

Strategy to create the proper legal, technical and social conditions for energy communities

Output 1.1

Prepared in the framework of the project:

DRP0200163 – NRGCOM - Creating appropriate operational conditions for renewable energy communities in the Danube Region

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Executive Summary

The Danube Region relies heavily on imported, fossil-fuel energy sources, which raises environmental, efficiency and security concerns. The concept of renewable energy communities (RECs) is not widely known in the region, and their operation is often hampered by legal, internal operational, infrastructural or technical barriers.

The overall goal of the NRGCOM project, funded by the Interreg Danube Region Programme and co-funded by the European Union, is to overcome these challenges and enhance the spread of energy communities by creating an appropriate environment for their proper functioning in the Danube Region. NRGCOM builds on a multilevel approach, gathering 13 Project Partners (PPs) +14 Associated Strategic Partners (ASPs) from 12 countries, including local / regional / national authorities, energy, development and sectoral agencies, one EGTC, NGOs, interest groups, higher education and research institutions and renewable energy source service providers.

In line with project specific objective 1 (SO1), *Initiating the establishment of the proper legal, operational and social environment for RECs*, this document focuses on the objective framework and strategic goals to create the legal, technical and social conditions for energy communities. It visualises a future state which will be achieved by taking certain steps based on extensive research, conclusions of national and transnational events and national reports from the 12 partner countries.

The vision of this strategy is accessible energy from renewable sources with low risk of dependence in the Danube Region countries. The mission of this strategy regarding the path towards reaching this future status is to ensure the necessary conditions for establishing energy communities through the following strategic objectives:

- legislative background, legal harmonisation;
- economic conditions, financial sources, funding opportunities, business models;

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- clarification of technical requirements and their adaptability;
- building valued and empowered communities to make meaningful contributions to the development of energy communities.

A robust legal framework is vital for renewable energy communities (RECs) in the Danube Region, as legal and policy challenges vary widely across countries. While most EU members support energy communities through EU grants, non-EU countries still require foundational legal structures, including specific bylaws for grid access, tariff models, and energy sharing.

Effective governance and social inclusion are key, ensuring active involvement, transparent decision-making, and fair benefit distribution among members. Engaging stakeholders—individuals, groups, and organisations affected by or influencing energy community activities—is central to ECs' strategic, long-term success. Constant communication with stakeholders allows ECs to address issues and adapt to community needs.

The focus of NRGCOM is on RECs (Renewable Energy Communities), aiming to strengthen and promote their development in the Danube Region to reduce the region's significant dependence on fossil-fuel energy. Within the project, the partners reviewed legal frameworks, analysed the operational systems and governance models of existing RECs, and collected best practices on the topic. contribution to the transition to renewable energy sources within the Danube Region Programme area. The strategy for the expansion of RECs involves three phases: (1) preparation and stakeholder engagement; (2) pilot actions and operational support; and (3) scaling and institutionalisation. Each Project Partner will contribute based on expertise and regional knowledge, with clear roles defined.

For monitoring, key elements include setting Key Performance Indicators (KPIs), data collection, feedback mechanisms, and annual evaluations, ensuring that the strategy remains responsive to changing needs and challenges.

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Introduction

This document is prepared in the framework of the project: DRP0200163 – NRGCOM – *Creating appropriate operational conditions for renewable energy communities in the Danube Region*. In line with the EU Strategy for the Danube Region (EUSDR) and the Interreg Danube Region Programme objectives, the NRGCOM project aims to reduce the challenges of energy dependency and greenhouse gas (GHG) emissions by identifying and improving the operational conditions of renewable energy communities in the Danube Region. Through transnational knowledge exchange, creating energy communities and improving the internal functioning of existing RECs, the project intends to increase local/regional energy production and consumption, while inducing more sustainable and efficient energy management and enhancing energy security in the Danube Region.

This strategy builds on extensive and in-depth research and collection of evidence-based and upto-date information on community energy initiatives in the partner countries. To achieve project specific objective 1 (SO1), the partners compared their national legal frameworks, analysed bustiness models and stakeholder management practices, mapped good governance techniques and internal operational models, assessed possible low-cost infrastructure investments and developments, developed policy recommendations and organised transnational roundtable discussions and internal workshops to jointly design the appropriate legal, operational and financial environment for the creation of energy communities in the Danube Region. Based on the gathered knowledge and results, the Project Partners jointly developed this Strategy, which will be widely disseminated among stakeholders across the Danube Region, further refined during project implementation, and ultimately incorporated into the project's final deliverable, the White Paper (Output 3.3).

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Background on renewable energy communities and their importance

The Danube Region relies heavily on imported, fossil-fuel energy sources, which raises environmental, efficiency and security concerns. The concept of renewable energy communities (RECs) is not widely known in the region, and their operation is often hampered by legal, internal operational, infrastructural or technical barriers.

An energy community, by definition, is an energetically self-sufficient or nearly self-sufficient association. It includes members who generate energy, some who both generate and consume energy, and others who only consume. Producers can include solar panels, biogas plants, or wind turbines, which are funded through the energy community's collective budget. Consumers may range from an office, a business, a warehouse, or even an electric vehicle charging station. If there is a surplus of energy, storage solutions ensure that the excess energy, not immediately needed, can be saved for later use.

Energy communities (ECs) usually take the form of associations, cooperatives, or similar entities, structured to emphasise economic efficiency and environmental responsibility. Financing is critical for ECs, relying on subsidies, EU funds, business activities, and private investment, with new EU programmes like Interreg and Horizon providing substantial support. The economic model typically involves non-profit structures that prioritise community benefit and inclusive participation.

The European Union has introduced the concept of energy communities into its legislation, in particular civil (CEC) and renewable energy communities (REC) through the Clean Energy for All Europeans package adopted back in 2019. Renewable energy communities can generally be seen as a subset, or type, of citizen energy community.

The Directive on Common Rules for the Internal Market in Electricity ((EU) 2019/944) contains new rules that allow active participation of consumers, individually or through civil energy communities,

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in all markets, either by producing, consuming, sharing or selling electricity, or by providing flexibility services through demand response. Instead of making a profit, as is the case with traditional energy companies, energy community initiatives focus primarily on providing affordable energy of a certain type (e.g. energy from RES) to its members or associates.

What unites these components into a whole - forming a true community - is that all energyproducing and storage devices, as well as all consumers, are interconnected. A smart grid software system keeps track of all energy produced and consumed, directing it to the appropriate destinations. Ideally, an energy community should generate slightly more energy than its members consume, allowing it to be entirely independent of the main grid. However, if this balance is not achieved and there is either too much or too little energy, the community can trade with the universal service provider. Ultimately, an energy community is an optimal way to ensure that all generated energy is utilised locally, in the most efficient way possible.

The NRGCOM project in a nutshell

The overall goal of NRGCOM is to enhance the spread of energy communities by creating an appropriate environment for their proper functioning in the Danube Region. NRGCOM builds on a multilevel approach, gathering 13 PPs +14 ASPs from 12 countries, including local / regional / national authorities, energy, development and sectoral agencies, one EGTC, NGOs, interest groups, higher education and research institutions and a renewable energy source service provider.

The main objective of NRGCOM is to promote the expansion of energy communities by fostering a supportive environment for their effective operation in the Danube Region. The project follows a multilevel approach, uniting 13 PPs and 14 ASPs from 12 countries. These include local, regional, and national authorities, energy and development agencies, sectoral bodies, one EGTC, NGOs, interest groups, academic and research institutions, and a renewable energy service provider.

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Within the project, the partners will review the legal frameworks, analyse the operation systems and governance techniques of existing RECs and collect best practises in the subject, in order to develop policy recommendations to remove the bottlenecks encountered, and jointly design a model and prepare a strategy for the creation of proper conditions for RECs establishment in the Danube Region. Through public awareness raising actions, the partnership will enhance the spread of the concept in their countries.

Within the project, the partners reviewed the legal frameworks, analysed the operating systems and governance techniques of existing RECs, and collected best practices on the subject in order to develop policy recommendations to address the identified bottlenecks. They jointly designed a model and prepared a strategy for creating the proper conditions for the establishment of RECs in the Danube Region. Through public awareness-raising actions, the partnership enhanced the spread of the concept in their countries.

By encouraging and supporting local self-production and consumption, NRGCOM will make a great contribution to the transition to renewable energy sources in the DRP area.

The need for transnationality is underlined by the diversity of partner countries' experiences with renewable energy communities: while in Austria, Germany (with more than 1500 RECs) offer a unique 'civil corporation' model, facilitating citizen-led projects by minimising setup complexity and costs, albeit with personal liability for members. .the Czech Republic or Slovenia, the legal framework for renewable energy communities is well-established and RECs have been developing for many years, whereas in Montenegro, Bulgaria, the Republic of Serbia and the Republic of Moldova there are no functioning energy communities. There are REC initiatives in Croatia, Romania, Slovakia and Hungary, but there are many obstacles hindering their proper functioning. Thus, NRGCOM not only aims to expand knowledge on an external level but builds on peer learning between the partners as well. The partners that need expertise and suggestions will be able to learn from partners from more experienced countries within the project.

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The project builds on three main objectives: 1) initiating the establishment of the proper conditions for energy community in the Danube Region, 2) raising awareness on the importance of the transition to renewable energy sources (RES) and the community-led energy initiatives, 3) supporting energy communities to operate properly and efficiently in the Danube Region.

The project will explore and propose legal solutions, and analyse various operational models, to promote the creation of the necessary and appropriate conditions for the creation of energy communities. In order to raise awareness on current energy challenges in the Danube Region and to achieve the most widespread change possible, the partners will address and involve various authorities and agencies, municipalities, members of energy communities, NGOs, SMEs, operators and service providers, as well as the general public, and develop and test incentive methodologies to enhance behavioural change. PPs will educate and train the target audience to become environmental and energy-conscious and to set up RECs.

