilities	Level of Engagement
Medium (aim of the company is the energetic transition)	***Medium*** (technical and management skills)	***Medium*** (just a few are potentially interested in the project)

BINGOs, Bank Foundations, ... potentially interested in PED development

23. **Fondazione per il Sud & Fondazione Puglia**

Resources	Capabilities	Level of Engagement
High (administrative, financial)	***High*** (relational technical)	***Medium***

Churches



TARGET Area

num_progr, NOME

- CH 01, Chiesa di Don Bosco
- CH 02, Chiesa di San Paolo
- CH 03, Parrocchia di San Gabriele dell'Addolorata
- CH 04, Chiesa Madre della Divina Provvidenza
- CH 05, Chiesa Parrocchiale di San Pietro Apostolo

Description of the area

In the San Paolo neighbourhood, there are five religious buildings distributed evenly in the neighbourhood, and in the target area there is the Don Bosco church.

The following buildings are present in the neighbourhood

- *Parish of Don Bosco and Multifunctional Centre (in the target area)*
- *Parish of San Gabriele dell'Addolorata*
- *Church of St. Paul*
- *Parish Church of St Peter the Apostle*
- *Mother Church of Divine Providence*

24. **"Parish of Don Bosco" (Multifunctional Centre)**

The service centre in via Barisano da Trani, built by the municipal administration in cooperation with the Archdiocese of Bari and Bitonto, was entirely financed with POR 2000-2006 measure 5.1 funds. The management is entrusted to the parish of San Giovanni Bosco, which will be responsible for adult care services and socio-educational services for minors with school and craft support workshops, computer and multimedia workshops, theatrical and musical animation and drama workshops, and sports training activities with school camps and holiday camps.

The centre covers a total area of 8,700 square metres with a large equipped green area, has a 280-seat auditorium and a sports facility equipped with two multi-purpose fields with a grandstand and two buildings housing the changing rooms and bathrooms.

Resources

The facility is an integral part of the parish complex and is located in the target area. It has large open areas that are only partially occupied by the sports fields.

Capabilities

The facility offers a range of workshops aimed at a very heterogeneous target group, both in terms of age and social background. This has made it possible to build a strong bond with the community, also based on a relationship of trust due to the fact that the facility is managed directly by the Don Bosco Parish. On the basis of these premises, it is believed that the facility can have a strong influence on the community, especially in the dialogue and discussion phase.

Level of engagement

The Don Bosco parish has shown interest in participating in the project, but relations with the parish association that manages the multifunctional centre need to be reviewed.

Resources	Capabilities	Level of Engagement
High (material – large areas in the target area owned by the Municipality of Bari; technical (in cooperation with other Associations)	***High*** (relational - important reference point for the whole community)	***High*** (interested in the project)

25. **Other Churches of the target area**

Resources

The religious buildings in the neighbourhood have a large surface area, with numerous annexes separate from the main religious building.

This large surface area is a valuable resource, although some have already installed numerous solar panels on the roofs of the annexes.

Capabilities

For the local community, parishes serve as a vital point of reference for all age groups. This is due not only to their numerous activities and initiatives engaging a significant portion of the population but also to their collaboration with other neighborhood associations, particularly those focused on social services and citizen support.

In particular, the Don Bosco Parish, which is located in the target area, also manages the spaces of the adjacent multifunctional centre and therefore operates in a very wide and heterogeneous catchment area.

Level of engagement

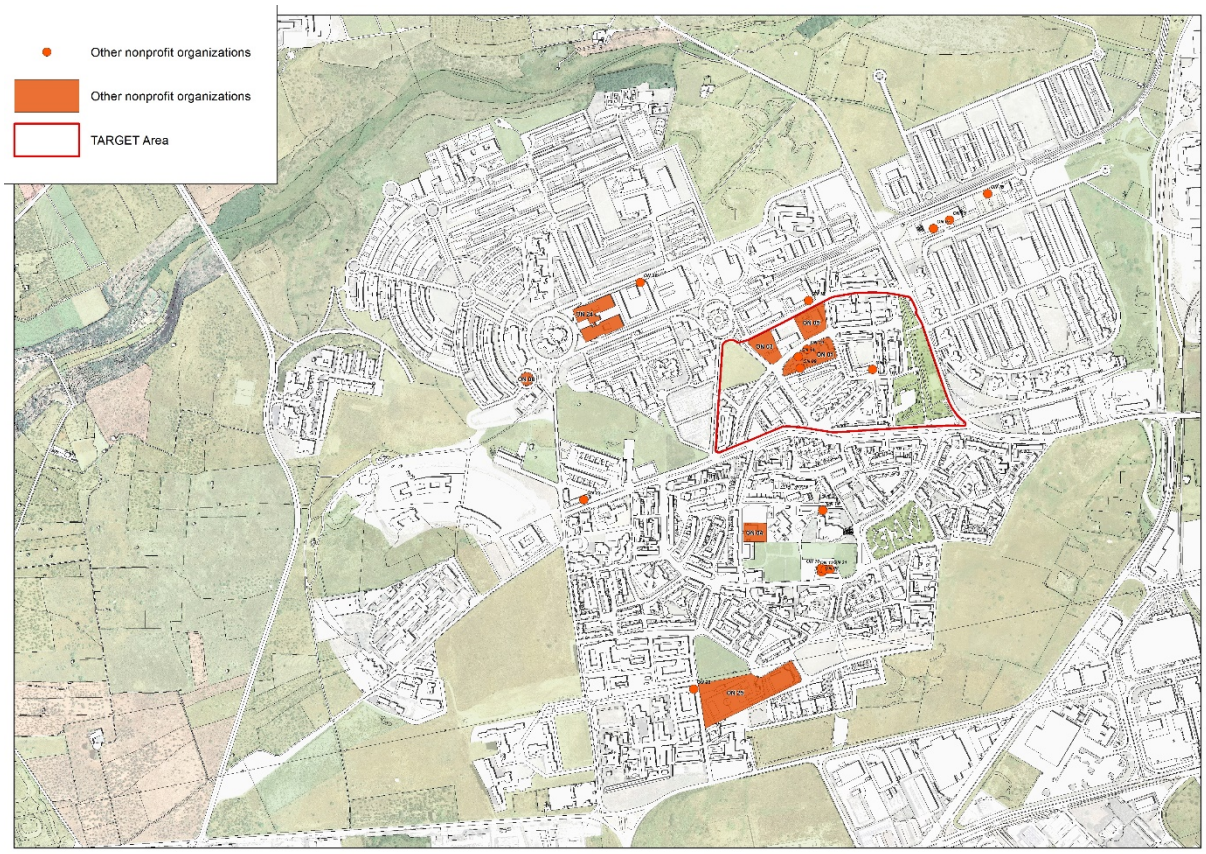
The parish of Don Bosco has shown a great interest in the project and it is expected that the other parishes will show the same interest.

Resources	Capabilities	Level of Engagement
Medium (material - large areas in the neighborhood owned by the Municipality of Bari	***High*** (relational - important reference point for the whole community)	***Medium*** (potentially interested in the project)

Other nonprofit organizations

For "Other non-profit organizations", we mean:

a) the organizational form (membership-based, service delivery-oriented or asset-based which are typical of, respectively, associations, social enterprises and foundations);
b) the major activity, according to the International Classification of Nonprofit Organizations (culture and recreation; education and research; health; social services; environment; development and housing; law, advocacy and politics; philanthropic intermediaries and voluntarism promotion; international; religion; business and professional associations, unions; others).



26. **“Casa delle Culture” Multipurpose Centre**

Who runs Casa delle Culture in Bari?

Medtraining is a social cooperative dedicated to promoting and enhancing social inclusion for disadvantaged individuals. It aims to address the diverse needs of socially vulnerable individuals and their families, as well as those of professionals and local administrations, to ensure the wellbeing of the entire community. The cooperative focuses on upholding the rights of the most vulnerable, supporting their sense of wellbeing, and empowering them to actively participate in society. By helping individuals explore and develop their talents and abilities, Medtraining enables them to shape their identities and realize their life aspirations.

San Giovanni di Dio is a social cooperative providing socio-medical-educational services and engaging in prevention, education, rehabilitation, and personal care. Its activities span home care, nurseries, day care centres, residential facilities, and public or private protected health service facilities. Operating as part of a nationwide network with diverse partners, the cooperative actively contributes to the social fabric through innovative and high-quality care solutions.

The Multipurpose Centre

‘Casa delle Culture' offers temporary residential reception services for 25 adults, a help-desk for the socio-cultural and health integration of immigrants, a help-desk for work orientation and legal advice.

The centre represents an innovative and experimental service aimed at creating a pole of reception, orientation to territorial services and promotion of intercultural activities and education in close synergy with the network of public and private realities in the area.

The Multipurpose Centre called 'House of Cultures' includes the services of temporary residential reception of immigrants, the Help Desk for the socio-cultural and health integration of immigrants and the Centre for intercultural promotion and confrontation.

Through workshops, initiatives, activities, presentations, shows, exhibitions, 'Casa delle Culture' aims to be a meeting point between the migrant reality and citizenship.

Resources

The co-operatives managing the 'House of Cultures' do not have any particular economic resources and many of the activities held at their premises are mainly financed by public funds of various kinds.

On the other hand, however, the building is owned by the Municipality of Bari, which is a partner in the project, and therefore from this point of view, the resources in terms of useful surfaces for the possible installation of solar panels is particularly relevant.

Capabilities

In terms of skills useful for the implementation of the project, 'Casa delle Culture' represents an extremely important centrality. In fact, with its numerous workshop activities involving a large part of the local community, it represents an important point of reference, both for its ability to build strong ties with the community and for the fact that it has a specially designed place in which to carry out the various activities, thus becoming a real point of reference.

However, the target audience for the activities is particularly specific (non-EU, people with economic problems...) and this is also an element of detachment from the majority of local residents. Nevertheless, Casa delle Culture is a strong reference point for the project.

Level of engagement

The cooperatives managing the space were interested in participating in the project and one of the meetings with the Living Lab community was held in one of the spaces of 'Casa delle Culture'.

Resources	Capabilities	Level of Engagement
High (material – large rooftop areas owned by the Municipality of Bari. Currently under renovation)	***High*** (relational - reference point for the community)	***Medium*** (interested in the project)

27. **"InConTra" Association**

InConTra was established in 2007 thanks to a number of volunteers who had already been engaged for some time in assistance services towards the most needy but who were operating in an autonomous, uncoordinated manner.

InConTra is a lay voluntary association that carries out positive actions against poverty by providing help to all those in need who are in difficult and marginalised conditions.

It acts independently of all religious or political beliefs and with deep respect for the individuality of others without distinction of age, race, social class.

Homeless people find themselves living on the streets, often unwillingly, for very different reasons. Some because of job loss or problematic family conditions, some have psychophysical problems and have no one to take care of them, others are immigrants with very precarious accommodation.

The InConTra group works among them, with them, trying to help them cope with small and big daily problems and above all not to feel alone and rejected because they are different.

Since 2011, it has been dealing with families who, also because of the economic crisis, have been 'pushed' far beyond the limits of poverty. Periodically InConTra's volunteers visit these families, bringing to their homes not only food and medicines, necessary to alleviate their material difficulties, but also support to try to solve the various problems that arise with the institutions.

InConTra Associazione ONLUS offers, through its volunteers of all ages, a constant service of assistance to the city's 'invisibles': homeless people, immigrants with precarious accommodation and families living in distress and uncertainty, not only economic.

Resources

The voluntary association does not have its own resources and carries out its activities also with donations from members, volunteers and citizens who cooperate with the association.

As is the case for many other associations in the area, the premises are in a former middle school owned by the Municipality of Bari, which is shared with other local associations.

Capabilities

The association offers assistance to numerous families in the neighbourhood (around 150) and therefore represents an important point of reference for the community because of the relationship of trust built up over time.

Level of engagement

The association has been involved before and seems to show interest in collaborating on the project.

Resources	Capabilities	Level of Engagement
Medium (material – large rooftop areas owned by the Municipality of Bari)	***High*** (relational - strong ties with more than 150 families)	***Medium*** (interested in the project)

28. **CAPS "Tonio Signorile" Therapeutic Community**

C.A.P.S. is a social cooperative that intervenes in situations of hardship, severe marginalisation and addiction. Over the years, the C.A.P.S. team has been enriched with professional figures who now make up a team of psychologists, social workers, pedagogues, professional educators, doctors, legal advisors, street workers and cultural mediators with the aim of preventing risky behaviour, offering shelter to homeless people, and initiating individual paths to overcome a situation of chronic discomfort.

Collaboration with public and private organizations, institutions, and volunteers is essential to the Cooperative's mission. This partnership goes beyond immediate intervention or mere assistance, aiming to foster the social inclusion of individuals.

The C.A.P.S. cooperative has numerous public facilities and spaces to support the community and people in difficulty, such as a protected listening room, a conference room, a social B&B housed in a property confiscated from the Mafia, a listening centre and a rehabilitation community, as well as numerous workshops and support facilities.

Resources

The cooperative carries out numerous activities and projects through local and national public funding and can also rely on donations from volunteers. Its resources are completely absorbed by the implementation of its own projects, but it does manage a number of municipally owned spaces that could lend themselves to the installation of photovoltaic panels, in particular the 'Tonio Signorile' therapeutic community, where the entire facility is available.

Capabilities

In recent years, the cooperative has also conducted numerous activities in the neighbourhood and has become an important point of reference for the community, especially for the marginalised and frail.

Although very close to the community, the cooperative mainly targets people with social or psychological problems, and this can build distances with the rest of the community and neighbourhood residents.

Level of engagement

The cooperative has shown particular interest in the project and does not exclude its cooperation within the limits of its competences.

Resources	Capabilities	Level of Engagement
Medium (material – large rooftop areas owned by the Municipality of Bari)	***High*** (relational – mixed ties with the local community)	***Low*** (not directly interested)

29. **"Giovanni Paolo II" Foundation**

The Giovanni Paolo II Foundation Onlus was established in 1990 with the aim of pursuing the achievement of its mission: the moral, human and social promotion of the San Paolo/Stanic neighbourhood and other peripheral areas of the city.

Since its inception, the Foundation has carried out its activities along three main lines:

- information and training in the social field, aimed at operators and educators of third sector organisations and realities;
- projects and intervention programmes, aimed at improving the quality and quantity of social services offered in the city's suburbs for children, adolescents and young people and families;
- studies, research and ongoing programmes to identify needs for improving the quality of life in the city.

Resources

The Foundation funds its activities through public grants and private donations. It has earned numerous national awards and recognitions.

It has its own multi-level premises, but outside the target area and the roof is almost entirely covered by solar panels.

Capabilities

Undoubtedly, the Foundation is an important reference point for the neighbourhood, especially for the numerous services it offers, aimed at a very diverse public, of all age groups and social backgrounds. Moreover, the activities aimed at children, including the play centre, also build direct relations with families in the neighbourhood.

Level of engagement

The Foundation has achieved a degree of energy autonomy through the installation of numerous solar panels on its facility's roof. As a result, it has shown limited interest in participating in the research project's activities. Additionally, its focus on its own initiatives leaves little time available to engage with the living lab.

Resources	Capabilities	Level of Engagement
Medium (financial – it manages several funded projects in the area; material - structure out of the target area and already covered by solar panels for self-consumption and sale)	***High*** (relational - strong relation with the families and their children; technical – role in technical and social skill education)	***Medium*** (although they cannot be part of a REC they are interested in the cooperation with the project)

30. **Social Cooperative "I Bambini di Truffaut"**

I Bambini di Truffaut is a non-profit Type A Social Cooperative, officially registered in national, regional, and municipal registers, with its headquarters in Bitritto (Ba) at Via Aporti 6. For 13 years, it has operated through the dedicated efforts of its members, focusing on a variety of social projects. These include school support, rehabilitation for individuals referred by Social Services, literacy and extracurricular courses for foreigners, and initiatives in image education, theater, and cineforums for children, adolescents, adults, and the elderly. Its core mission emphasizes raising awareness about the language of film and beyond. The cooperative's name honours director François Truffaut, whose work uniquely captured and conveyed the world through the eyes of children. The Four Hundred Blows, The Wild Boy, etc., are just a few titles of films in this genre.

The members formed a Social Cooperative in February 2007. Currently, the Cooperative is also a member of Confcooperative of Bari.

Resources

The cooperative has its operational headquarters in the neighbourhood, outside the target area, in a building shared with several other organisations and bodies. It therefore does not have its own facility for the installation of photovoltaic panels.

Economically, the cooperative's activities are funded by public authorities that subsidise project implementation. As a result, the cooperative generates no profit and lacks its own independent financial budget.

Capabilities

The cooperative organises numerous cultural events related to the performing arts and thus manages to involve an important part of the local community, including children from local schools and their families.

The cooperative is therefore an important reference point for a good part of the local community, even if mainly for cultural aspects.

Level of engagement

The cooperative also runs the Colibrì Library, where meetings related to the project were also held.

Therefore, it is believed that a more solid collaboration can develop over time regarding the activities planned for the project.

Resources	Capabilities	Level of Engagement
Medium (material - they manage the public library just outside the target area)	***High*** (strong relation with the families and their children)	***Medium***

31. **A.S.D. (amateur sports association) "Franco Ballerini" Cycling School**

The school is run by the 'Gruppo Sportivo Bari', a youth cycling club founded in the 1990s in the San Paolo neighbourhood, whose main purpose is the promotion and dissemination of cycling at a youth and social level. Over the years, it has invested its efforts in social and competitive cycling, organising events from the Giovanissimi to the Juniores categories.

The facility has a *#Nessunoescluso Bike Park* financed by the Municipality of Bari's 'Urbis' project. It is a circuit on which children from 6 to 15 years of age can compete in a kilometre of cross country for MTBs, six hundred metres of asphalt, where children can practice road safety education, a Pump Track, a wooden track with Bmx, a bridge and a skill park, for acrobatics and greater skills.

Franco Ballerini has always carried out projects with the aim of organising, protecting and promoting cycling in all its forms, competitive, recreational and educational. The aim is to make this sport more and more inclusive and accessible to young people with various forms of autism and hyperactivity, thanks to the aid of tricycles and 'Hug Bikes', tandem bikes that allow children with severe forms of

intellectual disability to ride accompanied. It has been recognised by the Italian Cycling Federation as the best cycling school blade and currently has 213 members.

Resources

The school is located on the premises of the City Hall and has a large open area where the Bike Park has been set up. Therefore, in terms of available space, the association shares resources with the "Municipio 3".

The association is nationally recognised and is the promoter of numerous events financed by public and private resources and is, therefore, also potentially capable of directing economic resources to projects promoting sustainable and low-energy living models.

Capabilities

The association is particularly active and, despite being very sectoralised, has built up strong ties with the community. The catchment area of the services offered is very broad from a territorial point of view and therefore the community of reference is not particularly linked to the neighbourhood alone.

Level of engagement

The association has not so far shown great interest in the project's themes, but forms of involvement in later, more operational phases directly with the community are not excluded.

Resources	Capabilities	Level of Engagement
Low (located in within the building of the Municipio III, out of the target area)	***Medium*** (relational - ties with the local community)	***Low*** (not directly interested)

32. **"Tracce Verdi" Social Cooperative**

The Tracceverdi Social Cooperative Society works actively in the field of land revaluation and protection of the local natural heritage through environmental education, architectural design and rediscovery of the environment as a tool for social inclusion, addressing especially disadvantaged youth. Formed in September 2011 Tracceverdi operates mainly in the Municipality of Bari at the "Lama Balice Park" and in the municipality of Gioia del Colle at the "Masseria Sociale Il gelso ritrovato".

Recognizing environmental education as a vital tool for fostering a stronger connection between the community and the territory, viewed as a place of origin, growth, and an integral part of daily life, the Cooperative has expanded its focus. It now addresses educational and environmental topics beyond the traditional 'natural' context, incorporating them into school settings through activities centred on agri-food education. In the area of social agriculture, Tracceverdi experiments with projects aimed at minors and adults with disabilities and various forms of discomfort through cultivation and green care workshops.

On the level of architectural and territorial design, the Tracceverdi Cooperative combines urban and bio-architectural intent with the social aims at the basis of its identity, orienting itself in the study of accessibility to natural areas (culminating in the elaboration of projects that can be developed within the Lama Balice Natural Regional Park) and towards participatory planning.

Resources

The cooperative's headquarters is outside the target area, a few kilometres from the San Paolo neighbourhood and operates mainly at the Lama Balice Regional Park, a nature area on the northern edge of the San Paolo neighbourhood.

The cooperative's projects are supported by public and private funding and contributions from participants in their activities.

Capabilities

"Tracce Verdi" is very active in the neighbourhood especially because of its collaborations with schools and many other associations in São Paulo, particularly those working in social work and with children.

The activities are aimed at a very wide and heterogeneous audience, and for this reason, it represents a reality capable of building strong ties with the community, also because of its proximity to the environmental issues dealt with in its activities.

Level of engagement

No particular interest has been shown in participating in the project, but it is believed that important collaborations can be built in future project activities, especially because of the proximity to the environmental and energy issues shared by the cooperative.

Resources	Capabilities	Level of Engagement
Low (located in a small flat out of the target area)	***High*** (relational - strong relation with the schools, families and their children; technical – skills on environmental issues)	***Medium*** (interested in the project)

33. **"La Paranza" theater company aps**

The Theatre Company is a Social Promotion Association that operates in the world of entertainment and also organizes cabaret meetings in the St. Paul Neighbourhood.

It does not have its own venue in the neighbourhood, but organizes shows in the venues of other associations including also "Casa delle Culture" and the Palazzetto dello Sport.

The shows are usually related to Bari's popular culture and involve a wide swath of the neighbourhood community, but also from other areas of the city.

Resources

The association does not have its own venue and the shows are also usually supported by numerous private sponsors.

Capabilities

The connection with the community is certainly very strong, but it is built only during the performances, which are not always very frequent.

Level of engagement

The association has not been actively involved in the project.

Resources	Capabilities	Level of Engagement
Low (located in a small flat out of the target area; works with private sponsors)	***Low*** (relational - relation with other local organizations a few times per year)	***Low*** (not directly interested)

34. **"CAF ACLI" Patronage - tax assistance center**

The Tax Assistance Center of the Christian Italian Workers Association operates in numerous locations in Italy and abroad to offer tax advisory services, assists taxpayers in completing and sending tax returns and in calculating different Municipal and State Taxes.

Resources

The Office in the St. Paul Neighbourhood is a facility located outside the target area, but has its own premises with a fenced and demarcated area.

The CAF ACLI staff organization is nationally coordinated and appears to offer its services during very limited hours and only on certain days of the week.

Capabilities

Tax assistance centres have always been a point of reference for the community for welfare and advisory services in tax and administrative matters.

They have therefore built a strong bond with the community and probably also with the households in the target area whose expenses they also manage that concern the energy consumption of individual households or entire apartment buildings.

The Patronage thus represents a valuable direct contact with the households in the neighbourhood with whom they share a lot of useful information for the development of the project.

Level of engagement

The Patronage does not seem to have shown any particular involvement so far, but it is believed that it may accrue interest in the later stages partly because of the economic return that the facility could have by making its areas available for use.

Resources	Capabilities	Level of Engagement
Medium (located in a building out of the target area already covered with solar panels)	***High*** (strong relation with the comunities)	***Low*** (not directly interested)

35. **Other Organizations for Political rights and Fiscal assistance**

List of Organizations in the neighbourhood:

- CAAF CGIL Puglia

- Anmil Patronage
- CIA Puglia - Confederazione Italiana Agricoltori
- C.I.S.L. Confederazione Italiana Sindacati Lavoratori
- Pensioners' Party

The structures again offer assistance services in the fiscal and labour spheres to families and individual workers by assisting them in completing administrative and bureaucratic paperwork and in defending their rights in the labour sphere.

They have been merged under one heading since they are considered to share the same classification in terms of Resources and skills useful to the project.

Resources

Unlike the ACLI Patronage, these facilities operate in offices located on the ground floors of residential buildings or in some cases in apartments on the second floor and therefore do not have their own outdoor areas.

Capabilities

Again, Tax Assistance Centres are a point of reference for the community for welfare and advisory services in tax and administrative matters.

Therefore, it is believed that the link with the community is very strong, but also confidential since they handle personal information including those concerning the energy consumption of individual households or entire apartment buildings.

Therefore, they are believed to represent a valuable direct contact with households in the neighbourhood.

Level of engagement

These organizations have not shown any particular involvement so far, but it is believed that an interest may mature in later stages.

Resources	Capabilities	Level of Engagement
Low (located in one building shared with other organizations and out of the target area)	***High*** (relational - strong relation with the communities)	***Low*** (not directly interested)

36. **Operators "Barletta Soccorso" Onlus.**

The organization provides temporary educational and social welfare services to people with disabilities including ambulance transport services.

Resources

The association shares a facility with other associations at a former middle school owned by the City of Bari, including Casa delle Culture.

Based in Barletta, it provides services through both volunteer efforts and paid personal care, with costs determined by the ISEE value of the individual receiving assistance.

Capabilities

The association offers services in health care, which allows it to establish a strong relationship with the local community.

Level of engagement

The association has not shown particular interest in the project.

Resources	Capabilities	Level of Engagement
Low (location shared with other organizations in target area)	***Medium*** (strong relation with the communities)	***Low*** (not directly interested)

37. **"Ala Azzurra" Association**

Volunteer Association for Ambulance Transportation Services and Blood Donation Services.

Resources

The association shares a facility with other associations at a former middle school owned by the City of Bari, including "Casa delle Culture".

It offers services on a volunteer basis.

Capabilities

The association offers services in the health field, which allows it to establish a strong relationship with the local community.

Level of engagement

The association has not shown particular interest in the project.

Resources	Capabilities	Level of Engagement
Low (location shared with other organizations in target area)	***Medium*** (strong relation with the communities)	***Low*** (not directly interested)

38. **Other "Fratres" Association (2 locations)**

Fratres is a nationwide Christian-inspired association that offers services primarily for blood donation. Three flagship groups in the St. Paul neighbourhood mainly rely on volunteers:

- *Fratres Group BARI "Madre Divina Provvidenza" ODV*
- *Fratres Group BARI San Paolo ODV*

Resources

Fratres groups at St. Paul's share the facility with other associations, including the House of Cultures location inside the Target area.

Offers services in the form of volunteerism.

Capabilities

The association is mainly targets blood donors and therefore establishes relationships with the community on a regular basis and on certain pre-established days

Level of engagement

The association has not shown particular interest in the project.

Resources	Capabilities	Level of Engagement
Low (location shared with other organizations)	***Low*** (relation with the communities just a few days)	***Low*** (not directly interested)

39. **S.S.D. Sport Project s.r.l. (amateur sports club)**

S.S.D. Sport Project s.r.l. is an Apulian company that manages the neighbourhood Municipal Swimming Pool in which it carries on both a swimming school and various fitness activities

S.S.D. Sport Project s.r.l. has been affiliated with the Italian Swimming Federation since September 2013, with the Italian Paralympic Swimming Federation since February 2013, and with the A.S.I. Sports Promotion Body.

The company conducts SWIMMING SCHOOL activities for children from 3 years old up to adults, infant, pregnant, senior and disabled courses. It has coached athletes who have achieved important results even in the international arena.

Resources	Capabilities	Level of Engagement
Low (location out the target area in a building owned by "Comune di Bari")	***Low*** (users also out of the neighborhood)	***Low*** (not directly interested)

40. **ATI CSI - Italian Sports Center (Temporary Business Association)**

Manager of the PALALAFORGIA Gymnasium.

Basketball and volleyball are mainly practiced in the gym.

Resources	Capabilities	Level of Engagement
Low (location out the target area in a building owned by "Comune di Bari")	***Low*** (users also out of the neighborhood)	***Low*** (not directly interested)

41. **ASD Bari Quartieri Uniti (amateur sports association)**

Manager of the Soccer Field SANTE DIOMEDE

Resources	Capabilities	Level of Engagement
Low (location out the target area in a building owned by "Comune di Bari")	***Low*** (users also out of the neighborhood)	***Low*** (not directly interested)

<u>Building managers</u>

42. **Building managers (most buildings are totally owned by ARCA)**

ARCA's residential condominiums are managed autonomously by condominium administrators who are responsible for: running the building as far as the common parts are concerned, supervising their maintenance and integrity, and paying the expenses necessary to maintain the common services.

There are currently more than 30 administrators whose operational headquarters are usually outside the neighbourhood.

Resources

They do not have autonomous resources, they are appointed by building and flat owners and execute their decisions.

Capabilities

Condominium administrators play a very important role in the management and maintenance of the building and the resources needed to maintain it. They steer regular meetings with owners, when decisions are made on the management of common parts of the building. They are responsive to owners, so they have little ties with tenants (which are the largest majority in the flats).

Despite the decisive role of the administrator, he or she is almost never one of the residents of the apartment building, let alone the neighbourhood, and this does not build a close bond with the community, but is only functional to the management of the building.

Moreover, the figure of the administrator changes over time, so he may not physically represent a fixed reference figure for the community.

Level of engagement

The figure of the administrator is not directly involved in the benefits of energy savings

Resources	Capabilities	Level of Engagement
Low (they are appointed by building owners, They do not have autonomous resources)	***Low*** (technical skills for the management of shared facilities of residential buildings but low ties with tenants)	***Low*** (not part of the community, not directly interested)

Residents in the target area

43. **Residents**

Total population in the target area in 2021: 2.184.

Total number of families: 783.

Resources	Capabilities	Level of Engagement
Low (low income families)	***Low*** (education degree lower than municipal average)	***High*** (they want to reduce costs for energy bills)

Retailers located in the target area

44. **Retailers**

In the perimeter identified for the Target Area are the following commercial activities:

- *Cyclops Steps (Shoes shop)*
- *Maxi Sidis (Supermarket)*
- *Pizzeria Parco San Pio (Restaurant)*
- *Pizza Sprint (Small restaurant en take away)*
- *Bar Angelo 2 (Coffee shop)*
- *Borgia Rosa (Food and grocery shop)*
- *Linea Giovane (Hairdresser shop)*

The businesses present are all arranged on the ground floors of the residential buildings owned by ARCA Puglia.

Resources

These are private businesses mainly for retail goods and everyday goods. Apparently, they do not have their own floor space, which would be useful for installing photovoltaic panels, but as entrepreneurs they might be interested in investments to reduce energy expenses incurred by the businesses including air conditioners and refrigerated counters.

Capabilities

Businesses are primarily used by the entire local community without particular age or gender distinctions, and are also frequented on a daily basis in some cases. For this reason, merchants are considered a direct point of contact with the community in the target area especially for the direct communication activities that the project could provide.

Level of engagement

It is believed that involvement could be of interest to merchants when economic returns could be envisaged, including in terms of energy savings.

Resources	Capabilities	Level of Engagement
Low (located in small units within residential condominiums, but not independent structures)	***Medium*** (daily relations with local community)	***Medium*** (interested if there can save energy costs)

<u>SME located in the target area</u>

45. **SME**

Small and midsize enterprises (**SMEs**) are businesses that maintain revenues, assets, or a number of employees below a certain threshold and are the backbone of Europe's economy. They represent 99% of all businesses in the EU.

The following SMEs are present in the target area.

- *Erre.Gi.Multiservice - operates in the field of civil and industrial cleaning in Bari.*
- *EdilCaradonna - deals with building renovation services*

Resources	Capabilities	Level of Engagement
Medium	***Low***	***Low***

Summary table with stakeholder characterisation and their role in the PED project

Below is a summary table of the stakeholder characterisation in order to keep them all together and also to allow quick comparisons between them.

Each of the stakeholders was associated with one or more potential roles in the PED development by choosing from the 15 previously established items.

