



# Handbook on Cross-border Energy Communities

Final Version

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# **Handbook on Cross-border Energy Communities**

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## Abbreviations

Abbreviation	Text
AEBR	Association of European Border Regions
BSW	Badische Stahlwerke
CBEC	Cross-border energy community
CEC	Citizen energy community
CEF-E	Connecting Europe Facility – Energy
CEP	Clean Energy for All Europeans Package
CHP	Combined Heat and Power
CKS	Calorie Kehl-Strasbourg
DSO	Distribution System Operator
ECBA	European cross-border association
EEA	European Economic Area
EEIG	European Economic Interest Grouping
EGTC	European Grouping of Territorial Cooperation
EMR	Electricity Market Regulation
ERDF	European Regional Development Fund
ETC	European Territorial Cooperation
EU	European Union
EUI	European Urban Initiative
IMED	Internal Market for Electricity Directive
JTF	Just Transition Fund
kV	kilovolt
MoU	Memorandum of Understanding
MS	Member State
MSME	Micro-, small- and medium-sized enterprise
NGO	Non-governmental organisation
P2P	Peer to Peer
PPA	Power purchase agreement

Abbreviation	Text
PV	Photovoltaic
Q-CBEC	Quasi cross-border energy community
REC	Renewable energy community
RED II	Renewable Energy Directive
RES	Renewable Energy Sources
RRF	Recovery and Resilience Facility
SCE	European Cooperative Society
SECAP	Sustainable Energy and Climate Action Plan
SEM	Société d'économie mixte
SEREH	Smart Energy Region Emmen-Haren
SME	Small- and medium-sized enterprise
TFEU	Treaty on the Functioning of the European Union
TSO	Transition System Operator
VPP	Virtual Power Plant



## PREFACE

For centuries, borders have been dividing populations, and have often been the scars of history. Over the years, the European project has turned historically “rigid borders” to “permeable and friendly” environments, and populations from “enemies” or “strangers” into “neighbours”, building trust and mutual understanding, as well as solidarity, in the European Union.

As recognised under **Article 174 of the Treaty on the Functioning of the EU**, the Union should pay particular attention to cross-border regions when it comes to economic, social and territorial cohesion and the reduction of disparities. They play a vital role in the European integration process acting as “living labs” where new European solutions are tested. However, their development and ambitions are often hampered by diverging national rules or different administrative procedures. This has implications in citizens daily lives who cross the border regularly for labour, health, education, or other reasons.

Since 1990, to enhance the development of border regions and foster cross-border cooperation, **Interreg (or European Territorial Cooperation)** supports cross-border investments and aims at tackling common challenges with joint solutions. Interreg aims at exploiting the untapped growth potential in border areas, while enhancing the cooperation process with a view to strengthening the overall harmonious development of the Union.

Breaking down administrative and legal barriers to cross-border cooperation in all sectors and improving citizens daily lives is at the heart of our policy, and this is why the **Border Focal Point** was created inside the Directorate-General for Regional and Urban Policy (DG REGIO). This team in DG REGIO Unit “Interreg, Cross-Border Cooperation, Internal Borders” focuses on providing support “beyond funding” to cross-border cooperation and complements the objectives reached through Interreg. This work includes actions of political, technical, and legal nature, as well as the development of studies, analysis, and tools in different policy fields: labour market, energy, public transport, health, disaster risk management, among others. The **B-solutions** initiative to solve legal and administrative obstacles, as well as the **Border Focal Point Network** to allow for the exchange of good practices and networking among border stakeholders, play a crucial role in facilitating cross-border cooperation and supporting local actors.

This ***Handbook on cross-border energy communities*** was developed to ensure that no-one is left behind in the green and energy transitions, and that citizens in border regions are supported in strengthening their own capacity to produce and consume locally produced renewable energy. This will contribute to the resilience of our border regions and make them more sustainable, as well as ensure reduction from external dependencies in face of future crises. The cross-border context entails a higher degree of complexity, and this is when our support comes into place. This Handbook provides a step-by-step methodology to establish cross-border energy initiatives and recognizes that more work and efforts are needed at European, national, regional and local level to build a favourable enabling and supportive framework for the success of these citizens-led energy initiatives.

I am delighted to introduce this publication and I am confident that the information provided will be valuable for citizens, local actors and stakeholders, as well as for policy-makers at different governance levels, encouraging further cooperation to the benefit of all European citizens.