Goals and scope of the strategy within the NRGCOM project

In line with project specific objective 1 (SO1), namely: *Initiating the establishment of the proper legal, operational and social environment for RECs*, this document focuses on the objective framework and strategic goals to create the legal, technical and social conditions for energy communities. It visualises a future state which will be achieved by taking certain steps based on national reports from the 12 partner countries.

The vision of this strategy is accessible energy from renewable sources with low risk of dependence in the Danube Region countries. The mission of this strategy regarding the path towards reaching this future status is to ensure the necessary conditions for establishing energy communities through the following strategic objectives:

• legislative background, legal harmonisation;

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- economic conditions, financial sources, funding opportunities, business models;
- clarification of technical requirements and their adaptability;
- building valued and empowered communities to make meaningful contributions to the development of energy communities.

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vision

ACCESSIBLE ENERGY FROM RENEWABLE SOURCES WITH LOW RISK OF DEPENDENCE IN THE DANUBE REGION COUNTRIES

mission

ENSURING THE NECESSARY CONDITIONS FOR ESTABLISHING ENERGY COMMUNITIES

3

strategic objectives

LEGISLATIVE BACKGROUND & LEGAL HARMONIZATION

ECONOMIC CONDITIONS, FINANCIAL SOURCES, FUNDING OPPORTUNITIES, BUSINESS MODELS

CLARIFICATION OF TECHNICAL REQUIREMENTS & THEIR ADAPTABILITY

VALUED & EMPOWERED COMMUNITIES

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I. Appropriate legal environment for energy communities

Establishing a robust legal environment is essential to the successful implementation and growth RECs. Across Europe, diverse legal frameworks shape REC development, from established systems in Austria and Germany to emerging frameworks in Slovakia, Serbia, and Romania. Key challenges facing RECs include administrative complexities, financial constraints, and limitations in grid access.

Countries like Austria and Germany benefit from advanced frameworks but still encounter barriers in grid connection costs and regulatory complexities, which can inhibit community engagement. For nations newer to the concept, such as Moldova and Montenegro, the absence of well-defined regulations poses a primary obstacle, necessitating new policies aligned with EU standards to foster local renewable production and energy-sharing.

The policy recommendations developed by the partners emphasise the need for simplified procedures, improved financial support, and accessible educational resources. Financial incentives, public awareness, and streamlined regulatory processes are repeatedly identified as vital for REC growth, particularly in regions where coal dependence or limited infrastructure still dominate, such as Serbia and Bulgaria. By establishing clear and supportive legal frameworks, nations can accelerate the transition to sustainable, community-led energy solutions.

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I.I Legal background of energy communities in the Danube Region

To compare the status of the development / implementation of the renewable energy communities in the countries of the Danube region, we present the key findings of reports conducted 2024 Q1-Q2, which covered the readiness of the legal framework, the availability of support and implementation practices.

Requirements of relevant EU level directives have been transposed into national legal frameworks in all EU member states. Although some countries lack the secondary regulation covering different aspects of ECs regarding the access to the grid, energy sharing etc. While other countries still are in the developing phase and knowledge transfer from EU countries is necessary for improvement.

Funds for financing production and promotion of energy communities are available in different forms across member states, however in some countries supporting mechanisms shall be established.

I.I.I Danube Region countries with an elaborate legal framework

Austria has a legal framework for RECs and CECs, with a single point of contact, registration procedures, grid connection rules, and tariffs by category. Support schemes, funded nationally and regionally through EU funds, aid energy communities, with generation facilities operating since 2017.

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In **Czechia**, the legal framework was updated in January 2024, defining registration procedures, capacity categories, grid connection, and tariffs. Financial mechanisms are available, yet regional restrictions and sharing limitations require further refinement for effective practice.

Germany also has a framework, with REC defined and CEC to be incorporated. Procedures and support schemes, like feed-in tariffs and incentives, support energy communities, active since 2005, with continued implementation planned.

Slovenia has a framework with defined REC/CEC registration, grid connection rules, and tariffs. Support mechanisms are active, yet increased promotion by municipalities and regional agencies is crucial to boost community engagement.

I.I.II Danube Region countries with inadequate legal framework

In **Croatia**, a legal framework defines energy community categories, grid connection procedures, and EU-funded support. However, REC implementation is minimal due to complex establishment processes and a need to streamline the framework.

Hungary's framework outlines REC setup procedures but lacks defined roles for network and service providers. Legal barriers prevent public entities from joining energy communities, and financial support is insufficient, resulting in a low number of registered communities and a delayed start-up of operation.

In **Romania**, the framework covers registration and grid connection, yet clearer definitions for RECs and CECs are necessary. EU-funded national and regional support exists, but stronger promotion is needed for growth.

In **Slovakia**, the framework includes a single point of contact and registration procedures, but support mechanisms are still under development.

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I.I.III Danube Region countries with an undeveloped legal framework

In **Bulgaria**, RECs are legally acknowledged, but specific bylaws are still being developed. A national scheme for renewable energy sources (RES) is in place, currently limited to household prosumers.

In **Moldova**, the legal foundation for RECs exists, but further assessment and detailed by-laws are required to clarify various aspects. Financing support mechanisms for RECs are planned for implementation once the legal framework is complete.

In **Montenegro**, a RES law, which will govern RECs, is under development. Programmes promoting energy prosumers already exist, and REC financing support mechanisms will follow the adoption of the Renewable Energy Sources law and relevant by-laws.

In **Serbia**, RECs are recognised by law but need additional regulation through supporting by-laws. The law provides for supporting schemes, which will be fully developed and implemented after the legal framework is finalised.

I.II Identified bottlenecks and areas of intervention

Developing energy communities in the Danube Region faces a range of legal and policy-related challenges, differing significantly across countries depending on their renewable energy development level and regulatory frameworks. This chapter identifies key bottlenecks in current legislation and policy needs, which are essential for advancing RECs across this diverse region.

In several countries, such as **Moldova** and **Montenegro**, regulatory frameworks for RECs are in their infancy, often lacking any specific laws or guidelines to support community-based renewable energy initiatives. This regulatory gap leaves these countries dependent on more general energy policies that fail to recognise or empower RECs. To enable effective REC formation, these countries

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require foundational legal frameworks that define the structure, rights, and operational guidelines of energy communities. Creating such frameworks, along with targeted financing mechanisms, is vital to encourage local investment and promote the growth of RECs.

In nations like **Serbia**, where legislative frameworks for RECs exist but remain underdeveloped, barriers arise from administrative complexities, unclear guidelines, and limited support schemes. The lack of streamlined procedures and insufficient incentives hinder REC expansion, especially for smaller communities. Addressing these issues requires the simplification of administrative procedures and the alignment of national policies with EU directives, as well as the introduction of financial incentives tailored to community-based renewable energy projects.

Countries with more established REC frameworks, encounter advanced challenges. Here, REC development is often slowed by high connection costs, intricate regulatory processes, and limited access to local grid infrastructure. Although these countries have supportive policies, further intervention is needed to reduce financial burdens on communities and enhance accessibility to grid infrastructure, which would support the long-term growth of RECs. Simplifying governance processes and providing specialised support for smaller communities can also boost participation and sustainability.

Overall, REC growth across the Danube Region demands targeted policy interventions tailored to each country's development level. From foundational legal frameworks in newer REC markets to refined policies in advanced settings, addressing these bottlenecks is crucial for building resilient, community-led energy solutions throughout the region.

I.II.I Danube Region countries with an elaborate legal framework

Countries with elaborate legal framework possess robust legal frameworks supporting RECs, enabling community-led renewable projects. However, both countries face challenges with high

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grid connection costs, complex regulatory processes, and limited access to grid infrastructure. While policies are supportive, further measures are needed to lower financial barriers and simplify governance, especially for smaller communities, to sustain REC growth and enhance energy accessibility. The analysis of the legal framework was also supported by the ReScoop project's materials and databases.¹

In **Austria** administrative burdens are still rather complicated, and the country shall become more user-friendly in terms of energy communities. Low-income and vulnerable households are not addressed in the transposition.

Czechia: Implementation in practice is limited; Enforcement of the new legal framework to be tested into practice; Improvement of the legal frameworks is envisaged regarding the removing regional restrictions and improving of the sharing possibilities.

In **Germany**, no formal assessment of the challenges and potential for energy community (EC) development has been conducted. The existing tenant supply scheme is based on a prior supply model and does not effectively support true energy sharing. Although the government initially announced plans to establish such a framework, its development has been postponed.

Though implementation is in progress, **Slovenian** local and regional energy agencies together with municipalities shall play a more important role in the promotion of energy communities.

I.II.II Danube Region countries with inadequate legal framework

In general, countries with inadequate legal framework face difficulties with the implementation of energy communities in practice after benchmarking, adapting and developing legislation from frontrunners of the project consortium.

¹ https://www.rescoop.eu/policy/transposition-tracker/enabling-frameworks-support-schemes



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In **Croatia**, the implementation into practice is limited. The process of establishing RECs is complicated. The legal framework shall be improved regarding its quality and consistency.

In **Hungary**, the responsibilities of network and commercial service providers need to be defined; Energy sharing possibilities shall be improved. Limitation for public entities to form/enter energy community to be resolved. Financial support to be straightened - rebates or other economic incentives to encourage the creation of communities. Implementation into practice is limited due to the imperfection of the legal framework and lack of the financial support.

In **Romania**, besides existing energy communities, foundation of new ECs shall be further promoted and supported through designed schemes.

In **Slovakia** implementation is at an early phase where electricity sharing and cooperation itself are still not feasible.

I.II.III Danube Region countries with an undeveloped legal framework

In general, countries with undeveloped legal framework lack by-laws and the implementation into practice cause difficulties. In **Bulgaria**, only those entities are allowed to form energy communities who produce and consume at the same time (prosumers) and only in household sector. Businesses are still not welcome to launch or join ECs.