Types of stakeholders	Organization	Resorces	Capabilities	Level of Engagement	Potential role in PED development
Local Authorities and Regional Government	Bari Municipality	***High*** (administrative, financial)	***High*** (relational, technical, management of community building)	***High***	Prosumer, facilitator, funder, building manager, consultants in PED-related activities
	Municipio III	***Low*** (administrative, financial)	***High*** (relational, technical, management of community building)	***High***	Prosumer, facilitator, local development coalition partner
	Apulia Regional Government	***High*** (administrative, financial)	***High*** (relational technical)	***Medium***	Funder
Schools (Public or accredited)	I.C. "Grimaldi-Lombardi": - *Biagio Grimaldi* - *Astrid Lindgren* - *SMS Lombardi* - *Plesso Lombardi* - *Breda I*	***High*** (administrative, financial, material-rooftop and public library)	***High*** (technical and relational)	***Medium***	Prosumer, Facilitator, Community builders, building manager
	I.C. "Don L. Milani": - Don Milani - Don Milani 25 CD Bari - De Filippo - Ungaretti - Via Lanave - Vito De Fano 25 CD - Via Trentino	***Medium*** (administrative, financial, material-rooftop)	***High*** (technical and relational)	***Medium***	Prosumer, Facilitator, Community builders, building manager
	Scuola Primaria Paritaria - Pietro Alberotanza	***Medium*** (administrative, financial, material-rooftop)	***High*** (technical and relational)	***Medium***	Prosumer, Facilitator, Community builders, building manager

Types of stakeholders	Organization	Resorces	Capabilities	Level of Engagement	Potential role in PED development
	I.C. “Falcone-Borsellino”: *- 18 Circolo* *- "Lopopolo" - 18 Circolo* *- Chiaia* *- Petrignani* *- G. Falcone 18 CD Bari* *- Cirielli 13 CD Bari* *- Chiaia 13 CD Bari* *- Falcone . Borsellino*	***Medium*** (administrative, financial, material-rooftop)	***High*** (technical and relational)	***Medium***	Prosumer, Facilitator, Community builders, building manager
	I.P. "E. MAJORANA"	***Medium*** (administrative, financial, material-rooftop)	***High*** (technical and relational)	***Medium***	Prosumer, Facilitator, Community builders, building manager
Health & care service providers	Ospedale San Paolo	***High*** (financial, material spaces***)***	***High*** (technical, management and relational)	***Low***	Prosumer, building manager
	Servizi di assistenza per anziani: *- San Gabriele RSA* *- Centro Diurno "L'altra casa"*	***Medium*** (administrative, financial, material-rooftop)	***High*** (technical, management and relational)	***Low***	Prosumer, building manager
	ASL CASA DELLA SALUTE -DISTRETTO SOCIO SANITARIO N. 6 BARI OVEST	***Medium*** (financial, material spaces)	***Medium*** (management and relational)	***Low***	Prosumer, building manager
	Centro diurno Cunegonda ASL	***Medium*** (material: large rooftop out of the target area)	***Medium*** (relational - ties with the local community)	***Low*** (not directly interested)	Facilitator, local development coalition partner
	Farmacia Lozupone	***Low***	***Medium***	***Low***	Prosumer, consumer
Other public organizations	Ufficio Giudice di Pace	***Low*** (aministrative, financiall)	***Low*** (management, relational)	***Low***	Prosumer, building manager
	IX Reparto Mobile polizia di stato	***High*** (financial, administrative)	***Medium*** (management, relational, technical)	***Low***	Prosumer, building manager

Types of stakeholders	Organization	Resorces	Capabilities	Level of Engagement	Potential role in PED development
Utilities and multiutility companies (public, private or mixed)	AMGAS spa	***High*** (financial, administrative, technical)	***High*** (management, relational)	***Low***	Funder, consultant in PED-related activities
	Retegas Bari Azienda Municipale Gas Spa	***High*** (financial, administrative, technical)	***High*** (management, relational)	***Low***	Funder, consultant in PED-related activities
	Poste Italiane	***Medium*** (management, financial, administrative)	***Medium*** (management, relational)	***Low***	Funder, consultant in PED-related activities
Social housing management agencies	ARCA Puglia Centrale	***High*** (administrative, financial, material-rooftop)	***High*** (relational, technical, management of community building)	***High***	Prosumer, funder, facilitator, local development coalition partner
Energy grid operators	TERNA	***High*** (financial, administrative, technical)	***High*** (management, relational)	***Low***	Funder, consultant in PED-related activities
Energy providers	Enel Illumia ENI IREN Edison	***High*** (financial, administrative, technical)	***High*** (management, relational)	***Low***	Funder, consultant in PED-related activities
ESCOs	Alkimia Energie srls C.N. Costruzioni generali spa & Co-Società Cooperativa C.S.F. Costruzioni e Servizi s.r.l. Energetic Puglia s.r.l. Gadaleta Building s.r.l. Giannelli Impianti s.r.l. Idea 75 s.r.l. Il Faro Società Cooperativa per azioni La Fluidotecnica del Geom. Spinelli	***High*** (aim of the company is the energetic transition)	***High*** (technical and management skills)	***Low*** (just a few are potentially interested in the project)	Funder, consultant in PED-related activities, developer

Types of stakeholders	Organization	Resorces	Capabilities	Level of Engagement	Potential role in PED development
	LFM s.r.l. LM Impianti s.r.l. Lorusso Impianti s.r.l. Maggi Michele s.r.l. Meit Multiservices s.r.l. New Euroart s.r.l. EcoBioService SIMET s.p.a. SET Impianti Elettrici				
BINGOs, Bank Foundations, ...	Fondazione per il Sud Fondazione Puglia (ex Fondazione Cassa di Risparmio di Puglia)	***High*** (administrative, financial)	***High*** (relational technical)	***Medium***	Funder
Churches	Don Bosco church	***High*** (material – large areas in the target area owned by the Municipality of Bari; technical (in cooperation with other Associations)	***High*** (relational - important reference point for the whole community)	***High*** (interested in the project)	Prosumer, facilitator, local development coalition partner
	Other churches out of the target area: - San Gabriele dell'Addolorata - San Paolo - San Pietro Apostolo - Madre della Divina Provvidenza	***Medium*** (material - large areas in the neighborhood owned by the Municipality of Bari	***High*** (relational - important reference point for the whole community)	***Medium*** (potentially interested in the project)	Prosumer, facilitator
Other nonprofit organizations	Centro Polifunzionale Casa delle culture	***High*** (material – large rooftop areas owned by the Municipality of Bari. Currently under renovation)	***High*** (relational - reference point for the community)	***Medium*** (interested in the project)	Prosumer, facilitator, local development coalition partner

Types of stakeholders	Organization	Resorces	Capabilities	Level of Engagement	Potential role in PED development
Other nonprofit organizations	Associazione InConTra	***Medium*** (material – large rooftop areas owned by the Municipality of Bari)	***High*** (relational - strong ties with more than 150 families)	***Medium*** (interested in the project)	Prosumer, facilitator, local development coalition partner
Other nonprofit organizations	Cooperativa sociale C.A.P.S.	***Medium*** (material – large rooftop areas owned by the Municipality of Bari)	***Medium*** (relational – mixed ties with the local community)	***Medium*** (not directly interested)	Prosumer, facilitator, local development coalition partner
Other nonprofit organizations	Fondazione Giovanni Paolo II	***Medium*** (financial – it manages several funded projects in the area; material - structure out of the target area and already covered by solar panels for self-consumption and sale)	***High*** (relational - strong relation with the families and their children; technical – role in technical and social skill education)	***Medium*** (although they cannot be part of a REC they are interested in the cooperation with the project)	facilitator, local development coalition partner
Other nonprofit organizations	Cooperativa Sociale I Bambini di Truffaut	***Medium*** (material - they manage the public library just out of the target area)	***High*** (strong relation with the families and their children)	***Medium***	Facilitator, local development coalition partner
Other nonprofit organizations	A.S.D. Scuola di Ciclismo Franco Ballerini	***Low*** (located in within the building of the Municipio III, out of the target area)	***Medium*** (relational - ties with the local community)	***Low*** (not directly interested)	Facilitator, local development coalition partner
Other nonprofit organizations	Cooperativa Sociale Tracce verdi	***Low*** (located in a small flat out of the target area)	***High*** (relational - strong relation with the schools, families and their children; technical – skills on environmental issues)	***Medium*** (interested in the project)	Facilitator, local development coalition partner

Types of stakeholders	Organization	Resorces	Capabilities	Level of Engagement	Potential role in PED development
Other nonprofit organizations	Compagnia Teatrale LA PARANZA aps	***Low*** (located in a small flat out of the target area; works with private sponsors)	***Low*** (relational - relation with other local organizations a few times per year)	***Low*** (not directly interested)	Facilitator, local development coalition partner
Other nonprofit organizations	Patronato ACLI	***Medium*** (located in a building out of the target area already covered with solar panels)	***High*** (strong relation with the communities)	***Low*** (not directly interested)	Prosumer, facilitator, local development coalition partner
Other nonprofit organizations	Other Organizations for Political rights and Fiscal assistance: - CAAF CGIL Puglia - Anmil Patronage - CIA Puglia - Confederazione Italiana Agricoltori - C.I.S.L. Confederazione Italiana Sindacati Lavoratori - Pensioners' Party	***Low*** (located in one building shared with other organizations and out of the target area)	***High*** (relational - strong relation with the communities)	***Low*** (not directly interested)	Prosumer, facilitator
Other nonprofit organizations	Operatori Barletta Soccorso Onlus	***Low*** (location shared with other organizations in target area)	***Medium*** (strong relation with the communities)	***Low*** (not directly interested)	Facilitator, local development coalition partner
Other nonprofit organizations	Associazione Fratres - Gruppo Fratres BARI "Ala Azzurra"	***Low*** (location shared with other organizations in target area)	***Medium*** (strong relation with the communities)	***Low*** (not directly interested)	Facilitator, local development coalition partner
Other nonprofit organizations	Other “Fratres” Association: - Madre Divina Provvidenza ODV - San Paolo ODV	***Low*** (location shared with other organizations)	***Low*** (relation with the communities just a few days)	***Low*** (not directly interested)	Facilitator, local development coalition partner
Other nonprofit organizations	S.S.D. Sport Project s.r.l.	***Low*** (location out the target area in a building owned by "Comune di Bari")	***Low*** (users also out of the neighborhood)	***Low*** (not directly interested)	Prosumer, Facilitator, Community builders, building manager

Types of stakeholders	Organization	Resorces	Capabilities	Level of Engagement	Potential role in PED development
Other nonprofit organizations	ATI CSI - Centro Sportivo Italiano	***Low*** (location out the target area in a building owned by "Comune di Bari")	***Low*** (users also out of the neighborhood)	***Low*** (not directly interested)	Prosumer, Facilitator, Community builders, building manager
Other nonprofit organizations	ASD Bari Quartieri Uniti	***Low*** (location out the target area in a building owned by "Comune di Bari")	***Low*** (users also out of the neighborhood)	***Low*** (not directly interested)	Prosumer, Facilitator, Community builders, building manager
Building managers	Building managers (most building are totally owned by ARCA)	***Low*** (they are appointed by building owners, They do not have authonomous resources)	***Medium*** (technical skills for the management of shared facilities of residential buildings but low ties with tenants)	***Low*** (not part of the community, not directly interested)	Facilitator, local development coalition partner
Residents	Residents in the target area	***Low*** (low income families)	***Low*** (education degree lower than municipal average)	***High*** (they want to reduce costs for energy bills)	Prosumer, consumer
Retailers located in the target area	Passi da ciclope Maxi Sidis Pizzeria Parco San Pio Pizza Sprint Bar Angelo 2 Borgia Rosa Linea Giovane	***Low*** (located in small units within residential condominiums, but not independent structures)	***Medium*** (daily relations with local community)	***Medium*** (interested if there can save energy costs)	Prosumer, consumer
SMEs located in the target area	Erre.Gi.Multiservice EdilCaradonna	***Low***	***Low***	***Low***	Prosumer, consumer

Table 35. *Summary table with stakeholder characterisation and their role in the PED project*

Reconstructing Stakeholder networks

To each Stakeholder has been assigned a sequential number as in the previous paragraph. Thus in the following models and graphics, only the corresponding number can be used instead of the complete stakeholder's name.

This was done in order to simplify the graphics of the schematic models used.

Here follows the numbered list of stakeholders with their respective Typologies.

Local Authorities and Regional Government

1. The Municipality of Bari
2. Municipio III
3. Apulia Region

Schools (Public or accredited)

4. I.C."Grimaldi-Lombardi"
5. The Istituto Comprensivo (I.C.) "Don L. Milani"
6. Scuola Primaria Paritaria "Pietro Alberotanza"
7. I.C. "Falcone-Borsellino"
8. I.P. "E. MAJORANA"

Health & care service providers

9. San Paolo Hospital
10. Servizi di assistenza per anziani
11. ASL CASA DELLA SALUTE -DISTRETTO SOCIO SANITARIO N. 6 BARI OVEST
12. "Cunegonda ASL" (local health authority) day care centre
13. Farmacia Lozupone

Other public organizations

14. Ufficio Giudice di Pace
15. Military Area - IX Reparto Mobile Polizia di Stato

Utilities and multiutility companies (public, private or mixed)

16. AMGAS SpA
17. Retegas Bari Azienda Municipale Gas S.p.A.
18. Poste Italiane

Social housing management agencies

19. ARCA Puglia Centrale

Energy Grid operators

20. Terna

Energy providers

21. Enel

ESCOs

22. ESCOs out of the target area

BINGOs, Bank Foundations, ... potentially interested in PED development

23. Fondazione per il Sud & Fondazione Puglia

Churches

24. "Parish of Don Bosco" *(Multifunctional Centre)*
25. Other Churches of the target area

Other nonprofit organizations

26. "Casa delle Culture" Multipurpose Centre
27. "InConTra" Association
28. CAPS "Tonio Signorile" Therapeutic Community
29. "Giovanni Paolo II" Foundation
30. Social Cooperative "I Bambini di Truffaut"
31. A.S.D. (amateur sports association) "Franco Ballerini" Cycling School
32. "Tracce Verdi" Social Cooperative
33. "La Paranza" theater company aps
34. "CAF ACLI" Patronage - tax assistance center
35. Other Organizations for Political rights and Fiscal assistance
36. Operators "Barletta Soccorso" Onlus.
37. "Ala Azzurra" Association
38. Other "Fratres" Association (2 locations)
39. S.S.D. Sport Project s.r.l. (amateur sports club)
40. ATI CSI - Italian Sports Center (Temporary Business Association)
41. ASD Bari Quartieri Uniti (amateur sports association)

Building managers

42. Building managers (most building are totally owned by ARCA)

Residents in the target area

43. Residents

Retailers located in the target area

44. Retailers

SME located in the target area

45. SME

Model 01

In the first analysis model, the value '0' was associated with the ratings 'Low' and 'Medium', with the value '1' only being assigned to the rating 'High'.

This shows that the majority of stakeholders are classified as 'Non Stakeholders', while many others are classified as 'Occasional' and "Dominant".

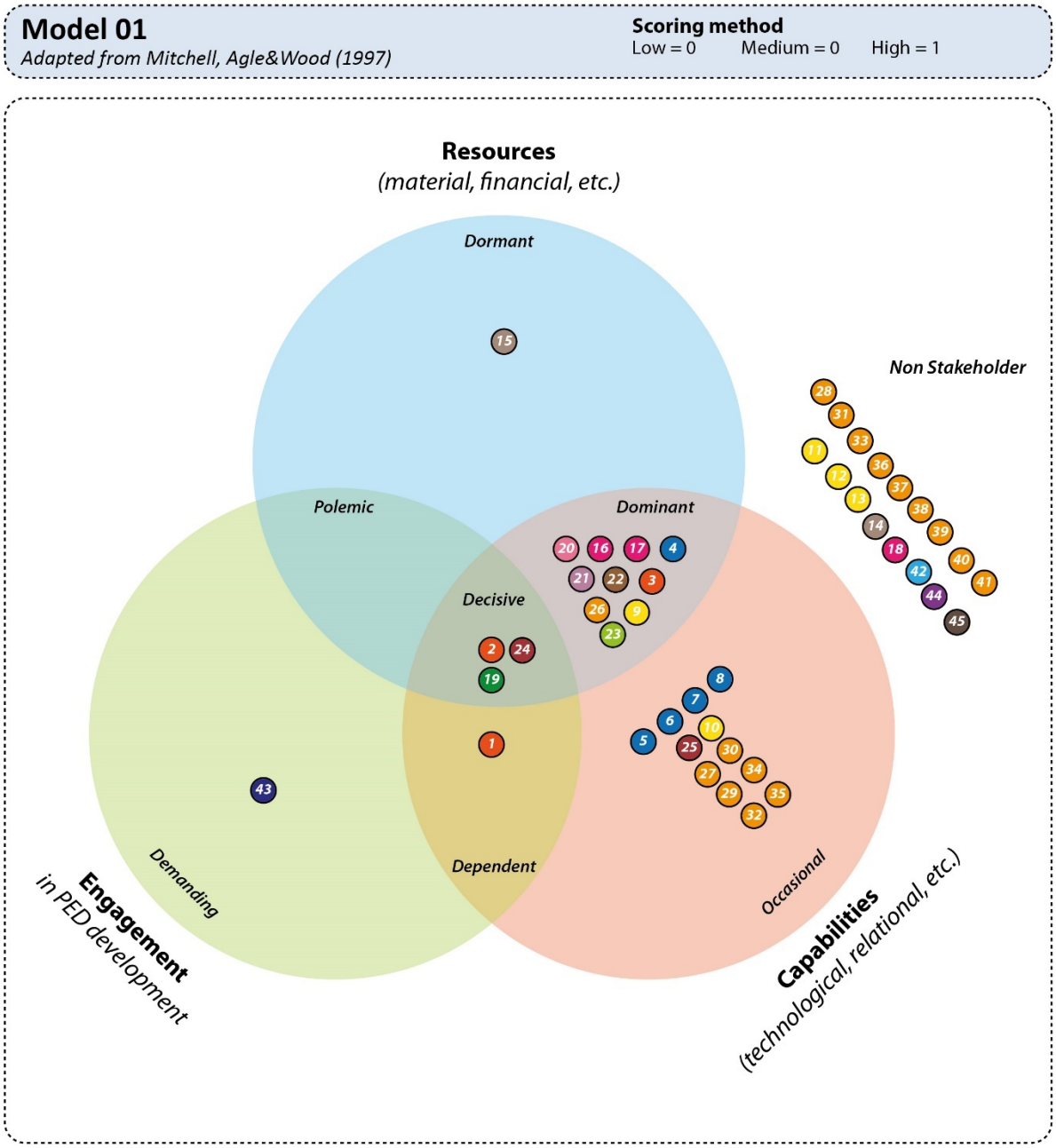


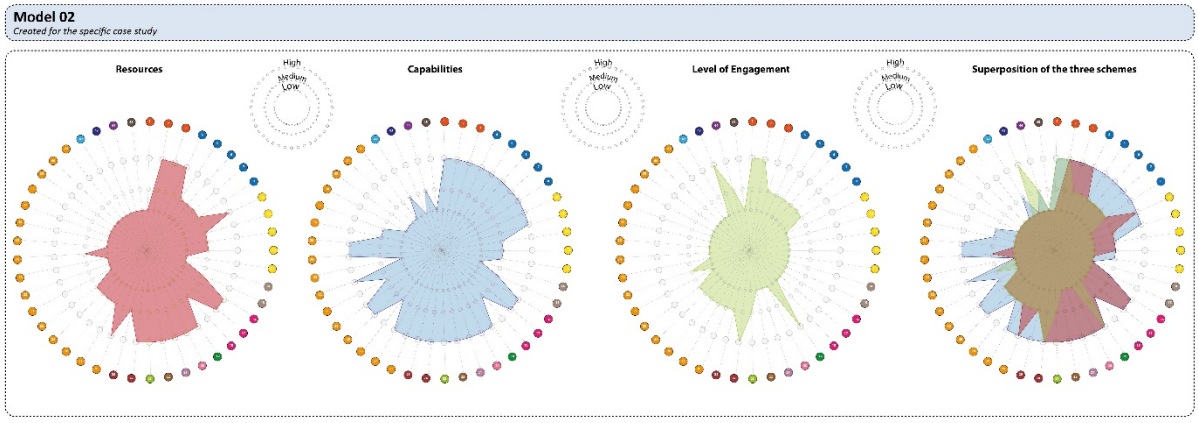
***Figure 10**. Model 1 for stakeholder characterisation&categorisation. Adapted from Mitchell, Agle&Wood (1997).*

Type of Stakeholders

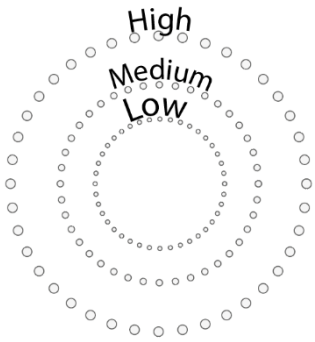
- Local Authorities and Regional Government
- Schools (Public or accredited)
- Health & care service providers
- Other public organizations
- Utilities and multiutility companies (public, private or mixed)
- Social housing management agencies
- Energy Grid operators
- Energy providers
- ESCOs
- BINGOs, Bank Foundations, ... potentially interested in PED development
- Churches
- Other nonprofit organizations
- Building managers
- Residents in the target area
- Retailers located in the target area
- SME located in the target area

Model 2

A further stakeholder characterisation model, briefly described here, was tested, based on radial star charts.



Each of the 40 stakeholders was associated with one of the numbered dots arranged on an equidistant circle.



Internally, three concentric circles with different dimensions were inserted, to which 'Low', 'Medium' and 'High' values were associated from the smallest to the largest respectively, as shown in the figure.

In this way, at each of the stakeholders, there are three possible values arranged radially.

At this point, the three graphs associated with 'Resources', 'Capabilities' and 'Level of Engagement' were produced, relating to the values obtained with the characterisation of the stakeholders, as shown in the figures below.

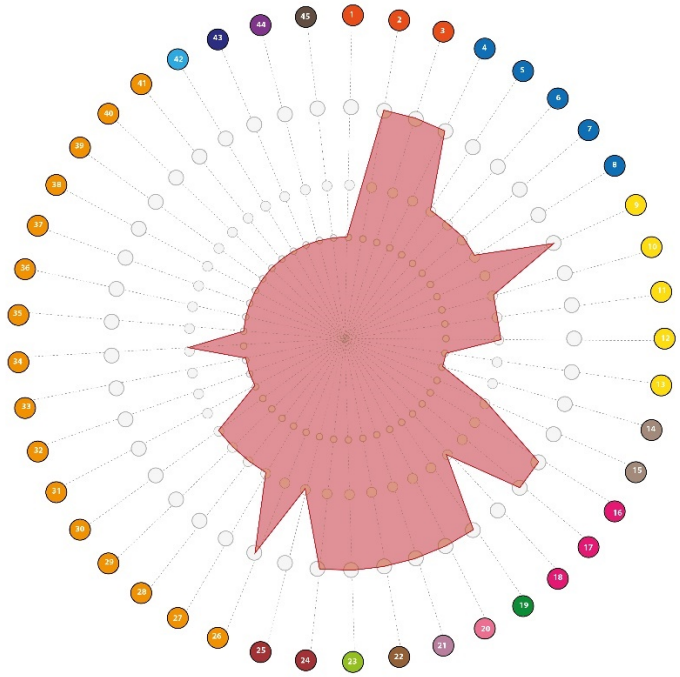


***Figure 11**. model 3 for stakeholder characterisation&categorisation. Resources in a Radar chart representation*

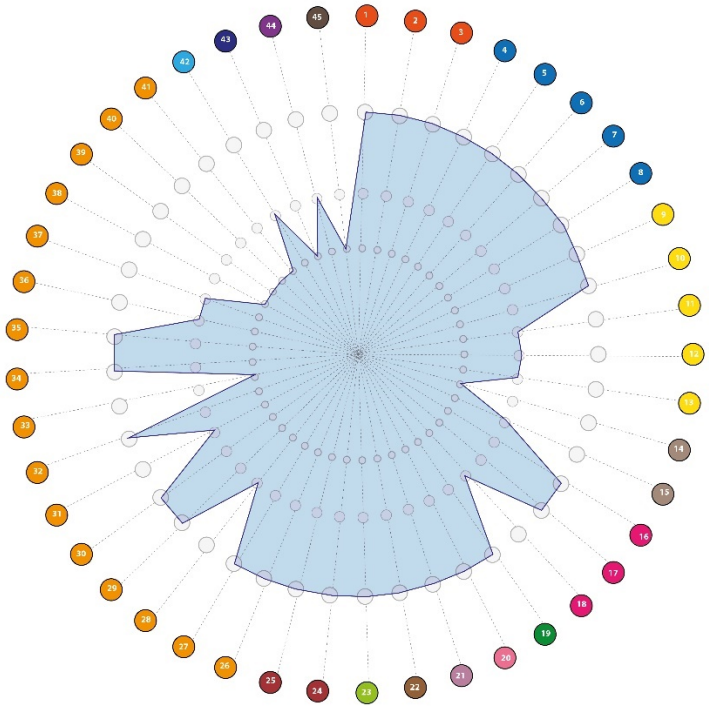


***Figure 12**. model 3 for stakeholder characterisation&categorisation. Capabilities in a Radar chart representation*

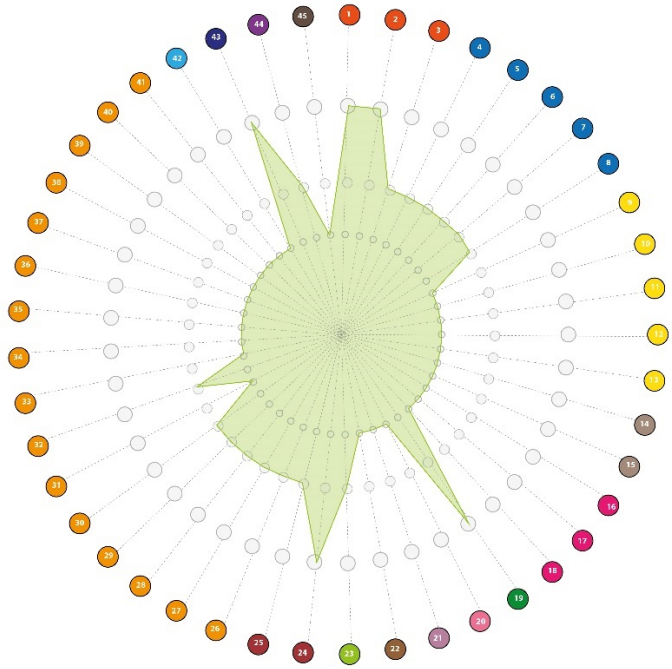


***Figure 13**. model 3 for stakeholder characterisation&categorisation. Level of engagement in a Radar chart representation*

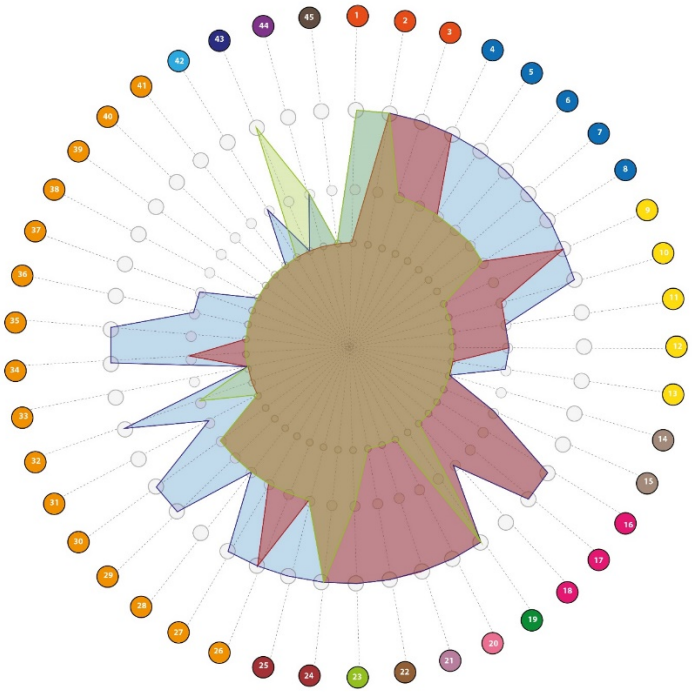
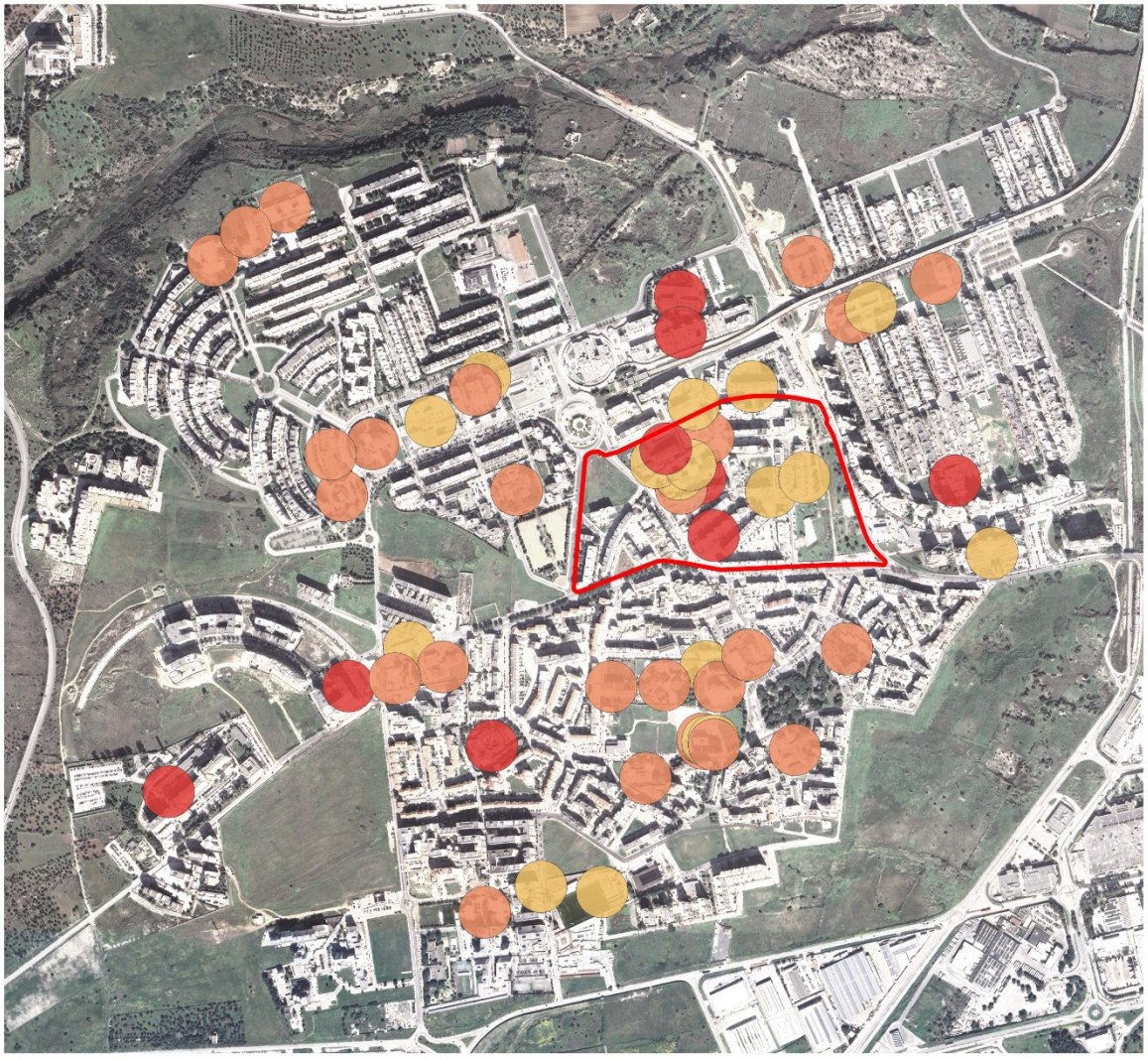


***Figure 14**. model 3 for stakeholder characterisation&categorisation. Superposition of the three schemes in a Radar chart representation*