**Jean-Pierre Halkin**

Head of Unit – Interreg, Cross-Border Cooperation, Internal Borders

## ABSTRACT

The Handbook on Cross-Border Energy Communities (CBECs) offers a comprehensive overview on how to establish and manage energy initiatives that span national borders within the European Union. It is aimed at empowering local actors, policymakers, and stakeholders to navigate the legal, technical, and administrative challenges unique to CBECs, while emphasizing their contribution to the EU's energy transition and cohesion objectives. CBECs present numerous benefits, including economic efficiencies, job creation, enhanced energy independence, and reduced carbon footprints. However, they face significant challenges. The Handbook provides practical information and highlights good practices, such as "Calorie Kehl-Strasbourg" and "Zusamme Solar! Colmar", which demonstrate successful governance, innovative financing, and collaborative technological approaches that can serve as inspiration for new cross-border projects. By addressing existing barriers to cross-border cooperation in this field and implementing its recommendations, policymakers and stakeholders can unlock the potential of border regions, transforming them into key contributors to a sustainable and interconnected energy future for the EU.

## EXECUTIVE SUMMARY

The Handbook on Cross-Border Energy Communities (CBECs) offers a comprehensive overview on how to establish and manage energy initiatives that span national borders within the European Union. It is aimed at empowering local actors, policymakers, and stakeholders to navigate the legal, technical, and administrative challenges unique to CBECs, while emphasizing their contribution to the EU's energy transition and cohesion objectives. These communities are designed to produce, distribute, and manage energy collaboratively, aligning with EU priorities like the European Green Deal, energy market integration and security, and sustainable territorial development.

CBECs present numerous benefits for cross-border functional areas which have specific needs, including economic efficiencies, job creation, enhanced energy independence, and reduced carbon footprints. However, they face significant challenges due to misaligned national legal frameworks, inadequate infrastructure for cross-border energy exchange, procedural inconsistencies, and socio-cultural barriers such as language differences and limited public acceptance. The Handbook highlights the importance of establishing enabling frameworks at national and regional levels to overcome these cross-border obstacles. Existing legal structures, like the European Groupings of Territorial Cooperation (EGTC), and bilateral agreements offer potential support but often require adaptation for energy-specific initiatives.

The Handbook underscores the economic, environmental, and social benefits of CBECs. These initiatives reduce system costs, create development opportunities, enhance regional self-sufficiency, and foster innovation – including social innovation. They also align with EU energy priorities by supporting renewable energy adoption, improving grid efficiency, and promoting regional cohesion. Practical case studies, such as "Calorie Kehl-Strasbourg" and "Zusammen Solar! Colmar", demonstrate successful governance, innovative financing, and collaborative technological approaches that can serve as inspiration for new cross-border projects.

To facilitate CBEC development, the Handbook provides practical information organized into key building blocks: stakeholder engagement, needs assessment, governance frameworks, financial strategies, and infrastructure alignment. It emphasizes the value of leveraging EU funding instruments like Interreg and LIFE programs and highlights the need for knowledge sharing and capacity building among cross-border stakeholders. Policy recommendations include harmonizing national frameworks with EU directives, improving cross-border spatial planning, adapting technical standards for energy exchange, and expanding funding mechanisms tailored to the unique needs of CBECs.

Ultimately, the Handbook highlights the significant potential of CBECs to advance Europe's energy transition and foster European territorial integration. By addressing existing barriers to cross-border cooperation in this field and implementing its recommendations, policymakers and stakeholders can unlock the potential of border regions, transforming them into key contributors to a sustainable and interconnected energy future for the EU.

## Résumé Exécutif

Le manuel sur les communautés énergétiques transfrontalières (CBEC) offre une vue d'ensemble exhaustive sur le lancement et la mise en œuvre d'initiatives énergétiques au travers des frontières nationales au sein de l'Union européenne. Il vise à donner aux acteurs locaux, aux décideurs politiques et aux parties prenantes les moyens de relever les défis juridiques, techniques et administratifs propres aux communautés énergétiques transfrontalières, tout en mettant l'accent sur leur contribution à la transition énergétique et aux objectifs de cohésion de l'UE. Ces communautés sont conçues pour produire, distribuer et gérer l'énergie de manière collaborative, en accord avec les priorités de l'UE telles que le Pacte Vert pour l'Europe, l'intégration et la sécurité du marché de l'énergie et le développement territorial durable.