In **Moldova**, significant bottlenecks persist in the development of RECs due to the absence of a structured, comprehensive framework. Currently, there is a lack of regulatory clarity, with no bylaws to govern key operational aspects, leaving REC activities largely unregulated and challenging to execute. Furthermore, financing support mechanisms are yet to be established, hindering the financial viability of REC projects. To address these gaps, Moldova must prioritise the creation of a detailed regulatory framework, which includes both specific by-laws and robust financing mechanisms to facilitate REC growth and implementation.

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Montenegro also faces several challenges in REC development, primarily due to the incomplete Renewable Energy Sources (RES) law, which has delayed any substantial progress in creating a supportive legal environment. Without an effective legal basis, practical implementation remains stalled, and the financial incentives necessary to stimulate REC growth are currently unavailable. To move forward, Montenegro must expedite the development of the RES law, establish targeted financing support mechanisms, and adapt the Law on the Use of Energy from Renewable Sources. These interventions are crucial to translating policy intentions into actionable support for RECs.

In **Serbia**, the development of RECs is constrained by a fragmented and underdeveloped support system. Although some supportive schemes exist, they remain insufficient, and without a comprehensive legal framework, REC projects struggle to gain momentum and enter practical implementation. For effective intervention, Serbia needs to focus on completing its legal framework to provide a stable foundation for RECs, followed by the introduction of expanded support schemes that can be immediately implemented to foster REC growth and sustainability.

I.III Recommendations to build and improve supportive legal frameworks for energy communities

Clear distinction between REC and CEC with aim of full alignment with the EU acquis is needed as it is implemented in **Austria**, **Czechia** and **Slovenia**.

Establishing a single point of contact is essential to streamline applicant guidance and simplify administrative processes. This single contact point may also manage a central register for energy communities, as seen in **Czechia**.

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Implementing varied energy community models, like those in **Germany**, is also effective—for instance, physical communities with direct connections between generation and consumption points, or virtual communities, where decentralised producers and consumers are not co-located but energy balancing is still managed relative to external electricity consumption.

Defining clear tariff models and calculation methodologies for energy generation and network charges, as established in **Czechia**, **Slovenia**, and **Austria**, is also crucial.

Moreover, countries like **Germany**, **Austria**, and **Slovenia** have tailored support mechanisms to promote energy communities.

Some countries still need to create specific bylaws to regulate aspects such as grid access, tariff models, and energy sharing, which would ease practical implementation.

Most EU member states have supporting mechanisms for developing energy communities through different EU grants however non-EU countries in the Danube Region are still in need of legal framework for energy communities.

I.III.I Danube Region countries with an elaborate legal framework

In **Austria** and **Germany**, REC growth is advanced but faces obstacles in regulatory complexity, high grid connection costs, and restricted access to grid infrastructure. To address these issues, streamlining regulatory processes is essential; simplifying administrative steps and reducing bureaucratic hurdles will make REC operations smoother and more accessible for communities. Additionally, targeted financial support specifically for smaller communities would help lower entry barriers and ensure that REC benefits reach a wider population. Lowering grid connection fees and enhancing access to local grids will further strengthen REC sustainability. Finally, adopting more flexible governance models could empower local REC leaders and foster innovation, allowing these

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communities to respond more effectively to unique local needs, thereby increasing engagement and scalability.

I.III.II Danube Region countries with inadequate legal framework

Countries with inadequate legal framework have made progress toward REC development, yet their legislations lack clarity, financial support, and administrative efficiency. Simplifying administrative processes, such as REC registration and approval, would greatly enhance accessibility. Aligning national policies with EU REC standards is also crucial, as it would provide guidance for community rights, operational standards, and environmental compliance. Financial incentives tailored for small- to medium-sized RECs could stimulate community investment in renewable projects. Clearer regulations on REC roles, member rights, and shared benefits will foster citizen confidence and wider adoption. Building supportive platforms to provide guidance and resources for emerging RECs would also create a more nurturing environment for these projects to thrive.

I.III.III Danube Region countries with an undeveloped legal framework

In countries with undeveloped legal framework, REC initiatives are hindered by an absence of foundational legal structures, leaving communities without the basic definitions, rights, or support needed to start renewable energy projects. Establishing a primary legal framework that defines RECs, delineates member rights, and provides basic operational guidelines is critical. Financial incentives, such as subsidies or grants, are necessary to make REC investment viable and to encourage initial community interest. Awareness campaigns and educational resources are equally essential to introduce citizens to the benefits and potential of RECs, building grassroots support for renewable energy initiatives. Additionally, building partnerships with experienced REC organisations in neighbouring countries could offer valuable knowledge and technical support,

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accelerating REC development and helping to establish a local culture of sustainable energy production.

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II. Economic and technical prerequisites for the operation of energy communities in the Danube Region

The partners generally agreed that in countries like **Hungary**, **Slovakia**, **Croatia**, **Serbia**, and **Romania**, the establishment of Energy Communities (ECs) is still in its early stages, with relatively few ECs operating domestically. In contrast, countries such as Austria and Germany are further advanced. In these countries, the legal framework for organising energy communities varies according to the project's size and sector.

A unique approach in **Austria** and **Germany**, not common elsewhere, is the formation of a "civil corporation" as the fastest, easiest, and most affordable way to launch citizen-led energy projects. This model, particularly popular for citizen-owned solar projects, lacks legal personality, meaning that it does not carry independent rights or obligations; instead, individual partners are directly responsible, assuming full legal liability through their personal assets. To mitigate this risk, a civil corporation can be combined with the establishment of a registered association, providing added security for participants.

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II.I Organisation and membership in energy communities

Associations focused on energy typically manage the production, distribution, redistribution, and efficient use of renewable energy resources, emphasising economic efficiency while adhering to environmental and social principles. Energy communities (ECs) often take the form of associations, cooperatives, or other legal entities. If a community chooses a legal form other than an association or cooperative, its founding document must ensure that its purpose and internal conditions align closely with those of an association or cooperative. Details are formalised during registration with the competent authority, typically through the EC's Charter or Statutes. Generally, ECs are established as legal entities, often non-profits, operating locally and regionally to focus exclusively on energy issues.

ECs are usually non-profit, with a primary mission of providing environmental, economic, or social benefits to members or their communities. The founding document defines the EC's purpose to serve members and the community; however, profit distribution varies by legal form and by national laws. In Czechia for example a cooperative EC may distribute a portion of profit (up to 33%) among members if it does not undermine the community's purpose. In contrast, associations and non-commercial ECs are prohibited from profit distribution, emphasising service over profit. There is no universally recommended legal structure for ECs; currently, most take the form of associations, non-profits, or cooperatives.

RECs have the right to produce, consume, store, and sell renewable energy, including through purchase agreements. RECs have equal access to energy markets, directly or through aggregation, and economic entities can be members if they do not pursue their primary business activities within the community. The Citizens' Energy Community focuses on providing environmental,

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economic, or social benefits to members or local areas rather than generating profit. Similarly, RECs prioritise these benefits over financial return. In some cases, profit distribution is legally limited, with a cap of 50% to prevent the community's activities from being classified as a business.

In practice, an EC's operation depends on its founding document, which sets member relations and community goals. Typically, each member has an equal vote in the highest body of the EC, as detailed in the EC's Statutes. After the EC is established, governance is handled by various elected bodies, with internal rules approved by the highest authority. A common organisational structure includes:

- 1. The General Assembly (highest body)
- 2. Board of Directors (executive body)
- 3. President (statutory body)
- 4. Supervisory Board (oversight body)

Other governing bodies may also exist, depending on the community's specific structure and needs.

II.II Key technical requirements for energy community development

Key technical requirements for the development of energy communities (ECs) in the Danube Region countries involve a series of steps to ensure efficient energy production and distribution. First, it is essential to conduct a thorough mapping of energy consumption at a defined location to understand the patterns of demand. Additionally, mapping local energy potential is crucial for identifying available renewable resources.

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The next step is to begin preparations for the construction of new energy sources, such as wind or solar power, near the site to cover the energy consumption of the entire area. This should be done in conjunction with maximising the use of available subsidy programmes to build the necessary infrastructure, including energy storage and grid connections. Along with this, it is important to create a supportive environment and provide the necessary capacities to manage communitybased energy projects.

Preparation for establishing an energy community at the chosen location must involve clear plans and strategies. Ensuring that significant financial support and aid are available is also key for the successful development of these communities. This includes securing funding for infrastructure, renewable energy projects, and energy storage solutions.

Establishing an internal organisational system within the energy community is vital for smooth operation. This system should include effective sales techniques and methodologies for customer management, as well as crisis management strategies to address potential problems that may arise within the community. Regular audits of the internal energy economy of individual ECs should be conducted, focusing on production and distribution based on renewable energy sources (RES).

Understanding the energy consumption patterns of different consumers within the community is vital for optimising energy use and deploying appropriate energy generation solutions. Consumers can be categorised into household, commercial, and industrial profiles.

Household energy consumption tends to peak in the mornings and evenings, with higher demand on weekends. The average household power demand is between 2000 - 3000 kWh/year.

Commercial businesses typically experience energy peaks around midday, weekdays only. Power demand may already be monitored with time resolution depending on the business and the energy demand. Heating provision via heat pumps or electromobility can amplify energy peaks.

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Industrial demand is highly specific and requires time-resolved analysis to ensure grid stability, especially during peak loads.

Energy communities employ various technologies to meet these diverse needs, with Photovoltaic (PV) systems, wind power, and Combined Heat and Power (CHP) systems being the primary methods for generating power and supporting heating networks. These technologies play a crucial role in providing a reliable and sustainable energy supply for the community while contributing to a greener, more energy-efficient future.