Mapping and Spatial Analysis

Resources distribution



TARGET Area

sub-group1

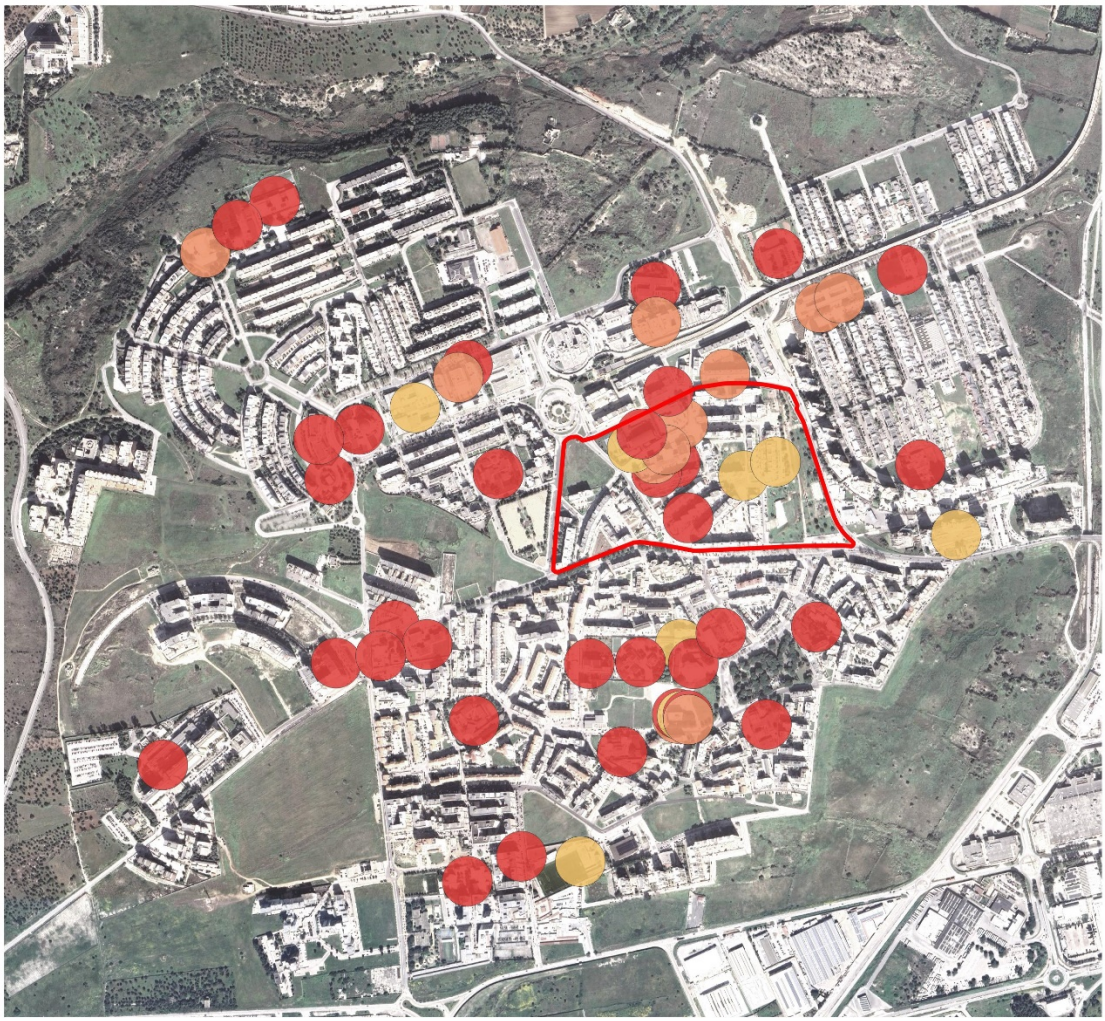
Resources

High

Medium

Low

Capabilities



TARGET Area

Evaluation 2

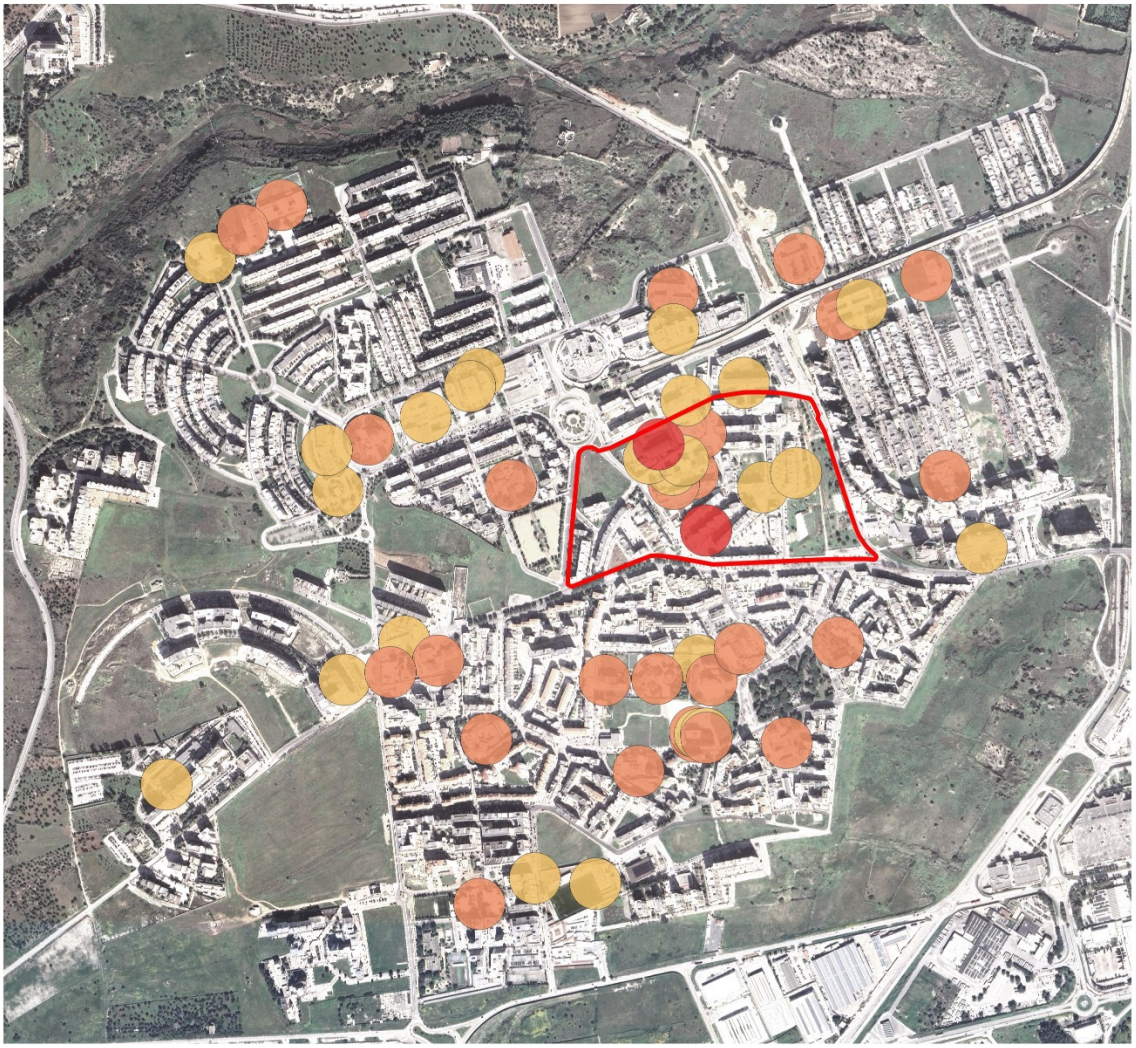
Capabilities

High

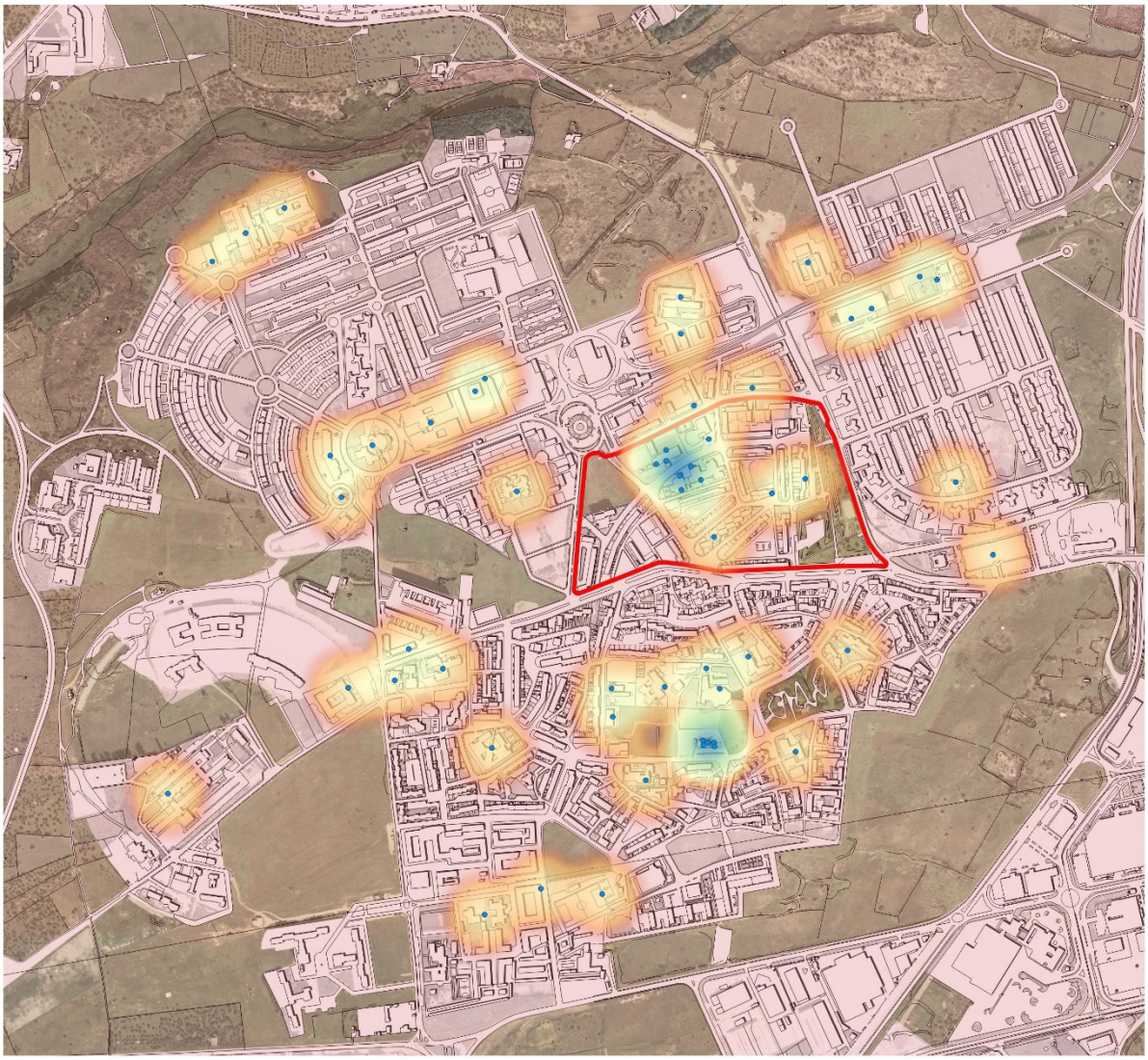
Medium

Low

Level of Engagement



Stakeholders Distribution



TARGET Area

Heatmap

Banda 1 (Gray)

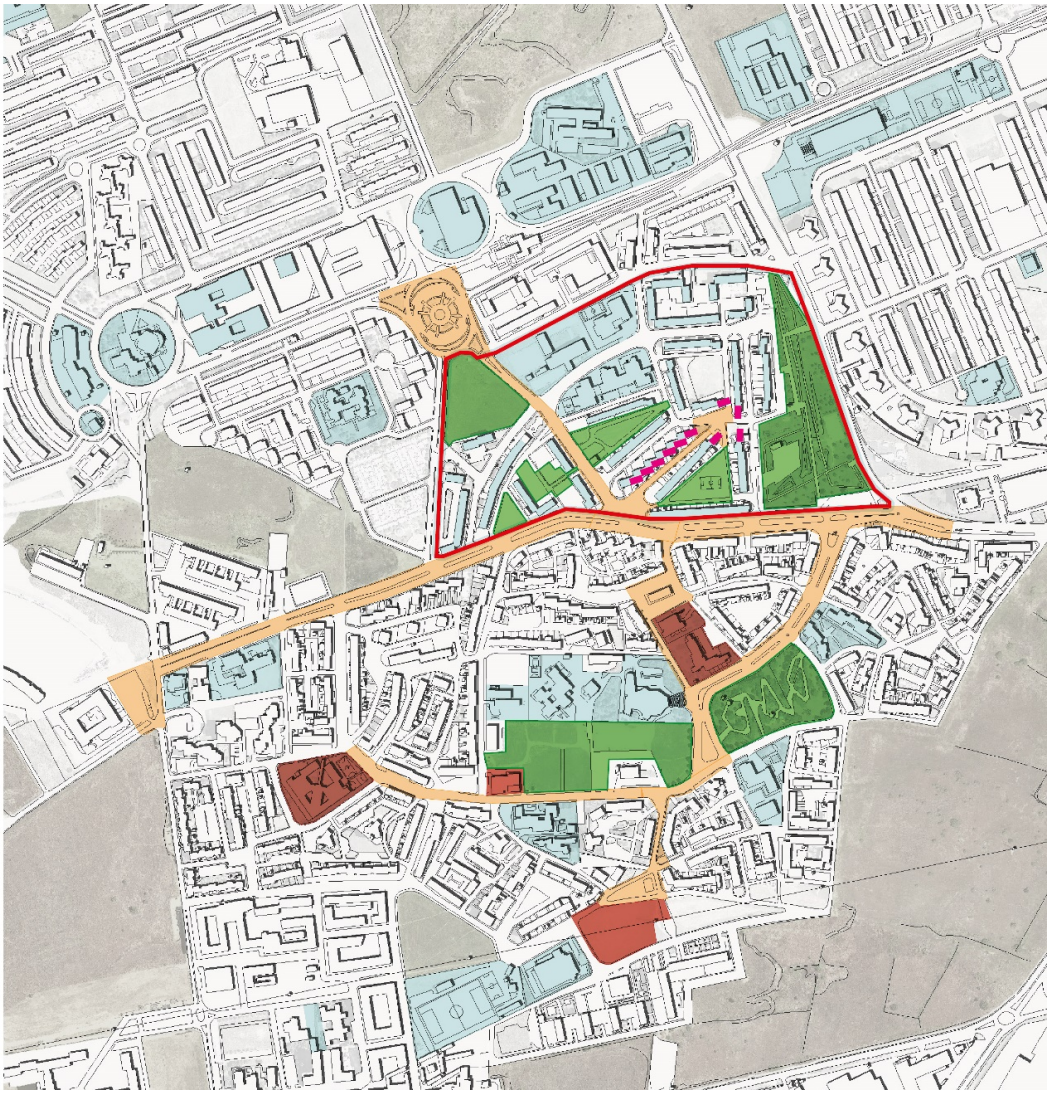
0

5,836795

Stakeholder POINT_ALL

Ongoing Projects in San Paolo neighbourhood

The following is a brief description of the main urban transformation projects underway in the San Paolo neighbourhood, schematically summarised in the image below.



Interventions of Urban Regeneration

Interventions on the road network to enhance slow mobility in the city and safety

Interventions for the realisation and enhancement of equipped green areas

Realisation of new community facilities and enhancement of existing ones

MQ0 project for the realisation of murals and artistic interventions on the facades of houses in the public residential district

Public utilities

TARGET AREA

Regeneration Plan of the San Paolo neighbourhood funded by the 'Periphery Programme'

Thanks to the 'Bando Periferie' (Pheriphery Programme) issued by the National Government in 2015, it was possible to implement a programme of urban regeneration interventions in the San Paolo neighbourhood, keeping the redevelopment of open and public spaces as the main objective.

The main objectives of the regeneration plan is the adaptation of infrastructures and accessibility, through the strengthening of public transport and slow mobility, especially by encouraging the recovery of the space between buildings, designing it as a collective space.

The transformation of the neighbourhood, in fact, strongly rely on the definition of a system of equipped public spaces where the community can meet and recognise itself.

The project create synergies with some interventions for the renovation of pedestrian areas and spaces, which are funded under the 'Patto con i Municipi', an urban programme consisting of 70 'urban acupuncture' interventions concerning public space spread throughout the municipal area.

Rigenerazioni Creative

Rigenerazioni Creative (Creative Regenerations) is a project for the activation of public spaces and participation that aims to stimulate the involvement of citizens in paths of regeneration of urban public areas, through dynamics of various kinds, in line with the principles of inclusiveness and participation, to be implemented with the involvement of associations, committees and citizens for the management of these spaces.

Interventions will be implemented in the form of participatory workshops with the active involvement of citizens. In addition to the physical regeneration of the spaces, Rigenerazioni Creative aims to create a collective identity of the places, which are the object of intervention, and to strengthen community ties around them.

In the San Paolo neighbourhood, a community garden was developed under the leadership of Incontra and Tracceverdi Associations, which led to planting of approximately 400 tree and shrub species that contributed to increasing the biodiversity and naturalistic and landscape value of the place.

The planting activities were carried out in cooperation with residents of the neighbourhood, children from the city's schools (more than 300 in total during the two-year project) and users of the Cunegonda, EPASS and Nuova Fenice day care centres during weekly appointments. The area was also the venue for various socialisation and environmental education activities. In order to also include differently-abled boys and girls in the activities, two above-ground vegetable gardens were created to make it possible for wheelchair users to create and maintain plants.

Renzo Piano's G124 for the redevelopment of Corte Don Bosco at San Paolo

The project aims to strengthen the relationship between the uncultivated space and the houses overlooking it, building a place of aggregation in which residents can once again recognise a sense of belonging to the neighbourhood. Insights into the intervention and its social context have led to the identification of three key design themes. The domestic condominium space, envisioned as a courtyard garden functioning as a large collective living room, an open-air extension of the residential spaces; the connection with the adjacent Giovanni Paolo II Park; and the integration with the urban murals of the Quartiere Museo, located just a few dozen meters from the site.

The courtyard will be transformed into a new green public space thanks to the planting of 110 trees, including laurels and holm oaks, arranged to allow the foliage to fully develop and to create a 'green roof'. A large circular clearing is planned in the centre of the courtyard that will allow the public to observe the sky: in fact, the central part has been designed as a social space dedicated to collective activities, with the installation of seats, a lighting system and the laying of stabilised draining earth.

Quartiere museo (QM) San Paolo, 10 mural works by Apulian, national and international artists

The Quartiere Museo (QM) San Paolo (Museum Neighbourhood San Paolo) is a project initiated by the Municipality of Bari. Its aim is to promote urban regeneration through urban art, seen as a tool to enhance beauty, improve the urban environment, and foster a stronger sense of community belonging. The project involves the community in defining the artworks, which are created by international, national, and local artists. This vision, shared with Fondazione Mecenate 90, evolved into the QM San Paolo project. It secured funding from the Apulia Region under policies promoting urban street art. Additionally, Arca Puglia Centrale is collaborating by providing several buildings it owns in the San Paolo neighbourhood to support the regeneration program.

Community Map in Brussels (La Roue and Usquare)

Characterization

As set out in our research protocol, the stakeholder characterization stage highlights the different interests and roles that each stakeholder plays within each living lab studied. This characterization exercise concerns a specific moment in the NDEP development process at two sites in very different contexts.

Furthermore, this characterization work is based on a triangulation of different types of data from semi-structured interviews, analysis of official documents, activity reports from the Collective de la Roue and other sources, and participant observation.

In the case of the two living labs in Brussels, focus groups are planned for the coming weeks, and will complete this stakeholder analysis.

The characterization of stakeholders as set out in our research protocol considers three types of elements, the definition of which must first be clarified, and then the choice of the type of measurement explained.

Here, we take into account the two contexts of the two Brussels living labs.

The resources

As far as resources are concerned, this refers to all the material and financial resources involved in developing a PED, considering the type of players involved.

In addition to their own financial resources, the public administrations involved in the two livings labs have received European funding, from the ERDF, which is helping to finance several innovative pilot projects (the Wheel through the Renolab.ID program) and to subsidize the renovation of certain community and university buildings in Usquare. This type of funding has been clearly identified as essential for the development of the two PED projects studied.

Legal resources also need to be considered, in other words, the means available to the stakeholder to create a binding or non-binding legal framework. Indeed, the various legal and institutional tools available to stakeholders influence the development of developing countries.

The capabilities

This concerns the room for manoeuvre and influence that a stakeholder must act within the framework of the development of a positive energy district. This also includes the ability to interpret regulatory texts.

The Level of Engagement

A stakeholder's level of commitment to the deployment of a PED can be objectivized through elements such as the efforts made, the time devoted (number of people mobilised, for example) and the resolution of a deployed problem.

In the case of an organization, for example, this will involve looking at the number of full-time staff employed on project follow-up, the different types of support and guidance provided on an ongoing basis, and the efforts made to resolve problems limiting the development of the PED.

A. La ROUE

As far as La Roue's living lab is concerned, the identification of stakeholders has highlighted certain actors whose resources, capabilities and level of commitment are analysed.

1. The Municipality of Anderlecht:

In terms of resources, the Municipality of Anderlecht benefits from its own financial resources and financial resources from the Region to promote de-carbonization projects at the neighbourhood level. It also has legal resources to regulate and make certain environmental regulations mandatory on its territory. Indeed, with those legal tools the Municipality validates the urbanization permit for the renovation building within its territory.

As a local administration, it also coordinates various social actors to address areas closely connected to citizens, including housing, social inclusion, energy access, and more. As a result, the Municipality has a human capital of expert collaborators in the field, which is a real advantage when it comes to addressing the different dimensions related to the deployment of a positive energy district.

The Municipality owns certain public buildings, for example the school of la Roue, whose rooftop could be mobilised for PV panels for example.

In terms of capabilities, the Municipality has an important capability to engage funds, to streamline permit authorization procedures, and to implement the regulation and to interpret it. Moreover, for the connection to the hit network the political agreement or at least the orientation is made at the municipality level. In the context of PED development, these kinds of capabilities are significant because it allows a wide window of manoeuvre for the Municipality.

However, there is a tension between the administrative agents who monitor the granting of environmental permits and the political will to achieve environmental objectives on the part of the alderman. Also, some renovation permits granted by the Municipality are perceived as arbitrary by residents, who do not understand the exceptions that are sometimes made and the infractions that are not punished.

As far as the level of commitment of the Municipality is concerned, in terms of solutions to obstacles, the Municipality of Anderlecht is participating in the Working Group aimed at establishing a clear definition of what a collective renovation is.

In addition, the Municipality participates in the Citizens4PED Project by employing a person exclusively in charge of the said project within it in order to draw lessons and learnings related to the collective renovation project carried out by the Group of la Roue. This commitment to energy is reflected in its 2023-2030 Climate Action Plan, which plans to "promote group energy renovations and Energy Communities".

However, a certain rigidity within the administration can sometimes hinder this level of commitment. Specifically, in the legal interpretation of building renovation authorizations, the Municipality has not prioritized simplifying procedures for residents.

The Municipality of Anderlecht can therefore be characterised according to the model adapted from Mitchell, Agle & Wood (1997), as illustrated in the following table.

Resources	Capabilities	Level of Engagement
Medium - Legal resources - Financial resources(limited) - Social actors	**Medium** - Depend on the political will of the Alderman - Large room of manoeuvre for implementing rules, interpret them, and facilitate the permit authorization	**Low**

It therefore appears that the Municipality of Anderlecht is a **dominant stakeholder**.

2. **Bruxelles Environnment:**

As far as resources are concerned, as a regional actor, Bruxelles Environnment (BE) manages regional and European funding intended for both:

- Pilot projects led by citizens aimed at removing the obstacles to sustainable and circular renovation of buildings, such as that of the group of neighbours at La Roue through the Renolab.ID programme.
- Subsidies for the renovation of buildings and the installation of new equipment for individuals and professionals or public services.
- Subsidies for the support of citizens wishing to implement a project to retrofit public space to the scale of their neighbourhoods.

This set of available funding is a key element for the deployment of positive energy neighbourhoods in the Brussels Region.

In addition, BE also has a team of consultants who are experts in specific fields and who provide advice and studies on the feasibility of implementing a heating network in a particular area of Brussels, for example.

Compared to its counterparts, BE can be considered to have a high level of resources available. Indeed, Bruxelles Environnment can be considered to have a real power of influence in the PED development.

As far as capabilities are concerned, as stated above, Bruxelles Environnment works with a whole network of local actors that makes it possible to cover a wide range of audiences. However, BE's action is limited in terms of actual implementation on the ground, in fact, its role stops at the allocation of subsidies and the monitoring of the various pilot projects but does not go beyond that. Therefore, his abilities can be considered to be of an average level.

In addition, in a long term, Bruxelles Environnment has a wider room of manoeuvre than the Anderlecht Municipality because of its capability to elaborate and plan the regional framework, make mandatory any rule, to give guidelines and tools for the deployment of PED.

Finally, in terms of level of commitment, BE's participation in the Citizens4PED project through the provision of an employee, as well as the organization and participation in the Working Group aimed at reflecting on the criteria for group renovation, show the degree of involvement of Bruxelles Environnment in the implementation of PEDs. However, like other public administrations, the decision-making process is characterized by a hierarchy which itself follows the directives set out by

the Cabinet of the Ministers concerned (Environment, Housing, Mobility, etc.). Therefore, hierarchy frames the level of commitment.

In the following table, the characterisation of Bruxelles Environnment is carried out according to the model adapted from Mitchell, Agle & Wood (1997).

Resources	Capabilities	Level of Engagement
High - Financial resources - Legal resources - Network of experts and social federations - Facilitators Services	**High** - Elaboration of regional framework enabling PED (PACE, Cobrace etc**)** - Allocation and Management of subsides for the Renolab.ID - This room of manoeuvre doesn't include field action	**Medium**

Bruxelles Environnment is a **decisive stakeholder** in the development process of the positive energy district at La Roue.

3. **Urban:**

In terms of resources, compared to Bruxelles Environnment, Urban has fewer financial resources devoted for the deployment of PED.

As far as capabilities are concerned, Urban has real expertise in the preservation of urban heritage, and a right of control regarding the granting of environmental permits. In addition, together with Bruxelles Environnment, Urban awards "Renolution" bonuses, which concern elements relating to the conservation of heritage. In the case of la Roue, Urban plays a central role that could slow down the momentum carried by citizens.

However, Urban has an important braking force in two axes: the renovation and the renewable production. Indeed, as the Municipality of Anderlecht, Urban gives the authorization for the environmental permit for houses renovation in la Roue. Moreover, for the installation of PV panels, Urban regulate strictly it through many criteria.

Finally, in terms of the level of commitment, the heritage department considers that Urban's agreement to test a group renovation option with citizens already illustrates their interest in developing the heritage dimension of building renovation. In the same way as BE and the Municipality of Anderlecht, Urban also participates in the Working Group concerning the definition and criteria of a grouped renovation.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	Capabilities	Level of Engagement
Medium - Architect experts - Legal resources linked to heritage conservation	**Medium** - Important braking force - Authorization for environment permit	**Low**

Urban seems to have a **dominant stakeholder** nature in the process of deploying PEDs in the context of La Roue.

4. **Foyer Anderlechtois, Social Housing of Anderlecht :**

In terms of resources, the Foyer Anderlechtois essentially owns certain housing units located in the so-called experimental zone at the Roue and outside it. In addition, like the other Brussels Public Service of Housings (SISP), the Foyer Anderlechtois depends on the Housing Company for Brussels Region (SLRB) for its budget and therefore remains limited in the mobilization of funding. For the renovation, the SLRB gives 50% and the Social housing gives 50% of the total amount.

Apart from the question of renovating the buildings, the Housing of Anderlecht is integrated into one of the heating network scenarios envisaged in the Roue district. Once again, the position of the Foyer until now is to wait for more in-depth expertise and the main obstacle already identified is the financing and the real usefulness of a heating network for houses and not buildings of the Foyer present in the scenario area.

As far as capabilities are concerned, the experience of a group renovation of 41 dwellings is a considerable asset for the rest of the renovation process. Indeed, this first experience has made it possible to identify strategies that are more appropriate to the realities on the ground. However, the Foyer Anderlechtois has a good room of manoeuvre to decide which kind of renovation (the size of the group renovation for their houses, the type of work).

Finally, in terms of commitment, the Foyer Anderlechtois has so far shown a medium level of commitment, although it has participated in the drafting of an opinion concerning the collective renovation proposal of the La Roue's collective, the SISP retains a marginal role in the discussions both concerning the renovations and those dealing with the heating network. However, the Foyer has been active in the field, renovating 86 homes. Nevertheless, it is true that we have no access to the consumption figures of the tenants of these renovated houses.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	Capabilities	Level of Engagement
Medium - Depends on SLRB for financial aspects - Owner of houses in la Roue and other places in Anderlecht **(250 houses in La Roue)**	**High** -Room of manoeuvre for renovation of their houses and buildings	**Low**

The Foyer Anderlechtois has the nature of a **dominant stakeholder**.

Next to the public administrations, there is a school, more precisely a Centre for Teaching and Research in the Food Industries (CERIA).

5. **CERIA:**

The main interest of CERIA concerns the renovation of its internal heating network and therefore the possibility of creating with the neighbourhood a heating network that is sized beyond its own and which, in scenario 1 integrates the main structuring buildings (Anderlecht home, nurseries, etc.), and in scenario 2 integrates all the buildings, including the catering industry, private houses, etc.

In terms of resources, CERIA already has an internal network, including two boilers that need to be renewed, and it already has photovoltaic panels. However, CERIA remains limited in terms of its own financial resources that can be mobilised in the case of a heating network. Indeed, CERIA depends on COCOF (French Community Commission).

In addition, in terms of capabilities, CERIA is subject to its Board of Directors, which oversees its activity and consequently its capacity for action in connection with the development of a positive energy district is limited. It has a central role in the project of heat network because as a main consumer it is the centrepiece of the project. The engagement of other main building owners depends on its participation in the heating network. As a result, it has real scope for action and choice when it comes to deploying positive-energy districts.

In terms of level of commitment, the position of the Board is awaited to see what decision is taken, for the moment the real level of commitment is low and is characterized by their participation in informative meetings given by Resolia. This commitment contrasts with the interest expressed by the energy manager we met. Also, Ceria buildings are required to draw up a Local Action Plan for Energy Management (PLAGE) to reduce their energy consumption.

From all the above, by mobilising the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	Capabilities	Level of Engagement
Low - Depends on COCOF - limited financial resources	**Medium** - Main building for the heating network project of la Roue - Room of maneuver for the implementation of the heating network	**Low/Medium** depends on the interlocutor (heterogeneity within Ceria).

For the moment, Ceria has **a decisive stakeholder nature**.

6. **NGO Habitat and Participation:**

The Habitat and Participation association is also part of the consortium of partners in the group renovation project at the garden city of la Roue. Its role is to mobilise households, develop means of communication and maintain the group dynamic.

In terms of resources, the association is very limited and receives funding from the Renolab.ID programme.

As far as capabilities are concerned, the association relies on relational skills, and experience with the public which facilitates their mission in the district of La Roue. However, the NGO has very little choice of action concerning the deployment of PED in la Roue.

In terms of level of commitment, faced with the various difficulties related to mobilization, the association has constantly been able to deploy new strategies to try to keep the interest of the neighbors.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	Capabilities	Level of Engagement
Low	**Low**	**High**

Habitat et Participation is a stakeholder of **a dependent nature**.

7. **Residents' collective:**

In terms of human resources, the collective benefits from the different individual abilities of its members (professional capabilities especially Quentin, Eva Tania for example), which complement each other and help to maintain the cohesion of the group.

The collective does not have financial or technological resources, which is why expert offices are part of the consortium of the project funded by the Renolab.ID programme. They asked for FEDER subsidies (that procedure requires a minimum of team organization skills).

In terms of capabilities, the collective has lobbying power with political decision-makers and local authorities. Indeed, the creation of the working group on the definition of “grouped renovation” can be seen as the result of pressure from the discontent of the residents' collective.

As for the level of commitment, the collective has a very high level of commitment to the decarbonisation of their neighbourhood, the creation of a developing country, and this is thanks to a very high level of environmental awareness.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	Capabilities	Level of Engagement
Medium - Human resources and personal expertise - Regional Subsidies	**Medium** - Lobbying power on political decision makers - Mobilization capacity	**High**

The resident’s collective of La Roue has a **decisive nature**.

8. **Resolia:**

As a design office and expert in the field of thermal energy networks, Resolia is one of the stakeholders in the project Renolab.ID carried out with the collective of citizens of La Roue. Resolia provides technological support through thermal energy capacities.

Also, in terms of capabilities, Resolia has relational resources, particularly with the private sector related to heating network issues. It also has in-depth expertise that makes it a stakeholder with a considerable level of capacity.

However, in terms of resources, Resolia is limited.

As for the level of commitment of private companies financed under the project Renolab.ID, it is important to differentiate private actor from public administrations because private companies are contracted to carry out specific missions according to their expertise. Therefore, they are required to achieve their objectives and therefore their level of commitment to the development of a PED is intertwined with their commitment to their mission.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	Capabilities	Level of Engagement
Low - Expertise on thermal energy network - Collaborative work with administrations	**Medium** - Its room of action depends on the involvement of others SH for the implementation of heating network	**High**

Resolia would have a **dependent nature** within the living lab of la Roue.

9. **Residents as individual:**

Among residents, it is possible to distinguish owners, tenants and social housing tenants.

In terms of resources, the owners have individual capacity to organize themselves for collective initiative as the collective renovation.

Owners:

Owners come from a wide variety of backgrounds, and do not form a homogeneous group.

Focus groups with residents are currently underway at La Roue and will shed light on any nuances and differences of opinion.

Resources	Capabilities	Level of Engagement
Low - Owns their house - Financial capacity	**Medium** - Medium room of maneuver for the renovation work	**Medium** (diversified according to the inhabitants, who are very heterogeneous)

The owners have a **decisive nature.**

Tenants (social housing or not):

Resources	Capabilities	Level of Engagement
Low -	**Low** - no scope for action regarding renovation work, no participation in discussions concerning the choice of a connection to a district heating network.	**Medium**

The tenants have a **dependent nature.**

Other actors present at La Roue's living lab have been identified without having such a central role in the deployment of PEDs; These are:

- **Utilities and public undertakings: Police station, Cambio Car station, Equipment loan Service**

For most of them they are not included in the discussions, they do not have a fundamental role at the moment in the existing dynamics of PEDs, but there is a real potential for the installation of photovoltaic panels on their roofs.

Although they need to verify their interest in participating in the development of PEDs, we can consider that these actors will have a dormant role.

- **Energy grid operators: Sibelga**

Sibelga is included on an ad hoc basis in the preliminary studies carried out by Resolia, in fact Sibelga shares information related to the annual consumption of the buildings located in the two scenarios planned for the heating network.

Sibelga's interest will be to see the possibility of being the manager of the future heating network under discussion at La Roue.

During the more advanced phases, Sibelga may have a more active role, particularly in the work of implementing the heating network. Indeed, this network operator has very significant technical capacities but does not necessarily have a significant level of commitment or resources to make available. Consequently, his nature would be more that of an occasional stakeholder.

- **Social Workers: Public Center of Social Action (CPAS) of Anderlecht**

So far, the workers of the Anderlecht's CPAS have not yet been included in the discussions. Being under the supervision of the Municipality of Anderlecht, the CPAS could have a role of relaying information to the inhabitants on the project underway of collective renovation and heating network in the Roue district.

Its resources are limited, but the capacity as a local actor close to the citizens is a real asset. Indeed, within the framework of its current prerogatives, the CPAS is responsible for assistance and advice in energy and housing matters, among other things.

The level of commitment of the CPAS has yet to be verified. As a result, it can be considered that the CPAS would be an occasional stakeholder.

- **School of la Roue**

Being a municipal school, the Roue's school is subsidized and supervised by the municipal administration of Anderlecht. Its roof could be equipped with photovoltaic panels and/or the school could be connected to the heating network in scenario 2 proposed by Resolia. They've renovated the boiler and don't want a heating network.

- **Small and medium-sized businesses in the vicinity**

As far as the small and medium-sized companies located in La Roue are concerned, these are the Brothers bookshop and the Bibal Bakery, which have not yet been contacted or included in the discussions relating to the collective renovation or the heating network.

- **NGO Graine du Savoir**

This association is located in the heart of the experimental area and could benefit from a connection to the heating network. So far, this non-profit organization has not been included in the discussions.

B. Usquare

Set in a completely different context from that of the garden city of la Roue, Usquare is a former gendarmerie barracks whose rehabilitation has been the subject of a whole programme established upstream between several stakeholders, and which took shape through a Master Development Plan (PAD) approved by the government in 2020.

Indeed, this programme integrates several aspects covering energy production, the energy performance of buildings, mobility, urban agriculture, not to mention the circular dimension and the reuse of materials. Consequently, numerous stakeholders were involved in the initial planning phase, though some no longer play an active role in Usquare today. Other stakeholders, absent from the planning phase, are currently involved in the execution and implementation process. Similarly, other stakeholders will take on a more important role, particularly in the management of buildings, for example, once renovation work has been completed.

There are very different temporalities within Usquare. As such, the nature of "temporary residents" has been added to the stakeholder identification template.

1. **SAU :**

In its mission to coordinate the various operations to be carried out on the site, and as the manager of the buildings, the SAU does not as such have its own financial resources that it would make available for the deployment of a PED in the case of Usquare. Its role is to manage the funding made available through various regional and European subsidies obtained for the development of the site's conversion.

Its central role has been assigned to it by the government of the Brussels Capital Region.

Otherwise, regarding the selection and management of temporary residents on the site, the SAU is responsible for signing contracts with the said local actors as well as looking for investors for university housing and the project management of public spaces. As a key entity overseeing the coordination of all site activities, the SAU demonstrates significant management and coordination expertise,

effectively engaging with a wide range of partners. In terms of room for manoeuvre, he is one of the stakeholders with a wide choice for the development of a ped in Usquare.

Regarding the level of commitment, certain rules outlined in the PAD, such as the specified square meters for housing construction, proved challenging to implement. To address this, the UAA had to strike a careful balance between adhering to the PAD's requirements and accommodating the realities on the ground. This in some ways illustrates the level of commitment of the SAU to reduce barriers in achieving one aspect of the DEP rollout. However, while the SAU's role is to encourage exchanges between the very heterogeneous stakeholders, it apparently failed to bring certain social housing players to the table, which limited the exchange of information.

Considering the model proposed by Mitchell et al., we observe:

Resources	Capabilities	Level of Engagement
Medium - Depends on regional subsides - SAU bought a mega heat pump - SAU receives 250 euros per built meter from social housing, for example (this is the land incidence).	**High** - site ownership - coordination of residents activities on Usquare - central role of collaboration between all site stakeholders	**Medium**

Therefore, the SAU has the nature of a **decisive stakeholder**.

2. **Perspectives:**

Like the SAU, Perspective was appointed by the Brussels-Capital Region to draw up the activity plan to be developed on the site and the Master Development Plan (PAD).

One of the special features of Usquare is that it is a site whose conversion has been programmed in several stages, and which was owned by the Region and then by the SAU. The purchase of the site is a good illustration of the resources available to the Region. As said before, the Region of Brussels has legal and financial resources which can be mobilised for the deployment of PED.

Indeed, the Region played an important role in the conceptualization and programming phase of the site with Perspective and voted for the PAD (Master Development Plan) document. At present, the Region's role is secondary, since it has delegated the management of the site to the SAU but remains the legal actor capable of transferring part of the buildings or not.

Since then, as a regional center of expertise, Perspective has been deploying its considerable skills in territorial knowledge and development, socio-economic statistics and analysis, and architectural quality. However, in the deployment of a PED in Usquare the room of manoeuvre of Perspectives is quite small now, in the first stage of the reconversion of the site Perspectives had a bigger window of action than now.

Indeed, its role was decisive in the early stages of the site's conversion and is relatively less so today. Nevertheless, its level of commitment has not been reduced.

Resources	*Capabilities*	*Level of Engagement*
Medium - Legal resources (participation on the elaboration of Master Development Plan) - Expertise on urbanism etc	**Medium and low now** -	**Medium**

The nature of Perspectives is **a decisive stakeholder**.