Les CBEC présentent de nombreux avantages pour les espaces fonctionnels transfrontaliers dont les besoins sont spécifiques, notamment en termes d'efficacité économique, de création d'emplois, de renforcement de l'indépendance énergétique de même que contre la pauvreté énergétique, et de réduction de l'empreinte carbone. Cependant, ils sont confrontés à des défis importants en raison de cadres juridiques nationaux non alignés, d'infrastructures inadéquates pour les échanges transfrontaliers d'énergie, de procédures incompatibles et de barrières socioculturelles telles que les différences linguistiques et l'adhésion limitée du public. Le manuel souligne l'importance d'établir des cadres favorables aux niveaux national et régional pour surmonter ces obstacles transfrontaliers. Les structures juridiques existantes, telles que le Groupements européens de coopération territoriale (GECT), et les accords bilatéraux offrent des solutions potentielles mais qui nécessitent souvent une adaptation pour les initiatives spécifiques à l'énergie.

Le manuel souligne les avantages économiques, environnementaux et sociaux des CBEC. Ces initiatives réduisent les coûts des systèmes, créent des opportunités de développement, renforcent l'autosuffisance régionale et encouragent l'innovation – y compris l'innovation sociale. Elles s'inscrivent également dans les priorités énergétiques de l'UE en favorisant l'adoption des énergies renouvelables, en améliorant l'efficacité des réseaux et en promouvant la cohésion régionale. Des études de cas pratiques, telles que « Calorie Kehl-Strasbourg » et « Zusammen Solar Colmar », démontrent une gouvernance réussie, un financement innovant et des approches technologiques collaboratives qui pourraient servir d'inspiration pour de nouveaux projets transfrontaliers.

Pour faciliter le développement des CBEC, le manuel fournit des informations pratiques organisées en blocs thématiques : engagement des parties prenantes, évaluation des besoins, cadres de gouvernance, stratégies financières et alignement de l'infrastructure. Il souligne l'intérêt de tirer parti des instruments de financement de l'UE, tels que les programmes Interreg et LIFE, et insiste sur la nécessité de partager les connaissances et de renforcer les capacités des parties prenantes transfrontalières. Les recommandations politiques comprennent l'harmonisation des cadres nationaux avec les directives de l'UE, l'amélioration de l'aménagement du territoire transfrontalier, l'adaptation des normes techniques pour l'échange d'énergie et l'expansion des mécanismes de financement adaptés aux besoins uniques des CBEC.

En fin de compte, le manuel souligne le potentiel important des CBEC pour faire avancer la transition énergétique de l'Europe tout en favorisant l'intégration territoriale européenne. En s'attaquant aux obstacles à la coopération transfrontalière en la matière et en mettant en œuvre les recommandations proposées dans cet ouvrage, les décideurs politiques et les acteurs de l'énergie peuvent libérer le potentiel des régions frontalières et les transformer en contributeurs clés d'un avenir énergétique durable et interconnecté pour l'UE.

## INTRODUCTION

This Handbook aims to provide a comprehensive overview of the state of cross-border energy communities (CBEC) and related cross-border initiatives on energy in the European Union (EU), including specific examples, good practices and practical recommendations to start, run and support local initiatives in this context.

The Handbook is meant to be a tool for actors at local level, including citizens, citizen organisations and local actors such as local authorities and non-governmental organisations (NGOs), who want to establish a CBEC. At the same time, it aims to support institutions at European, national, regional and local level in understanding and promoting the benefits of CBECs for territorial development, for achieving the objectives of the European Green Deal and the integration of the European energy market.

The legal framework for energy communities at EU level is rather recent: the legal frameworks for Citizen Energy Communities (CECs) and Renewable Energy communities (RECs) were established by the Internal Market for Electricity Directive (EU) 2019/944 (IMED)<sup>1</sup> and Renewable Energy Directive (EU) 2018/2001 (RED II)<sup>2</sup>, respectively. Both Directives (RED II and IMED) acknowledge the importance of cross-border cooperation and include the possibility of creating "cross-border renewable energy communities" and "cross-border citizen energy communities". In particular, RED II stipulates in Article 22 that RECs shall be open to cross-border participation, and Article 16 of the IMED Directive states the same for CECs.

Cross-border energy initiatives are facing multiple obstacles that hamper the effective set up and integration of energy communities across borders, including legal obstacles at EU level, legal obstacles at national and regional level, non-supportive frameworks at national level, administrative barriers, physical-technical barriers as well as socio-cultural obstacles.

To date, most practical experiences in the EU refer to energy communities in a national context. However, during the elaboration of this Handbook, 27 cross-border initiatives related to energy were identified and analysed. Most of them do not classify (yet) as a true CBEC for several reasons. Examples of their limitations are a lacking community involvement or a limited/lacking cross-border activity despite a joint interest. In many cases, this is linked to the complexity of setting up and running a CBEC. Several initiatives are still at planning stage and have the potential to become a CBEC.