Photovoltaic (PV) systems convert sunlight into electricity and are key to renewable energy in communities. Using abundant solar energy, they are sustainable, scalable from small rooftops to large solar farms, and have low maintenance costs. PV systems emit no greenhouse gases, supporting cleaner air and reduced carbon emissions. In energy communities, they are often paired with batteries to store excess energy for use during low-sunlight periods, ensuring a reliable power supply.

Types of PV installations

Rooftop PV systems:

Rooftop PV systems make efficient use of roof space, reducing transmission losses and avoiding extra land use. Challenges include limited area and possible suboptimal orientation. South-facing roofs maximise midday energy, while east-west orientations help balance morning and evening generation.

Ground-mounted PV systems:

Ground-mounted systems allow optimised orientation for better energy output but require more land. Agri-PV systems address this by combining solar panels with agricultural land, enabling dual land use and a sustainable approach.

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Optimisation strategies

- **Panel placement and orientation:** Position panels according to latitude for maximum sunlight, adjusting tilt for peak production based on demand. Minimise shading.
- **High-efficiency panels and components:** Use high-efficiency panels and quality inverters; PV cell efficiency now exceeds 20%, boosting output.
- **System sizing and scaling:** Sise systems to energy needs and roof space. Consider phased investment if costs are high.
- **Maintenance and monitoring:** Regular cleaning and real-time monitoring improve performance and lifespan, quickly addressing issues.
- **Energy storage integration:** Battery storage helps use excess energy later, enhancing resilience and grid independence.
- **Grid interaction and net metering:** Net metering enables feeding surplus energy to the grid for credits or sharing within the community, supporting resilience and efficient energy use.

Wind power uses wind turbines to convert wind energy into electricity, especially effective in areas with steady winds. It is a clean, renewable energy source that reduces reliance on fossil fuels. With low operating costs, wind power complements PV systems in energy communities by supplying power when solar output is low.

Optimisation strategies

- **Site selection:** Assess wind resources to identify sites with consistent, high wind speeds, ensuring optimal energy production.
- **Turbine selection:** Match turbines to the wind profile, using advanced designs like variable pitch blades to maximise energy capture.

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- **Maintenance and monitoring:** Use predictive maintenance and real-time monitoring, scheduling during low wind periods to minimise downtime and output loss.
- **Grid integration and storage:** Ensure grid compatibility and incorporate storage to manage variability, enabling reliable energy supply.
- Aerodynamic optimisation: Optimise blade design and angles for efficiency across wind conditions.

Combined heat and power (CHP) systems, or cogeneration, produce electricity and heat simultaneously, ideal for district heating networks. CHP is highly efficient, using waste heat from electricity production, and can operate on natural gas, biomass, or biogas. In energy communities, CHP reduces waste, enhances energy efficiency, and supports resilience. Combining CHP with PV and wind power ensures reliable local energy, reduces emissions, lowers costs, and strengthens energy security, helping communities toward sustainability and resilience.

Optimisation strategies

- **System design and sizing:** Assess energy demand to size CHP systems according to community needs, maximising power and heat use.
- **Fuel selection:** Choose cost-effective, sustainable fuels like biomass or biogas to meet energy needs and minimise environmental impact.
- **Technology selection:** Use advanced technologies and combined cycles for high efficiency, yielding more power and heat per fuel unit.
- **Thermal utilisation:** Employ heat recovery and storage to capture excess heat for future use, improving efficiency.
- **Control and monitoring:** Automated controls optimise CHP performance in real-time, reducing costs and enhancing output.



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- **Maintenance:** Preventive maintenance ensures reliability, minimising downtime and extending lifespan.
- **Economic optimisation:** Analyse costs, leverage incentives, and produce energy during high-price periods to maximise financial return.
- **Environmental compliance:** Implement emission controls to reduce environmental impact and meet regulatory standards.

Technological innovation is crucial for improving the efficiency, reliability, and sustainability of energy communities. Developments in renewable energy technologies, energy storage systems, smart grid infrastructure, and energy management software empower communities to better utilise clean energy, optimise distribution, and enhance overall system performance. By adopting these innovations, energy communities can decrease reliance on fossil fuels, reduce their environmental footprint, and adapt to changing energy demands.

Optimising REC infrastructure involves energy planning, technology integration, storage, grid management, efficiency measures, community engagement, and regulatory compliance.

Comprehensive energy planning: Energy audits and demand forecasting help identify efficiency improvements and guide resource allocation.

Renewable integration: A mix of solar, wind, biomass, and hydro stabilise the grid and meets diverse demands, with site assessments ensuring scalability.

Advanced storage solutions: Battery, chemical, and thermal storage systems, including hybrid options, store excess energy for consistent supply.

Sector coupling: Integrating heating and mobility (e.g., heat pumps, electric vehicles) reduces fossil fuel reliance.

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Smart grid and microgrid technologies: Real-time monitoring and decentralised management enhance grid resilience and balance supply and demand.

Energy efficiency measures: Building retrofits and smart devices improve energy use and support sustainability.

Community engagement: Awareness campaigns and training build local knowledge, ownership, and participation.

Financial and regulatory support: Incentives, subsidies, and regulatory frameworks support REC viability, with community financing aiding project funding.

II.III Optimal operational conditions and business model development

Financing mechanisms play a critical role in the establishment and operation of energy communities (ECs). These mechanisms include subsidies from national budgets, EU funds, personal income generated from EC business activities, regional contributions, and private investments or crowdfunding. Currently, a broad array of subsidy programmes is being prepared, particularly through the European Union's budget and resources from programmes like Interreg, Horizon, and other similar initiatives. In addition, domestic support from both state and private funds is expected to provide substantial financing for energy community initiatives, including the acquisition of technologies and necessary personnel training.

Examples of key financial support programmes include the Modernisation Fund, the National Recovery and Resilience Plans, Operational Programmes on Environment, Technologies and Applications for Competitiveness, Just Transformation, and the MIT Effect III program. Alongside these subsidy programmes, repayable financial assistance tools are also available, such as

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preferential loans, bank guarantees, or a combination of both. The European Investment Bank (EIB) provides essential financial instruments, and the National Development Bank will also offer repayable financial aid targeted at energy communities.

As non-profit entities, the income generation methodology of each energy community is outlined in its business plan. This document details expected revenues, expenses, and strategies for achieving financial goals. A major source of income for most ECs will be cost sharing among members. Additionally, some communities will pursue project funding through European and national research initiatives, collaborating with researchers and utilising their facilities and equipment.

Energy communities commonly use several financing models. These include financing by building owners through reserves or co-owners, where the costs are shared among the owners. Another approach is participant funding, where members collectively invest in the community's energy projects. Financing by third parties, such as energy suppliers or external service providers, is also a viable option. In these cases, an association is formed with the purpose of constructing, maintaining, and operating the energy system. The association is typically responsible for the system, and the distribution of financing costs and tariffs is governed by its articles of association. Additionally, association members may pay an investment share in return for the right to purchase electricity from the community's generation system.

In some countries, however, there is limited access to significant external financing and subsidies, making it more challenging for energy communities to secure the necessary funds. Despite this, most energy communities, being legal entities under regional laws, must comply with all applicable regulations related to taxes, requiring them to maintain dual accounting systems and meet other legal obligations.

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To ensure the optimal development and operation of energy communities, it is crucial to establish effective business models and secure diverse financing sources that align with both the community's goals and available resources.

Operational models of energy communities

Energy communities can be structured in several different ways, each with its own unique operational model:

- Energy community as an interest association: This model, found in countries such as Czechia and Hungary, is based on voluntary association, where members are motivated by a shared interest in energy production and distribution.
- 2. **Energy community as a cooperative**: In Czechia, this model is based on cooperative principles, allowing members to collectively manage energy production and distribution while ensuring equitable participation in decision-making and profit-sharing.
- 3. Energy community as a business entity: Energy communities can also operate as business entities, such as limited liability companies (LLCs) or joint-stock companies (JSCs). These models allow for broader participation from both individuals and legal entities (e.g., SMEs, local councils, and associations).
 - Limited Liability Company (LLC): This model allows for up to 50 natural persons or legal entities to make decisions on company activities through shareholder meetings. There is no minimum share capital requirement, and shareholders' voting power is proportional to their shareholding.
 - Joint-Stock Company (JSC): In this model, at least two natural persons or legal entities are required. The share capital is prescribed by national law, and shareholders are liable only to the extent of their capital contributions.

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Shareholders manage the company through a general meeting and may appoint directors for governance.

4. Association With Connection And Participation Of Citizens

: The structure of an energy community operating as a non-profit organization is determined by national economic laws regulating the establishment of non-profits, foundations, and similar entities. Such communities are defined by member participation, where decision-making is carried out solely through voting rights granted to members.

While the JSC model allows for a larger pool of investors, it can also introduce challenges, such as the potential for unequal control among shareholders with differing stakes. To mitigate this, energy communities adopting this model must ensure member control and adhere to the non-profit purpose requirement, which can be fulfilled by transforming the entity into a social enterprise.

Integrating different operational models and optimising technical integration within energy communities requires careful planning and alignment with local conditions. By leveraging diverse models—whether interest associations, cooperatives, or business entities—energy communities can enhance their operational efficiency, facilitate financial support, and ensure the active participation of members. The ongoing technical optimisation, such as improving data exchange, energy storage, and grid integration, will enable these communities to operate sustainably and contribute to the transition towards a low-carbon energy future.

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II.IV Identified bottlenecks and areas of intervention

In countries where energy communities (ECs) have not yet been established, several significant bottlenecks hinder the development of such initiatives. One of the primary issues is the lack of financial support and administrative frameworks necessary to kickstart energy community projects. Without adequate financial resources, often provided through subsidies or national funding mechanisms, these communities are unable to access the technologies or expertise needed to establish operational energy systems. Additionally, the absence of supportive measures, such as tax incentives or grants, prevents potential participants from moving forward with their plans.