3. **Brussel Capital Region Housing Company (SLRB):**

The Brussels-Capital Region housing company is responsible for the social housing in Usquare. It is responsible for the administration of the 16 SISPs (Société Immobilière de Service Public) in the Brussels-Capital Region, of which BinHôme is one. As said for the case of Foer Anderlechtois, the SLRB finances 50% of the cost of renovating the Binhôme buildings.

In this case, the social housing in Usquare consists of three buildings located in an annex, formerly known as “le Clos des Mariés”. The company has launched a contract for the design and supervision of works for the major renovation of three existing buildings to create around 33 social rental housing units. The work is being carried out on behalf of SISP BinHôme, the owner.

The SRLB does not seem to have mobilised any capacities in the deployment of a PED. Once the renovations have been completed and the units allocated and occupied, the SRLB will exercise its role of administrative guardianship and ensure compliance with the various obligations of the SIPS in terms of housing allocation, building maintenance and renovation. In terms of room of manoeuvre, the SLRB has a few options for action for the deployment of PEDs. However, the SLRB can promote sustainability aspects in the various renovation and new housing construction projects.

Resources	*Capabilities*	*Level of Engagement*
Medium 50% costs of renovating buildings	**Medium** Project owner for “Clos des Mariés”	**Low**

The nature of the SLRB seems to be that of a **dominant stakeholder.**

4. **BInhôme : Social Housing:**

BinHôme is one of the Usquare stakeholders who has not previously played a major role in the site's roll-out. Having entrusted SRLB with the management of the project, BinHôme will undoubtedly play a role in the management of the newly renovated homes.

In terms of resources, BinHôme has its own financial resources and investment programmes for renovation, construction and landscaping projects. These investment programmes are proposed by the SLRB and are subject to approval by the regional government. These funds are therefore very useful in the implementation of a PED integrating social housing. Specifically in the case of Usquare, BinHome's source of funding is 50% own funds and 50% subsidies from the Brussels-Capital Region.

As far as capacity is concerned, as mentioned above, as a SISP, BinHôme implements management capacities linked to the occupation of its buildings and their upkeep. In addition, the concierge service provided for each SISP building could make a significant contribution to the integration of new social housing tenants on the Usquare site. BinHôme, like other stakeholders likely to be connected to the site's heating network, has limited capacity to manage and maintain the network. In terms of room for maneuver, the scope of action of Binhôme is quite limited.

Binhôme's temporality is distinct from that of the other stakeholders involved in site planning, and so far, it has been involved in the Usquare site specifically in relation to Les Clos des Mariés. In terms of the level of commitment, Binhôme's investments demonstrate its interest in making energy-efficient housing accessible to the underprivileged. However, as far as the actual deployment of a PED is concerned, BinHôme was not involved in the preliminary discussions, and its involvement is focused on the renovation of Clos des Mariés.

Resources	***Capabilities***	***Level of Engagement***
Low - Owner of the buildings (clos des mariés) - Subsidies from the Region	**Medium** – Make the technical choices for housing construction	**Low** (they would like to go further)

Considering the model proposed by Mitchell et al, we observe that BinHôme has the nature of an **occasional stakeholder**.

However, this situation is likely to change as work begins on the Clos des Mariés buildings.

5. **Pali-Pali:**

In 2019, Pali-Pali was awarded the contract to manage the temporary occupation of Usquare under the name “See you”. In mid-2022, Pali-Pali won the contract to continue the Usquare transitional occupancy process initiated in 2019.

In concrete terms, Pali-Pali oversees creating activities within the site that will enable links to be forged between Usquare residents and those from the neighbourhood and Brussels more widely. The success of Pali-Pali's first temporary occupation is a clear illustration of this stakeholder's proven ability to weave social dynamics around activities on a specific site.

In addition to managerial skills, these include the ability to network players from different sectors, and collective intelligence. This set of skills is crucial for the deployment of a PED, particularly in the case of a new site where there are no inhabitants yet, and consequently no social ties or shared histories linking people. However, as an NGO, Pali-Pali has a small decisional influence on the deployment of a PED in Usquare.

Pali-Pali's level of commitment is high because, given that the buildings were occupied at a time when the heating system was non-existent, Pali-Pali's workers were inventive in creating, with whatever resources were at hand, solutions to keep warm and carry out their missions.

However, as is the case for many of Usquare's other stakeholders, Pali Pali's action has taken place within a certain timeframe, and with the departure of the temporary occupiers, Pali Pali's role will no longer be the same. Consequently, its nature could change.

Resources	*Capabilities*	*Level of Engagement*
Low	**Medium**	**High**

Considering the model proposed by Mitchell et al, we can establish that Pali-Pali has the nature of a **dependent/demanding stakeholder**.

6. **MEET U:**

As residents of the neighbourhood in which Usquare is located, the collective Meet U has had to set up collaborative meetings and activities with Pali-Pali. Their financial resources are limited and come from regional subsidies, notably the Inspirons le quartier programme. In terms of capacity, the Meet U collective could have greater room for manoeuvre once the new residents of social housing and university residences are settled on the site. But for the time being, their options for action remain very limited.

Resources	*Capabilities*	*Level of Engagement*
Low	**Low**	**High**

Considering the model proposed by Mitchell et al, we can establish that Meet U collective has the nature of a **demanding stakeholder**.

7. **ULB and VUB:**

Right from the start of the initial discussions on the purchase of the Usquare site by the region, the two rectors of ULB and VUB shared their keen interest in creating an innovative, international university cluster on the site.

In terms of available resources linked to the deployment of PED, the two universities do not have any. Still in terms of human resources, the two universities are providing two project managers, whose tasks include

The two universities possess significant expertise in analysing, conceptualizing, and experimenting with societal phenomena. Additionally, they benefit from an emphyteusis agreement, granting them use of six buildings provided by the region free of charge for 50 years. This gives them a real right to renovate, restore, transform and reallocate these buildings into an innovative university hub, integrating both university facilities and housing for researchers.

The level of interest shown by the two universities is very significant, as they were the ones who pushed for the development of the site and all the preliminary work involved in the conversion of the former barracks.

Resources	*Capabilities*	*Level of Engagement*
Medium - they have pledged money to pay for site development costs	**High** - Has a long lease on the buildings on the site - carry out studies on PED, develop software such as pareto front for managing production resources in future PED - Can promote new energy practices inside those buildings - They took part in decision-making on riothermal energy on the site	**High**

Considering the model proposed by Mitchell et al, it appears that the two universities are **decisive stakeholders.**

8. **Pédalo :**

As a collaborative supermarket, the resources available to this player are very limited. Indeed, Pedalo benefits from subsidies from BE and its own funds invested by employees. The idea is to offer a short circuit of local, organic and fair-trade products.

The added value of an initiative like PEDALO is its social dimension, which creates links between employees and future occupants of the Usquare site and the surrounding area. Secondly, the continuity created in terms of urban agriculture designed for the site with compost and solidarity fridge projects. In terms of room of manoeuvre, Pedalo has limited capacity in enhancing the deployment of PED in Usquare.

Resources	*Capabilities*	*Level of Engagement*
Low	**Low**	**High**

Considering the model proposed by Mitchell et al, it appears that Pedalo is a demanding stakeholder.

9. **Temporary residents:**

As previously stated, throughout its renovation phase, Usquare brought together temporary and permanent residents. These are mainly associations and cooperatives offering activities in a variety of fields: culture, sport, clothing, sustainable food and more.

Like the universities and research centres present on the site, the temporary residents play an active part in the life and cohesion of the site, whose renovation and construction of the accommodation buildings has not been completed, yet. Regarding autonomy, they lack true freedom of action as their activities are coordinated by the SAU. Moreover, because of their temporary stay, their influence remains limited.

Resources	*Capabilities*	*Level of Engagement*
Low	**Low**	**Medium**

Considering the model proposed by Mitchell et al, we observe that temporary residents have a **demanding stakeholder nature**.

Reconstructing stakeholder's networks

As mentioned in the chapter describing methodological choices, the objective of the "Actor Linkage Matrix" tool is to summarize the degree of interaction between stakeholders.

Since then, several types of sources have been mobilised: transcripts of semi-interviews. The focus has been on the analysis of the relations between the parties in the specific framework of the two living labs, and not in general terms.

A. La Roue

These tables show the type of cooperation between the stakeholders on the left of the table and each of the other players, from the perspective of the stakeholder on the left.

	Energy Provider	Social housing	Residents	CERIA	NGO	Private Expert
Local Authorities	_____	**Low cooperation**	**High conflict**	**Low interaction**	**Medium / High cooperation**[1]	**Low cooperation**

	Energy Provider	Local Authorities	Residents	CERIA	NGO	Private Expert
Social housing	**No interaction**	**Low cooperation**	**Low interaction**	**No interaction**	**Low interaction**	**Low interaction**

	Energy provider	Local Authorities	CERIA	Social housing	NGO	Private Expert
Residents	**No interaction**	**High Conflict**	**Low cooperation**	**Low cooperation**	**High Cooperation**	**High Cooperation**

	Energy Provider	Local Authorities	Social Housing	Residents	NGO	Private Expert
CERIA	**Low cooperation**	**Low cooperation**	**No interaction**	**Low cooperation**	**Low cooperation**	**Low cooperation**

	Energy Provider	Local Authorities	Social Housing	Residents	CERIA	Private experts
NGO	**No interaction**	**High/ Medium cooperation ***	**No interaction**	**High cooperation**	**Low cooperation**	**Low cooperation**

	Energy Provider	Local Authorities	Social Housing	Residents	CERIA	NGO
Private Expert	**Medium cooperation**	**Low cooperation**	**Medium cooperation**	**Medium cooperation**	**Low cooperation**	**Low cooperation**

A first observation emerges from the analysis tool: the Renolab.ID project is a favourable framework for the development of cooperative links between players who generally do not meet and have not always worked in synergy. Indeed, the Matrix link highlights a high level of cooperation between residents, NGOs and private-sector players, and a high to medium level of cooperation with local authorities.

Regarding the absence of interaction, "***no interaction***", it can be observed that the energy providers in the context of the Renolab.ID project (grouped renovation) do not interact with most of the stakeholders involved, except with the local authorities with whom they have little cooperation in this specific context. This can be explained by the fact that for the moment the discussions are mainly focused on two axes, that of the sizing of the future heating network and that of group renovation and the various blockages related to renovation permits.

Regarding CERIA, within the Universities and Research Centre categories, it does not engage directly with the social housing managed by Foyer Anderlechtois. However, it maintains limited cooperation with the residents' collective, primarily through the heating network project. This is because CERIA buildings are considered key structures in the scenarios developed under the Renolab.ID project. At the time of our meeting with the administration in charge of purchasing and building management of the COCOF, a note had been drawn up for the attention of the College to inform and explore the advantages of creating a heating network based on the one already existing at CERIA. It would be interesting to check whether CERIA has chosen to renovate its heating network by participating or not at the district level.

Moreover, the "Actor Linkage Matrix" highlights "***high cooperation***" between associations and residents as well as between local authorities and NGOs. This close cooperation can be explained by the fact that residents are very often involved in the associative life of their neighbourhood. This is all the truer for the case of Renolab.ID where the residents themselves form the collective of la Roue and are active in several associations in the neighbourhood. Similarly, still in the context of that project, Bruxelles Environnment maintains a strong cooperation with the group of inhabitants, which can be explained by the fact that a monitoring committee accompanies them throughout the project, which is subsidized by the said regional administration.

In terms of conflict, there is a ***"high conflict"*** situation between residents and local authorities, as mentioned above. This has mainly crystallized around environmental permits subject to conditions from the Municipality of Anderlecht. In general, we observe that there is a lot of ***"low cooperation"*** between, for example, local authorities and all the stakeholders in la Roue.

Moreover, it is interesting to note that the fieldwork has shown that the administrations have a very low level of interaction and cooperation between them. Indeed, the specialization of each of the administrations leads to a kind of silo work that complicates the integrated approach necessary for the implementation of a positive energy district. However, as mentioned above, the local authorities involved in the collective renovation project of the Cité Jardin de la Roue have created a working group bringing together all the decision-making actors to define the criteria for a grouped renovation.

It would therefore be interesting to check whether this working group makes it possible to reduce the silo work and the moderate level of cooperation between the administrations involved in la Roue.

B. Usquare :

	Energy Provider[2]	Social Housing	Temporary Residents	Universities	NGO	Private Experts
Local Authorities	**?**	**Low cooperation**	**Medium cooperation**	**Low cooperation**	**Medium cooperation**	**Low cooperation**

	Energy Provider	Local Authorities	Temporary Residents	Universities	NGO	Private Experts
Social Housing	**?**	**Low conflict**	**No interaction**	**No interaction**	**No interaction**	**Medium interaction**

	Energy Providers	Local Authorities	Universities	Social Housing	Private Experts	NGO
Temporary Residents	**No interaction**	**Medium cooperation**	**Low cooperation**	**No interaction**	**No interaction**	**High cooperation**

	Energy Providers	Local Authorities *	Residents	Social Housing	NGO	Private Experts
Universities	**?**	**Medium cooperation (depends on the stage of the project)**	**Medium cooperation**	**Low cooperation**	**Low interaction**	**Low interaction**

In the case of Usquare we observed that one actor is missing, in the municipality of Ixelles. Through indirect sources, the Municipality of Ixelles is not interested.

As far as the purchase of energy is concerned, negotiations with energy suppliers have resulted in advantageous prices at the Usquare site.

	Energy Providers	Local Authorities	Residents	Universities	Social Housing	Private Experts
NGO	**No interaction**	**Medium cooperation**	**High cooperation**	**Low cooperation**	**No interaction**	**No interaction**

	Energy Providers	Local Authorities	Residents	Universities	Social Housing	NGO
Private Experts	**NO interaction**	**Medium cooperation**	**No interaction**	**Low cooperation**	**High cooperation**	**No interaction**

For Usquare, the Actor Linkage matrix highlighted several dynamics:

There is a "***high cooperation***" between residents and NGOs because until now they were temporary residents since the future residents of the kots and social housing have not yet arrived on site.

However, the temporary residents are essentially cooperatives, NGOs except for the fablabs and other research centres present in Usquare. As a result, there is significant cooperation between temporary residents and NGOs. It remains to be seen whether this level of cooperation will be maintained with the departure of temporary residents and the arrival of so-called permanent residents.

The particularity of Usquare is the role played by the SAU, which is the central one responsible for the operational development of the site, it maintains direct relations with all the stakeholders. This crucial player does not exist in the case of La Roue. Moreover, despite the central role of the SAU, the analysis shows that several stakeholders have no contact with each other.

Indeed, there are several absences of interaction, "**no interaction"**, between the energy supplier and various stakeholders on Usquare: residents and NGO. Indeed, whether it is the energy supplier or the network regulator, they do not have direct interaction with the other stakeholders in the context of two living labs, with the exception of occasional intervention for authorisations (for example, for energy sharing).

The same applies to social housing provider Binhôme, which has had minimal interaction with the other stakeholders set to occupy the site. While it is not too late, the lack of interaction among stakeholders, particularly those who will be long-term residents and investors in the site, undermines the overall success of the project. First, in terms of exchanges of experience, particularly concerning circularity practices related to the construction or renovation of buildings. Second, in terms of a common vision on practical issues, such as for example the maintenance and management of public spaces on the site.

The lack of interaction leads to a lack of information exchange leading to conflict situations where each of the stakeholders tries to defend their interests and their own vision. This lack of synergy encourages stakeholders to work in silos.

The different temporalities of the stakeholders in their arrivals and their involvement in the Usquare project partly explain the difficulties in terms of cooperation.

It is interesting to note that depending on the configurations of each living lab studied, we observe that the degree of interaction is distinct between the same categories of stakeholders. Therefore, for example, while in the case of the Wheel the category “local authorities” has a high level of conflict with residents, in Usquare on the contrary, both types of stakeholders have a medium level of cooperation. This shows that the context and configuration of the living lab have a decisive influence on the type of interaction that prevails between stakeholders.

[1] As far as the relationship between local authorities and NGOs is concerned, a distinction needs to be made between Bruxelles Environnement, which has a high level of cooperation, and the Commune of Anderlecht and Urban, which have a lower one.

[2] As far as the purchase of energy is concerned, negotiations with energy suppliers have resulted in advantageous prices on the Usquare site.

Mapping

To gain a clearer picture of the interactions between the various stakeholders, we have mobilised the KUMU tool as a stakeholder network-mapping tool to track contacts and sketch networks.

The size of the circles corresponds to the nature of the different stakeholders: actors of a decisive or dominant nature have a larger size than those of a dependent, occasional or dormant nature. As mentioned in the legend, each colour designates a type of stakeholder.

Similarly, the thickness of the arrows indicates the level of exchange and cooperation between stakeholders. The thicker the arrow, the higher the level of cooperation.

This mapping highlights several interesting elements.

For la Roue:

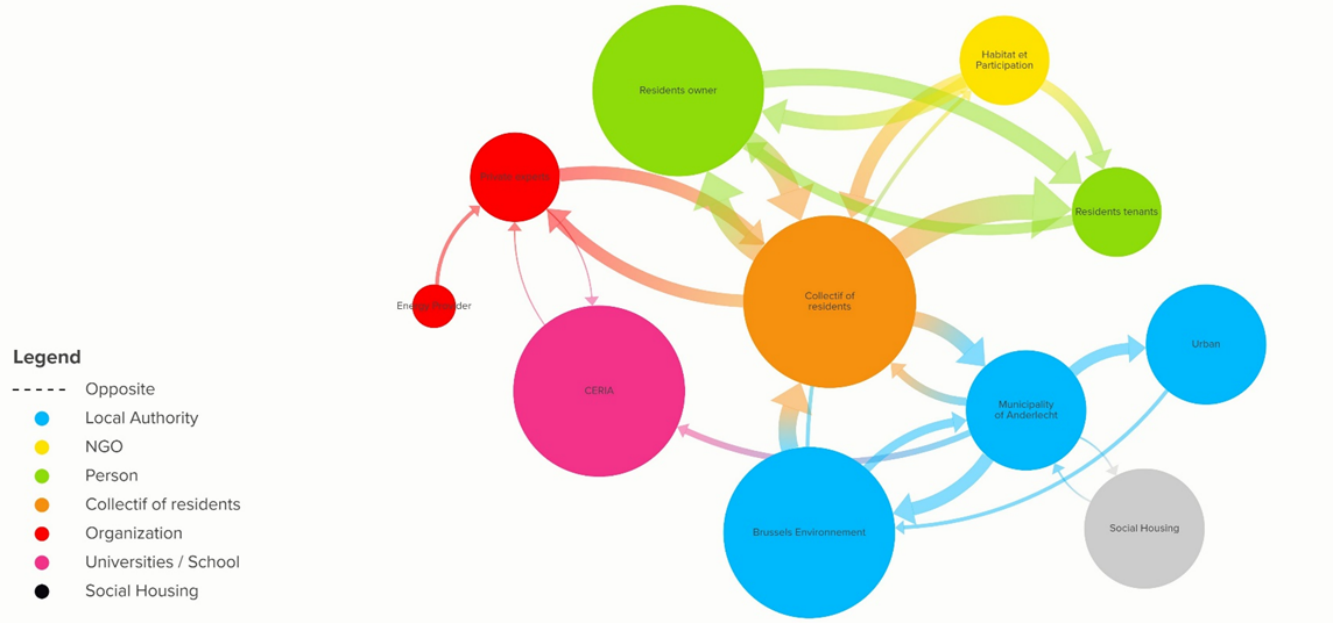


Figure 15. *Stakeholder Map in La Roue.*

As mentioned earlier, the analysis of the interactions and capabilities of the stakeholders was done at a specific time, these same interactions evolve and some of the observations made may change over the months.

The residents' collective appears to be the stakeholder with the greatest number of interactions with the other stakeholders at the Wheel. However, the lack of interaction with CERIA and social housing, which are of a decisive and dominant nature, is an area for improvement. Indeed, by deepening its relations with these two stakeholders, the collective could improve its fields of action and influence.

Another interesting element that the mapping points out is the lack of connectivity between several actors, even though they are of a dominant or decisive nature in the process of deploying developing countries. This illustrates the difficulty of bringing together all the players who do not share the same interests.

For Usquare :

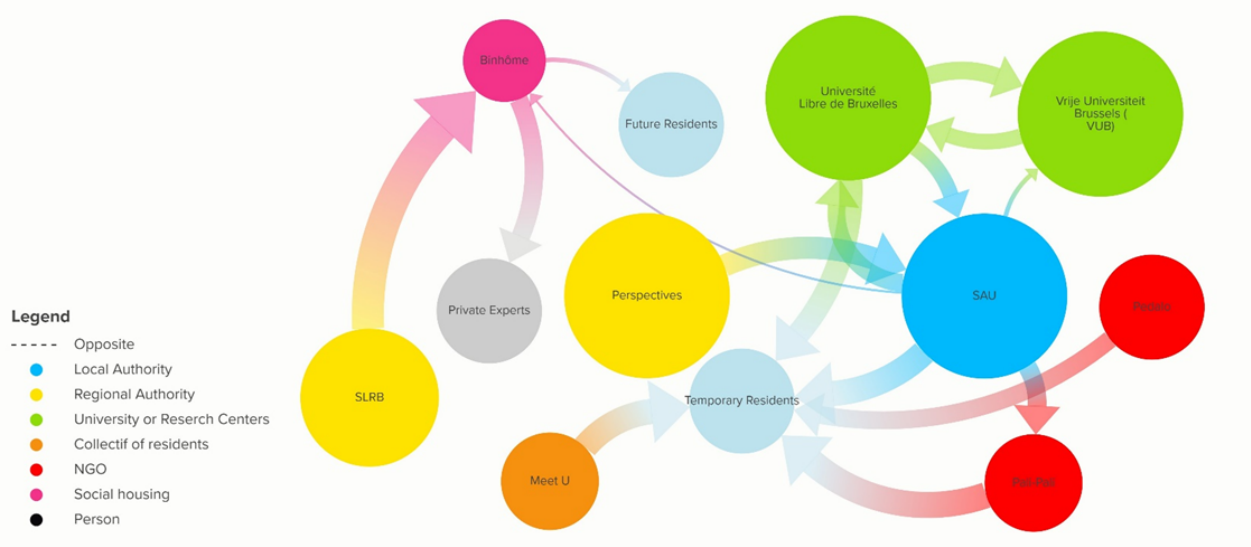


Figure 16. *Stakeholder Map in USquare.*

Because of its mission, the SAU occupies a central place in the scheme of interactions between stakeholders at Usquare. However, the analyses showed that the degree of interaction or cooperation between the SAU and the other stakeholders varied according to several factors. Indeed, stakeholders are not subject to the same types of temporalities, administrative procedures or interests as the SAU.

We also note that the degree of interaction with stakeholders who have begun to intervene on the site more recently is rather limited and even tends towards a lack of communication generating tensions. This is the case with the social housing Binhôme.

On the other hand, the mapping shows that, like the SAU, the temporary residents also interact with various stakeholders: the universities, the NGO Meet U and Pedalo. This point is interesting on two levels: firstly, it shows that the challenge of social mixing has been met, at least for this phase of site occupation. Secondly, it demonstrates once again the importance of local players in creating the synergies that are essential in the case of new sites without prior occupants.

In addition, some key players for the development and sustainability of the site are still absent. This is particularly the case for the Municipality of Ixelles, which would be responsible for the management of public spaces, but which has so far shown no interest in participating.

Community Map in Kahlenbergerdorf (Vienna)

Stakeholder Analysis Klimadörfl

Scoping the PED study area

Kahlenbergerdorf is a small area in Döbling - the nineteenth district (postal code 1190) in the north of Vienna. The centre of the PED study area is located in a protected zone of the City of Vienna. The heat supply is currently largely based on natural gas. The Kahlenbergerdorf is located close to the Danube, with a dense centre and a street village on a hillside. The building types range from winegrowers' houses to modern detached single-family homes and three-storey terraced houses; the years of construction and insulation standards vary widley. Most of the buildings are residential, social housing, the unused fire station building, some public houses, a carpentry workshop, a church and a vicarage. A large part of the buildings and land is owned by Klosterneuburg Abbey and leased out on a hereditary basis.

An active community of Kahlenbergerdorf residents has set itself the goal of becoming carbon neutral. The City of Vienna's Renewable Heat Roadmap is a first step towards achieving this goal. Some residents have already organised themselves into the "Klimadörfl" association with the aim of achieving a climate-neutral Kahlenbergerdorf. In order to deal with the extremely heterogeneous structure of users and owners of the properties in Kahlenbergerdorf, this voluntary association provides the necessary framework for building the structures of a local community capable of making decisions. The association provides the opportunity to work together as a neighbourhood, to hold meetings, to make fundamental decisions and to gain knowledge about the possibilities and interests of the neighbours. The association plays a central role in activating residents and also fulfils an important educational role by disseminating relevant knowledge.

Stakeholder identification

Types of stakeholders	***Name***
Local Authorities and Regional Government	City of Vienna (Stadt Wien)
Local Authorities and Regional Government	District council of the 19th disitrict of Vienna (Bezirksvorstehung 19. Bezirk)
Social housing management agencies	Gemeindebau Wien / Wiener Wohnen
Utilities and public undertakings	Via Donau
Energy grid operators	Wiener Netze
ESCOs (Energy Service Company)	Wien Energie
	"Alternative" Energy Providers
Contractors	Beyond Carbon Energy
CBOs, NGOs, Voluntary Organizations, Tenants' associations	Association Klimadörfl
	Catholic Parish
	Klosterneuburg Abbey
Local leaders	
Residents/Building owners	
Retailers located in the neighbourhood	Restaurant Flamingo

SMEs (subject matter expert) located in the neighbouhood	Andre
Schools, health&care facilities, universities& research organizations, public services providers and facilities located in the neighbourhood	WISEG – Kahlenbergerdorf fire station
Professional experts (in technology, management, citizens participation and social inclusion, etc.)	E7
	Reenag
	RealityLab

Stakeholder characterisation & categorisation (Definitions)

Definitions

As outlined in our stakeholder analysis protocol for PEDs, the stakeholder characterisation phase highlights the different dimensions that are likely to have an impact on the role of each stakeholder in the PED development process and on the current and future dynamics of social networking related to local energy transitions. The present characterisation is based on a triangulation of different types of data from questionnaires, interviews, analysis of official documents, activity reports of the Klimadörfl association and others, as well as participant observation. The characterisation of stakeholders, as envisaged in our research protocol, considers three dimensions: (1) resources, (2) capabilities, and (3) level of engagement. These dimensions must first be clarified and then the choice of the type of intervention explained. The context of the Living Lab in Vienna is taken into account.

Resources
In terms of resources, we have identified the following areas/forms associated with the development of a PED:

- financial,
- spatial,
- material,
- personnel,
- norms/legal
- *enforcement power = The ability to enforce your own interests within social relationships*

The stakeholder identification process has shown that there are many different types of stakeholders (such as administrations, private companies, citizens, NGO, and others) involved in the living lab with different types and amounts of resources.

The most important financial resources for PED development are private funds by the building owners together with public funding that supports the development and planning process as well as the actual buildings and refurbishment. While these financial resources are very important, without the voluntary work of the members of “Klimadörfl” it would not be possible to manage a substantial common decarbonization process. Furthermore, the legal resources must also be considered, i.e. the means of creating a binding or non-binding legal framework available to the actors involved. The various legal and institutional instruments available to the actors do indeed influence the development of PED.

Capabilities

By capabilities, we mean the capacities in terms of technology, managerial skills, funding consulting (=ability to identify and secure funding sources), social/cultural skills and networking. For example, public actors like the City of Vienna usually have a whole network of local actors at their disposal who have the necessary expertise and are able to mobilize and raise awareness among the general public.

To better categorize the stakeholders, we have classified them according to the following areas, how high or low their capabilities are:

- *management,*
- *relational,*
- *technological,*
- *cultural,*
- *funding consulting,*

Level of engagement

The level of engagement of an actor in the use of PEDs can be objectified by elements such as the efforts made, the time spent (e.g. number of people mobilized) and the resolution of a problem.

An active community made up of the residents of Kahlenbergerdorf has set itself the goal of becoming climate-neutral.

In our stakeholder analysis we assign three levels of engagement:

- high
- medium
- low

without saying how this engagement is realised. That should become clear from the columns left.

Characterization

In the following, we will describe the relevant stakeholders and their resources, skills and level of engagement for the Kahlenbergerdorf living lab.

1. **City of Vienna**

The City of Vienna has high social and ecological ambitions which is also reflected in the fact that the city often achieves high positions in quality-of-life rankings. It has a dense urban heat network with a supply rate of 50% of all households (460,000 households). There are city-wide strategies such as "Raus aus Gas" (“escape from gas”). The reason for this, in addition to ecological considerations, is not least that most of the heat in the network comes from Russian gas.

Resources and capabilities: City of Vienna and its entities have many employees. In addition to human resources, such as consulting, the City of Vienna has resources in the areas of finance (subsidies, favorable loans) and legal standards (e.g. building standards, building regulations, subsidies for the installation of PV systems). It set out strategies and made it law that the city and all its entities will decarbonise it’s heating infrastructure by 2040. The City of Vienna has a high potential and is actually

rolling out services, support and subsidies, see below. However, it is dependent on regulations and funding from the federal government and the EU. (see Policy Canvas)

Level of commitment: The City of Vienna set out strategies, roadmaps and made it a law that the city and all its entities will decarbonise it's heating infrastructure by 2040. It challenged itself to create PEDs in various testing areas, creating a single agency, WieNeu+, for that. However, WieNeu+ is not operational in the Kahlenbergerdorf at all. The city wants to become an important player in decarbonization and feels responsible for the issue. All it's administrative body and entities set up "working groups" addressing decarbonization efforts – so it is relatively easy to identify someone responsible and with knowledge on the respective matter or potentially participating in creating PEDs.

Potential role in PED development: In summary, it can be said that the City of Vienna plays a major role in the development of PED. To this end, it has already created the following offices:

1. The wohnfonds_wien, a limited-profit organization run by the City of Vienna for fostering affordable (social) housing, has set up an information centre on how to start decarbonisation called "Hauskunft". It enables owners to finance a "Future Check" and advises owners and housing administrations on possible renovation technologies, approaches or alternatives. This agency does not sell anything, it only advises. About 10 houses already used the possibility of a "Future Check", so to have a list of recommendations for refurbishment of their buildings at Kahlenbergerdorf.
2. A wide range of funding and subsidy schemes for innovative green buildings and quality assurance, such as Sockelsanierung, Thewosanierung, Huckepacksanierung or the Grundstücksbeirat (property advisory board), which is available to every owner, including in Kahlenbergerdorf.
3. Policy plans for carbon-free heat supply and climate protection, such as the Heat Plan 2040, provide relevant and helpful information, e.g. on whether to wait for the expansion of the Cities local heat network in one's own neighbourhood, or to look for local individual solutions, etc.

The City of Vienna provided a "Future Check" for about 10 houses in the area. The "Future Check" contains recommendations for the refurbishment of a building. "Hauskunft" of the City of Vienna is also subsidizing (by 50%) a more elaborated "Refurbishment Concept" that is also containg cost estimates for recommended refurbishment measures. The "Refurbishment Concept" must be authored by a technical expert or company.

From all the above, by referring to the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
High	**High**	**Medium**

It therefore appears that the City of Vienna is a **decisive stakeholder**.

2. **Gemeindebau Wien / Wiener Wohnen**

The company "Stadt Wien - Wiener Wohnen" manages, renovates and administers Vienna's municipal housing estates. This includes around 220,000 council flats. Wiener Wohnen wants to decarbonize all its buildings according to Viennese standards and at the same time provide affordable housing.

Resources and capabilities: With 220,000 apartments, Wiener Wohnen is a traditionally large and influential player in the Viennese housing market, which is 100% owned by the City of Vienna. The properties are professionally managed by Wiener Wohnen's own property management company. The staff (a total of 4500 employees) is well trained and experienced and could contribute its know-how in the field of dem, although there is still a lot to learn in the field of decarbonisation at Wiener Wohnen.

Level of commitment: Wiener Wohnen is still in the process of defining its decarbonisation strategy. However, the housing complex in Kahlenbergedörfl does not seem to be a priority in the decarbonisation strategy. At least there is no information available at the moment. Discussions have taken place with Wiener Wohnen in which the company has expressed interest in the activities of the Klimadörfl and the research projects, but no concrete commitment has yet been made.

Potential role in PED development: It would be desirable for Wiener Wohnen to design the heating systems (potentially geothermal and heat pumps) in the decarbonisation of its municipal building in Kahlenbergerdörfl in such a way that neighbours could easily connect, or that the system could become part, or possibly even the core, of a larger local heating network. Wiener Wohnen could devote considerable human, financial and physical resources to such a project.

From all the above, by referring to the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
High	**High**	**Low**

It therefore appears that the Gemeindebau Wien is a **dormant stakeholder**.

3. **via Donau**

Via Donau is the leading international waterway operator in the Danube region. By utilising the knowledge of our experts in infrastructure management, shipping and logistics, along with electronic information and navigational systems, flood control and environmental hydraulic engineering, it provides services for the public sector, businesses, holidaymakers and residents along the Danube.

Via Donau owns the land and the building that is rented out to the Restaurant Flamingo or the yacht-club Kuchelauer Hafen, located at the shore of Kahlenbergerdorf.

Resources and Capabilities: The ViaDonau company has considerable holdings along the Danube river and in the Kuchelau harbour area. In contrast to the majority of Kahlenbergerdorf, the area benefits from an abundance of sunlight, a flat terrain and an abundance of suitable roof space for the installation of photovoltaic (PV) modules. Additionally, the area is not located within a protected cultural heritage zone. The Klimdörfl Association contemplated utilising the expansive parking facilities on the premises for the installation of surface collectors (asphalt collectors). As a substantial state-owned enterprise, viadonau possesses a workforce with the requisite expertise and

qualifications to engage in decarbonisation initiatives along the Danube. However, this would entail a considerable workload for the employees:

"The core task of our real estate team is the competent and environmentally friendly management of around 127 million m² of land and shore areas in the Republic of Austria. In addition, viadonau manages around 2.3 million m² of company-owned building and land areas, which corresponds to around 320 football pitches... Every year, about 500 permits are issued along the Danube for stairways and about 300 one-day events and about 200 contracts are drafted and concluded. Currently, the real estate team manages over 2,000 contracts."

Source: https://www.viadonau.org/infrastruktur/liegenschaften

Level of Engagement: Given the extensive nature of the areas in question and the numerous tasks currently being undertaken by Via Donau, it appears that there is a dearth of resources available for the allocation to comparatively minor, yet innovative, tasks in the Kahlenbergerdorf. Consequently, Via Donau's commitment to these tasks is currently minimal. Furthermore, the land in question is leased to a tenant (the restaurant "Flamingo Marina"), who has demonstrated only a modicum of interest in the efforts made by Klimadörfl.