This Handbook analyses the state of the art of cross-border energy initiatives in the EU and defines lessons learned from existing (and finalised) initiatives. It offers recommendations on how to promote CBEC at local level with support from national, regional and local stakeholders.

Successful CBECs and other cross-border initiatives on energy require a) favourable enabling frameworks at national and regional level at both sides of the border, and b) adequate and effective cooperation to plan, set up and run a cross-border community.

This Handbook is divided into two parts. PART I gives a general overview on CBECs in the EU and makes recommendations on favourable national enabling frameworks.

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<sup>1</sup> DIRECTIVE (EU) 2019/944 of 5 June 2019 on Common Rules for the Internal Market for Electricity and Amending Directive 2012/27/EU (recast) (Text with EEA relevance). <https://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:32019L0944&from=en>, Article 16.

<sup>2</sup> DIRECTIVE (EU) 2018/2001 of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources (recast) (Text with EEA relevance). <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=EN>, Article 22.

PART II offers practical information on the building blocks of effective cross-border cooperation on energy and recommendations on how to set-up, run and support a CBEC in Europe. This part differentiates seven building blocks, each of which is described in a separate chapter of Part II.

The Handbook is accompanied by three inventories to be used as thesaurus for more detailed background information:

- The Annex document “Border Fiches” provides an inventory of border fiches, which sets out the situation in each border with respect to the legal and technical framework for CBECs, based on the comparison and analysis of the state of the art in the two sides of the border.
- An inventory of all cross-border (CB) energy cases collected within this study offers a more detailed description of their status, circumstances, obstacles and context. This inventory is included in a separate Excel file.
- Moreover, an inventory of obstacles observed while setting up and running CB energy communities was developed and is included in a separate Excel file.

All information presented in this Handbook has been established by a comprehensive methodological mix consisting of:

- Collecting and analysing obstacles for setting-up and running CBECs. This collection led to a total of 64 obstacles identified.
- Collecting and structuring of CB energy cases from different sources, which led to a total of 27 cases (see Annex I). These were not necessarily CBECs, but included also preparatory cases and CB energy projects. A selection of these has been analysed in depth through case studies.
- A survey among actors of CB energy projects, related interest groups and stakeholders, achieving in total 46 responses with different levels of completeness.
- In parallel, the preparedness of national enabling frameworks has been scrutinised using different sources, including inter alia, the REScoop transposition tracker<sup>3</sup>. This analysis focused on the relation of the enabling frameworks between neighbouring countries rather than the individual national frameworks.

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<sup>3</sup> <https://www.rescoop.eu/transposition-tracker-support-schemes>



## PART I – Overview

### 1. Context

According to Eurostat's methodology manual on territorial typologies<sup>4</sup>, a border region in the European Union (EU) is a region at NUTS 3 level with an EU internal or external land border, or those regions where more than half of the population lives within 25 km of such a border. EU internal border regions cover 40 % of the EU territory and produce 30 % of the EU's GDP. They are home to 30 % of the population and host almost two million cross-border commuters<sup>5</sup>. Border regions face particular challenges due to their geographical location and usually a long distance from the economic and political centre of their country. Many of these regions have insufficient infrastructure or limited access to public services, which limits their capacity to communicate, connect economic actors and develop.

Cross-border regions, whether they are urban, rural or maritime, are characterised by common functional areas where people cross the border to work or make purchases, where they have a shared heritage and environment as well as important trade and tourism exchanges. With the Single Market, it has become easier to develop common cross-border job markets and share equipment and services (hospitals, transport, schools, etc.). However, many obstacles for the development of cross-border areas persist. They matter for different sectors in different ways<sup>6</sup>. A 2017 Commission study estimated the losses stemming from the legal and administrative barriers in cross-border regions to be EUR 458 billion, which accounts for 3 % of the EU's total and 8.8 % of cross-border regions' GDP<sup>7</sup>. These losses translate into an estimated six million fewer jobs, accounting for 3 % of the EU's total and 8.6 % of cross-border regions' employment.

At the same time, cross-border territories are laboratories for European integration where cooperation has a true European added value. They are regions where the advantages of the single market and freedom of movement are very visible, and where new ideas and solutions for European integration are often tested for the first time<sup>8</sup>.

Cross-border cooperation is essential to overcome barriers, to maintain value chains, develop labour markets and cultural activities, provide public services and coordinate economic and social activities. Article 174 of the Treaty on the Functioning of the European Union (TFEU) on economic, social and territorial cohesion lists cross-border regions among the least-favoured and stipulates that the EU must aim to reduce regional disparities. To do so, different instruments have been developed over time. For example, European Territorial Cooperation (ETC) or Interreg, which provides project funding since 1990 and creates the basis for joint strategic development across borders. Since 2006, this funding instrument has been complemented with the European Groupings of Territorial Cooperation (EGTC) as a legal instrument for joint structures across borders.