Another major challenge is the limited awareness and understanding of energy communities among the general population and key stakeholders. Without effective awareness-raising campaigns, communities may not recognise the benefits of participating in energy systems that utilise renewable energy sources, leading to a lack of public interest. Additionally, the absence of training programmes for local administrators and future energy community founders further exacerbates the situation, leaving them unprepared to manage the technical, legal, and financial complexities of starting an EC.

In countries where energy communities have been formed or are already operational, there are several challenges that continue to impede their full development. One key issue is the difficulty in accessing data necessary for efficient energy management. Many energy communities struggle to obtain accurate data on energy consumption, production, and system performance, making it harder to optimise energy distribution and ensure system reliability. This issue is compounded by the lack of robust national financial support systems tailored for ECs, leaving communities to rely on limited funding sources that are not always sufficient to meet their needs.

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Additionally, energy communities in some regions face challenges with grid connectivity. Inadequate infrastructure or complicated network connection procedures can delay the integration of energy communities into national grids, preventing them from fully utilising their generated energy. The difficulty of securing private household financing for energy transition projects is another critical bottleneck. Many households within energy communities lack the necessary financial resources or access to loans, which limits their ability to invest in renewable energy technologies like solar panels or energy storage systems.

The slow pace of the transition to renewable energy is also a persistent challenge. While energy communities may have the potential to significantly contribute to the energy transition, the process is often hindered by bureaucratic delays, regulatory uncertainty, and slow adoption of new technologies. Moreover, the rising costs of maintenance for energy infrastructure, such as renewable energy generation and storage systems, add to the financial burden of these communities, making it difficult for them to remain sustainable in the long term.

Areas of intervention for overcoming challenges

To address these bottlenecks, several targeted interventions are required. First, enhancing financial mechanisms is crucial. For countries without existing energy communities, financial incentives such as grants, subsidies, and low-interest loans should be introduced to make the establishment of ECs more financially viable. Flexible funding options, such as project-specific funding for renewable technologies, can help kickstart EC development. In regions where energy communities already exist, strengthening access to data-sharing platforms, integrating digital tools for better energy management, and improving national financial support systems are necessary steps.

Improving grid integration and network connection processes is another critical intervention. Streamlining the connection procedures for energy communities will reduce delays and facilitate faster integration into the national grid. In parallel, expanding financing options for private

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households, including low-interest loans and incentives for renewable energy investments, will encourage more households to participate in energy communities. This, in turn, will help scale up renewable energy adoption and accelerate the transition to cleaner energy sources.

To foster the growth and sustainability of energy communities, public awareness campaigns are essential. Educating both citizens and local decision-makers about the benefits of energy communities, as well as providing training programmes for community leaders and managers, will ensure that energy communities are not only established but also effectively managed. Lastly, ensuring that energy communities have access to affordable maintenance services and the expertise required for long-term operation is crucial for their continued success. This can be supported through partnerships with local service providers and the establishment of training and certification programmes for energy technicians.

II.V Possibilities for integrating different operational models and optimising technical integration

In **Czechia**, around 160 municipalities and towns are engaged in supporting and implementing various systems for electricity and heat production. Among these systems, rooftop photovoltaic power plants and biomass heating systems are the most commonly used. Additionally, municipalities also operate water, biogas, and wind power plants, contributing to a diverse energy mix. These projects collectively have an installed capacity of 24 MW of electricity and 116 MW of thermal energy.

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In **Hungary**, all of the registered energy communities are currently comprised only of founding members. However, as the communities expand, these partners will continue to manage relationships with new members. They will handle customer service, including complaints, and provide 24/7 customer support and service guarantees.

Austria's "Energy Data Exchange" (EDA) platform facilitates communication and energy trading within energy communities. The EDA User Portal is a web-based platform designed to process tasks for energy service providers and energy communities, offering easy access to energy data exchange. Participation in the user portal is free for both energy service providers and energy communities.

In **Slovenia**, community projects often adopt a bottom-up approach, with strong local interest and participation. The issue of reducing high electricity costs through community self-supply is particularly significant for municipalities and public institutions, such as schools, kindergartens, and public utility services like water treatment plants. The energy systems are designed so that schools, which have high electricity production in the summer when their consumption is low, are ideally connected to water pumping stations or water treatment plants, where energy consumption peaks in the summer months. In Slovenia, active consumers have the right to participate in the market either directly or through aggregation, allowing them to sell electricity from their own production, enter power purchase agreements, and engage in flexibility and energy efficiency programmes.

In **Croatia**, energy communities are legally structured to invest in photovoltaic power plants located on members' properties. These communities acquire debt financing to balance the capital value of the investment, and the legal entity managing the energy community may enter into property lease agreements with members for these projects. The income from the sale of energy to community members is used to settle the debt and balance the books, as energy communities are typically non-profit entities.

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In **Slovakia**, flexibility aggregators provide a solution for reducing electricity costs and lowering carbon footprints by optimising and managing the operation of flexible devices from both consumers and producers in real time. These aggregators collect unused electricity from consumers and smaller providers and feed it into the transmission system. Municipal heating plants, which also generate electricity while providing heat, present significant opportunities for energy communities, especially when local government participation is involved.

In **Germany**, with around 86%, energy communities in Germany are primarily involved in the production of electricity (electricity (photovoltaics, wind) and heat (biomass), but 20% also in energy distribution as well as in investments in renewable energy. Less often, energy communities act as grid operators (bioenergy villages, "Bioenergiedörfer").

ASSOCIATION WITH CONNECTION AND PARTICIPATION OF CITIZENS?

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III. Social inclusion and governance practices in energy communities

Social inclusion and effective governance are essential to successful energy communities, fostering active participation, shared decision-making, and equitable benefits. ECs drive local economic growth and job creation, improve quality of life, and strengthen social cohesion by uniting members around shared energy goals. Transparent governance and clear communication build trust, while long-term engagement supports lasting positive impacts. This chapter explores key governance aspects, stakeholder management, and strategies for addressing challenges and enhancing inclusivity in ECs.

III.I Governance and communication techniques in energy communities

Community development: Many individuals join energy communities to support local economic growth, create employment opportunities, and enhance the overall quality of life in their area. Energy communities offer a collaborative model that enables direct citizen and local involvement in renewable energy initiatives, ensuring that members gain reliable access to clean, locally sourced energy.

Social cohesion: Participation in an energy community fosters stronger relationships among neighbours and community members through collective action. By engaging in energy community

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activities, members enhance social cohesion by increasing interaction and dialogue. Working together, members develop a shared identity, strengthening loyalty and trust within the community. Additionally, through collaborative processes, they address shared challenges, finding solutions to problems that may be difficult to tackle individually.

Transparent governance: Members expect the energy community to operate with transparency and integrity in governance and decision-making. They value accountability, clear communication, and trustworthiness in how projects are managed and funds are allocated, looking for an open and fair approach in the community's operations.

Long-term engagement and impact: Participants are interested in meaningful, long-term engagement, seeking a lasting positive impact on their lives, the environment, and the local economy. They anticipate that the energy community will continue evolving, responding to new challenges and opportunities, and maintaining a constructive influence over time.

III.II Stakeholder management

In this chapter, the stakeholder groups potentially involved in the development of ECs and the activities initiated by them are presented. Steps are defined to facilitate contact with these groups and outline engagement strategies aimed at ensuring the development's success.

Stakeholders, or interested parties, are individuals, groups, organisations, institutions, or other entities affected by the launch of ECs and the resulting EC activities – and vice versa, those who can influence the foundation and operation of ECs. Stakeholders can be either external or internal, such as members of the target audience, businesses, political decision-makers on local, regional, national and transnational levels, partner organisations, etc. The stakeholder approach primarily aids in forming and enhancing relationships consciously.

The stakeholder approach is a critical element of strategic and long-term thinking, recognising that the development and resulting activities of ECs affect more than just the direct target audience and

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that various stakeholder groups may impact each other. Understanding stakeholders more deeply helps us gain insight into the environment in which ECs operate. This approach also creates opportunities to engage the target audience more effectively. Maintain constant communication with stakeholders can help address identified issues, needs, and requirements.

A stakeholder-focused approach enables more efficient and effective internal and external communication. Reaching and involving new stakeholders supports the capacity-building efforts of the ECs, thus contributing to their sustainability. This approach is relevant in both organisational and project contexts. The following sections present the so-called stakeholder map as an analytical tool, which helps assess stakeholders efficiently and plan and implement communication and engagement strategies more effectively.

The following stakeholder map categorises different organisations and communities, forecasting the form and significance of communication with them and outlining the expected cooperation from each group.

We consider as *Engines* those stakeholders who are the intellectual originators and/or implementers of ECs. *Primary* stakeholders are organisations or communities we aim to reach, engage, and invite for collaboration during implementation, with whom mutual benefits are anticipated. *Supporters* and *Experts* are those who advance implementation or ensure continuous and smooth operation through financial or professional assistance. Partners are those with whom we establish contractual or informal cooperation to achieve common goals set within the NRGCOM project framework. The *Other* category includes stakeholders who, although impacted by the project, do not have a major influence over its success or failure. Their cooperation, however, can still be essential to achieving project goals, even if they do not directly affect the project's outcomes.

Residents may choose to join an energy community to reduce their energy costs by gaining access to affordable, locally produced renewable energy. Through shared solar or wind projects, they can enjoy lower electricity bills and potentially earn income by selling surplus energy back to the grid.

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By participating, residents also contribute to the clean energy transition, reducing their carbon footprint and enhancing local air quality. In addition, energy communities offer residents opportunities to engage in community activities, such as energy events and workshops, which can build social connections and foster a sense of belonging.

Municipalities might join an energy community to achieve renewable energy goals and boost local energy security. Through community-owned renewable energy projects, they can diversify their energy mix, lessen reliance on imported fossil fuels, and strengthen energy resilience. Being part of an energy community also enables municipalities to drive local economic development and create jobs, especially in the renewable energy sector. By pooling community resources and expertise, municipalities can implement energy efficiency programmes, promote sustainable transportation, and support innovative clean energy projects, ultimately improving residents' quality of life and supporting a thriving local economy.