Potential Role in PED development: In accordance with the terms of the lease agreement with the restaurant "Flamingo Marina", ViaDonau is unable to act directly as an actor in this matter. It is imperative that all requests and concepts be discussed with Flamingo Marina prior to any action being taken. Nevertheless, it is conceivable that ViaDonau could assume a long-term responsibility for contributing to the decarbonisation of areas along the Danube. It seems reasonable to posit that this task can also be identified, at least in general terms, within the company's task descriptions. In order to operationalise the form of ViaDonau's contribution to the national climate plan, it may be beneficial to extend an invitation to ViaDonau to participate in a research project.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
Medium-high	**high**	**Low**

It therefore appears that ViaDonau is a **decisive stakeholder**.

4. **Wiener Netze**

The supply area of Wiener Netze encompasses the entirety of Vienna, in addition to neighbouring regions within Lower Austria and Burgenland. All residents of this region are automatically connected to the Wiener Netze network. The responsibility for the maintenance, upkeep and operation of their grid falls upon Wiener Netze. Wiener Netze is closely affiliated with Wien Energie, an energy supplier that is owned by the City of Vienna. Wiener Netze is responsible for the provision of the electricity, gas and district heating, while Wien Energie is the entity that supplies the actual electricity and, through its subsidiaries, provides gas and district heating. Each Viennese household is required to connect to Wiener Netze, but is free to use an alternative energy provider in addition to Wien Energie or Wien Gas. There is no known alternative to Fernwärme Wien (district heating) available in Vienna. The district heating network in Vienna represents the largest such network in the world and it is not anticipated that it will be extended to Kahlenbergerdorf.

Resources and Capabilities: The district heating network in Vienna represents the largest such network in the world. It is therefore unlikely that it will be extended to Kahlenbergerdorf. For further information, please refer to the Vienna Heat Plan 2040.
(https://www.wien.gv.at/umwelt/waermeplan-2040). As a municipal entity, the City of Vienna has established a dedicated department for the decarbonisation of Viennas energy infrastructure.

Level of Engagement: Their main commitment right now is updating the electrical grid so it is more capable of handling renewable energy sources and developing a long term plan in phasing out the gas distribution network. A potential future scenario would involve energy storage along its network to overcome short periods of time – however it's unclear or no public knowledge how far these plans are developed and therefore no help for the Kahlenbergerdorf.

Potential Role in PED development: The establishment of a functional electrical grid for the purpose of supplying electricity derived from renewable energy sources is of paramount importance for any PED area. However, the specific actions being taken in the Kahlenbergerdorf area and their potential impact on ongoing efforts remain unclear. Nevertheless, the establishment of a functional grid is a fundamental prerequisite for the formation of an Energy Community.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
High	**High**	**Low**

It therefore appears that Wiener Netze is a **decisive stakeholder**.

5. **Wien Energie**

Wien Energie is the municipal utility company responsible for the provision of electricity and gas within the city. It has established subsidiaries for the distribution of gas (Wien Gas) via a municipal grid, as well as for the supply of district heating and cooling (Fernwärme Wien) through the city's municipal heat and cooling network, Wiener Netze. While the district of Kahlenbergerdorf does receive electricity and gas via the aforementioned grids, there is currently no heat network in place, nor are there any plans to expand the heating network to this area.

Resources and Capabilities: Wien Energie employs over two thousand individuals and is one of the thirty companies with the highest turnover in Austria. In addition to the provision of gas, heat and electricity via the grid of Wiener Netze, Wien Energie also offers bespoke heating and cooling solutions, which are planned, pre-financed and installed by Wien Energie. (Contractual)

Level of Engagement: The company's offerings also extend to areas such as Kahlenbergerdorf, yet they appear to be relatively disinclined to engage in the sale of these products. Nevertheless, the company website asserts that it is a comprehensive provider, assuming responsibility for all aspects of the process. The company's services encompass a range of activities, including planning, construction, the operation of facilities, and customer billing management. Wien Energie has not been approached by the residents of Kahlenbergerdorf with a request for the development of a contractual solution for the provision of heating and cooling services, nor has the company itself initiated any action in this regard. Consequently, the company has not yet been particularly active in this area.

Potential Role in PED development: It is possible that building owners and housing administrators could initiate a project in collaboration with Wien Energie, given their assertion that they are able to provide comprehensive services. However, the majority of their current efforts are focused on areas where district heating is a viable option. Moreover, decarbonising district heating represents a significant challenge for the company. Additionally, Wien Energie is not regarded as the most cost-effective service provider in the city. Furthermore, Wien Energie provides administrative services for energy communities on a contractual basis.

Wien

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
Medium	**High**	**Low**

It therefore appears that Wien Energie is a **decisive stakeholder**

6. **"Alternative" Energy Providers**

In accordance with European legislation, households are entitled to select their preferred energy suppliers, wherever feasible. In the case of Vienna, this pertains to both gas and electricity. Consequently, the erstwhile monopolist, Wien Energie, is not invariably the most favored option, however, still has a vast number of clients. Nevertheless, the transmission of gas and electricity occurs via the grids of Wiener Netze.

As a result, alternative energy providers either maintain their position in the market due to more favourable tariffs or due to the provision of specific services.

Resources and Capabilities: The range of capabilities or resources available from energy providers varies considerably, depending on the specific services they offer. Some former monopolists in other regions than Vienna are now offering their services in Vienna as well. Consequently, they have access to extensive resources and expertise at their headquarters, which they make available through a variety of products.

Level of Engagement: The level of engagement exhibited by providers varies considerably. Nevertheless, some residents indicated a desire for services such as the real-time provision of information regarding the primary energy source currently being purchased, with the objective of ensuring an adequate supply of electricity. In certain instances, the range of services provided may encompass comprehensive assistance for a local energy community. Such providers may evince considerable interest in Klimadörfl's activities.

Potential Role in PED development: The majority of these entities are still perceived as general energy providers. Nevertheless, a select few have initiated a role as educators through their products and services. For example, the provision of real-time energy consumption data while simultaneously pursuing decarbonisation objectives facilitates a more nuanced comprehension of the utilisation of photovoltaic-generated power to operate domestic machinery, such as washing machines, during the daytime rather than at night. The sharing of experiences is a common practice among members of the Association Klimadörfl. Once the energy community has become established as a centre of expertise

in energy matters, these customers may assume the role of peer group leaders, sharing their knowledge with others who are less familiar with the latest technologies, such as photovoltaic panels.

Otherwise, some of these alternative energy providers, offer similar administrative services for energy communities like Wien Energie.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
Medium	**High**	**High**

It therefore appears that “Alternative” Energy Providers are **decisive stakeholder**.

7. **Contractor like e.g. Beyond Carbon Energy**

Beyond Carbon Energy represents one of several potential contractors capable of investing in energy infrastructure such as geothermal drilling, low-temperature grids, heat pumps, and other related technologies. In addition to providing these services on a pro bono basis, the company is also positioned to offer paid heat and cold services to households in the Kahlenbergerdorf area.

Resources and Capabilities: Contactors such as Beyond Carbon Energie facilitate the development of technical solutions (e.g. a cooling and heating network), the financing of their realisation, and the organisation of their legal aspects (with contracts).

Level of Engagement: A comprehensive mutual familiarisation with Beyond Carbon Energy has been conducted, yet no collaborative endeavours with Beyond Carbon Energy or another provider have been initiated thus far.

Potential Role in PED development: Prior to assuming a central role in the area, it is essential that contractors have access to energy concepts or plans for each building, or at the very least, for typical buildings in the area. This information serves as a foundation for cost estimates and profitability calculations by contractors. In the absence of the requisite conceptual and planning work, it is not yet possible to involve contractors.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
High	**High**	**low**

It therefore appears that Beyond Carbon Energy is a polemic-**decisive stakeholder**.

8. **Association Klimadörfl**

The association, designated the "Association for the Promotion of Climate Neutrality in the Kahlenberg Village" (or "Klimadörfl" in short), was established by residents of the Kahlenbergerdorf. The

Klimadörfl association aims to secure funding for initiatives that would benefit the wider community. The association organises events, including workshops and seminars, on topics related to energy, nutrition and mobility. Furthermore, it serves as a point of contact for matters of concern to the residents of the village.

Resources and Capabilities: The members of the Klimadörfl association contribute a wealth of resources to PED development. Many possess a robust technical and academic background, coupled with extensive professional experience, enabling them to excel in a multitude of domains. These include electrical engineering, medicine, property management, physics, law, and economics, among others. It is probable that deficiencies in expertise will be identified in the field of 'architecture and construction'. The Klimadörfl is able to compensate for existing deficiencies in expertise by collaborating with research partners such as e7, realitylab and reenag. Furthermore, eminent specialists are invited to participate in the association's events, such as the Klimadörfl forum, a sort of agora for the residents of Kahlenbergerdorf.

Many residents of Kahlenbergerdörfl are financially affluent. They are frequently also (co-) owners of the residences in which they reside and thus have a vested interest in maintaining their property and potentially enhancing its value by supplying the house with cost-effective and sustainable energy.

Level of Engagement: The association is actively engaged in the developmental process. The association currently comprises approximately 50 members and aspires to expand further in order to assume a more prominent role in the future and exert greater influence on the decarbonisation of the Kahlenberg village. The association's initial objective was to develop a joint local heating network. However, this solution was ultimately dismissed on economic grounds. Subsequently, the association has sought to identify novel and creative strategies to garner support from property owners for the transition to heating solutions.

Potential Role in PED development: The association was established at the beginning of 2022 and has since assumed a variety of roles. The association assumed the role of a manager or conductor of an orchestrated refurbishment and decarbonisation process on individual properties in the area. This was done with the aim of achieving synergy effects in the planning and implementation of construction measures and in the operation of systems, despite the fact that these are individual projects.

Furthermore, the association has positioned itself as a neighbourhood initiative that aims to support good cooperation in the village and also provides impetus for mobility, nutrition, culture and village renewal.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
High	**High**	**High**

It therefore appears that the association Klimadörfl is a **decisive stakeholder**.

9. **Catholic Parish**

The Catholic Parish, in collaboration with their priest, aims to provide support to Catholics in the Kahlenbergerdorf community. They seek to maintain contact with these individuals and prevent them

from becoming inactive members. The organisation operates a number of properties, including the local church, which are all owned by the Klosterneuburg Abbey. The parish hall building comprises the parish offices, the priest's residence, and a multitude of additional rooms, including a smaller stage with a bar and a considerably sized courtyard, which is arguably the largest flat area in the Kahlenbergerdorf area.

The Asssociation Klimadörfl is allowed to use the premises for it's assemblys, workshops or cultural events.

Resources and Capabilities: The priest serving the parish is appointed and remunerated by Klosterneuburg Abbey. The parish is responsible for the administration of the property belonging to Klosterneuburg Abbey. These comprise the church and the vicarage. The vicarage comprises a historic ensemble of structures situated on a spacious site in the centre of Kahlenberg village, which would be highly conducive to geothermal utilisation. The Georgssaal in the vicarage is available for use by the Klimadörfl association for the purpose of holding meetings. In inclement weather, various festivals held by Klimadörfl are conducted within the vicarage and its cellar. The social network of the parish and the network of the association are mutually reinforcing, with the potential to enhance each other's capabilities. The church continues to exert a significant degree of influence. Additionally, the parish council is a locally influential body that includes members of the association.

Level of Engagement: Notwithstanding the considerable resources at the disposal of the parish and the social networks that have been established, the level of commitment on the part of the parish and its priest is disappointingly low. This may be attributed, at least in part, to the fact that a range of decarbonisation options have been discussed without a concrete request being made to the parish or the foundation. As the parish is dependent on the abbey in numerous respects, it would be necessary to conclude more far-reaching agreements and contracts with the abbey. It is to be hoped that the priests will be able to assist in this process, although this has yet to be seen.

Potential Role in PED development: The parish could play a significant role in the management of resources belonging to the abbey, given the suitability of its buildings and the size of the vicarage courtyard, which could be utilised for geothermal probing. It is also possible that the Parish Council may make decisions that would encourage commitment when dealing with Klosterneuburg Abbey. (also see "Klosterneuburg Abbey".)

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
High	**High**	**Low**

It therefore appears that the Catholic Parish is a **polemic stakeholder**.

10. **Klosterneuburg Abbey**

Klosterneuburg Abbey has an administrative structure that has grown over the centuries. No fewer than 28 parishes belong to the monastery, most of which are located in Vienna and Lower Austria, but some are even in Norway and the USA. This is the result of the organisation of the Augustinian canons. The monastery's business operations have an annual turnover of 40 million euros. In addition to one of the largest vineyards in Austria, the monastery also has extensive forests. The biomass from the

forests is used to operate an underground heating plant in the town of Klosterneuburg, which supplies communal buildings with heat. There are 40 Fathers in the convent. The business enterprises have around 180 employees.

The Abbey is the proprietor of a number of vineyards and historic residences in Kahlenbergedörfl. The Abbey's objective is to maintain the property as a unified entity, while simultaneously reducing operational and energy-related expenditure. The Abbey owns a sizeable proportion of the village's real estate and delegates the pastoral care of its parishioners to the Catholic Parish.

Some properties owned by the Abbey are let for extended periods, with leases of up to 99 years.

Resources and Capabilities: In addition to the vicarage and the church, the monastery also has other significant buildings in the centre of Kahlenbergerdorf. These buildings, which are centuries old and listed, are still in use as residential properties. Furthermore, the monastery possesses vineyards in the vicinity of Kahlenbergerdorf. It can be reasonably deduced that the vineyards would be suitable for the installation of photovoltaic (PV) or geothermal energy generation systems. (Similar trials conducted in vineyards owned by other parties have yielded positive results.) The monastery has expertise and operational experience in a local heating network in Klosterneuburg and is in a financially advantageous position to provide substantial support to Klimadörfl's efforts to decarbonise Kahlenbergerdorf, whether through financial contributions or as a contractor.

Level of Engagement: Notwithstanding the considerable resources at the monastery's disposal, there is currently no discernible engagement with the local community of Kahlenbergerdorf. It would appear that the monastery is not developing any activities of its own accord. The Klimadörfl association is currently exploring potential avenues for activating the monastery. It is likely that a concrete proposal, comprising a technically sound and economically viable plan, will be required in order to initiate discussions with the monastery. Members of the Klimadörfl board who are also engaged in the Kahlenbergerdorf parish council consider the matter to be of great delicacy, as a negative response from certain decision-makers may result in unforeseen challenges to the decarbonisation of Kahlenbergerdorf in the long run.

Potential Role in PED development: Given its extensive real estate holdings in Kahlenbergerdorf, the monastery is well-positioned to spearhead innovation in the area. As an ecclesiastical institution, it is able to plan for the long term and evaluate the profitability of investments over an extended period. From an economic standpoint, the monastery's investment in a local district heating network may prove advantageous in the long term, particularly if the network is capable of supplying heating and cooling to the monastery's owned properties. Should the monastery opt to decarbonise its building stock, it is possible that neighbouring buildings may also participate. The monastery could therefore act as a catalyst for the decarbonisation of Kahlenbergerdorf, disseminating its experience to other properties and parishes within its sphere of influence.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	***Capabilities***	***Level of Engagement***
High	**High**	**Low**

It therefore appears that the Catholic Parish is a **dormant stakeholder**.

11. **Local Leaders/building owners**

The proprietors of the buildings in Kahlenbergerdorf have the following interests: The primary objective is to reduce expenditure. Should decarbonisation prove an effective means of achieving this objective, it will be pursued. Some proprietors have a genuine interest in decarbonising their buildings in order to reduce CO_2 emissions and contribute to climate change mitigation. Others are reluctant to implement any modifications due to the age of the building or themselves. They are disinclined to reside in an area characterised by construction for the remainder of their lives or to invest largely in a property that will not show any return on investment within their personal lifetime.

Resources and Capabilities: In comparison to the Austrian norm, this area of Vienna can be considered relatively affluent. It is therefore anticipated that the requisite financial resources should be available to facilitate the necessary changes. However, the recent economic downturn has also had an impact on Kahlenbergerdorf, with people becoming more reluctant to discuss investment opportunities and instead saving their expenditure for a later date. Nevertheless, there is a considerable pool of volunteers with extensive and relevant knowledge, there are spatial resources available for all the necessary decarbonisation efforts, and at least 40 building owners have expressed interest in joining potential efforts to create a PED in Kahlenbergerdorf.

Level of Engagement: Given that the Association Klimadörfl was established by proprietors of buildings and apartments and has received commitments from over half of the privately owned edifices in Kahlenbergerdorf, it can be reasonably inferred that a considerable degree of involvement is already in place. The voluntary contributions of the members of the Association Klimadörfl have already resulted in the allocation of financial resources for the implementation of several research projects. Furthermore, they have facilitated the long-term education of the entire Kahlenbergerdorf community regarding the potential consequences of decarbonisation initiatives and the rationale behind them.

Potential Role in PED development: It is not feasible to decarbonise the heating infrastructure or any other infrastructure of the buildings in Kahlenbergerdorf without the aforementioned parties. It is not feasible to implement a PED Kahlenbergerdorf without the involvement of building owners and pioneers, who can act as peer group leaders.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	***Capabilities***	***Level of Engagement***
High	**High**	**High**

It therefore appears that the Local Leaders is a **dominant stakeholder**.

12. **Professional experts: e7**

e7 is a research, consulting and planning office specialising in energy efficiency, the energy industry and energy and climate policy. It disseminates expertise and provides technical orientation on the transformation of heat.

Resources and Capabilities: The interdisciplinary team is equipped to assess all potential decarbonisation pathways, comprehend the prospective products on the market, and provide the Klimadörfl with its expertise in decarbonising the village.

Level of Engagement: In collaboration with Klimadörfl, reenag and RealityLab, e7 has successfully obtained a number of funding opportunities for research projects in this field. Moreover, they provide support and participate in networking events with the Klimadörfl association, offering feedback on new technological ideas and developments.

Potential Role in PED development: The provision of consultancy, planning, and research services on all matters pertaining to the technological feasibility of decarbonisation efforts in the context of heating or the potential establishment of an energy community, together with the preparation of the requisite planning tools for the effective realisation of such efforts. This encompasses the provision of consultancy services pertaining to prospective or requisite renovations to the affected edifices, with the exception of architectural planning.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
High	**High**	**High**

It therefore appears that the e7 is a **decisive stakeholder**.

13. **Professional experts: REENAG**

REENAG is a competence centre for the development, financing, construction and operation of plants for the generation of energy from renewable energy sources.

Resources and Capabilities: reenag is a leading specialist in the field of renewable energy finance. Consequently, should the Klimadörfl association either commence this endeavour independently or establish a new organisation with the objective of constructing a future local heating network or analogous infrastructure, reenag will be available to provide support and assistance with the formulation of a viable business plan and the development of appropriate financing or potential technological solutions available on the market at present time.

Level of Engagement: To date, reenag has participated in relevant workshops and presented its best practice examples. They are available, if needed.

Potential Role in PED development: As financial experts and developers, they will play an instrumental role as key partners in the construction of the actual infrastructure in Kahlenbergerdorf.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	*Capabilities*	*Level of Engagement*
High	**High**	**High**

It therefore appears that the reenag is a **decisive stakeholder**.

14. **Professional experts: RealityLab**

RealityLab is a leading expert in the organisation of social processes in the fields of housing and urban development. Through a commitment to fostering self-organisation within communities, RealityLab is enabling these communities to assume a pioneering role in the transformation of their own futures and to become increasingly independent from fossil fuels.

Resources and Capabilities: RealityLab has consulted with numerous organisations of varying sizes that have assumed a pioneering role in housing or local communities. This has enabled the company to gain a comprehensive understanding of the processes involved in establishing a group of individuals who are prepared to assume the necessary responsibilities.

RealityLab's approach involves the design and promotion of social cohesion and self-organisation at the group and neighbourhood levels. This is intended to facilitate the co-creation of engaging and sustainable developments that are responsive to the needs of the people involved. RealityLab's work also encompasses the promotion of urban commoning at the local level.

Level of Engagement: RealityLab maintains a close working relationship with the board of the association Klimadörfl, participating in nearly all meetings and contributing to the association's ongoing development.

Potential Role in PED development: The objective is to facilitate the organisational and social processes for residents of Kahlenbergerdorf in cooperation with Klimadörfl, through the provision of consulting, training, and mediation services.

From all the above, by mobilizing the characterization model developed by Mitchell, Agle & Wood (1997), we can therefore establish this table:

Resources	***Capabilities***	***Level of Engagement***
High	**High**	**High**

It therefore appears that RealityLab is a **decisive stakeholder**.

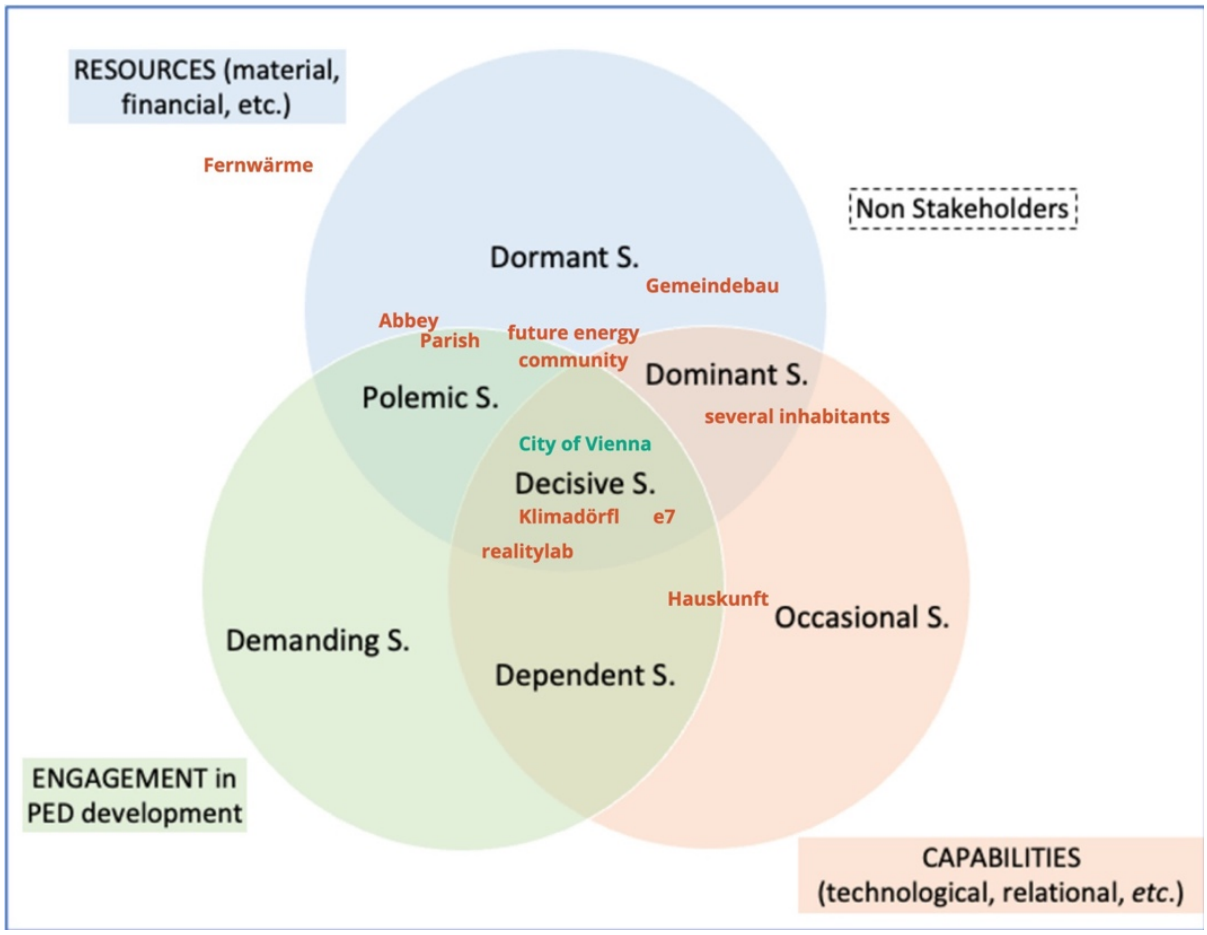


Figure 17. *Stakeholder characterisation&categorisation in Kahlenbergerdorf.*

The participation of other actors at Klimadörfl's living lab has been documented, though they have not been identified as having a central role in the deployment of PEDs. The aforementioned are as follows:

- The District Council of the 19th District of Vienna
- The Kahlenbergerdorf fire station
- The Flamingo Restaurant

Reconstructing Stakeholder networks

Mapping Stakeholders

The software program "Obsidian" was employed as a tool for the reconstruction of the interactions between the actors depicted. Obsidian is a software tool designed for the creation and organisation of notes in markdown format. This can be employed in the construction of a knowledge database. Furthermore, Obsidian enables the creation of internal links for the notes, which can then be visualised as a diagram, specifically a "Canvas". The individual stakeholders were described using Obsidian, with the relevant information presented as notes. Subsequently, the extant relationships between the local stakeholders were mapped in the form of a stakeholder map. We identified significant interconnections and formulated hypotheses regarding potential transformative measures.

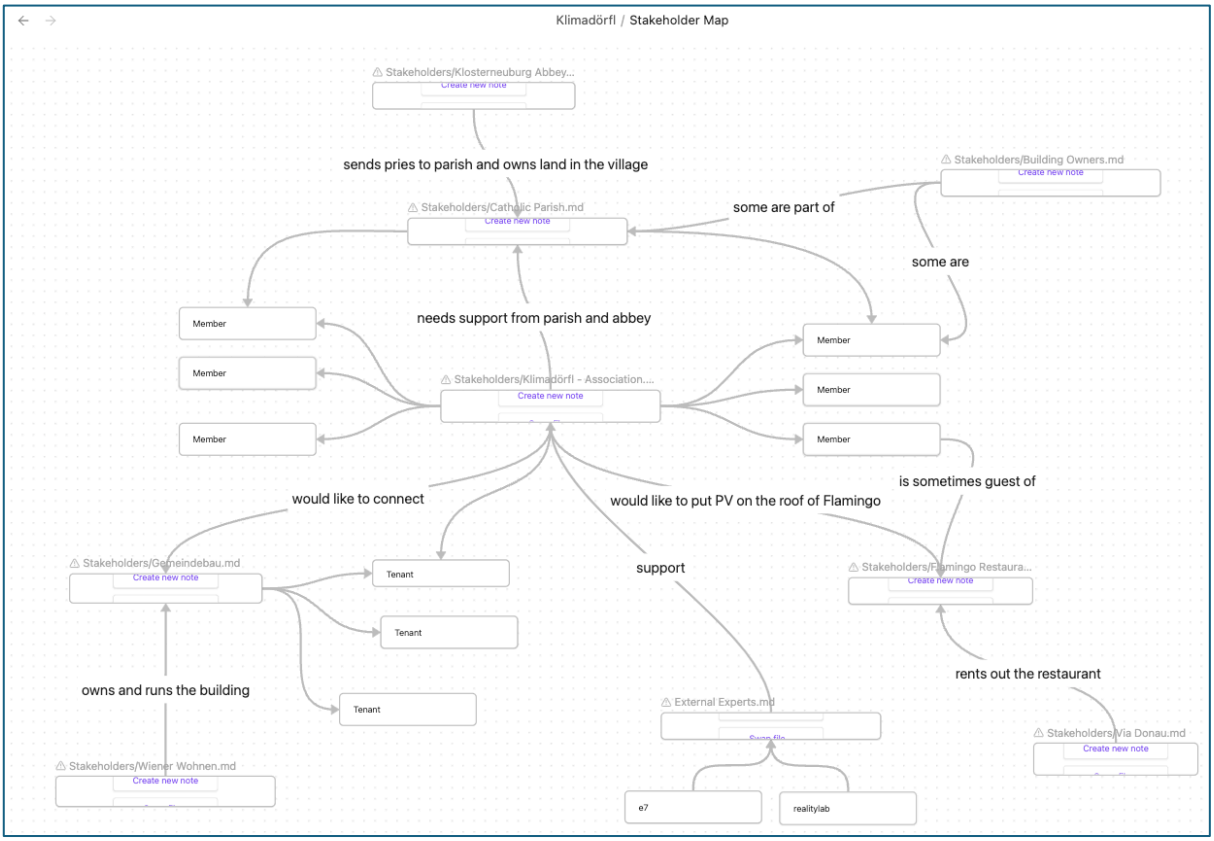


Figure 18. *A Stakeholder map about the Kahlenbergerdorf district in Vienna, created by RealityLab with the Obsidian application.*

To get an impression of the benefits of Obsidian as a tool for Stakeholder Analysis we invite you to download the software and the "vault" containing our Stakeholder Analysis.

Here is a summary of what we consider to be the benefits of Obsidian:

- Each Stakeholder can be documented as file (called note in Obsidian)
- Each of this stakeholder file can have descriptive elements
    - Types of stakeholders
    - Name
    - Aims and areas of interests
    - Potential role in PED development Resources
    - Capabilities
    - Level of engagement in PED development
- This description can have different forms within Obsidian. They can be
    - Properties,
    - Tags,
    - Or simple text descriptions, that
- Can be search filtered and ordered into lists and tables
- E.g. it is easy to make a list of all stakeholders with a high level of involvement
- Or a list of stakeholders that offer specific resources e.g. spatial resources.
- Descriptions can be generated out of forms and questionnaires filled in by stakeholders
- A special function called "Canvas" can help to map the relationships among stakeholders what provides a useful visualisation when involving inhabitants and other stakeholders.

- This brings us to probably the most important benefit: Obsidian allows to integrate the stakeholder analysis in a broader perspective when managing a project. Stakeholder analysis in Obsidian can be considered as a start for creating a flexible and useful tool for project and knowledge management after inviting key stakeholders – above all the inhabitants - to use it for “their” project.
- In the next step we will present Obsidian and the idea to use it as management tool for the decarbonisation of the Kahlenbergerdorf to the association Klimadörfl.

PED Enabling Framework

Methodology

The PED Enabling Framework is based on the interplay between two dimensions:

- Four **priority processes in PED development** that may be influenced by the Regulatory&Policy framework, on the one hand, and yet are also contingent on stakeholder relationships, on the other hand:
    - Energy demand transformation in the city/district
    - Community-led local development in the city/district
    - Local energy system innovation in the city/district
    - Place-based ecological transition in the city/district
- Four **key areas of policy/practice interaction**, on which the effects of different policies and measures converge or clash, which are best investigated against the backdrop of current energy practices and potential innovations, and are here presented in terms of intertwined constraints and opportunities –
    - Costs/Subsidies
    - Uncertainty, Unconcern/Learning (specialised&applied knowledge), Awareness, Commitment
    - Restrictions/Design criteria
    - Self-initiative, Autonomy/Coordination, Networking.

The regulations and policies that have been surveyed in the three target cities because they are relevant to PED development provide for the implementation of measures that are likely to address some key issues (costs, knowledge gaps, organizational innovations, *etc*.) by mobilising similar mechanisms (subsidies, coordination procedures, information systems, awareness-raising campaigns, *etc*.).

With respect to each priority process, four areas of policy interaction (Oikonomou & Jepma, 2008) are presented as intertwined constraints&opportunities to highlight potential synergies and frictions between the different measures.

Attention to "regulatory frameworks" in energy transition is widespread (Boll *et al*., 2021; Bertelsen *et al*., 2019; Gauthier & Lowitzsch, 2019) as it reflects a shift towards decentralised administration and collaborative governance, under the thrust of globalization and market integration (Majone, 1997; Newman, 2005). The PED Enabling Framework maintains the essential characteristics of a regulatory framework. This framework provides a structured approach to ensure compliance with rules, regulations, and guidelines governing the actions of individuals and organizations within a specific jurisdiction or sector (Black, 2008).

However, it goes beyond traditional regulatory purposes. It focuses on empowering local stakeholders, addressing power imbalances in decision-making processes, and countering the commodification of energy (Feldpausch-Parker et al., 2021).

The enabling framework's format has therefore been designed to empower local stakeholders to start up PED-related activities and to engage in the cooperation needed to advance PED development. The framework should allow living lab participants and the prospective partners of a multi-stakeholder

coalition to navigate the relevant web of constraints and opportunities brought about by regulations and policies, while devising their own PED Action plans

In the proposed template, four sections reflect as many priority processes in PED development, while the four key areas of policy-practice interaction are suggested as prompts to shape the content of each section. It is understood that each section can have two layers - a general introduction to the policies in place in the city in question, whether they come from the state, regional or other administrative levels, and a brief illustration of the constraints and opportunities specific to the target neighbourhood.

In most cases, though not always, the same PED Policy Canvas will be applicable to multiple districts within the same city. It may also largely apply to different cities within the same region, where "region" refers to the lowest-level political jurisdiction with significant legislative authority. In contrast, the PED Enabling Framework is influenced by the more specific findings of the Stakeholder Analysis (Activity 5.1.2). This analysis is tailored to the unique characteristics of the four target neighbourhoods.

Hence, the overall PED Enabling Framework is expected to vary across cities and even neighbourhoods, following how local actors play out their synergies and frictions in PED-relevant actions against the background of structural imbalances.

Underlying assumptions and design criteria

In defining the "priority processes in PED development" (Fig. XXX), we aimed to balance two key aspects. On one hand, we considered a focused set of priority goals—such as increasing renewable energy capacity and improving energy efficiency—commonly emphasized in policy documents (Boll et al., 2021; JPI Urban Europe/SET Plan Action, 2020; Shnapp et al., 2020). On the other hand, we incorporated insights from a growing body of research advocating for integrated approaches to energy transition. These approaches highlight the importance of considering the socio-materiality and territorial diversity of PED development processes (Coutard & Rutherford, 2010; De Laurentis & Pearson, 2021; Hoppe & Miedema, 2020).

This approach is in line with the recommendations of other recent PED research projects, which warn on the risks of silo-thinking in energy transition theory and practice (Yoo *et al*., 2021) and advocate for place-sensitive, integrated approaches (Alpagut&Gabaldón, 2020; Boll *et al*., 2021).

The proposed priority processes in PED development are as follows (see also **Fig. 19**):

1. **Energy demand transformation** – following the Intergovernmental Panel on Climate Change's Sixth Assessment Report (IPCC, 2022), it concerns 1) socio-cultural factors (individual and group choices, lifestyles, energy saving behaviour), 2) the willingness to use the supporting infrastructure that enables transformative change (e.g., district heating, charging stations for electric vehicles) and 3) the uptake of technologies and devices by end-users. From a broader viewpoint, energy demand transformation acknowledges the structural embeddedness of energy use in wider social, institutional, and infrastructural systems (Bouzaroski, 2020). Within energy demand-side management measures, sufficiency is gaining ground as encompassing "*a set of measures and daily practices that avoid demand for energy, materials, land and water while delivering human wellbeing for all within planetary boundaries*" (IPCC, 2022: 42). Sufficiency differs markedly from efficiency, as it prioritises the amount, level, and nature of goods and services that require resources, instead of focusing on improving the input/output ratio or, in other words, it is concerned with the prudent moderation of ends rather than with the rationalization of means (Erba et al., 2021; Sufficiency Manifesto, 2024).