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<sup>4</sup> [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Territorial typologies manual - border regions](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Territorial_typologies_manual_-_border_regions)

<sup>5</sup> European Commission, 2017.

<sup>6</sup> Pucher et al., 2017, Zillmer et al., 2021.

<sup>7</sup> Politecnico di Milano, 2017.

<sup>8</sup> European Commission, 2021b.

In consequence of these efforts, cross-border cooperation is well established in the EU and has led to numerous cross-border public transport services<sup>9</sup>, cross-border public services across several policy fields<sup>10</sup>, as well to numerous joint cross-border governance mechanisms and tools<sup>11</sup>. Initiatives such as *b-solutions*<sup>12</sup> help to find solutions to overcome specific border obstacles.

Within this context, cross-border initiatives on energy and especially CBEC face multiple obstacles. In addition to more general administrative and cultural obstacles for cross-border cooperation, they face important legal and technical challenges like other energy communities, rooted widely in unfavourable frameworks at national level. In addition, border regions face specific difficulties for setting-up and running energy communities in a cross-border territory deriving from uneven preparedness for cooperation on energy between Member States<sup>13</sup>. Still few countries in the EU plan better renewable energy deployment and energy efficiency measures in cooperation with their neighbours. Furthermore, energy markets do not yet function across borders as seamlessly as they do within a country. For example, cross-border electricity transactions are frequently limited because legal frameworks do not allow for low-voltage exchanges of electricity across borders.

Despite these obstacles, cross-border cooperation on energy is possible, as several initiatives all over Europe show. The following chapters give an overview on the state of art of CBECs and related initiatives in the EU, including a presentation of benefits and challenges.

## 2. What is a cross-border energy community?

The concept of "energy community" was introduced by the European Commission through the Clean Energy for All Europeans Package (CEP)<sup>14</sup>, as a way to "organise" collective cooperation of an energy related activity, fostering innovative and responsible ways to produce and consume energy with the engagement of local communities<sup>15</sup>.

Energy communities are defined in two separate laws of the Clean Energy Package. The revised Renewable Energy Directive II (RED II)<sup>16</sup> sets the framework for "**renewable energy communities**" (**RECs**) covering renewable energy and refers to their specific characteristics in terms of size and ownership structure. The revised Internal Electricity Market Directive (IMED)<sup>17</sup> introduces new roles and responsibilities for "**citizen energy communities**" (**CECs**) in the energy system covering all types of electricity and constituting

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<sup>9</sup> Zillmer et al., 2022b.

<sup>10</sup> Zillmer et al., 2022a.

<sup>11</sup> For an overview see, for example, ESPON, 2021.

<sup>12</sup> <https://www.b-solutionsproject.com/>

<sup>13</sup> European Commission, 2021a.

<sup>14</sup> European Commission, 2019.

<sup>15</sup> Caramizaru and Uihlein, 2020.

<sup>16</sup> DIRECTIVE (EU) 2018/2001 of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources (recast) (Text with EEA relevance). <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=EN>

<sup>17</sup> DIRECTIVE (EU) 2019/944 of 5 June 2019 on Common Rules for the Internal Market for Electricity and Amending Directive 2012/27/EU (recast) (Text with EEA relevance). <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0944&from=en>



a new type of entity due to their membership structure, governance requirements and purpose.

The two definitions of energy communities introduced by the REDII and IMED Directives frame energy communities around specific criteria characterised by the following set of common elements<sup>18</sup>:

- **Governance:** open and voluntary participation.
- **Ownership and control:** participation and effective control by citizens, local authorities and smaller businesses whose primary economic activity is not the energy sector.
- **Purpose:** generate social and environmental benefits rather than focus on financial profits.
- **Activities:** generation, distribution, supply, aggregation, consumption, sharing, storage of energy and provision of energy-related services.

At the same time, CECs and RECs differ with respect to the following features:

- **Geographical scope:** RECs should be located in proximity of renewable energy projects owned and developed by the community, while CECs are not bounded geographically.
- **Activities:** RECs can cover all forms of renewable energy in the electricity and heating sector while CECs are technology neutral.
- **Participants:** In CECs any actor can participate, but stakeholders involved in large-scale commercial activity where energy is the primary economic activity cannot make decisions. Besides citizens and small end-users, any size entity can participate in a CEC, while RECs restricted membership limits the participation to micro-, small- and medium-sized enterprises (MSMEs), who's membership/participation is not their primary economic activity.
- **Autonomy:** RECs must be autonomous from individual members and other traditional market actors, while autonomy is not mentioned for CECs.
- **Effective control:** RECs can be effectively controlled by MSMEs that are located in proximity to the community's projects, while CECs exclude medium-sized and large enterprises from being able to exercise effective control.