Local businesses might join an energy community to cut operational costs and improve profitability. By investing in renewable energy projects or participating in group purchasing for clean energy, they can reduce energy expenses, boosting competitiveness. Embracing sustainability can also enhance a business's reputation, appealing to eco-conscious consumers and investors. Additionally, energy community membership allows businesses to demonstrate their commitment to corporate social responsibility, strengthening ties with customers, employees, and other stakeholders, and supporting long-term business growth and success.

Power plant manufacturers and developers bring essential technical expertise to energy communities. They provide cutting-edge solutions tailored to the community's energy needs, ensuring efficient and scalable systems. Beyond technology, these stakeholders can offer financial support through co-development initiatives or innovative financing mechanisms, reducing upfront costs for the community. Developers can also play a role in capacity building by training local operators, fostering long-term independence and sustainability. Collaborative partnerships with

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manufacturers that prioritise local hiring and pilot projects further enhance community buy-in and economic benefits.

PR agencies are instrumental in shaping the public perception of energy communities. They help craft a strong brand identity, making the community's goals and achievements visible and relatable to the broader public. By designing targeted awareness campaigns, PR agencies can educate local populations about the benefits of renewable energy, energy independence, and community participation. Additionally, they can engage with various stakeholders—government bodies, local businesses, and residents—through strategic communication and advocacy efforts, amplifying the push for supportive policies. Crisis management is another area where PR agencies can help, addressing concerns and mitigating potential opposition to infrastructure projects.

Media serves as a powerful tool for raising awareness and ensuring transparency. Positive media coverage fosters trust among community members and stakeholders while shining a spotlight on the tangible benefits of energy communities. Through compelling narratives, success stories, and visual reporting, media outlets can demonstrate the real-life impact of these projects. Media also plays a critical role in advocating for supportive regulations, displaying the alignment of energy communities with national and regional goals for renewable energy adoption. Partnerships with local media, press events, and regular updates from the energy community are effective ways to maintain consistent and accurate media engagement.

Stakeholders' impacts on ECs might vary from country to country.

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GROUPS	ORGANISATION / COMMUNITY	IMPACT on ECs	IMPACT of ECs	CONTRIBUTION	STEPS to INVOLVE
	Residents	high	high	investors and operators	design and fundraising
ENGINE	Local businesses	high	high	investors and operators – might either join the EC or sponsor it	design and fundraising
PRIMARY	Local municipalities	middle	low	supportive local policy, advocacy	communication
	National ministries responsible for energy, climate, environment or economy and mining	high	middle	financial and professional support, granting constructions	development policies
SUPPORIER	Local member of parliament	middle	low	advocacy, fundraising	communication
	Local businesses	middle	low	regional market embeddedness, sponsorship	common advantages, PR, marketing benefits
EXPERT	Legal professionals Consultants	low	low	fundraising, legal representation, advocacy, advisory	development recommendations
	Power plant manufacturers / developers	high	middle	technical expertise, innovative solutions, financial support, capacity building	joint ventures, incentivize local collaboration, feedback mechanisms, pilot projects
PARTNER	PR Agencies	middle	low	brand building, awareness campaigns, crisis management, stakeholder engagement	providing mutual benefits, define objectives, co-design campaigns, engage in advocacy, capacity building
OTHER	Media (local / regional / national)	middle	low	public awareness, transparency and trust, narrative shaping, advocacy	establish media partnerships, host press events, share success stories, offer expertise

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III.III Identified bottlenecks and areas of intervention

The concept of energy communities (ECs) in the Danube Region has proven to be a valuable model for promoting renewable energy, fostering social cohesion, and contributing to sustainable local development. However, significant challenges persist, particularly in countries where energy communities are still in their early stages of development or where the concept remains largely unknown. These challenges can hinder progress and slow the broader adoption of energy communities in the region.

Lack of awareness and professional skills

In many underdeveloped countries within the Danube Region, energy communities are either an unknown concept or are poorly understood. This lack of awareness about the potential benefits and functionality of energy communities represents a significant bottleneck. In some cases, energy communities are perceived as complex or unattainable for local communities. This barrier is further compounded by a lack of professional skills and training opportunities necessary to develop, manage, and sustain energy communities. As a result, potential stakeholders, including local authorities, community members, and energy suppliers, may lack the knowledge to engage effectively or to recognise the long-term value of participating in such initiatives.

Areas of intervention:

 Awareness-raising campaigns: Initiatives that educate citizens, municipalities, and businesses about the benefits of energy communities can stimulate interest and reduce misconceptions. Public awareness campaigns should highlight the potential economic, environmental, and social benefits of community-led energy projects.

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 Capacity building and training: Offering professional training programmes tailored to local needs—such as workshops, seminars, and online resources—can equip stakeholders with the knowledge and skills necessary to engage in energy community projects. These programmes should cover areas such as renewable energy technologies, project management, financing models, and governance.

Lack of motivation and PR challenges

In countries where energy communities have been established, there is often a lack of motivation among potential members to actively engage. This is due to various factors, including limited understanding of the financial and social benefits, low community involvement, and insufficient outreach efforts. Furthermore, the public relations (PR) challenges faced by energy communities in these countries often result in poor visibility and lack of trust in the governance practices of energy projects.

Areas of intervention:

- Effective PR and communication strategies: Energy communities need to develop robust communication plans that emphasise their benefits and successes, particularly in terms of reducing energy costs and creating local jobs. Clear communication can help overcome scepticism and foster greater participation.
- Incentives and recognition: Offering incentives, such as reduced energy costs or local investment opportunities, can motivate individuals and businesses to participate. Publicly recognising contributions from community members can strengthen engagement and commitment.

Conflict of interest with operators and energy suppliers

A major challenge in the development of energy communities is the conflict of interest that can arise between the members of the community and traditional energy suppliers or operators.

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Energy suppliers may view community-based initiatives as a threat to their market dominance, while local operators may be reluctant to share data or collaborate with ECs. This dynamic can create significant barriers to the integration of local energy systems with the broader grid, reducing the potential for synergies between energy communities and national networks.

Areas of intervention:

- Facilitating dialogue and conflict resolution: Creating structured platforms for dialogue between energy communities, energy suppliers, and operators is essential to build trust and resolve conflicts. Mediation services and conflict resolution workshops can be established to address concerns and find mutually beneficial solutions.
- Building partnerships with operators: Energy communities should work to establish collaborative partnerships with energy operators and suppliers. Clear frameworks that define roles, responsibilities, and benefits for all parties involved can reduce friction and encourage cooperation.

Social acceptance and inclusivity issues

Social acceptance of energy communities remains a significant issue in some Danube Region countries, particularly in rural or less developed areas. There may be resistance to change, a lack of understanding of the benefits, or fear of increased costs. Moreover, the governance structures of many energy communities are still evolving, and there is often a lack of inclusive decision-making processes that reflect the diverse interests of all stakeholders. In particular, marginalised groups, such as low-income households, may feel excluded from the benefits of energy communities due to high upfront costs or complicated membership requirements.

Areas of intervention:

• **Inclusive governance practices**: Ensuring that energy communities adopt inclusive and transparent governance structures is crucial. This includes involving all members in

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decision-making processes and ensuring that everyone's voice is heard. Representation of marginalised groups can be promoted through specialised committees or advisory boards that focus on the needs of vulnerable populations.

- Social inclusion programmes: Energy communities should implement programmes aimed at improving access to energy for all members, particularly vulnerable or lowincome households. This could include financial assistance programmes, such as subsidies or low-interest loans, to help these households participate in energy community initiatives.
- Promoting long-term engagement: Building trust and fostering long-term engagement requires that energy communities maintain consistent communication with all stakeholders. Demonstrating the tangible benefits of participation, such as cost savings, energy independence, and improved local services, will help ensure the ongoing involvement of community members.

Sustaining long-term engagement and impact

While initial interest in energy communities may be strong, maintaining long-term engagement and ensuring that energy communities continue to deliver positive impacts over time remains a significant challenge. This requires sustained effort in capacity-building, transparent communication, and the establishment of clear and measurable goals.

Areas of intervention:

 Regular monitoring and evaluation: Regularly assessing the progress of energy community projects and evaluating their social, economic, and environmental impacts will help sustain stakeholder motivation and ensure that goals are being met. Feedback mechanisms should be built into the governance framework to allow for continuous improvement.

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 Ensuring financial sustainability: Securing long-term financial stability through diversified funding sources, including government subsidies, private investments, and community contributions, is essential for the longevity of energy communities. Clear financial strategies and transparent accounting practices should be developed and communicated to all stakeholders.

The establishment and development of energy communities in the Danube Region are faced with a variety of social, political, and operational challenges. By addressing issues such as lack of awareness, insufficient professional skills, PR challenges, conflicts of interest, and social acceptance, countries can create an enabling environment that fosters the growth of energy communities. With targeted interventions in governance practices, capacity building, communication strategies, and inclusive participation, energy communities can become a key driver of sustainable energy transformation in the region.

III.IV Potential member and stakeholder incentives and recommended measures for effective capacity-building and communication

The creation of a thriving energy community necessitates the unification of individuals possessing diverse backgrounds, interests, and areas of expertise, all striving toward the shared objective of sustainable energy utilisation. This ambitious undertaking demands a comprehensive and robust strategy for engaging stakeholders, encompassing a multifaceted approach built upon several fundamental components. These core elements include the meticulous identification of key

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stakeholders; a thorough understanding of their individual needs and potential concerns; the cultivation of strong, trusting relationships; the facilitation of open dialogue and collaborative efforts; the provision of comprehensive education and readily accessible information; the active solicitation of feedback and input; and finally, the continuous evaluation and adaptation of strategies based on gathered insights.