2. **Community-led adaptation to climate change** – also covering socioeconomic adaptations in energy transition (employment opportunities and start-ups in energy-demanding supply chains, etc.) and the right to energy for vulnerable groups.
3. **Local energy system innovation** – encompassing renewable energy capacity building, energy network redesign (digitalization, storage, etc.), and energy market innovation (prosumerism, flexibility, sharing, emerging energy services, etc.).
4. **Place-based ecological transition** – including higher-level spatial restructuring (siting, zoning, decommissioning) and sustainable energy uses of local ecosystems, landscape, and built environment (nature-based, heritage-led design approaches), improving energy performance of buildings (materials&technology).

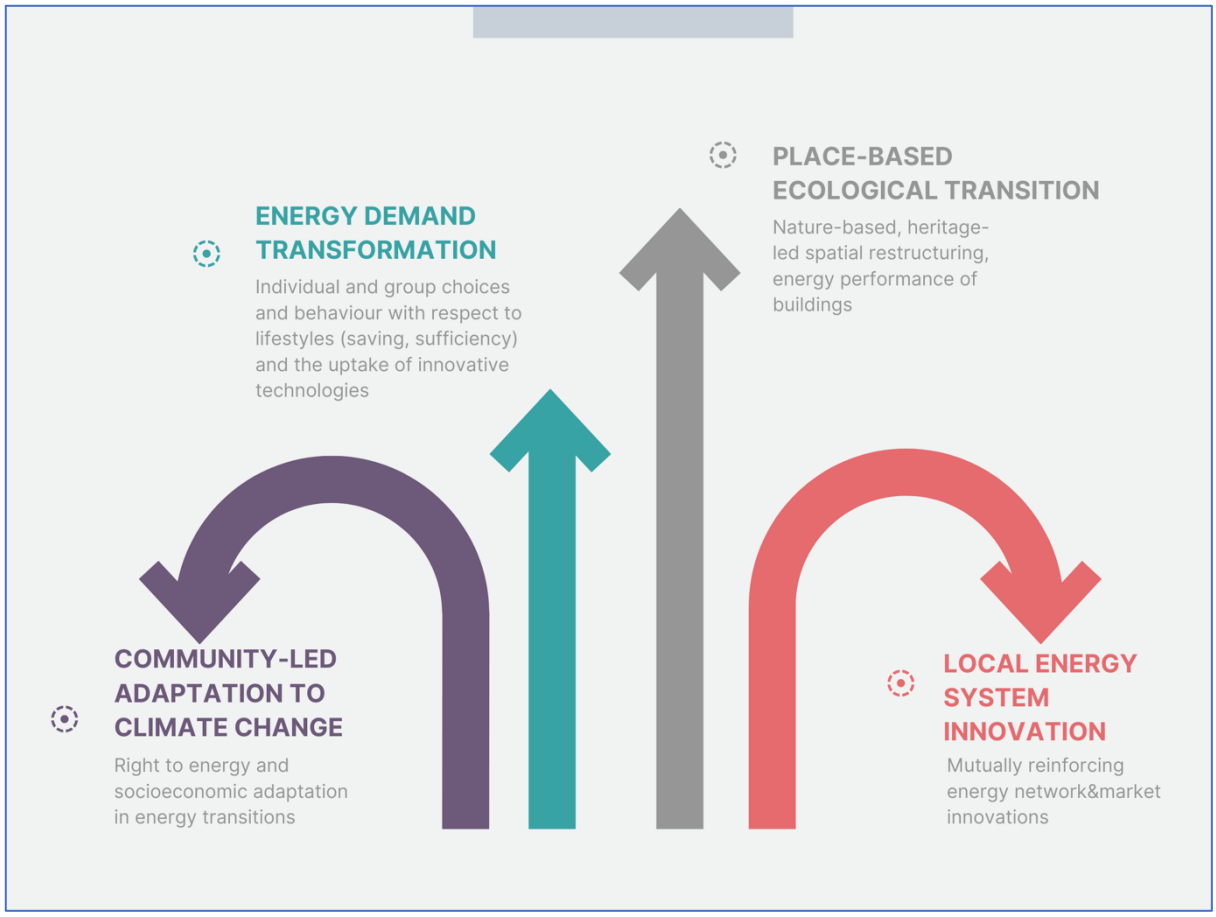


Figure 19. *Four priority processes in PED development.*

The proposed PED Enabling Framework spans multiple policy domains, aiming to direct the focus of local stakeholders toward several critical areas. First, it emphasizes mutually reinforcing priority goals, such as decarbonization and energy efficiency, which are fundamental to energy transitions. Second, it addresses critical issues often overlooked in local public discourse, particularly the transformations in energy networks and markets. Lastly, it highlights key processes essential for ensuring integration, justice, and sustainability, including community-led local development, social innovation, and place-based, heritage-sensitive spatial governance.

Since the project proposal stresses the importance to identify both the key disabling mechanisms that hamper PED development in the four target neighbourhoods and those which can favour it, the "**key areas of policy interaction**" have been accordingly identified in terms of intertwined constraints and opportunities:

- **Costs/Subsidies** – Regulations and policies are expected to be screened for available subsidies (including in-kind contributions, such as free public rooftop lease), and their relations with socioeconomic dynamics and market conditions (including investment costs and operating expenditures of PED-related innovations) will be further investigated.
- **Uncertainty, Unconcern/Learning (specialised and applied knowledge), Awareness, Commitment** – Uncertainty is used as an umbrella term, that calls for measures to foster the uptake of consolidated knowledge (information, communication, training, *etc*.) as well as for those to facilitate learning in innovative energy practices (experimental projects, monitoring, evaluation, *etc*.). Moreover, policies aimed at addressing unconcern and strengthening the commitment of local stakeholders to the energy transition would fall under this policy interaction area.
- **Restrictions/Design criteria** – PED-relevant requirements (from building codes to administrative rules), all the more so when consisting in legally binding restrictions to works and operations, pose major challenges to local stakeholders but, at the same time, they might effectively guide PED planning, especially if proactive design criteria are provided along.
- **Self-initiative, Autonomy/Coordination, Networking** – Energy transition policies in the EU and elsewhere are tapping into a combination of individual initiative and collective behaviour, and a better understanding of the range of cooperation and multiple stakeholder participation models enabled by the different frameworks (Lennon *et al*., 2019) is a key contribution to grassroots PED development.

Key areas of policy interaction are plotted against Priority processes in PED development in **Tab. 37**, to give an indication of how they might help to shape the PED Enabling framework.

The areas of policy interaction concern a limited set of highly significant issues, that have been identified consistently with recent developments in *policy integration studies* and, more specifically, in the investigation of policy interactions in climate&energy policy making (Maor & Howlett, 2022; Oikonomou & Jepma, 2008).

The information needs on contraints&opportunities lend themselves to be translated into prompts that reflect the way these issues are perceived and conceptualised by local stakeholders (e.g., Is public/private funding available to reduce *investment expenditures* or make *operating costs* sustainable? Are we allowed to implement this particular action – under what conditions? With whom should we, or can we, collaborate to pursue this goal?), thus paving the way for an effective integration between the different activities foreseen under WP5 (and especially Activity 5.1.2 Stakeholder analysis) in the design of the overall PED Enabling framework.

PRIORITY PROCESSES IN PED DEVELOPMENT	KEY AREAS OF POLICY INTERACTION (presented as intertwined constraints&opportunities)			
	Costs/ Subsidies	**Uncertainty, Unconcern/ Learning (specialised and applied knowledge), Awareness, Commitment**	**Restrictions/ Design criteria**	**Self-initiative, Autonomy/ Coordination, Networking**
1. Energy demand transformation – individual and group choices and behaviour, lifestyles, energy saving, sufficiency, use of infrastructure and uptake of technologies by end-users.				
2. Community-led adaptation to climate change – socioeconomic adaptation in energy transition (employment opportunities and start-ups in energy-demanding supply chains, *etc.*) and the right to energy for vulnerable groups.				
3. Local energy system innovation – encompassing renewable energy capacity building, energy network redesign (digitalization, storage, *etc.*) and energy market innovation (prosumerism, flexibility, sharing, emerging energy services, *etc.*)				
4. Place-based ecological transition – including higher-level spatial restructuring (siting, zoning, decommissioning) and sustainable energy uses of local ecosystems, landscape and built environment (nature-based, heritage-led design approaches), improving energy performance of buildings (materials&technology)				
	Summary of available subsidies and their relations with socioeconomic dynamics and market conditions	Main areas of uncertainty, in terms of both limited diffusion of consolidated knowledge and handling of unknown issues	Overall assessment of PED-relevant requirements and of the opportunities for adaptation presented by design criteria	Range of cooperation and multiple stakeholder participation models enabled by the framework (Lennon et al., 2019)

Table 36. *The interplay between "Priority processes in PED development" and "Key areas of policy interaction" in the PED Enabling framework.*

PED enabling framework in San Paolo (Bari)

Energy demand transformation

The evolution of energy demand in Bari over the last century reflects similar trends in medium-sized Italian cities, along with some peculiarities of southern regions. In the early 1900s, imported coal and local firewood supplied limited domestic needs and small-scale industrial activities. Towards the middle of the twentieth century, oil began to increasingly support the growing manufacturing and transport sectors, while electricity mainly served public lighting infrastructures, as evidenced by the inauguration of the iconic wrought-iron street lamps along the waterfront (https://archiviostorico.enel.com/it/risultati-ricerca/dettaglio-ricerca.html?type=video&id=e2d7c80d-a1d3-41d3-9779-ccd493f0d7f7).

When Puglia's first oil-fired power plant was built (in 1958, https://www.barinedita.it/bari-report-notizie/n3382-bari-centrale-dell-enel--la-storia-del-colosso-industriale-in-via-di-smantellamento) next to the existing oil refinery (built in 1937, https://www.barinedita.it/bari-report-notizie/n3389-bari-alla-scoperta-di-quell-enorme-area-inaccessibile-dove-un-tempo-sorgeva-la-stanic), electricity from fossil fuels supported the steady growth in population, urbanisation and industrialisation that accompanied post-war reconstruction.

When the oil crisis hit the country in the 1970s, energy diversification took the form of a renewed natural gas network run by a municipal utility (from 1975) and had a major impact on heating and cooking practices - although it took almost 25 years to reach all the suburbs and at least 10,000 households are still not connected.

The economic boom of the 1980s triggered rising living standards and, combined with continued suburbanisation, expanded the city's energy footprint for the growing use of appliances and air conditioning, as well as for transport and home heating. As environmental awareness slowly took hold, the energy transition of the 21st century began with a slight interest in renewable energy and climate change mitigation, manifested more in the smart city paradigm implications for electrification and digitalisation (e.g. in the mobility sector) than in decarbonisation and prosumerism (where the city ranks very low in the region according to relevant indicators).

Since 1995, the municipal government has set up an Energy Management Office (https://www.comune.bari.it/web/ambiente-verde-energia-e-impianti/piano-energetico-ambientale), in keeping with the provisions of Law 10/1991. It has also tried to promote energy saving awareness and behaviour, while integrating energy efficiency and renewable energy sources into the operations of the administration itself and exploiting synergies in the public and private sectors in general (Capezzuto, 2006).

While the supply-side management of the current energy transition seems to be driven by similar factors to those at work in Italy and most European countries, as reflected in publicly funded deep energy renovation projects and renewable energy capacity building, the focus of demand-side

management is slowly evolving from sharing good practices in energy saving (https://www.comune.bari.it/web/ambiente-verde-energia-e-impianti/istruzioni-per-il-risparmio-energetico) to mainstreaming low-carbon lifestyles and skills (Comune di Bari, 2011).

The efforts of civil society hint at a sufficiency perspective by constantly joining a national campaign for energy saving and sustainable lifestyles, named in a pun on the famous four-word poem "Mattina" ("Morning") by Giuseppe Ungaretti: "M'illumino di meno" instead of "M'illumino d'immenso", which means "I light up less" instead of "I am illumined with immensity"[4].

Community-led adaptation to climate change

Energy transition poses significant challenges for vulnerable populations, including low-income households and marginalized populations in general. These face systemic barriers to access affordable and reliable energy, also connected to geographical disparities within cities (EC, 2019) as low income neighbourhoods usually have poorer facilities and housing facilities with lower efficiency rates. Those barriers may be strengthened by energy transition if no specific policy measures are in put in place to ensure that benefits from the transition do not disproportionately favour wealthier segments of society (International Energy Agency, 2020), especially in times of rising energy prices. Without those measures, the risk of being excluded from better off solutions while paying parts of their costs through indirect costs is high and would further exacerbate existing inequalities and hinder sustainable socioeconomic development.

Community-led approaches to energy transition may thus play a crucial role to rebalance unjust transitions. They may empower local stakeholders through local cooperation in the face of power imbalances and the commodification of energy (Feldpausch-Parker et al., 2021). These initiatives can also foster new opportunities for socio-economic development at the local level while enhancing energy security and contrasting energy poverty, thus contributing to the right to energy by vulnerable groups[5].

Costs&Subsidies

In Italy, some policy measures have been taken to contrast energy poverty and to secure a sufficient access to energy for basic needs from vulnerable groups. The main one is the Social Bonus (Social Bonus for Energy and Social Bonus for Gas). These measures are specifically designed to reduce energy and gas bills for low-income households. Eligible families can receive a discount on their electricity and gas bills based on their income and household composition. Statistics from ARERA show that in

[4] (https://www.rai.it/milluminodimeno).

[5] On the link between energy poverty, meant as the inability to secure sufficient energy for basic needs, and social justice see also Bouzarovski et al. (2018).

2023 7,6 million household received social bonuses for electricity and gas, with an estimated amount of more than 2.4 Billion Eur.

Given the socio-economic conditions of the household living in the San Paolo area – the residential units are for the largest majority public houses assigned to households on the basis of socio-economic vulnerability, while only a few of them has been redeemed by previous tenants – it is likely that almost all residents receive those bonuses.

Besides this, on a National basis energy and gas contracts reserve special tariffs to vulnerable groups, which are fixed outside market regulation.

Uncertainties

Because of the liberalization of the energy market, it is not easy for consumers to understand the most appropriate electricity and gas contracts. This is due to the variety of plans offered by different providers, the complexity of the tariff structures and market dynamics, the lack of consumer awareness and literacy. Vulnerable groups may not even know they have the possibility to get special tariffs. Because of this situation, an innovative service company was created in Italy by Federconsumatori (a prominent consumer association in Italy) to support citizens in understanding energy contracts and navigating among offers and tariffs. This new company, named "Centro Assistenza Bollette" (CAB), now counts about 250 branches on the Italian national territory. One of them is in the San Paolo neighbourhood and is a reference points for low-income and vulnerable families, which are supported to cope with rising energy costs and challenges related to energy poverty.

Self-initiative, Coordination & Networking

The CAB experience, outlined above, does not only deal with consumers on individual basis; CABs also organize – together with consumer associations, local authorities and other institutions – campaigns and training courses to educate consumers on energy topics, rights, and obligations, including energy savings, thus contributing to raising awareness about energy issues. They may also support initiatives for social inclusions tailored to low-income families or connect them with local initiatives and organizations providing further assistance.

The change in the energy market and the need of specialized professionals in the energy supply chain, including the need to install and manage more sophisticated technologies for energy production and use within flats and condominiums, are leading to a serial of new job opportunities with different educational skills. Within the San Paolo neighbourhood, where the level of education is lower than the average in Bari and there is a much higher dropout rate during compulsory education, a three-year professional training programme for “electric operator” was offered to young people under 18 years old. It was organised between 2021 and 2024 by an accredited educational enterprise and a secondary school, with funding from the Apulia Region under the ESRF-ESF Regional Operational Programme 2014-2020, within the multi-functional rooms of the San Bosco parish, within the project target area.

Local energy system innovation

Innovations in the local energy system in Bari are closely influenced by developments in the national regulatory framework and in the strategies of the key players, namely:

- Terna S.p.A., the single electricity Transmission System Operator (TSO)
- SNAM Rete GAS, Italy's main natural gas TSO
- E-distribuzione, the electricity Distribution Network Operator (DNO) in Bari and in all other but two municipalities in Apulia.

The liberalization of the energy market, driven by a series of Directives (beginning with Directives 1996/92/EC and 2003/54/EC), has produced similar outcomes across EU countries, particularly in the unbundling of electricity and gas transmission infrastructure—an effort solidified with the third energy package under Directive 2009/72/EC. However, the Italian energy system still reflects the legacy of a four-decade-long period of nationalization (1962–1999). This legacy is evident in the high market concentration among major Distribution Network Operators (DNOs), which emerged from the privatization of former monopolistic public companies, and their associated companies in electricity production and supply. For instance, E-distribuzione and Enel hold market shares of 85%, 17%, and 27%[6], respectively, in distribution, production, and provision.

There is a multilevel and multidimensional regulatory&policy framework on renewable energy capacity building in force in Bari that is mostly ensued from EU legislation (Directive 2018/2001/EU on renewable sources, Directive 2012/27/EU on the electricity market, Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency, each of which includes provisions on renewable energy capacity building).

Costs&Subsidies

The governance of major investments and infrastructure upgrading programmes in the electricity sector hinges upon the ten-year National Transmission Network Development Plan, drafted by the TSO (Terna S.p.A.), adopted by the Ministry for the Environment and updated every second year. The 2023 plan allocates over 50% of its €21 billion budget to developing a high-voltage direct current (HVDC) hyper grid. This initiative aims to integrate 70 GW of additional renewable capacity required to meet the 2030 targets under the "Clean Energy for All Europeans" framework and to enhance transmission capacity between Italy's seven market zones, including Bari in the South market zone[7]). The main project affecting the target area concerns a series of interconnected extra-high- and high-

[6] https://www.statista.com/statistics/804019/market-share-of-the-main-household-electricity-providers-in-italy; https://www.arera.it/it/relaz_ann/23/23.htm.

[7] Market zones have been identified as the largest geographical areas within which market participants are able to exchange energy without capacity allocation, while there are limitations on the buying and selling of energy between different zones", pursuant to Article 2(3) of the Regulation 543/2013 of 14 June 2013 on submission and publication of data in electricity markets and to Article 2(65) of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (Electricity Market Regulation).

voltage lines and transforming stations. The project focuses on optimizing transmission around the main station serving the region's major gas-fired power plant (800 MW, located on the outskirts of Bari near the target neighbourhood) and enhancing transport capacity from the large power plants in Brindisi (south of Bari). To date, €46 million has been invested, with an additional €32 million needed to complete the development[8] (see map in **Fig. 1** below).

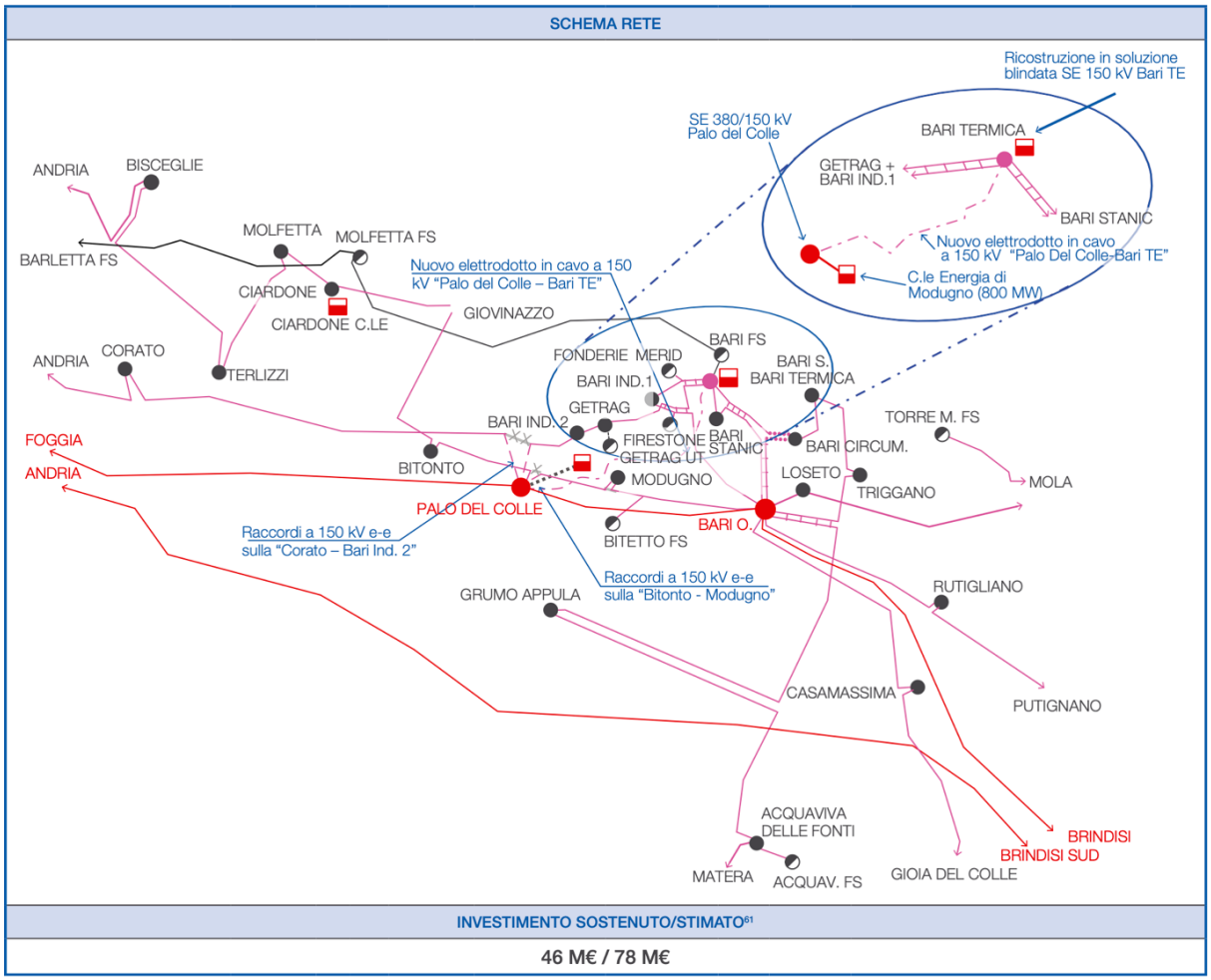


Figure 20. *the electricity network around Bari, including primary substations and some of the main consumers (industrial compounds and railway stations). Source: Terna S.p.A. National Transmission Network Development Plan 2023, p. 128.*

8 https://download.terna.it/terna/Terna_PdS_2023_Avanzamento_Piani_Sviluppo_Precedenti_Avanzamento_Centro_Sud_8db254beeb13f67.pdf.

As for renewable, feed-in tariffs are available for most sources (save for PV systems with a power of less than 20 kW) but conditional on previously defined power quotas and downward auctions (for installations with a power of more than 1 MW). Producers and prosumers may alternatively opt for net metering (*scambio sul posto*) or simplified purchase&resale arrangements (*ritiro dedicato*). Many other funding sources are available, also at sub-national level, including:

3) funding provided directly by the regional law on Renewable Energy Communities (200 k€ total), along with grants offered by a banking foundation to non-profit organizations in six Southern regions (1,5 M€ total funding, max 150 k€/project)
3) funding available under the ERDF/ESF+ 2021-27 programming cycle (33 M€ total for the whole region, with a specific target of 40 new RECs)
3) regional energy income, a grant given to chartered renewable energy installers (up to 6 k€ per household or 8,5 k€ per building/block) on condition that the customers who enjoy self-consumption opt for net metering and transfer export tariff's revenues to a regional revolving credit account (to fund further installations).

Uncertainty/Awareness&Learning

The Decree of the Ministry for the Environment, dated 4 July 2019, establishes differentiated subsidy schemes based on the level of uncertainty in feasibility and profitability. Well-established technologies with stable costs, such as onshore wind, solar PV, and hydro, are treated differently from innovative sources and technologies, like offshore wind, thermodynamic solar and geothermal energy, which involve higher investment costs or longer development cycles. The primary uncertainties appear to revolve around state subsidy schemes, which underwent significant changes in 2012 and have since been amended every two to three years. Additionally, the interaction between zoning regulations and design rules for utility-scale installations has led to widespread and ongoing legal disputes.

Restrictions/Design criteria

As mentioned in the above paragraph, areas zoned out for renewable power plants under multilevel (state/regional) regulations appear to be, together with detailed design requirements, the most relevant restrictions. To address this interplay, design guidelines for energy facilities, included in the 2015 Regional Landscape Plan, along with spatially differentiated analysis of the interlinkages between socioecological processes and heritage.

Self-initiative/Coordination

Most policy measures aimed at building renewable energy capacity are premised upon self-initiative and the promotion of prosumerism. However, not only the very same policies often imply the support of one or more different actors (think of the chartered renewable energy installers who are the actual recipients of the regional energy income on behalf of self-consuming households), but also the policies

addressing RECs foster networking and collaboration within local communities, while envisaging a coordination role by local authorities.

Place-based ecological transition

Ecological transition has long been informed by a technocratic and market-driven approach rooted in ecological modernization (Hajer, 1997), which has also been responsible of new forms of "green capitalism" and resource grabbing (Scheidel et al., 2023). These tend to replicate the distortions of energy production systems from fossil sources (Lipari, 2020) while generating a new geography of social and territorial inequalities (Magnani and Carrosio, 2021; Sovacool, 2021).

Place-based energy transition is specifically aimed to foster decarbonisation while promoting sustainable energy uses of local ecosystems, the improvement of energy performance in buildings, as well as resilience and adaptation through community engagement. It is part of a territorial strategy combining the development of local energy potential with the enhancement of the identity of the territory and the recovery of a proactive role for local actors (Magnaghi and Sala, 2013). A place-based transition can thus promote a holistic approach to sustainable development that at the same time respects local contexts and maximizes the benefits for communities and ecosystems.

Initiatives in the San Paolo neighbourhood

In the San Paolo neighbourhood, several urban regeneration initiatives are ongoing, which also include some measures for energy efficiency and sustainable energy uses. Among them, it is worth mentioning the Periferie programme, which was funded under a national programme for urban regeneration in 2015 and is currently in the implementation phase. Among the actions funded under this programme it is possible to find the greening of several public spaces and streets, which would contribute to reduce the urban heat island effect and have a positive impact on energy consumption for cooling within residential units and public buildings. As a follow-up of this programme, a project for the greening of a large square in the target area has been recently approved and is currently under implementation. The project will develop what has been names a ‘climate refugee’ in that square, as a place where the effect of the urban heat island will be reduced and where the local community can gather in the hot summer days to reduce indoor cooling needs while strengthening community links. A massive change in the technology for public street lighting is also currently ongoing in the San Paolo as well as in other neighbourhoods of the city of Bari.

Costs/Subsidies

In Italy, a big push for the implementation of energy efficiency renovations and renewable energy installations came from the so-called “Superbonus 110%”, which was introduced by the Government in 2020 until 2023. It allowed for a 110% tax deduction for several types of interventions, including thermal insulation, solar panels, and efficient heating systems, while giving the possibility to transfer deductions to contractors. In the target area, ARCA Puglia Centrale made a bid in 2021 to identify a contractor to be engaged in the energy efficiency renovation of several buildings of their property.

Unfortunately, the possibility to access the incentive ended before the contractor could start the works. This constituted an important missed opportunity for PED transition in the target area. No residential unit have undertaken any renovation so far. As for the public service buildings, energy efficiency renovations are now starting in the ‘Casa delle Culture’ building.

PED enabling framework in USquare (Brussels)

Energy demand transformation in Brussels

Transforming energy demand involves several aspects and dimensions. Starting with new consumption habits at the individual level.

This transformation also involves reducing the energy requirements of the building stock.

In addition, the introduction of infrastructure enabling collective use, such as district heating networks, is also contributing to this energy demand transformation.

In Brussels, the legal framework puts set up a whole series of strategies designed to encompass the various issues involved in the necessary transformation of energy demand.

Costs&Subsidies

When it comes to changing heating habits, the notion of sufficiency is central. A study conducted in Brussels, "*Slow heat*"[1], led participants to explore new ways of heating bodies rather than homes. However, this focus on sufficiency is still new and within the legal framework, the "rational use of energy" is more mentioned.

Indeed, the rational use of energy, as set out in PACE, refers to behaviour within buildings. It is planned to reinforce the support users of high-performance buildings through two actions: support for associations that provide this support in public housing, and the setting up of a platform for exchanges between the various players, coordinated by Bruxelles Environnment.

Jointly to the individual behaviour, the energy demand transformation must be addressed in a more holistic approach.

Indeed, to reduce the energy consumption of building Brussels Region relies on several mechanisms, notably energy performance certificates for buildings and the circular economy for buildings.

In terms of the circular economy for building renovation and construction, there is a whole range of innovative tools and indicators for reuse, material reversibility and waste reduction. Tools such as TOTEM, for example, have been designed to reduce the environmental impact of a construction or renovation project throughout its lifecycle by comparing and optimizing architectural solutions linked to the choice of materials.

Although there are a few cases of mini heat networks in Brussels, their deployment is still under study. In fact, the Decarbonation Task Force at Bruxelles Environnment is working with other experts to evaluate the different types of technology available, as well as the renewable energy sources that can be mobilised in the Brussels-Capital Region.

[1] https://www.slowheat.org/

Uncertainty/Awareness&Learning

In terms of experimental project for the district heating, the case of Usquare is a good case of implementation of heat network. Furthermore, Usquare also includes the circular economy dimension of building renovation.

Restrictions/Design criteria

In terms of deployment of heat network, many issues are still under study, particularly the issues raised during fieldwork at Usquare and La Roue, concerning the technical management and maintenance costs of such heat networks.

Self-initiative/Coordination

The "Slow heat" research project was replicated in several schools and offices in Wallonia to test and gather feedback from the various participants. A publication summarizing all the lessons learned from the various experiments was published a few days ago and is available for a fee. [2]

Community-led local development in Brussels

To face increasing energy poverty in Belgium, different policies and services have been implemented, both at the Federal and regional level. These policies and services aim mainly to improve the access to renewable energy for vulnerable public, to guarantee support and assistance in case of difficulty paying the energy bills, and finally to protect the consumer.

At the Federal level, due to the energy crisis a "social tariff" has been created, which is an advantageous energy tariff depending on the income and situation of the particulars. Furthermore, the VAT reduction of energy bills from 21% to 6% is now permanent for particulars with an excise system.

At the regional level, we can distinguish two types of measures:

a. The support and assistance services:

Through subsides, Bruxelles Environnment participate in financing different NGO and municipalities actors present at the most local level: for administrative and technical service citizens can contact Homegrade, for support service for renovation, consumption and rational use of energy and energy bills analyse or juridical assistance there is a network of NGO called " Réseau Habitat". This network of NGO are actives in specific municipalities, within the "urban renewal zone" where the vulnerable

[2] https://pul.uclouvain.be/book/?gcoi=29303100724760

public is located. In addition, there is a support service for information mediation called “InfoGaz Elec” which is a public centre, which informs the consumers. There is also, a support at local level (municipalities): The Public Centre for social action (CPAS) which can help to pay in some specific cases, the energy bills.

b. Policies for access and use of renewable energy for vulnerable householders.

There are different policies, such as:

The status of protected customer. In case of debt and difficulties, paying the electricity or gas bills with this status citizen’s contract is suspended with the energy company supplier and Siblega (the grid operator) becomes the supplier. This status lasts for 5 years.

There are other options for vulnerable households: debt clearance (CPAS), guaranteed supply of energy (in Brussels nobody can be cut off from energy without a judicial decision).

Furthermore, to improve the access of renewable energy, the Company for social housing in Brussel Capital region (SLRB) received a budget to install photovoltaic panels for the renovation of their buildings. That allowed many social housings to be renovated and become passive housing whose energy consumption is very low. There is an assistance for the use of new equipment within the “high energy potential “buildings supported by NGO financed by Bruxelles Environnment.

Otherwise, the activities of sharing energy and energy community allowed vulnerable households to have access to renewable energy.

Restrictions/Design criteria

As described before, there are different criteria to fill into the specific categories for receiving assistance. Additionally, due to the current energy crisis, a new public is applying for these subsidies and assistance (seniors, students, self-employed etc.), that situation increases the process period for all the applicants.

Self-initiative/Coordination

Through cooperatives and NGO, citizens have initiated a project that aims to get access to the North Sea Energy (sea coop); to install PV and impulse energy communities and be the first citizens suppliers in Brussels region (Brupower).

Moreover, on the other hand, collective citizens organized themselves at district level to create sustainable neighbourhoods.

the sharing of energy between citizens. This text is innovative because it gives the ability for the prosumer to be an actor within the energy market and redefines the new duties of the energy suppliers and the regulator in this new context of energy sharing.

Also, in terms of renewable energy capacity, to promote renewable energy production, the subsidies available cover both the installation of new equipment certified and investment incentives which allow a return on investment.

Costs&Subsidies

1. Sharing energy

Although establishing energy sharing incurs no financial cost, energy communities must invest time and human resources in administrative management carried out by their members. There are no direct subsidies, but there are indirect subsidies available:

The mechanism of green certificate can be applied for the owner of the solar panels. In terms of incentive, the regulator of the grid has defined specific tariff for the use of the grid. The tariff is advantageous for the EC located within the same perimeter. Those tariffs will change after two years.

The initial experiences with energy communities in Brussels have highlighted challenges, particularly the burden of managing dual billing—one from the traditional operator and another for EC members—as well as the monitoring of additional taxes. These complexities can pose significant barriers for citizens. To face this situation, Bruxelles Environnment is searching for a solution that should help with the double billing tasks within energy communities.

2. Renewable energy capacities

- **Brussels Photovoltaic subsides:** In the region Brussels Capital for the installation of photovoltaic panels certified, the owner receives “green certificate” which will be sold by the electricity suppliers. Indeed, every energy supplier has the obligation to buy those “green certificate” from local prosumers. The green certificate prices depend on the offer and demand on the market, for now the minimum amount for one green certificate is 65 euros.
- **Brussels Heat Pump subsides:** Brussels provides subsidies for the installation of heat pump under specific conditions: for residential use, the heat pump must be a non-reversible pump, and the installation must be certified. The amount of the subsidies depends on 3 categories of income. In addition, there is a “bonus” for households, which decide to change their old fuel oil or coal boiler, this “bonus” depends on their incomes category (from 300 to 1000 euros bonus).
- **Domestic Hot water heat pump:** almost the same as the heat pump but the heat pump must be energy class A.

- **Solar thermal subsides:** Concern the implementation of an installation of domestic hot water through at least 2m² of solar thermal panels. The installation must be certified Rescert and beyond 4m² of surface, there is a bonus.