Both Directives (RED II and IMED) acknowledge the **importance of cross-border cooperation** and include the possibility of creating "cross-border renewable energy communities" and "cross-border citizen energy communities". In particular, RED II in Article 22 and Article 16 of the IMED Directive stipulate that RECs and CECs shall be open to **cross-border participation**.

However, even if the legal provisions in principle allow the establishment of CBECs at all EU borders, the lack of definition and the fact that transposition to national law is uneven and voluntary lead to constellations that hinder or even prohibit cross-border cooperation on energy and the creation of CBECs. While the progress of the transposition of the provision on definitions for RECs and CECs into national law, as well as enabling

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<sup>18</sup> See also: REScoop.eu. Q&A: What are 'citizen' and 'renewable' energy communities?.2021.  
<https://www.rescoop.eu/toolbox/q-a-what-are-citizen-and-renewable-energy-communities>

frameworks and national support schemes at national level are monitored by the *REScoop transposition tracker*<sup>19</sup>, there is no monitoring of the "cross-border participation" provisions for RECs and CECs.

Considering the common elements for energy communities of the RED II and IMED Directives and adding the cross-border notion, CBECs can be defined as follows:

### Definition of a Cross-Border Energy Community (CBEC)

A "Cross-border Energy Community" is a "renewable energy community" or a "citizen energy community" of cross-border nature.

A legal entity:

(a) which is based on **voluntary and open participation** in both border regions of the same cross-border region and is effectively **controlled by members and shareholders** of the cross-border region where it is set in place and operates. The shareholders are **natural persons, local authorities, including municipalities or small- and medium-sized enterprises (SMEs)**;

(b) has for its primary purpose to **provide environmental, economic or social community benefits to its members or shareholders** in both border regions of the same cross-border region where it operates, rather than to generate financial profits;

(c) may engage in **generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders in the cross-border region** where it is established and operates. Some of the aforementioned activities shall be of cross-border nature (e.g. energy is produced at least in one border region of a cross-border region and distributed, stored, supplied, or consumed in the other border region or in both border regions of the same cross-border region).

*Based on Article 2(16) Recast Renewable Energy Directive and Article 2(11) Recast Internal Electricity Market Directive*

Given the complexity of setting up and running an energy community in a cross-border context, it is useful to widen the definition of CBEC and introduce the concept of "Quasi cross-border energy communities" (Q-CBEC) and thereby adding to the formal definitions of energy communities.

### Definition of a Quasi- Cross-Border Energy Community (Q-CBEC)

A **quasi cross-border energy community** is an energy community that develops energy related activities (e.g. generation, distribution, supply, consumption) or provides energy services on one side of a national border, or separately on both sides of a same cross-border region, but without distributing energy across the border, and has at least one of the following aspects:

(a) **Joint management**: management as a cross-border legal personality, e.g. an EGTC;

(b) **Joint funding**: participants in one border region contribute to the funding of investments of another border region in the same cross-border region;

<sup>19</sup> See: <https://www.rescoop.eu/transposition-tracker>

(c) **Joint resources:** human resources, technical expertise or knowledge, or equipment are shared amongst the two or more border regions of the same cross-border region.

While energy communities in general can take different legal forms, such as cooperatives, social enterprises, not-for profit associations or partnerships, the creation of a single legal entity is more complex in a cross-border context.

Practice shows that there are three different groups of legal instruments that can enable the establishment of CBECs or other local cross-border energy initiatives as legal entities. However, not all instruments are available at all EU or European Economic Area (EEA) borders and there are also uncertainties associated with each group that could potentially act as barriers.

The first group covers **EU legal instruments for cross-border cooperation** that can be applied at all EEA borders. These are the EGTC, the "European Economic Interest Grouping" (EEIG) and the "European Cooperative Society" (SCE). These legal instruments are aimed at different purposes and focus on different types of actors (e.g. regional and local authorities, including public enterprises; private enterprises; cooperatives). Although not specifically designed for energy-related local cross-border cooperation, these instruments may indeed allow for the establishment of a CBEC as a legal entity. However, it depends on the provisions of the respective EU regulations whether they allow active participation of citizens or contain restrictions on carrying out certain types of energy-related activities (e.g. physical transfer of locally produced renewable energy; energy sharing and self-consumption; energy trading, etc.).