Sustaining the motivation and active participation of stakeholders within an energy community requires a concerted and ongoing effort. Central to this endeavour is the maintenance of transparent and open communication channels. This involves the consistent and readily available sharing of project updates, significant milestones achieved, and successes attained, utilising a variety of methods, such as regular newsletters, email communications, and informative community meetings. Keeping stakeholders well-informed about progress and accomplishments fosters a sense of value and underscores their integral role in the community's ongoing development.

Equally crucial is the consistent demonstration of recognition and appreciation for stakeholder contributions. Public acknowledgment and celebration of individual and collective achievements strengthens feelings of ownership and pride in the project's success. Whether highlighting specific individual accomplishments or commemorating collective milestones, this recognition cultivates a positive atmosphere and encourages sustained active participation. Furthermore, providing substantial opportunities for stakeholders to contribute directly to the community's direction is paramount. This can be facilitated through workshops, training sessions, and collaborative decision-making forums. Involving stakeholders in decision-making processes ensures their voices are heard, fostering a strong sense of ownership and investment in the project's ultimate outcomes.

Establishing clear, measurable goals and consistently tracking progress is another significant factor in maintaining stakeholder motivation. By ensuring that all members remain aligned and focused on shared objectives through clearly defined goals and regular updates on progress, stakeholders

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can witness the tangible impact of their contributions, thereby bolstering their commitment and enthusiasm. Maintaining flexibility and adaptability in response to evolving stakeholder needs is equally important. Demonstrating responsiveness and respect for stakeholder input by actively listening to feedback and adjusting project plans accordingly strengthens their sense of ownership and investment.

Facilitating networking and community-building activities also plays a vital role in sustaining stakeholder motivation. Creating opportunities for stakeholders to connect, share experiences, and build relationships fosters a sense of camaraderie and mutual support. Encouraging collaboration and partnership building further strengthens these bonds and promotes a unified sense of purpose. Finally, investing in continuous learning and capacity building ensures stakeholders possess the necessary knowledge and skills to contribute effectively. Offering training programmes, workshops, and educational resources on relevant topics deepens their understanding of renewable energy and community engagement, ultimately empowering them to make meaningful contributions.

Effective decision-making within energy communities hinges on the implementation of several key strategies. Democratic processes, such as voting systems—potentially utilising online platforms for enhanced accessibility—and regular general assemblies where members can express opinions, vote on critical issues, and elect representatives, are crucial. Collaborative platforms, including online forums for ongoing discussions and feedback, alongside workshops and focus groups for in-depth deliberations, are essential tools for fostering consensus. Feedback mechanisms such as surveys, questionnaires, and suggestion boxes (both physical and digital) allow for the gathering of diverse perspectives. Inclusive representation, achieved through diverse committees and the active encouragement of participation from youth and minority groups, ensures that all voices are heard.

Consensus building, a collaborative process aimed at finding common ground and achieving mutually acceptable agreements, can be significantly facilitated through skilled facilitation,

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deliberative processes encouraging consideration of diverse perspectives, and structured consensus workshops designed to identify shared values and common interests. Transparent communication, achieved through regular updates via newsletters, emails, and online platforms, is critical for building trust and ensuring all members are aware of decisions and their implications. Empowering committees and working groups allows for specialised decision-making, leveraging the expertise and interests of community members. Finally, feedback and accountability mechanisms, including regular feedback sessions and measures like reporting and audits, ensure that decision-making processes remain responsive, fair, and aligned with the community's values and goals. Celebrating successes and learning from setbacks contribute to a robust and adaptive decision-making process.

IV. Necessary steps towards the creation of the proper environment for energy communities in the Danube Region

Renewable energy communities have immense potential in the Danube Region. These communities enable self-sufficient or nearly self-sufficient energy production, balancing generation, consumption, and storage, typically through solar, wind, or biomass. Creating a favourable environment for these communities involves addressing legal, technical, and social barriers. The Danube Region's diversity, ranging from countries with advanced REC frameworks to

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those lacking any support structures, demands tailored approaches to foster an environment conducive to sustainable and resilient energy communities.

IV. I Establishing a supportive legal framework

A strong legal foundation is crucial for REC growth, ensuring that communities can legally form, access energy markets, and share energy within a supportive structure. Some Danube countries, like Austria and Germany, already possess established legal frameworks for RECs, although improvements are needed, especially concerning grid connection fees and regulatory complexities. Conversely, countries such as Moldova, Montenegro, and Bulgaria lack specific REC regulations, relying instead on general policies that do not effectively support community-based energy initiatives.

To foster REC expansion, Danube countries should focus on:

- Simplifying regulatory procedures: Streamlined and accessible processes for REC registration, grid connection, and energy trading are essential. Austria and Germany's models, which offer a single point of contact for guidance, could be replicated across the region.
- Defining roles and standards: Clearly defining REC activities, such as energy generation, storage, and sharing, aligns communities with EU directives and facilitates smoother market participation.
- Providing financial support: Incentives like feed-in tariffs, rebates, and subsidies can lower financial barriers, encouraging REC growth and attracting participants. Non-EU countries in the region, in particular, may benefit from adopting EU-funded schemes tailored to their local contexts.

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These steps would enable countries with varying REC maturity levels to advance REC growth by offering a supportive, accessible, and incentive-backed legal framework.

IV. II Addressing economic and technical prerequisites

REC development hinges on robust economic and technical underpinnings that ensure reliable operation and sustainability. The economic structure of RECs typically includes non-profit models focused on community benefit rather than profit maximisation, allowing for inclusive participation and equitable cost-sharing. To support REC sustainability, accessible financing, diverse operational models, and efficient grid integration are necessary.

Key steps include:

- Mapping local energy demand and resources: A thorough assessment of local energy consumption and potential renewable sources allows communities to optimise production. Additionally, constructing renewable energy infrastructure, such as photovoltaic (PV) and wind installations, enables RECs to meet community needs sustainably.
- Integrating advanced technologies: Combining PV systems, wind turbines, and combined heat and power (CHP) systems ensures a reliable energy supply. CHP systems are particularly beneficial in areas with significant heating needs, allowing communities to use both generated electricity and waste heat.
- Securing funding and developing business models: Financing RECs requires various sources, including national subsidies, EU funds, and community investments. Business models for RECs may involve co-ownership or crowdfunding, enabling community

members to collectively invest in renewable projects, which reinforces community engagement and provides a sustainable funding structure.

• **Optimising grid and storage infrastructure**: Efficient grid connectivity and energy storage systems allow RECs to balance supply and demand effectively, reducing grid dependency. Countries can adopt Austria's "Energy Data Exchange" platform model, which facilitates energy data sharing and trading, thereby enhancing operational efficiency.

By building these technical and economic foundations, the Danube Region can enable sustainable REC operation and support communities in their transition to cleaner energy.

IV. III Fostering social inclusion and effective governance

Social inclusion and strong governance practices are essential for REC success. Energy communities thrive on community engagement, and their governance structures must reflect local interests, building trust and ensuring equitable decision-making. Effective stakeholder engagement is particularly vital in regions where energy communities are still unfamiliar or mistrusted.

Steps to improve social integration and governance include:

- Public awareness campaigns: Educating citizens, local authorities, and businesses on REC benefits, such as reduced energy costs and environmental impact, can reduce misconceptions and stimulate interest. Campaigns should focus on the community and economic advantages of local renewable energy.
- **Inclusive governance models**: Ensuring diverse stakeholder representation in REC decision-making processes fosters transparency and accountability. By establishing

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democratic governance structures, like cooperative boards or regular assemblies, RECs can ensure that all members' voices are heard and respected.

- Offering training and capacity building: Providing professional development and training in areas such as energy management and project finance empowers local leaders and equips community members with skills to contribute meaningfully to REC projects. Workshops, online courses, and collaboration with experienced RECs from other regions can build community knowledge and engagement.
- Promoting long-term engagement: Transparent communication on REC milestones and the celebration of community achievements enhance community cohesion and sustained commitment. Recognising members' contributions and fostering a sense of ownership over the REC project encourages ongoing involvement and supports a stable community base.

By prioritising social cohesion and inclusive governance, energy communities can enhance local participation, support long-term engagement, and foster a sense of shared responsibility in renewable energy projects.

IV. IV Mitigating operational barriers and optimising model integration

Many operational challenges hinder REC development, including high setup costs, limited financial support, and bureaucratic obstacles. Addressing these barriers requires a flexible approach that adapts to the unique needs of each country while optimising REC operational models.

Strategies to enhance REC operations include:

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- Improving financial and technical support systems: Implementing subsidies, grants, and low-interest loans tailored to REC projects lowers entry barriers, making participation feasible for households and small businesses. Additionally, robust financial systems that allow for community contributions and external investments provide a stable funding base.
- Optimising operational models: Different operational models, such as interest associations, cooperatives, and business entities (e.g., LLCs or JSCs), enable communities to choose structures that best suit their needs. These models allow for flexibility in decision-making, financial management, and participant engagement.
- Encouraging private-public partnerships: Collaborations between RECs, local governments, and private sector entities can accelerate REC development. Partnerships offer RECs access to expertise, infrastructure, and resources that may be otherwise unattainable. Involving municipal bodies as active members can provide strategic support and legitimacy, particularly in regions where RECs are nascent.

The Danube Region's diversity in REC maturity levels means that tailored approaches, including operational flexibility and targeted financial support, are essential for enabling energy communities to overcome operational barriers and optimise performance.

IV. V Enabling a sustainable future for RECs in the Danube Region

The creation of a supportive environment for RECs across the Danube Region requires a coordinated approach that addresses legal, economic, technical, and social dimensions. By simplifying regulatory frameworks, establishing robust financial systems, fostering social inclusion, and optimising operational models, Danube countries can cultivate a conducive atmosphere for

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RECs. This strategy promotes a low-carbon, community-centred energy transition, ultimately enhancing energy independence, reducing greenhouse gas emissions, and contributing to a more sustainable future in the Danube Region. Through these concerted efforts, the Danube Region can become a leader in renewable energy, empowering communities to take control of their energy production and contribute actively to regional sustainability.