Uncertainty/Awareness&Learning

As a quite new activity in Brussels, the concept of energy sharing is still unknown, and citizens have a lot of questions. Detailed information is available through:

1. One stop shop, free service of Le Facilitateur de Partage et Communautés d'Energie : https://environnement.brussels/citoyen/services-et-demandes/conseils-et-accompagnement/facilitateur-partage-et-communautes-denergie
2. Tools for implementation of EC are available through the Facilitator service
3. Workshop organized by Bruxelles Environnment: these workshops are usually made for target audience (co-ownership, social housing.)
4. For December 2024 research on the obstacles, opportunities and risks for the deployment of Energy communities in Brussels Capital Region will be available.

There is a free service "*Facilitateur Batiment Durable et Copropriété* "that is available for technical advice about the implementation of renewable energy sources within buildings for example.

Restrictions/Design criteria

To share energy and in the specific case of Energy Community, citizens must follow different steps:

First, the community must be a legal entity. Then, a convention must be signed between all the members, that convention identifies the rights and duties of the member of EC.

Second, the members of the energy community may have smart meter.

Third, the EC has to receive the authorization from the regulator of the grid (Brugel). This authorization is valid for ten years- and can be extended.

Fourth, the EC must declare their activity to the grid operator (Sibelga).

Also, the free service of le *Facilitateur Partage et Communautés d'énergie*, must be contacted when the group of citizens have already been constituted and this service won't follow step by step the group.

For the renewable energy capacities:

Regarding the photovoltaic panels, it is important that the installation is made by a certified installer and follow the different steps of control (electric control, attestation from the grid operator (Sibelga).

Moreover, for the photovoltaic panels which are not visible from public space there is no need for an urban permit.

In term of geothermal energy, a cartography of the potentialities of heat network is in progress for Brussels, nevertheless nowadays is it still complicated to implement a heat network because of the different authorizations needed (due to dig and what you can find underground) and the cost of investments

Self-initiative/Coordination

Every citizen can initiate a project of energy sharing, following the rules described before, and can be helped by the Facilitator who provides support as helpdesk. During 2023, the Facilitator received almost 1000 consultations, and 500 initiatives of energy sharing have been registered (5 new energy communities) in Brussels.

From 2021 to 2022, there were examples of coordinated initiative, such as "pilot project" like" Nos bambins", and "Sun Sud" that was implemented before the legal framework was established. https://nosbambins.be/ , https://foyerdusud.be/sunsud_vlogaert/ . Those coordinated projects received, at this time, the political support of local municipality and subsidies from the region (Bruxelles Environnment) and specific support by NGO present at the neighborhood. Now that the legal framework is elaborated, such coordinate initiative is not implemented.

Also, in terms of renewable energy capacity, through subsidies, Brussels's citizens have been able to implement self-initiative (mostly photovoltaic panels). Furthermore, for public buildings there is a special programme subsides call "Renoclick" which helps them for the installation of new energy production.

Place-based ecological transition in Brussels

It is necessary to distinguish two axes: firstly, the *spatial restructuring* and *the improving of the energy performance of buildings*.

Costs&Subsidies

As far as spatial restructuring is concerned, there are several programmes.

Indeed, to actively participate in the retrofitting of their districts, Brussels citizens can apply to a subsidy called "Sustainable district contract". The aims are to improve the living environment of precarious neighbourhood through three axes:

- Retrofitting of public areas
- Renovation or creation of public housing

- Socio-economic project

The budget is based on an action plan for 4 years passed between the region, the municipalities and citizens from the specific district.

In addition, there is "Urban blocs and streets contract" which is a unique mechanism at local level that has different objectives: renovation of buildings, intensification of uses, better inclusion of citizens projects.

Despite the fact the project is presented by the municipalities, citizens have an important role in those "Urban blocs and streets contracts", indeed, at least 12 citizens and 6 associations must be part of the project to define a district diagnosis, identify the priorities and establish and action plan. As the "Sustainable district contract", the budget available is for 4 years.

At a regional level, there is "Urban Renovation Contract" which is a programme applied in the multi-municipality level that has as priority to improve the public area, urban network to create infrastructure and housing.

In terms of improving energy efficiency of building in Brussels Capital Region, through the "Renolution programme", citizens have access to different kind of tools to renovate the energetic efficiency of their buildings. Indeed, within the Renolution programme there are the credit "Ecoreno", "Premiums" and Subsides and Project Calls (Renolab ID and Relonad.B).

There are many types of Renolution Premiums available depending on the nature of work: https://renolution.brussels/fr/primes-et-soutiens-financiers

Also, there are subsidies for the installation of new boilers, heat pumps, solar boilers.

In terms of monitoring, there is a Sustainable Building Facilitator Helpdesk, and the services of Homegrade for advice.

In the specific case of Usquare the cost of the renovation was covered by the FEDER subside (80%), in La ROUE citizens are applying for another FEDER subside, and they have already obtained a subsides from Renolab.ID, which every year opens a call for innovative project replicable in districts. https://renolution.brussels/fr/renolabid

Uncertainty/Awareness&Learning

As with every subsidy, citizens must wait for the results, to receive the money and engage in the project.

The regeneration of public spaces is a task shared by different administration in Region Brussels Capital (Urban, Bruxelles Environnment, Perspectives, Municipalities). This situation creates uncertainty for citizens who don't know which administration is competent.

In La Roue, the collective of citizens has identified the overlapping of administrative tasks related to heritage as a significant concern.

In terms of learning, there is in Brussels region a Free Service of "Sustainable District Facilitator " who provide support, advice and propose a specific approach "Be sustainable" for all the citizens local initiatives. Also, there is a guide available online which give specific information on sustainable Building.

There is a Toolbox available online with different tools like: the Quickscan : which help to do the first balance of the durability of the project; Compass: which Sets benchmarks to identify the level of sustainability of the existing situation and its potential for improvement.

Also, with the modification of the "Cobrace" 2024, each EPB certificate recommends renovation work to improve the energy class of the property. Those recommendations are useful for each inhabitant.

Restrictions/Design criteria

As indicated before, there are different administrations involved, and each one has developed its own regulatory plans and tools. Sometimes it happens that some contradictions appear, or the application of the regulation create some difficulties on the field.

For instance, at Usquare, the PAD (Plan d'Aménagement Directeur) overlooked certain site-specific details, leading to some challenges.

In terms of improving energy efficiency of building, most of the renovation need an urban permit, regulated by legislations: CoBAT , Cobrace, and Ordonnance PEB 07/96/2007 and 02/05/2013. Before initiating any renovations, citizens must review the EPB regulations, which outline the energy efficiency requirements for renovations and specify the mandatory inspections for heating and cooling systems.

Moreover, the main issue for citizens is the fact that they must pay in advance all the costs of the renovations and get the money back only after the work is done. This obstacle has been clearly identified in La Roue by the neighbors.

Self-initiative/Coordination

Every project "Inspirons le Quartier" starts with a self-initiative of citizens who are organized, and who want to improve their neighbourhood. They applied then to the subsides "Inspirons le quartier" and they received subsidies. Without this self-initiation there cannot apply. There is no coordination structure in the Brussels region.

In La Roue, citizens have organized themselves for a joined renovation at the district level. This initiative is innovative because in Brussels the procedure for renovation has been conceptualized for an individual approach. Trying to reduce all the administrative and authorization, neighbours of La Roue joined forces to experiment with this collective approach.

PED enabling framework in Kahlenbergerdorf (Vienna)

The implementation of Plus-Energy Districts (PEDs) in Austria is driven by a mix of federal and regional policies, subsidies, and incentives aimed at promoting renewable energy, enhancing energy efficiency, and fostering community-driven local development. This regulatory environment in Vienna highlights key initiatives, restrictions, and opportunities within the context of PEDs.

Energy Demand Transformation

Costs/Subsidies

Austria supports renewable energy through the **Green Electricity Act** (Ökostromgesetz), offering **feed-in tariffs** for electricity from sources like photovoltaics (PV), solar thermal, and hydropower. In Vienna, additional financial support programmes cover a significant portion of the investment costs for PV systems, solar thermal installations, and heat pumps. These subsidies reduce financial barriers to adopting renewable energy technologies, playing a pivotal role in enabling energy demand transformation by making renewable energy technologies more accessible.

Through the **Participatory Climate Budget**, the city of Vienna provides financial support to community-led projects that contribute to the energy transition. This funding mechanism enables local actors to implement renewable energy solutions and energy efficiency measures that may otherwise be out of reach. The combination of city-level support and community-driven initiatives reduces the financial burden on individual stakeholders, ensuring that the economic costs of energy transition are shared and more accessible. Both federal and city-level subsidies are available to support the deployment of innovative local energy systems. For example, the Austrian government provides financial incentives for the installation of geothermal and groundwater heat pump systems, which are crucial for replacing fossil fuel-based heating in urban areas like Kahlenbergerdorf. These subsidies help to reduce the high upfront costs associated with cutting-edge technologies, enabling wider adoption and integration into the local energy grid. Additionally, the city of Vienna offers support for central energy stations (heating, cooling, and electricity) in areas that are not connected to the existing district heating network. These central energy stations are designed to decentralize energy production and distribution, allowing neighborhoods like Kahlenbergerdorf to become more self-sufficient and less reliant on centralized fossil-fuel-based systems.

Uncertainty, Unconcern/Learning (Specialized and Applied Knowledge), Awareness, Commitment

One of the key challenges in the energy transition is overcoming uncertainties and knowledge gaps related to new technologies and practices. The Federal Ministry for Climate Action and the city of Vienna provide various **programmes aimed at raising awareness and fostering learning** about energy-efficient behaviors and technologies. These initiatives include workshops, information campaigns, and pilot projects that allow local actors to experiment with renewable energy solutions in a hands-on

manner. Community-led local development also plays a key role in addressing knowledge gaps and promoting learning within the district. By involving residents directly in the design and implementation of energy projects, the PED framework fosters a deeper understanding of renewable energy and energy-saving practices. Workshops, educational events, and public consultations help build awareness and encourage commitment from community members. This active participation also helps to overcome concerns or uncertainties about new technologies and their long-term benefits.

The PED framework addresses the uncertainties that often accompany the implementation of innovative energy systems. Knowledge gaps regarding the technical feasibility, economic viability, and long-term benefits of these systems can hinder their adoption. To overcome these barriers, the framework emphasizes learning and awareness-raising initiatives. By offering platforms for stakeholders to engage in experimental projects and pilot programmes, the framework enables local actors to gain hands-on experience with new technologies. Educational programmes and awareness campaigns are key components of this effort, helping to demystify complex energy systems and build commitment among residents and businesses to participate in the energy transition. As stakeholders become more familiar with the potential of local energy systems, their confidence and willingness to invest in such innovations increase.

Restrictions/Design Criteria

Energy efficiency and renewable energy measures in Vienna face restrictions, particularly in **protected zones like Kahlenbergerdorf**, where maintaining the historical and architectural integrity of buildings is paramount. These restrictions limit visible modifications such as solar panels on roofs. In response, the PED framework encourages innovative solutions that align with the design criteria set for these areas, offering guidelines for stakeholders to implement renewable energy technologies without compromising the aesthetic and cultural value of the district. Even within community-led initiatives, design restrictions in protected areas like Kahlenbergerdorf must be respected. The PED framework provides guidance to ensure that proposed projects adhere to local regulations while still advancing energy goals. For example, in areas where visible modifications are restricted, community projects may focus on energy efficiency upgrades that preserve the external appearance of buildings, or on technologies like hidden solar installations.

In the context of Kahlenbergerdorf, where design restrictions exist due to the district's historical character, implementing new energy systems can be challenging. The PED framework provides guidance on how to navigate these restrictions while still fostering innovation. For example, geothermal and underground heat pumps offer a viable solution in areas where visible infrastructure changes are restricted. These systems operate below the surface, allowing the district to transition to more sustainable heating solutions without compromising its architectural integrity.

Self-Initiative, Autonomy/Coordination, Networking

Vienna's **Participatory Climate Budget** engages citizens in climate protection. This bottom-up approach fosters self-initiative and ensures that local needs are addressed within the energy

transition. The PED framework emphasizes autonomy and coordination among local stakeholders, encouraging the formation of local energy networks and collaboration between residents, businesses, and energy providers. By supporting self-organized initiatives such as Renewable Energy Communities (EEGs), the framework empowers stakeholders to take control of their energy production and consumption, creating a more resilient and sustainable local energy system. The success of community-led local development in Kahlenbergerdorf depends heavily on self-initiative and the ability of local stakeholders to coordinate their efforts. The PED framework supports this by fostering networks among residents, local businesses, and energy providers. These networks facilitate the sharing of knowledge, resources, and best practices, ensuring that the community can collectively address the challenges of energy transition. By empowering local actors to coordinate their activities, the PED framework helps create a more resilient and sustainable energy system.

Community-Led Local Development

Vienna's **Participatory Climate Budget** plays a significant role in community-led local development, offering a unique approach that empowers residents to directly participate in climate action. By allocating approximately 5 million euros per district for projects proposed and implemented by the community, this initiative encourages grassroots involvement in the energy transition. Residents can propose local projects that align with broader climate goals, ensuring that community needs and priorities are integrated into the district's development plans.

The **PED framework** in Kahlenbergerdorf builds on this participatory approach by promoting **self-initiative** among local stakeholders, encouraging them to take ownership of energy-related projects. This bottom-up method allows the community to play a central role in shaping the district's energy future, aligning local actions with city-wide climate strategies.

Costs/Subsidies

Through the Participatory Climate Budget, the city of Vienna provides financial support to community-led projects that contribute to the energy transition. This funding mechanism enables local actors to implement renewable energy solutions and energy efficiency measures that may otherwise be out of reach. The combination of city-level support and community-driven initiatives reduces the financial burden on individual stakeholders, ensuring that the economic costs of energy transition are shared and more accessible.

Uncertainty, Unconcern/Learning (Specialized and Applied Knowledge), Awareness, Commitment

Community-led local development also plays a key role in addressing knowledge gaps and promoting learning within the district. By involving residents directly in the design and implementation of energy projects, the PED framework fosters a deeper understanding of renewable energy and energy-saving practices. Workshops, educational events, and public consultations help build **awareness** and

encourage **commitment** from community members. This active participation also helps to overcome concerns or uncertainties about new technologies and their long-term benefits.

Restrictions/Design Criteria

Even within community-led initiatives, **design restrictions** in protected areas like Kahlenbergerdorf must be respected. The PED framework provides guidance to ensure that proposed projects adhere to local regulations while still advancing energy goals. For example, in areas where visible modifications are restricted, community projects may focus on energy efficiency upgrades that preserve the external appearance of buildings, or on technologies like hidden solar installations.

Self-Initiative, Autonomy/Coordination, Networking

The success of community-led local development in Kahlenbergerdorf depends heavily on **self-initiative** and the ability of local stakeholders to coordinate their efforts. The PED framework supports this by fostering **networks** among residents, local businesses, and energy providers. These networks facilitate the sharing of knowledge, resources, and best practices, ensuring that the community can collectively address the challenges of energy transition. By empowering local actors to coordinate their activities, the PED framework helps create a more resilient and sustainable energy system.

Key Area: *Self-Initiative, Autonomy/Coordination, Networking* – The framework supports the creation of robust networks that enhance collaboration among local stakeholders. By fostering a culture of autonomy and self-initiative, it encourages communities to develop locally appropriate solutions, which are crucial for the success of PEDs. This collaborative approach also helps to bridge gaps between different levels of governance and ensure that local actions align with broader policy objectives.

Local Energy System Innovation

Vienna is committed to fostering **local energy system innovation** as part of its broader energy transition strategy, particularly within the context of Plus-Energy Districts (PEDs) like Kahlenbergerdorf. This involves not only the adoption of renewable energy technologies but also the reconfiguration of local energy systems to enhance resilience, flexibility, and sustainability. The PED framework in Kahlenbergerdorf supports these innovations through subsidies, regulatory incentives, and community engagement, creating the conditions for local stakeholders to experiment with and implement new energy solutions.

Costs/Subsidies

Both federal and city-level subsidies are available to support the deployment of innovative local energy systems. For example, the Austrian government provides financial incentives for the

installation of **geothermal and groundwater heat pump systems**. These subsidies help to reduce the high upfront costs associated with cutting-edge technologies, enabling wider adoption and integration into the local energy grid.

Uncertainty, Unconcern/Learning (Specialized and Applied Knowledge), Awareness, Commitment

The PED framework addresses the **uncertainties** that often accompany the implementation of innovative energy systems. Knowledge gaps regarding the technical feasibility, economic viability, and long-term benefits of these systems can hinder their adoption. To overcome these barriers, the framework emphasizes **learning and awareness-raising** initiatives. By offering platforms for stakeholders to engage in experimental projects and pilot programmes, the framework enables local actors to gain hands-on experience with new technologies.

Educational programmes and **awareness campaigns** are key components of this effort, helping to demystify complex energy systems and build **commitment** among residents and businesses to participate in the energy transition. As stakeholders become more familiar with the potential of local energy systems, their confidence and willingness to invest in such innovations increase.

Restrictions/Design Criteria

In the context of Kahlenbergerdorf, where **design restrictions** exist due to the district's historical character, implementing new energy systems can be challenging. The PED framework provides guidance on how to navigate these restrictions while still fostering innovation. For example, **geothermal and underground heat pumps** offer a viable solution in areas where visible infrastructure changes are restricted. These systems operate below the surface, allowing the district to transition to more sustainable heating solutions without compromising its architectural integrity.

In addition, the framework encourages the use of **smart energy systems** that can be integrated discreetly into the existing urban fabric. These systems include **energy storage solutions** and **digital energy management platforms** that optimize energy usage and distribution without requiring extensive physical modifications to buildings or public spaces.

Self-Initiative, Autonomy/Coordination, Networking

The successful deployment of innovative energy systems relies heavily on **coordination** between various stakeholders, including local authorities, residents, and energy providers. The PED framework encourages **self-initiative** by enabling these stakeholders to collaborate on energy projects that suit the specific needs of Kahlenbergerdorf. The establishment of **local energy networks** allows for the shared generation and distribution of energy, making the district more resilient to external energy market fluctuations.

The framework also promotes the concept of **prosumerism**, where residents and businesses not only consume energy but also produce and share it within the community. This model enhances the

autonomy of the district's energy system, reducing dependency on external providers and fostering a collaborative approach to energy innovation.

Key Area: *Uncertainty, Unconcern/Learning* – Addressing the knowledge gaps and uncertainties that can impede the adoption of innovative energy systems is a key focus of the PED framework. The framework promotes learning and awareness as essential strategies, encouraging stakeholders to engage in experimental projects, participate in training, and utilize monitoring and evaluation tools. By fostering a culture of continuous learning, the framework aims to reduce uncertainty and increase stakeholder commitment to the energy transition.

Place-Based Ecological Transition

The **Place-Based Ecological Transition** in Kahlenbergerdorf is a critical component of the PED framework, emphasizing the need to integrate ecological considerations with local urban development. This approach ensures that energy transitions are tailored to the specific environmental, architectural, and social context of the district. By focusing on sustainable energy use, spatial restructuring, and the preservation of the local ecosystem, the framework aligns with Vienna's broader goals of achieving climate neutrality while maintaining the district's unique character.

Costs/Subsidies

The ecological transition in Kahlenbergerdorf is bolstered by various subsidies designed to encourage the sustainable use of local resources. For instance, financial incentives are available for projects that incorporate **nature-based solutions**, such as green roofs and walls, which contribute to the ecological health of the area while improving building energy performance. These subsidies help to offset the additional costs associated with integrating ecological design elements into energy projects.

Moreover, **spatial energy planning** is closely linked to the ecological transition, with public funds allocated for identifying optimal sites for renewable energy installations, such as **solar and geothermal projects**, that minimize environmental impact. By aligning financial support with ecological goals, the framework encourages the adoption of sustainable practices that are economically feasible for local stakeholders.

Uncertainty, Unconcern/Learning (Specialized and Applied Knowledge), Awareness, Commitment

As with other aspects of the PED framework, overcoming **uncertainties** related to the ecological transition is key to its success. Many stakeholders may be unfamiliar with the potential benefits of **nature-based solutions** or hesitant to implement **heritage-sensitive energy upgrades** due to a lack of knowledge. The framework addresses these challenges by fostering **learning opportunities** that focus on the intersection of ecological preservation and energy transition.

Awareness campaigns and **educational programmes** are designed to increase understanding of how ecological approaches, such as the use of local ecosystems to support renewable energy projects, can

contribute to sustainability. By building **commitment** to ecological goals, the PED framework ensures that stakeholders are not only aware of the benefits but are also actively engaged in making the district's energy transition both environmentally and socially responsible.

Restrictions/Design Criteria

Kahlenbergerdorf, with its **protected heritage zones**, presents significant challenges for large-scale energy infrastructure projects. However, the PED framework promotes **place-sensitive design criteria** that allow for ecological and energy transitions to occur in harmony with the district's architectural and cultural heritage. For example, **solar panels** may need to be carefully integrated into the landscape, or **geothermal systems** could be prioritized to avoid altering the visible urban fabric.

The framework provides specific guidelines to ensure that energy efficiency upgrades, such as improved insulation and window replacements, respect the historical integrity of buildings while still enhancing their ecological performance. This balance between modern energy solutions and heritage conservation is essential to maintaining Kahlenbergerdorf's identity while advancing ecological goals.

Self-Initiative, Autonomy/Coordination, Networking

The **place-based approach** of the ecological transition emphasizes the importance of **local initiative** and coordination among community members, local authorities, and energy providers. The PED framework encourages the formation of **local networks** that facilitate the implementation of sustainable practices at the district level. These networks allow stakeholders to share resources, knowledge, and best practices, ensuring that the transition is driven by local needs and expertise.

Coordination between local actors is essential for ensuring that projects are not only ecologically sound but also socially inclusive, addressing the needs of all residents. The framework supports the development of **collaborative governance models** that integrate input from diverse stakeholders, ensuring that ecological projects, such as the management of green spaces or the installation of energy-efficient technologies, are implemented in a way that benefits the entire community.

Key Area: *Restrictions/Design Criteria* – The PED framework carefully navigates the design restrictions that apply in Kahlenbergerdorf, ensuring that energy efficiency measures are implemented without compromising the district's historical character. By providing proactive design criteria and guidelines, the framework helps local stakeholders to meet regulatory requirements while advancing their energy goals. This approach not only preserves the district's heritage but also enhances its long-term sustainability.

Concluding remarks

In this report we have analysed key enabling and disabling mechanisms for the development of Positive Energy Districts in the four pilot neighbourhoods in Bari, Brussels and Vienna, with specific attention to those related to the policy and regulatory framework, as well as to the institutional and relational dynamics. Those mechanisms may effectively foster or hamper the development of a PED and may be determinant for the integration of PED processes with wider spatial strategy making for just energy & climate transitions at both district and urban/region level. Below we summarise the main lessons learned with respect to key challenges and enabling factors for PED transition in each neighbourhood/city. Below a summary of key lessons learned.

Key Challenges and enabling factors for PED Transition in the San Paolo neighbourhood, Bari

Key challenges

The San Paolo neighbourhood represents a particularly challenging context for just energy transitions. The population consists primarily of low-income families residing in social housing managed by ARCA Puglia Centrale. Educational levels are lower than the municipal average, with higher dropout rates during compulsory education. These socio-economic conditions create significant barriers to energy transition, as vulnerable populations face systemic challenges in accessing affordable and reliable energy. Without targeted policy measures, there is a substantial risk that energy transition benefits will disproportionately favour wealthier segments of society, potentially exacerbating existing inequalities.

The ownership structure in the target area presents unique challenges. Most residential buildings are owned by ARCA Puglia Centrale (the regional social housing agency), with only a few units redeemed by former tenants. Public buildings and land are owned by the Municipality of Bari but managed by various organizations. This fragmented ownership and management structure complicates decision-making processes for energy interventions. Building managers, who are typically not residents of the neighbourhood, have limited ties with tenants and possess low engagement levels with community-based energy initiatives.

Despite a comprehensive multilevel regulatory framework supporting renewable energy communities (RECs) and energy efficiency improvements, bureaucratic and administrative complexities frequently impede implementation. The Superbonus 110% incentive scheme, which could have enabled significant energy efficiency renovations in ARCA-owned buildings, expired before contracted works could begin, representing a major missed opportunity. The frequent changes to subsidy schemes (typically every 2-3 years) create uncertainty for long-term planning and investment.

The liberalization of the energy market has created confusion for consumers, particularly vulnerable groups who struggle to understand electricity and gas contracts due to the variety of plans, complex

tariff structures, and market dynamics. While Social Bonuses for energy and gas exist for low-income households (with an estimated 7.6 million households receiving these in 2023), awareness of entitlements remains limited among the target population.

Enabling factors and opportunities

The Municipality of Bari has demonstrated significant commitment to energy transition through its Sustainable Energy Action Plan (SEAP, approved 2011) and the 2024 decision to draft an updated Sustainable Energy and Climate Action Plan. The city leverages regional, national, and EU funds to implement initiatives enhancing energy efficiency and sustainability. The municipality possesses strong human capital with expertise in energy management, urban planning, and social policy, enabling a holistic approach to energy challenges.

The neighbourhood benefits from a rich ecosystem of non-profit organizations, churches, and community groups with strong ties to local residents. Key stakeholders include the Don Bosco Parish and Multifunctional Centre (located in the target area), Casa delle Culture (offering social inclusion services), and numerous associations providing social assistance, educational activities, and community building. These organizations possess high relational capabilities and can serve as facilitators and community builders for PED initiatives. The Don Bosco Parish, in particular, has shown high interest in the project and manages significant spaces suitable for renewable energy installations.

Multiple funding sources may support PED development, including: the National Recovery and Resilience Plan (PNRR) allocations for urban regeneration, social housing improvements, and sustainable mobility; the Regional ERDF/ESF+ 2021-27 programming (€33 million specifically for renewable energy communities, targeting 40 new RECs); the regional "energy income" grants for renewable energy installations (up to €6,000 per household or €8,500 per building); the grants from banking foundations for non-profit organizations in Southern Italy

The neighbourhood's educational institutions (including several comprehensive schools and a vocational high school) represent valuable partners with high relational and technical capabilities. A three-year professional training programme for "electric operators" was recently organized, addressing the need for specialized professionals in the energy supply chain while providing employment opportunities for local youth.

Several urban regeneration projects are creating synergies with energy transition objectives. The "Periferie Programme" includes greening interventions that reduce urban heat island effects. A "climate refugee" square is being developed as a community gathering space designed to reduce cooling needs. Massive upgrades to LED street lighting are underway. These initiatives demonstrate momentum toward place-based ecological transition and provide opportunities for integrated approaches combining energy efficiency with community engagement and climate adaptation.

The Apulia Region has established progressive policies supporting RECs, including specific recognition of "RECs of high social and territorial relevance" that involve low-income groups and social housing management bodies—directly relevant to San Paolo's context. The regional framework provides technical support, monitoring mechanisms, and coordination bodies to facilitate REC development.

In conclusion, the San Paolo neighbourhood presents both significant challenges and promising enabling factors for PED transition. Success will depend on effectively engaging the low-income community, coordinating among diverse stakeholders with fragmented ownership structures, and linking PED development to broader urban regeneration and social inclusion strategies. The strong institutional commitment, engaged civil society, available funding mechanisms, and ongoing regeneration initiatives provide a foundation for just energy transition—provided that processes actively address power imbalances, ensure meaningful community participation, and prioritize benefits for vulnerable populations.

Key Challenges and enabling factors for PED Transition in La Roue and Usquare neighbourhoods, Brussels

Key challenges

The Brussels Capital Region's regulatory framework presents significant complexity for PED development. Multiple administrations—Bruxelles Environnement, Urban Brussels, Perspectives, and individual municipalities—share responsibilities for urban planning and energy transition, each with distinct competencies and priorities. This fragmentation creates what stakeholder analysis identified as "silo working", where administrations operate with limited coordination. In La Roue, this manifested in high conflict levels between residents and local authorities, particularly regarding environmental permit procedures that residents perceived as arbitrary and inconsistent. The stakeholder analysis revealed that despite their crucial roles, these administrations demonstrate very low levels of interaction and cooperation between them, complicating the integrated approach necessary for PED implementation.

Heritage conservation requirements pose substantial barriers, particularly in La Roue where the entire garden city enjoys protected status. Urban Brussels, the heritage authority, exercises strict control over renovation permits and photovoltaic panel installations through numerous criteria. The stakeholder characterization identified Urban as having "important braking force in two axes: the renovation and the renewable production." While Urban agreed to test group renovation approaches, its cautious stance creates delays and uncertainty. This tension between preserving architectural heritage and implementing energy-efficient technologies represents a fundamental challenge requiring careful negotiation and innovative design solutions that respect heritage values while enabling energy transition.

Despite numerous available subsidies (Renolution premiums, FEDER funds, Renolab.ID program, heat pump subsidies), significant financial obstacles persist. Citizens must advance all renovation costs before receiving reimbursement—identified by La Roue residents as a major barrier. This pay-first model disproportionately affects lower-income households and limits participation in collective initiatives. For district heating networks, high investment costs and uncertain operational expenses

create hesitation among key stakeholders. At Usquare, CERIA (Centre for Teaching and Research) demonstrated low commitment to the heating network project despite its central role, primarily due to limited financial resources and dependence on the French Community Commission (COCOF) for budget decisions.

The stakeholder network analysis revealed critical coordination challenges in both neighbourhoods. At La Roue, the Actor Linkage Matrix showed minimal interaction between CERIA, social housing (Foyer Anderlechtois), and residents' collectives – despite all being decisive or dominant stakeholders. Energy providers demonstrated no interaction with most stakeholders except minimal cooperation with local authorities. At Usquare, the situation was more pronounced: social housing provider BinHôme had no interaction with other long-term stakeholders, and the Municipality of Ixelles showed no interest in participating despite its future responsibility for public space management. This lack of stakeholder connectivity undermines collective vision-building and information exchange essential for successful PED development.

Particularly evident at Usquare, stakeholders operate on different timelines, complicating coordination. Temporary residents (NGOs, cooperatives, cultural organizations) played crucial roles in site activation and community building but would eventually depart. Meanwhile, permanent stakeholders like BinHôme and university housing managers had not yet fully engaged. The SAU (Usquare development agency), despite its central coordinating role, struggled to synchronize these varied temporalities and ensure knowledge transfer between phases. This temporal challenge threatens continuity in vision, practices, and social cohesion essential for long-term PED sustainability.

Enabling factors and opportunities

The Brussels Capital Region has established a comprehensive regulatory framework supporting PED development. The March 2022 Ordinance on electricity market organization enables three types of energy communities (Renewable Energy Communities, Local Energy Communities, and Citizen Energy Communities) with flexible membership criteria. The ordinance introduces innovative provisions: differentiated distribution fee discounts based on sharing proximity (51% for same building, 26% for same low-voltage network, 8% for same high-voltage network), and requirements that regulators balance grid cost solidarity with energy community participation incentives. As of October 2024, 13 energy communities existed in the region, demonstrating growing uptake. The "Renolution" strategy provides a holistic framework targeting two-thirds reduction in average housing energy consumption and carbon neutrality in the tertiary sector by 2050.

La Roue demonstrates exceptional community mobilization through its residents' collective, characterized as having very high level of commitment to the decarbonisation of their neighbourhood. The collective successfully leveraged human resources and personal expertise, secured regional subsidies, and exercised lobbying power with political decision-makers – evidenced by the creation of a working group to define "grouped renovation" criteria. The collective maintains the highest number of stakeholder interactions despite administrative obstacles. Habitat and Participation NGO, though resource-limited, provides crucial support through mobilization strategies and communication development. At Usquare, temporary residents and NGOs like Pali-Pali demonstrated strong

capabilities in creating social dynamics and fostering connections, essential for new sites without existing community ties.

Brussels has developed an extensive support ecosystem for energy transition. The free Facilitateur Partage et Communautés d'énergie (Energy Sharing and Communities Facilitator) provides one-stop-shop services, receiving nearly 1,000 consultations in 2023 and supporting 500 energy sharing initiatives. The Sustainable Building Facilitator and Homegrade offer technical advice, while the Réseau Habitat network of NGOs provides administrative support, energy bill analysis, and juridical assistance in vulnerable neighbourhoods. Bruxelles Environnement funds multiple facilitation services and pilot projects, including the innovative Renolab.ID program supporting experimental approaches like La Roue's collective renovation. Digital tools such as TOTEM (environmental impact assessment), online guides, Quickscan, and Compass support citizens in evaluating and improving building sustainability.

Beyond traditional subsidies, Brussels offers innovative funding approaches. The Renolab.ID program specifically supports pilot projects addressing obstacles to sustainable building renovation, with FEDER funding covering up to 80% of costs at Usquare. Sustainable District Contracts and Urban Blocks and Street Contracts provide four-year funding for citizen-led neighbourhood improvement initiatives, requiring minimum participation of 12 citizens and 6 associations to ensure community ownership. Green certificates for photovoltaic installations create ongoing revenue streams for prosumers. The regional "Inspirons le Quartier" program directly funds bottom-up citizen initiatives. These mechanisms recognize that traditional building-by-building approaches are insufficient and that collective, experimental approaches require dedicated financial support.

Despite fragmentation challenges, key institutions demonstrate significant commitment. Bruxelles Environnement, characterized as a "decisive stakeholder" with high resources and capabilities, participates in Citizens4PED, funds facilitator services, and leads the Decarbonation Task Force studying heating network technologies and renewable sources for Brussels. The SAU at Usquare, despite coordination challenges, demonstrates "high management and coordination expertise" and made strategic adaptations to balance Master Development Plan requirements with on-ground realities. The formation of a multi-stakeholder working group at La Roue—bringing together Bruxelles Environnement, Urban, the Municipality of Anderlecht, and citizens—represents progress toward breaking down administrative silos and developing shared definitions for collective approaches.

The Brussels framework's flexibility in defining energy community types creates opportunities for various organizational models suited to different contexts. Local Energy Communities allow production facilities to be owned by members or third parties (requiring only use rights), providing flexibility for social housing contexts. The absence of geographical scope limitations (beyond Brussels Capital Region membership) enables creative configurations. Successful flagship projects—"Nos Bambins" and "SunSud"—demonstrate viability before legal frameworks were established, providing templates and building confidence for new initiatives.

In conclusion, the Brussels experience reveals that PED transition success requires simultaneously addressing regulatory complexity, financial barriers, and stakeholder coordination challenges while

leveraging strong civil society mobilization and comprehensive support infrastructure. La Roue demonstrates that highly motivated community collectives can drive innovation despite administrative obstacles, though their efforts risk exhaustion without streamlined procedures and faster institutional responsiveness. Usquare illustrates that even with strong institutional planning and significant resources, inadequate stakeholder coordination across different temporalities can undermine collective vision and social cohesion.