The second group covers specific legal instruments that may allow the establishment of a CBEC as a legal entity **in the context of intergovernmental agreements on cross-border cooperation** on some EEA borders (including CH). Examples for such agreements including such legal instruments are the "Karlsruhe Agreement" of 1996, which covers the borders FR-CH, DE-CH, DE-FR, DE-LU, and FR-LU; or the "Isselburg-Anholt Agreement" of 1993, which covers the border DE-NL. A common feature of these agreements is their provision for the establishment of cross-border cooperation bodies with their own legal personality based on the public law of the countries concerned. In addition, they sometimes provide instruments for the participation of actors from one state in existing (public) entities with legal personality in another state. As these instruments were not specifically designed for energy-related local cross-border cooperation, they may include restrictions for the participation of certain types of actors (e.g. individual citizens, NGOs, private enterprises, cooperatives) or limitations as regards the possible types of energy-related activities (e.g. physical transfer of locally produced renewable energy, energy sharing and self-consumption, energy trading, etc.).

The third group includes other legal instruments based on the **national law (private or public) of one of the neighbouring countries**. In general, this solution requires local actors from one side of the border to participate in a local organisation with legal personality that already exists (or has to be created) on the other side of the border. One option could be the establishment of a non-profit association with legal personality based on private law on one side of the border, with actors from the other side as members. Another option is the participation of public (or private) actors from one country in a local public (or semi-public) company established in the neighbouring country. This cooperation model, for example, has been applied to formalise the energy cooperation "Calorie Kehl-Strasbourg", which will use industrial waste heat in district heating systems on both sides of the border between France and Germany.

### 3. CBEC, Q-CBEC and related initiatives in the EU

While there is extensive information about energy communities in general – usually in a domestic context within a given country<sup>20</sup> –, there is very limited information on CBEC, Q-CBEC or related cross-border initiatives.

Therefore, during the elaboration of this study, comprehensive field work<sup>21</sup> was carried out to identify relevant initiatives and gain a better understanding on the objectives, characteristics and challenges of existing (including past and planned) CBECs, Q-CBECs and related initiatives in the EU.

In this context, 27 initiatives have been identified as examples for CBECs or Q-CBECs or related initiatives<sup>22</sup>. Two initiatives classify as CBEC but are still in the planning phase and not yet implemented<sup>23</sup>. Six initiatives classify as Q-CBEC, while 19 initiatives are cross-border initiatives that are related to CBEC, but either they do not fully comply with the definition of CBEC/Q-CBEC or are still in an early planning phase.

With regard to country coverage, these initiatives are located in 17 EU Member States<sup>24</sup> and at 14 different borders. Most initiatives are located at the Franco-German border and between Spain and Portugal (four in each case).

With regard to energy activity, eight initiatives relate to district heating networks. Six initiatives relate to electro-mobility, i.e. car sharing, car-pooling and/or charging stations for e-bike rental services, operation and management. Four initiatives foresee joint planning of multiple energy cooperations in a cross-border region. Three initiatives relate to solar energy and cooperation for the generation, distribution and sharing of electricity with photovoltaic installations. Two initiatives each relate to (i) offering services around energy generation, distribution and consumption as well as energy communities, (ii) joint activities and cross-border cooperation on hydrogen and (iii) energy activities based on biomass.

Practical examples also show the variety of solutions and technologies used in the context of cross-border energy cooperation. Electricity generation from renewable energy sources (RES) and electricity supply (including electricity trading) is part of the Franco-German project "Zusamme Solar Colmar" and the European energy cooperative "Efi-Duero Energy SCE" on the Spanish-Portuguese border. Cross-border renewable electricity generation, supply and trading are envisaged in the "Smart Energy Region Emmen-Haren" (SEREH)

<sup>20</sup> [REScoop.eu](https://rescoop.eu) is the European federation of energy communities with a growing network of 2,500 energy communities from across Europe covering 2 million citizens who are active in the energy transition. The European Commission ([DG Energy](https://ec.europa.eu/energy)) offers information on existing energy communities and manages different support tools. The [Energy Communities Repository](https://ec.europa.eu/energy-communities-repository) was launched in April 2022 and ended in January 2024. Its objective was to assist local actors and citizens willing to set up a CEC or an REC in an urban area, through technical and administrative advice, to encourage their development.

<sup>21</sup> More than 70 documents have been analysed in an extensive literature review. Between January and March 2024 an EU-wide survey was organised. An invitation was sent to 260 institutions working in the cross-border and energy community context across Europe. 27 complete responses were registered in a total of 46 responses, indicating relevant experiences related to CBECs and related initiatives. A long list of 41 cases of potential CBECs, Q-CBECs and related initiatives was gathered. 27 cases were then registered in the Inventory of CBECs, Q-CBECs and related projects. 19 cases were analysed more in-depth via case studies. At the same time an inventory of obstacles was elaborated with a total of 64 registered obstacle entries in the context of CBECs, Q-CBECs and related initiatives.