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V. Implementation and monitoring of the Strategy

The implementation of this jointly developed strategy by the partners will mark a critical step forward in expanding renewable energy communities across the Danube Region. With a comprehensive approach that addresses legal, technical, and social barriers, this strategy aims to create a supportive environment, increase the number of RECs, and foster sustainable energy practices. This strategy will be shared with national and transnational key stakeholders, and its findings and recommendations will serve as essential elements of the NRGCOM project's final result, a White Paper.

This chapter outlines the phased approach, key responsibilities, and mechanisms for monitoring and evaluation that will guide the strategy's implementation and ensure its long-term impact.

V.I Phased approach to the implementation of the Strategy

The strategy's implementation will proceed in three main phases, structured to progressively build the necessary foundation for energy communities across the Danube Region. These phases allow for continuous adaptation, assessment, and scaling of the strategy as progress is made and insights are gained.

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V. I. I Preparatory actions and stakeholder engagement

In the initial phase, Project Partners will prioritise the foundational steps of legal alignment, stakeholder identification, and awareness-raising. This phase includes reviewing existing national regulations to ensure compliance with EU directives, identifying necessary legislative adjustments, and simplifying administrative processes for REC formation. Concurrently, partners will engage stakeholders such as local authorities, businesses, community members, and energy providers through targeted outreach campaigns to build awareness about the benefits of RECs and their role in advancing the regional energy transition. Capacity-building activities will be launched to provide training for REC stakeholders on best practices in governance, finance, and technical aspects.

V. I. II Piloting and operational support

Once preparatory actions are underway, the second phase will involve piloting REC initiatives and providing operational support to ensure efficient setup and functioning. During this phase, selected communities will serve as pilot sites, implementing REC models with support from the Project Partners. This phase is crucial for testing the practical applicability of legal, financial, and technical frameworks in different local contexts. Partners will monitor these pilot RECs to identify challenges, successes, and areas for improvement. Based on the findings, best practices will be documented, and standardised resources will be developed to support other communities interested in establishing RECs.

V. I. III Scaling and institutionalising

The final phase will focus on scaling successful REC models across the Danube Region and institutionalising support systems. In this phase, partners will work to integrate REC support mechanisms into national and regional policies, creating long-term funding sources and embedding REC frameworks within legal structures. By this stage, networks of RECs across countries will be formed, with support platforms and partnerships with local agencies, utilities, and

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financial institutions. Educational materials, guidelines, and case studies from the pilot phase will be shared widely to encourage further community participation and investment in renewable energy. The institutionalised support systems will serve as an enduring framework for expanding RECs across the Danube Region.

V. II Roles and responsibilities

The successful execution of this strategy relies on clear roles and collaboration among all Project Partners. Each partner will play a specific role based on their expertise, regional knowledge, and resources.

V. II. I Project partners

Responsible for driving implementation at the local level, Project Partners will coordinate with local stakeholders, government agencies, and energy providers to ensure smooth strategy execution. Their role includes overseeing pilot actions and projects, gathering data for monitoring, and reporting on progress.

V. II. II National and regional authorities

As the primary regulators, national and regional authorities will support legislative adjustments, streamline REC establishment procedures, and facilitate the integration of RECs into the broader energy market. These authorities will also promote supportive policies that align with EU energy directives.

V. II. III Technical and financial Experts

Technical experts will provide essential guidance on renewable technologies, grid integration, and energy management systems. Financial experts, including representatives from national banks and funding agencies, will assist in identifying funding sources, developing viable REC financing models, and supporting business plans to ensure REC sustainability.

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V. II. IV Community leaders and local stakeholders

Community leaders and members of existing or potential RECs will actively participate in piloting and feedback processes. Their insights and on-the-ground experience are crucial for refining the strategy's applicability and impact, ensuring that REC models are aligned with local needs and preferences.

V.II Monitoring and evaluation mechanisms

To track the strategy's impact and ensure accountability, an integrated monitoring and evaluation (M&E) framework will be established. This framework will employ quantitative and qualitative metrics, capturing data from the pilot actions and feedback from stakeholders to assess progress across different stages of the strategy.

V. II. I Key Performance Indicators (KPIs)

Specific KPIs will measure the growth of RECs, legal alignment progress, financial support availability, and social engagement. Examples include the number of established RECs, policy changes enacted, funds allocated, and the level of community involvement. KPIs will be reviewed and adjusted annually to reflect evolving goals and challenges.

V. II. II Data collection and reporting

Regular data collection will provide partners with real-time insights into implementation progress and highlight any obstacles. Data sources will include REC operational data, participant feedback, financial reports, and policy updates from partner countries. Project Partners will submit biannual reports summarising their findings, which will be incorporated into a centralised project dashboard.

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V. II. III Feedback mechanisms

Stakeholder feedback will be systematically gathered through surveys, focus groups, and community meetings. This feedback will help refine the implementation approach, address emerging challenges, and improve stakeholder engagement. Special attention will be given to feedback from pilot communities, whose experiences will inform best practices and the development of supportive resources for other communities.

V. II. IV Annual evaluations and adjustments

An annual evaluation will assess the overall impact of the strategy, with adjustments made based on the insights gathered. Evaluation criteria will include REC growth, regulatory and financial improvements, and community engagement levels. Recommendations from these evaluations will shape future actions, ensuring that the strategy remains relevant and responsive to local and regional needs.

The phased implementation and thorough monitoring of this strategy represent a collaborative, adaptive approach that can significantly impact the Danube Region's renewable energy landscape. By actively involving local stakeholders, pilot testing REC models, and institutionalising supportive frameworks, the strategy will establish an enduring foundation for energy communities. As RECs grow and mature, they will contribute to a sustainable, low-carbon energy future for the Danube Region, enhancing energy security, promoting economic resilience, and empowering communities to take an active role in the energy transition.

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VI. Conclusions

The NRGCOM **Strategy to create the proper legal, technical and social conditions for energy communities in the Danube Region**, has outlined in the preceding sections, provides a comprehensive framework addressing legal, operational, economic, and social aspects. This conclusion synthesises key findings and actionable insights to ensure the successful establishment and growth of ECs, contributing to the energy transition in the region.

VI.I Legal aspects

Creating a supportive legal environment is fundamental for ECs. The analysis reveals significant disparities among the Danube Region countries:

- **Developed frameworks**: Countries like Austria and Germany have established robust legal systems but still face challenges such as grid access complexities and high connection fees. Streamlined administrative processes and targeted incentives for vulnerable groups could further enhance inclusivity and efficiency.
- **Emerging frameworks**: Nations like Romania, Slovenia, and Hungary show progress but require clearer definitions of REC activities and financial mechanisms. Simplifying administrative hurdles and introducing robust financial incentives are essential.
- Underdeveloped frameworks: Countries such as Montenegro, Moldova, and Bulgaria lack foundational legal structures. Priority actions include creating detailed by-laws, aligning policies with EU standards, and establishing single points of contact to guide stakeholders through the setup process.

Harmonising these frameworks across the region can facilitate knowledge transfer, reduce barriers to entry, and promote transnational energy cooperation.

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VI.2 Operational and economic considerations

Operational efficiency and economic sustainability are the pillars of successful ECs:

- 1. **Technical integration**: ECs require a mix of renewable energy technologies, including photovoltaic systems, wind power, and combined heat and power units. Developing shared infrastructure like smart grids and energy storage solutions ensures optimised energy distribution and reduces grid dependency.
- Financial models: Funding remains a critical challenge. While EU programmes like Horizon and Interreg provide support, many countries lack domestic mechanisms. ECs can adopt cooperative funding models, involve private investments, or utilise crowdfunding to secure resources. Transparent and participatory financial planning boosts member trust and engagement.
- 3. **Scalable business models**: Diverse operational structures, such as cooperatives, interest associations, or limited liability companies, allow ECs to adapt to local needs. Tailoring these models to regional contexts enhances flexibility and resilience.

Social Inclusion and Governance

Strong governance and community engagement ensure the longevity and acceptance of ECs:

- **Stakeholder engagement**: Building awareness through targeted campaigns helps demystify EC concepts. Training programmes equip local leaders and members with the skills to manage projects, fostering ownership and confidence.
- Inclusive governance: Transparent decision-making structures, such as democratic voting systems and inclusive boards, ensure fair representation. Special initiatives for low-income households and marginalised groups enhance accessibility and social equity.

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• **Long-term engagement**: Celebrating community milestones, recognising member contributions, and maintaining clear communication help sustain motivation and cohesion.

VI.3 Strategic steps forward

To enable a thriving ecosystem for ECs in the Danube Region, the following steps are paramount:

- 1. **Legal harmonisation**: Align national frameworks with EU directives, ensuring clarity, simplicity, and inclusivity.
- 2. **Financial empowerment**: Establish national funds, incentivise community investments, and expand access to international grants.
- 3. **Technical readiness**: Invest in renewable infrastructure, smart grids, and energy storage, optimising local resource use.
- Capacity building: Educate stakeholders through workshops, training, and peer learning initiatives.
- 5. **Monitoring and adaptation**: Regular evaluations using Key Performance Indicators (KPIs) ensure strategies remain relevant and effective.

VI.4 Broader impacts

By addressing these multi-dimensional challenges, energy communities can become key drivers of sustainable development in the Danube Region. They reduce dependency on fossil fuels, enhance energy security, and foster economic growth through local job creation. Socially, ECs strengthen community ties and empower citizens to play active roles in the green energy transition.

The collaborative effort across Danube countries, supported by shared frameworks and regional knowledge exchange, positions the region as a leader in renewable energy innovation and

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community-led initiatives. With sustained commitment and targeted interventions, the vision of a resilient, inclusive, and low-carbon energy future can be realised.

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