Critical lessons include: (1) the necessity of breaking down administrative silos through formalized coordination mechanisms beyond ad-hoc working groups; (2) the importance of aligning financial mechanisms with citizen capacity, particularly eliminating advance payment requirements; (3) the value of facilitator services and pilot project funding in enabling experimental, context-specific approaches; (4) the need for proactive stakeholder engagement strategies that account for temporal differences and ensure information flow between project phases; and (5) the potential of energy communities as mechanisms for just transition, provided that regulatory complexity is reduced and technical support is readily accessible. Both neighbourhoods demonstrate that heritage protection and energy innovation can coexist, but require dedicated dialogue, flexible interpretation of regulations, and willingness to experiment with collective approaches that respect local context while achieving ambitious climate goals.

Key Challenges and enabling factors for PED Transition in the Kahlenbergerdorf neighbourhood, Vienna

Key challenges

The most significant challenge facing Kahlenbergerdorf's energy transition stems from its status as a protected heritage zone. These restrictions severely limit visible modifications to buildings, particularly concerning solar panel installations on roofs and façade alterations necessary for thermal insulation. The regulatory framework prioritizes maintaining the historical and architectural integrity of buildings, creating tensions between preservation goals and energy efficiency objectives. Implementing renewable energy technologies requires innovative, often more expensive solutions that align with stringent design criteria. Underground systems like geothermal heat pumps offer viable alternatives but involve higher upfront costs and technical complexity. The framework demands careful navigation between modern energy solutions and heritage conservation, requiring specialized expertise in heritage-sensitive energy upgrades that many stakeholders lack.

The neighbourhood's fragmented ownership structure presents substantial coordination challenges. Klosterneuburg Abbey owns considerable real estate in the area, including the church, vicarage, vineyards, and historic residential buildings, yet demonstrates remarkably low engagement despite having high resources and capabilities. The stakeholder characterization identified the Abbey as a "dormant stakeholder" with substantial potential to catalyze decarbonization but currently showing

no discernible engagement with the local community. Similarly, Wiener Wohnen (Vienna's municipal housing company), managing approximately 220,000 apartments citywide including buildings in Kahlenbergerdorf, has expressed interest but made no concrete commitments, with the area apparently not being a priority in their decarbonization strategy. This lack of engagement from major property owners significantly hampers coordinated action, as successful PED development requires synchronized efforts across multiple buildings and property boundaries.

Critical energy infrastructure stakeholders demonstrate low engagement levels despite possessing high resources and capabilities. Wiener Netze, responsible for electricity, gas, and district heating networks throughout Vienna, is characterized as a "decisive stakeholder" but shows low commitment to specific Kahlenbergerdorf initiatives. The district heating network – Vienna's largest globally – will not be extended to Kahlenbergerdorf, requiring alternative local solutions. Wien Energie, the municipal utility company, similarly demonstrates low engagement despite offering customized heating and cooling solutions. Their services are available in Kahlenbergerdorf, but the company appears "relatively disinclined to engage in the sale of these products" to the community. Via Donau, which owns strategic land and buildings along the Danube shore with excellent potential for photovoltaic installations, shows minimal commitment due to extensive existing responsibilities and limited resources for "comparatively minor, yet innovative, tasks."

Despite Austria's comprehensive subsidy framework – including Green Electricity Act feed-in tariffs, city-level support for PV systems, solar thermal installations, heat pumps, and Vienna's Participatory Climate Budget (approximately 5 million euros per district) – significant financial obstacles persist. The extremely heterogeneous structure of users and property owners complicates collective investment decisions. Many residents are affluent property owners capable of financing renovations, but recent economic downturns have increased reluctance to discuss investment opportunities. The economic viability of proposed solutions, particularly a joint local heating network initially considered by Klimadörfl, proved challenging, with the association ultimately dismissing this solution "on economic grounds." High upfront costs for heritage-appropriate technologies, uncertainties about return on investment timelines, and the complexity of coordinating financing across multiple property owners with different economic capacities create substantial barriers.

Significant uncertainties exist regarding technical feasibility, economic viability, and long-term benefits of innovative energy systems suitable for heritage-protected contexts. The stakeholder analysis revealed expertise deficiencies particularly in architecture and construction within the Klimadörfl association, despite members possessing strong backgrounds in electrical engineering, medicine, property management, physics, law, and economics. Knowledge gaps concern appropriate renovation technologies for historic buildings, integration of renewable energy systems without compromising architectural integrity, and operation of innovative solutions like geothermal systems and low-temperature heating networks. Many residents and property owners remain unfamiliar with nature-based solutions and heritage-sensitive energy upgrades, creating hesitation about implementation.

Enabling factors and opportunities

The establishment of the Klimadörfl association in early 2022 represents a crucial enabling factor, characterized as a "decisive stakeholder" with high resources, high capabilities, and high engagement. The association comprises approximately 50 members who demonstrate exceptional commitment to neighborhood decarbonization. Members contribute diverse professional expertise spanning multiple disciplines, compensating for gaps through partnerships with research organizations (e7, RealityLab, reenag). The association has successfully secured funding for research projects, organized educational events (forums, workshops, seminars on energy, nutrition, mobility), and serves as a contact point for resident concerns. Voluntary contributions from members provide essential human resources that would otherwise be unavailable, with the association functioning as manager or conductor of an orchestrated refurbishment and decarbonisation process on individual properties. This community-driven approach fosters social cohesion, knowledge sharing among residents, and peer-to-peer learning about energy transition possibilities.

Vienna benefits from a robust multilevel regulatory framework supporting PED development. At the national level, Austria has transposed EU Directive 2018/2001/EU through the Renewable Energy Expansion Act, establishing legal foundations for renewable energy communities (RECs). The city has set ambitious targets: decarbonizing all heating infrastructure by 2040 and achieving 100% renewable energy nationally by 2040 (annual balance). Approximately 325 RECs are already operational nationally, with another 400 starting up. Vienna's support infrastructure includes the wohnfonds_wien "Hauskunft" information center providing free advisory services and subsidizing "Future Checks" (building refurbishment assessments) and detailed "Refurbishment Concepts" at 50% subsidy rates. About 10 houses in Kahlenbergerdorf have already utilized the Future Check opportunity. Multiple funding schemes support innovative green buildings, including specific programmes for thermal insulation upgrades (Sockelsanierung, Thewosanierung, Huckepacksanierung) and quality assurance mechanisms like the Grundstücksbeirat (property advisory board).

The Participatory Climate Budget represents an innovative mechanism allocating approximately 5 million euros per district for community-proposed climate projects. This approach empowers residents to directly participate in climate action, ensuring local needs and priorities integrate into district development plans. The bottom-up methodology aligns with the PED framework's emphasis on self-initiative, autonomy, and coordination among local stakeholders. By supporting grassroots involvement, this mechanism reduces financial burdens on individual stakeholders while fostering collective ownership of energy transition processes. The budget enables implementation of renewable energy solutions and energy efficiency measures that might otherwise remain inaccessible, particularly for experimental or innovative approaches requiring initial investment without immediate returns.

Austria's REC framework provides substantial advantages: no capacity limitations for renewable power generation, virtual energy sharing models with smart meter tracking (15-minute intervals), network charge reductions of 28-64% depending on grid level, and mandatory annual balancing data

provision by grid operators. RECs must consist of at least two members forming legal entities delivering ecological, economic, or social benefits. Eligible members include private entities, legal entities, municipalities, local authorities, and SMEs. The geographical scope is flexible, defined by electricity grid levels (local: Grid-Level 6&7 until next transformer; regional: Grid Level 4&5 until next substation). The national Climate & Energy Fund (KLIEN) provides grants of €15,000 per community to support startup, with additional grants available at local, regional, and national levels for building renewable energy production facilities.

Kahlenbergerdorf benefits from partnerships with professional experts providing crucial technical and social support. E7, characterized as a "decisive stakeholder" with high resources, capabilities, and engagement, offers consultancy, planning, and research services on technological feasibility of decarbonization efforts, heating systems, energy community establishment, and building renovation planning. RealityLab provides expertise in organizing social processes, community self-organization, and urban commoning, maintaining close working relationships with Klimadörfl's board and participating in nearly all meetings. Reenag contributes financial expertise and development capabilities for renewable energy projects, assisting with business plan formulation and financing solutions. This professional support compensates for community expertise gaps and provides access to cutting-edge knowledge about heritage-appropriate technologies, innovative financing models, and effective community engagement strategies.

In conclusion, Kahlenbergerdorf demonstrates that heritage-protected neighbourhoods can pursue ambitious climate neutrality goals through community-driven approaches, but success requires addressing the paradox of dormant high-resource stakeholders and navigating complex heritage regulations. The neighbourhood's experience reveals that strong community organization can compensate for institutional inertia to some extent, but cannot fully substitute for engagement from major property owners and infrastructure providers. Critical success factors include: (1) developing heritage-appropriate technical solutions that balance preservation with energy performance; (2) activating dormant stakeholders, particularly Klosterneuburg Abbey and Wiener Wohnen, through concrete proposals demonstrating technical feasibility and economic viability; (3) leveraging Vienna's comprehensive support infrastructure while adapting generic solutions to heritage contexts; (4) utilizing community expertise and peer-to-peer learning to overcome knowledge gaps; and (5) maintaining momentum through visible small-scale successes that build confidence for larger collective investments. The Klimadörfl association's evolution from pursuing a single joint heating network to orchestrating synchronized individual property improvements represents a pragmatic adaptation to complex ownership structures, potentially offering a replicable model for similar heritage contexts where collective infrastructure proves economically or institutionally unfeasible.

References

Regulatory and policy analysis

Allulli, M., & Tortorella, W. (2013). Cities in search of policy. The urban issue in the Italian National Political Agenda. *Métropoles, 12,* 1–18.

Armondi, S. (Ed.). (2018). *Il governo della città complessa. Verso una nuova formazione.* Guerini e Associati.

Austrian Strategy for Adaptation to Climate Change. (2017). Retrieved from https://www.bmk.gv.at/en/topics/climate-environment/climate-protection/austrian-strategy-adaptaion.html

Bauordnung für Wien (BO für Wien). (2024). Retrieved from https://ris.bka.gv.at/NormDokument.wxe?Abfrage=LrW&Gesetzesnummer=20000006&FassungVom=2024-07-03&Artikel=&Paragraf=71a&Anlage=&Uebergangsrecht=

Becker, S., Kunze, C., & Vancea, M. (2017). Community energy and social entrepreneurship: Addressing purpose, organisation and embeddedness of renewable energy projects. *Journal of Cleaner Production, 147,* 25–36. https://doi.org/10.1016/J.JCLEPRO.2017.01.048

Bonifazi, A., & Grassini, L. (2024). Place-based strategies for energy transitions in Apulia: Pilot experiences, limitations, and prospects. In A. Marucci, F. Zullo, L. Fiorini, & L. Saganeiti (Eds.), *Innovation in Urban and Regional Planning* (pp. 523–535). Springer. https://doi.org/10.1007/978-3-030-00000-0

Bonifazi, A., Sala, F., & Bolognesi, M. (2022). Energy community innovations and regional policy diversification in Italy: A preliminary analysis. *2022 AEIT International Annual Conference (AEIT)*, Rome, Italy, 1–6. https://doi.org/10.23919/AEIT56783.2022.9951853

Bundeskanzleramt der Republik Österreich. (2020). *Austria and the 2030 Agenda: Voluntary National Review – Report on the Implementation of the Sustainable Development Goals.* Retrieved from https://sustainabledevelopment.un.org/content/documents/26512VNR_2020_Austria_Report_English.pdf

Bundeskanzleramt der Republik Österreich. (2022). *Landesgesetzblatt für Wien: Wiener Energie- und Klimarechts-Umsetzungsgesetz 2020 – WERUG 2020; Änderung [CELEX-Nr.: 32018L2001].* Retrieved from https://www.ris.bka.gv.at/Dokumente/LgblAuth/LGBLA_WI_20220708_29/LGBLA_WI_20220708_29.html

Bundeskanzleramt der Republik Österreich. (2024a). *Bundesrecht konsolidiert: Gesamte Rechtsvorschrift für Elektrizitätswirtschafts- und -organisationsgesetz 2010, Fassung vom 09.10.2024.* Retrieved from https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20007045

Bundeskanzleramt der Republik Österreich. (2024b). *Bundesrecht konsolidiert: Gesamte Rechtsvorschrift für Systemnutzungsentgelte-Verordnung 2018, Fassung vom 09.10.2024.* Retrieved from https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20010107

Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie (BMK). (2017). *Austrian Strategy for Adaptation to Climate Change.* Retrieved from https://www.bmk.gv.at/en/topics/climate-environment/climate-protection/austrian-strategy-adaptaion.html

Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie (BMK). (2021). *Austria's 2030 Mobility Master Plan.* Retrieved from https://www.bmk.gv.at/en/topics/mobility/mobilitymasterplan2030.html

Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie (BMK). (2024). Retrieved from https://www.bmk.gv.at/

Candelise, C., & Ruggieri, G. (2020). Status and evolution of the community energy sector in Italy. *Energies, 13*(8), 1888. https://doi.org/10.3390/en13081888

Carrosio, G. (2013). Energy production from biogas in the Italian countryside: Policies and organizational models. *Energy Policy, 63,* 3–9. https://doi.org/10.1016/J.ENPOL.2013.08.072

Carrosio, G., & Scotti, I. (2019). The 'patchy' spread of renewables: A socio-territorial perspective on the energy transition process. *Energy Policy, 129,* 684–692. https://doi.org/10.1016/J.ENPOL.2019.02.057

CEC. (1997). *The EU Compendium of Spatial Planning Systems and Policies.* Regional Development Studies No. 28. Luxembourg: Office for Official Publications of the European Communities.

de Vidovich, L., Tricarico, L., & Zulianello, M. (2023). How can we frame energy communities' organisational models? Insights from the research 'Community Energy Map' in the Italian context. *Sustainability, 15*(3), 1997. https://doi.org/10.3390/SU15031997/S1

di Somma, M., Dolatabadi, M., Burgio, A., Siano, P., Cimmino, D., & Bianco, N. (2024). Optimizing virtual energy sharing in renewable energy communities of residential users for incentives maximization. *Sustainable Energy, Grids and Networks, 39,* 101492. https://doi.org/10.1016/J.SEGAN.2024.101492

E-Control Austria. (2024). Retrieved from https://www.e-control.at/

Energieeffizienzgesetz (EEffG) – WKO. (2023). Retrieved from https://www.wko.at/oe/handel/energiehandel/energieeffizienzgesetz

Energiegemeinschaften – Formen von Energiegemeinschaften. (2024). Retrieved from https://energiegemeinschaften.gv.at/formen-von-energiegemeinschaften/

ESF in Österreich. (2024). Retrieved from https://www.esf.at/en/funding-programme/esf-in-oesterreich-2/

Europäische Kommission. (2019). Empfehlung der Kommission vom 18. Juni 2019 zum Entwurf des integrierten nationalen Energie- und Klimaplans Österreichs für den Zeitraum 2021-2030. Retrieved from https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32019H0903(20)&from=EN

Eurostat. (2024a). *nrg_pc_204.* Retrieved from https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_PC_204

Eurostat. (2024b). *nrg_pc_205.* Retrieved from https://ec.europa.eu/eurostat/web/products-datasets/-/nrg_pc_205

Gesamte Rechtsvorschrift für Wiener Wohnbauförderungs- und Wohnhaussanierungsgesetz (Wohnbauförderungsgesetz). (2024). Retrieved from https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrW&Gesetzesnummer=20000049

Grünstattgrau Forschungs- und Innovations-GmbH. (2024). Retrieved from https://gruenstattgrau.at/

Klima- und Energiefonds. (2024). Download-Bereich. Retrieved from https://energiegemeinschaften.gv.at/downloadbereich/

KliP Wien - Klimaschutzprogramme 1999 bis 2021 - Stadt Wien. (n.d.). Retrieved from https://www.wien.gv.at/umwelt/programm-klip

Magistrat der Stadt Wien, Technische Stadterneuerung. (2024). Termine. Retrieved from https://www.gbstern.at/termine/

Magnani, N., & Osti, G. (2016). Does civil society matter? Challenges and strategies of grassroots initiatives in Italy's energy transition. *Energy Research and Social Science, 13,* 148–157. https://doi.org/10.1016/j.erss.2015.12.012

Neugebauer, W., & Stroissnig, U. (2021). Country profile of Austria. Hannover: ARL Country Profiles. Retrieved from https://www.arl-international.com/knowledge/country-profiles/austria/rev/4121

Organisation for Economic Co-operation and Development (OECD). (n.d.). Regional development. https://doi.org/10.1787/9789264271906-en

Österreichisches Raumordnungsgesetz. (n.d.). Retrieved from https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LROO&Gesetzesnummer=10000370

Parlament Österreich. (2017). Kleine Ökostromnovelle (288/ME). Retrieved from https://www.parlament.gv.at/gegenstand/XXV/ME/288?selectedStage=100

Renowave.at e.G. (2024). Retrieved from https://www.renowave.at/

Scarlat, N., Dallemand, J. F., Motola, V., & Monforti-Ferrario, F. (2013). Bioenergy production and use in Italy: Recent developments, perspectives, and potential. *Renewable Energy, 57,* 448–461. https://doi.org/10.1016/J.RENENE.2013.01.014

Stadt Wien. (2022). *Climate roadmap.* Retrieved from https://www.wien.gv.at/english/environment/klip/program.html

Stadt Wien. (2024). *WieNeu+.* Retrieved from https://wieneuplus.wien.gv.at/

Stadt Wien. (n.d.). Technische Stadterneuerung. Retrieved from https://www.wien.gv.at/wohnen/wohnbautechnik/

Stadt Wien. (n.d.). ViennaGIS – Applikationen. Retrieved from https://www.wien.gv.at/viennagis/applikationen.html

Staatspreis Architektur & Nachhaltigkeit 2021: Massivbau punktet bei Neubau- und Sanierungspreisen | Fachverband der Stein- und keramischen Industrie. (2021). Retrieved from https://www.ots.at/presseaussendung/OTS_20211208_OTS0050/staatspreis-architektur-nachhaltigkeit-2021-massivbau-punktet-bei-neubau-und-sanierungspreisen

Stadtentwicklungsplan 2035. (n.d.). Retrieved from https://www.wien.gv.at/stadtentwicklung/strategien/step/step2035/

Urban@it. (2016). *Rapporto sulle città. Metropoli attraverso la crisi.* Bologna: il Mulino.

Wirth, S. (2014). Communities matter: Institutional preconditions for community renewable energy. *Energy Policy, 70,* 236–246. https://doi.org/10.1016/J.ENPOL.2014.03.021

Stakeholder Analysis

Alpagut, B., & others. (2020). *MAKING-CITY Innovation Action, D4.1 Methodology and Guidelines for PED Design.* Retrieved from https://makingcity.eu/wp-content/uploads/2021/12/MakingCity_D4_1_Methodology_and_Guidelines_for_PED_design_final.pdf

Bastian, M., Heymann, S., & Jacomy, M. (2009). Gephi: an open-source software for exploring and manipulating networks. *Third International AAAI Conference on Weblogs and Social Media.* Retrieved from https://www.aaai.org/ocs/index.php/ICWSM/09/paper/view/154

Biggs, S., & Matsaert, H. (1999). An actor-oriented approach for strengthening research and development capabilities in natural resource systems. *Public Administration and Development, 19,* 231–262.

Biggs, S., & Matsaert, H. (2004). Strengthening poverty reduction programmes using an actor-oriented approach: Examples from natural resources innovation systems. *AgREN Network Paper 134.* London: The Overseas Development Institute.

Billgren, C., & Holmén, H. (2008). Approaching reality: Comparing stakeholder analysis and cultural theory in the context of natural resource management. *Land Use Policy, 25*(4), 550–562. https://doi.org/10.1016/j.landusepol.2007.11.004

Black, J. (2008). Constructing and contesting legitimacy and accountability in polycentric regulatory regimes. *Regulation & Governance, 2*(2), 137-164. https://doi.org/10.1111/j.1748-5991.2008.00034.x

Boll, J. R., Dorizas, V., Broer, R., & Toth, Z. (2021). Policy mapping and analysis of plus-energy buildings and neighborhoods: Barriers and opportunities of plus-energy neighborhoods in the national and local regulatory framework. *Deliverable 5.1, Sustainable Plus Energy Neighborhoods (Syn.ikia) Horizon Project.* Retrieved from https://www.synikia.eu/wp-content/uploads/2021/06/syn.ikia_policy-mapping-SPEN-1.pdf

Bertelsen, S., Livik, K., & Myrstad, M. (2019). *D2.1 Report on Enabling Regulatory Mechanism to Trial Innovation in Cities. +CityxChange, Work Package 2, Task 2.1.* Retrieved from https://cityxchange.eu/wp-content/uploads/2019/08/D2.1-Report-on-Enabling-Regulatory-Mechanism-to-Trial-Innovation-in-Cities.pdf

Bouzarovski, S. (2020). Transforming urban energy demand: A timely challenge. *Frontiers in Sustainable Cities, 2,* 554175. https://doi.org/10.3389/frsc.2020.00029

Butterfield, K. D., Reed, R., & Lemak, D. J. (2004). An inductive model of collaboration - From the stakeholder's perspective. *Business & Society, 43*(2), 162–195. https://doi.org/10.1177/0007650304265956

Cities4PEDs. (2021). *Goals and relevant aspects of a common PED definition - Integrative working document as part of WP2.* Retrieved from https://energy-cities.eu/wp-content/uploads/2021/11/Cities4PEDs-Definition-Nov.-2021.pdf

Coutard, O., & Rutherford, J. (2010). Energy transition and city-region planning: Understanding the spatial politics of systemic change. *Technology Analysis & Strategic Management, 22*(6), 711–727. https://doi.org/10.1080/09537325.2010.496284

Day, R., Walker, G., & Simcock, N. (2016). Conceptualising energy use and energy poverty using a capabilities framework. *Energy Policy, 93,* 255–264. https://doi.org/10.1016/j.enpol.2016.03.019

De Laurentis, C., & Pearson, P. J. G. (2021). Policy-relevant insights for regional renewable energy deployment. *Energy, Sustainability and Society, 11*(1), 19. https://doi.org/10.1186/s13705-021-00295-4

Enger, S. G., & Gulbrandsen, M. (2020). Orchestrating collaborative projects: Inside ICT networks in Horizon 2020. *Science and Public Policy, 47*(3), 396–409. https://doi.org/10.1093/scipol/scaa021

Erba, S., Pagliano, L., Maestosi, C., Lai, C. M., & Phelan, P. E. (2021). Combining sufficiency, efficiency, and flexibility to achieve positive energy districts targets. *Energies, 14*(15), 4697. https://doi.org/10.3390/en14154697

Feldpausch-Parker, A. M., Endres, D., Peterson, T. R., & Gomez, S. L. (Eds.). (2021). *Routledge Handbook of Energy Democracy* (1st ed.). London: Routledge. https://doi.org/10.4324/9780429402302

Gauthier, C., & Lowitzsch, J. (2019). Outlook: Energy transition and regulatory framework 2.0: Insights from the European Union. In Lowitzsch, J. (Ed.), *Energy Transition* (pp. 733–765). Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-319-93518-8_30

Greenland, S. J., Combe, I. A., & Farrell, A. M. (2016). Stakeholder preference and stated vs derived importance satisfaction research. *International Journal of Market Research, 58*(1), 35–56. https://doi.org/10.2501/IJMR-2016-005

Grimble, R., & Wellard, K. (1997). Stakeholder methodologies in natural resource management: A review of principles, contexts, experiences, and opportunities. *Agricultural Systems, 55*(2), 173–193. https://doi.org/10.1016/s0308-521x(97)00006-1

Grossmann, K. (2019). Using conflicts to uncover injustices in energy transitions: The case of social impacts of energy efficiency policies in the housing sector in Germany. *Global Transitions, 1,* 148–156. https://doi.org/10.1016/j.glt.2019.10.003

Hills, J. (2011). Fuel poverty—the problem and its measurement: Interim report of the Fuel Poverty Review. *CASE Report, 69.* London: Centre for Analysis of Social Exclusion, London School of Economics and Political Science. Retrieved from https://webarchive.nationalarchives.gov.uk/ukgwa/20121217154326/http://www.decc.gov.uk/en/content/cms/funding/fuel_poverty/hills_review/hills_review.aspx

Hoppe, T., & Miedema, M. (2020). A governance approach to regional energy transition: Meaning, conceptualization, and practice. *Sustainability, 12*(3), 915. https://doi.org/10.3390/su12030915

IPCC, Intergovernmental Panel on Climate Change. (2022). *Mitigation of Climate Change: Working Group III Contribution to the Sixth Assessment Report, Summary for Policy Makers.*

JPI Urban Europe/SET Plan Action 3.2. (2020). *White Paper on PED Reference Framework for Positive Energy Districts and Neighbourhoods.* Retrieved from https://jpi-urbaneurope.eu/ped

Junker, B., Buchecker, M., & Müller-Böker, U. (2007). Objectives of public participation: Which actors should be involved in the decision making for river restorations? *Water Resources Research, 43*(10), 10438. https://doi.org/10.1029/2006wr005584

Khanra, S., Kaur, P., Joseph, R. P., Malik, A., & Dhir, A. (2022). A resource-based view of green innovation as a strategic firm resource: Present status and future directions. *Business Strategy and the Environment, 31*(4), 1395–1413. https://doi.org/10.1002/bse.2961

Lennon, B., Dunphy, N. P., & Sanvicente, E. (2019). Community acceptability and the energy transition: A citizens' perspective. *Energy, Sustainability and Society, 9*(1), 1–18. https://doi.org/10.1186/s13705-019-0218-z

Luyet, V., Schlaepfer, R., Parlange, M. B., & Buttler, A. (2012). A framework to implement stakeholder participation in environmental projects. *Journal of Environmental Management, 111,* 213–219. https://doi.org/10.1016/j.jenvman.2012.06.026

Maor, M., & Howlett, M. (2022). Measuring policy instrument interactions in policy mixes: Surveying the conceptual and methodological landscape. In *The Routledge Handbook of Policy Tools* (pp. 453–465). https://doi.org/10.4324/9781003163954-43

Majone, G. (1997). From the positive to the regulatory state: Causes and consequences of changes in the mode of governance. *Journal of Public Policy, 17*(2), 139–167. https://doi.org/10.1017/s0143814x00003524

Marcon Nora, G. A., Alberton, A., & Ayala, D. H. F. (2023). Stakeholder theory and actor-network theory: The stakeholder engagement in energy transitions. *Business Strategy and the Environment, 32*(1), 673–685. https://doi.org/10.1002/bse.3168

Matschoss, K., & Repo, P. (2020). Forward-looking network analysis of ongoing sustainability transitions. *Technological Forecasting and Social Change, 161,* 120288. https://doi.org/10.1016/j.techfore.2020.120288

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *The Academy of Management Review, 22*(4), 853. https://doi.org/10.2307/259247

Newman, J. (Ed.). (2005). *Remaking Governance: Peoples, Politics and the Public Sphere.* Bristol: The Policy Press.

Oikonomou, V., & Jepma, C. J. (2008). A framework on interactions of climate and energy policy instruments. *Mitigation and Adaptation Strategies for Global Change, 13*(2), 131–156. https://doi.org/10.1007/s11027-007-9082-9

Persia, M., Balena, P., Bonifazi, A., Marzulli, M. I., Orlando, A., & Torre, C. M. (2020). Sustainable local development and smart specialization strategies: Recent developments in agri-food research and innovation partnerships in Puglia, Italy. In O. Gervasi, B. Murgante, S. Misra, C. Garau, I. Blečić, D. Taniar, B. O. Apduhan, A. M. A. C. Rocha, E. Tarantino, C. M. Torre, & Y. Karaca (Eds.), *Computational Science and Its Applications – ICCSA 2020: 20th International Conference, Cagliari, Italy, July 1–4, 2020, Proceedings, Part V.* Lecture Notes in Computer Science, Vol. 12253 (pp. 221–236). Springer International Publishing. https://doi.org/10.1007/978-3-030-58814-4

Putra, Z. D. W., & van der Knaap, W. (2019). A smart city needs more than just technology: Amsterdam's energy atlas project. In L. Anthopoulos (Ed.), *Smart City Emergence* (pp. 129–147). Amsterdam: Elsevier. https://doi.org/10.1016/b978-0-12-816169-2.00006-7

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C. H., Quinn, C. H., & Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management, 90*(5), 1933–1949. https://doi.org/10.1016/j.jenvman.2009.01.001

Ruggiero, S., Onkila, T., & Kuittinen, V. (2014). Realizing the social acceptance of community renewable energy: A process-outcome analysis of stakeholder influence. *Energy Research and Social Science, 4,* 53–63. https://doi.org/10.1016/j.erss.2014.09.001

Scott, J. (2012). *Social Network Analysis.* London: Sage.

Selman, P. (2004). Community participation in the planning and management of cultural landscapes. *Journal of Environmental Planning and Management, 47*(3), 365–392. https://doi.org/10.1080/0964056042000216519

Shnapp, S., Paci, D., & Bertoldi, P. (2020). *Enabling Positive Energy Districts across Europe: Energy efficiency couples renewable energy.* EUR 30280 EN. Luxembourg: Publications Office of the European Union. https://doi.org/10.2760/452028

Sovacool, B. K. (2010). A critical stakeholder analysis of the Trans-ASEAN Gas Pipeline (TAGP) Network. *Land Use Policy, 27*(3), 788–797. https://doi.org/10.1016/j.landusepol.2009.10.012

Suchiradipta, B., & Raj, S. (2015). Agricultural Innovation Systems (AIS): A study of stakeholders and their relations in the system of rice intensification (SRI). *The Journal of Agricultural Education and Extension, 21*(4), 343–368. https://doi.org/10.1080/1389224x.2014.939200

Sufficiency Manifesto. (2024). *Resilient and resource-wise Europe: Sufficiency at the heart of the EU's future.* Retrieved from https://fedarene.org/sufficiency-manifesto-towards-a-resilient-and-resource-wise-europe

Varvasovszky, Z., & Brugha, R. (2000). How to do (or not to do)… A stakeholder analysis. *Health Policy and Planning, 15*(3), 338–345. https://doi.org/10.1093/heapol/15.3.338

Yoo, H.-K., Nguyen, M.-T., Lamonaca, L., Galanakis, K., & Ackrill, R. (2021). Socio-economic factors and citizens' practices enabling Positive Energy Districts: Challenging 'silo thinking' for promoting PEDs. *Smart Value Generation by Building Efficiency and Energy Justice for Sustainable Living (Smart-BEEjS Horizon 2020 project), Deliverable 3.2.* Retrieved from https://smart-beejs.eu/deliverables

PED enabling framework

ARERA. (2024). *I bonus sociali elettrico e gas: stato di attuazione per l'anno 2023.* 277/2024/I/COM.

Bouzarovski, S., et al. (2018). Energy poverty in the European Union: A review of the literature and policy initiatives. *Energy Policy, 116,* 30–39. https://doi.org/10.1016/j.enpol.2018.02.010

European Commission. (2019). *A clean planet for all: A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy.*

Feldpausch-Parker, A. M., Endres, D., Peterson, T. R., & Gomez, S. L. (Eds.). (2021). *Routledge handbook of energy democracy* (1st ed.). London: Routledge. https://doi.org/10.4324/9780429402302

Hajer, M. A. (1997). *The politics of environmental discourse: Ecological modernization and the policy process.* Oxford: Oxford University Press.

Lipari, S. (2020). Industrial-scale wind energy in the Italian southern Apennine: Territorio grabbing, value extraction, and democracy. *Scienze del Territorio, 8,* 154–164.

Magnaghi, A., & Sala, F. (Eds.). (2013). *Il territorio fabbrica di energia.* Milano: Wolters Kluwer Italia.

Magnani, N., & Carrosio, G. (2021). *Understanding the energy transition: Civil society, territory and inequality in Italy.* Cham: Palgrave Macmillan.

Scheidel, A., Sorman, A. H., Avila, S., Del Bene, D., & Ott, J. (2023). Renewables grabbing: Land and resource appropriations in the global energy transition. In A. Neef, C. Ngin, T. Moreda, & S. Mollett (Eds.), *Routledge handbook of global land and resource grabbing* (pp. 189–204). Abingdon and New York: Routledge.

Sovacool, B. K. (2021). Who are the victims of low-carbon transitions? Towards a political ecology of climate change mitigation. *Energy Research & Social Science, 73,* 101916. https://doi.org/10.1016/j.erss.2020.101916

Citizens4PED TEAM

Coordinator:

ULB IGEAT	Université Libre de Bruxelles (ULB)

Partners:

e7 ENERGY INNOVATION ENGINEERING	e7 Energy Markt Analyse GmbH (e7)
VUB VRIJE UNIVERSITEIT BRUSSEL	Brussels Institute for Thermal-fluid systems and clean Energy (BRITE) for Vrij Universiteit Brussel (VUB)
Anderlecht 1070	Anderlecht Municipality – Division: Sustainable development (Anderlecht)

	Bruxelles Environnment Division: Air Climat, Energy Sustainable Buildings (Bruxelles Environnement)
	Resolia Engineering bureau Sustainable & efficient thermal networks (Resolia)
	Arteria technologies engineering bureau (Arteria)
	Realitylab consultancy bureau (realitylab)
	FH Technikum Wien (FHTW) University of Applied Science Vienna
	Bari Municipality
	Politecnico di Bari

	ARCA Puglia Centrale
	Ricerca Sistema Energetico
	UNI

CONTACT

Project Coordinator:

Université Libre de Bruxelles

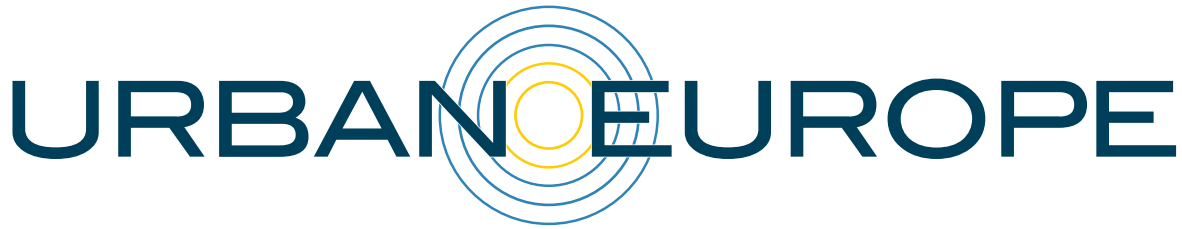
Grégoire Wallenborn | gregoire.wallenborn@ulb.be

WP5 Leaders:

Polytechnic University of Bari

Laura Grassini | laura.grassini@poliba.it

Alessandro Bonifazi | alessandro.bonifazi@poliba.it



This project has received funding from the European Union's Joint Programme Initiative Urban Europe programme and is co-funded by the following Funding Agencies:

Région de Bruxelles-Capitale – Innoviris

The Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) of Austria

The Italian Ministry of University and Research