<sup>22</sup> They are included in the Inventory of Cases annexed to this Handbook reflecting the situation in July 2024 (see also Annex I).

<sup>23</sup> The cooperation between German and Luxembourgish communities in the Ralingen Rosport-Mompach "Borderless energy region", as well as the cross-border district heating network initiated by the Regionalwerk Chiemgau-Rupertiwinkel gKU in the Energy Region Southeast Bavaria (DE) - Upper Austria-Salzburg (AT) supported by the Connecting Europe Facility (CEF).

<sup>24</sup> AT, BE, DE, DK, FR, ES, FI, HU, IT, LU, NL, PL, PT, RO, SE, SI, SK.

on the Dutch-German border and the "Borderless Energy Region Ralingen-Rosport-Mompach" on the German-Luxembourg border.

Various initiatives focus on activities in the field of transport and e-mobility, for example, the cross-border bicycle rental system between the two border cities of Nova Gorica (Slovenia) and Gorizia (Italy) as well as the cross-border e-bike rental system at the border between North Rhine-Westphalia (Germany) and the German-speaking community of Belgium.

Two initiatives are planning to undertake activities in the field of heat. The Franco-German project "Calorie Kehl-Strasbourg" focuses on cross-border energy supply (i.e. pipeline-based transport of industrial waste heat) to enable further processing and distribution of this energy source on the other side of the border. On the Austrian-Italian border, a planned local cross-border district heating network, connected to a biomass power plant, foresees distributing heat produced from renewable sources directly to the final consumers.

Solar energy (based on photovoltaics – PV) is used as a single technology by two cross-border initiatives: the European energy cooperative "Efi-Duero Energy SCE" on the Spanish-Portuguese border and the Franco-German project "Zusamme Solar Colmar".

Wind is not used as a single technology by any of the cross-border initiatives planned or in operation identified in the context of this Handbook, but there are several cases where it is planned to be used in combination with solar energy and additional technologies such as hydropower or green hydrogen. Examples of such planned multiple technology use include SEREH on the Dutch-German border (wind, solar, green hydrogen), the planned "Borderless Energy Region Ralingen-Rosport-Mompach" on the German-Luxembourg border (wind, solar, hydropower), and the planned cooperation between the Dutch municipality of Kerkrade and the German town of Herzogenrath (wind, solar, green hydrogen), as well as several municipalities in the Bavarian-Austrian cross-border region covered by the "Euregio via salina" (wind, solar, hydropower).

Two cross-border initiatives included in the inventory on existing cases (Annex I) focus on biomass as energy source, e.g. this is the planned local cross-border district heating network on the Austrian-Italian border, which will be connected to a biomass power plant. The newly started Interreg project ALDEALIX between Galicia (ES) and North of Portugal (PT) envisages different ways to support community energy with biomass, including the promotion of cross-border services for energy communities.

## 4. Benefits of cross-border cooperation on energy

Apart from the economic, social and environmental benefits of energy communities in general, cross-border cooperation on energy generation, distribution and sharing can bring important benefits<sup>25</sup> to border regions that often face challenges like economic or geographical limitations.

With regard to EU priorities, CBECs fully contribute to the five dimensions of the energy union<sup>26</sup>: (1) diversifying Europe's sources of energy and ensuring energy security through solidarity and cooperation between EU countries, (2) enabling the free flow of energy through the EU in a fully integrated internal energy market through adequate infrastructure and without technical or regulatory barriers, (3) improving energy efficiency and thereby reducing dependence on energy imports and lowering emissions, (4) decarbonising the

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<sup>25</sup> Among others, see Stroink et al., 2022, MOT, 2019, and BRIDGE Secretariat, 2021.

<sup>26</sup> [https://energy.ec.europa.eu/topics/energy-strategy/energy-union\\_en#ref-5-dimensions-of-the-energy-union](https://energy.ec.europa.eu/topics/energy-strategy/energy-union_en#ref-5-dimensions-of-the-energy-union)



economy and promoting renewable energy, (5) supporting innovation and breakthroughs in low-carbon and clean energy technologies.

In particular, with new facilities for energy generation, supply, distribution and storage at local level, CBECs contribute to the green transition. At the same time, improving interconnections of electricity systems between EU Member States contributes to achieve an internal energy market in the EU and to increase the resilience of the European energy systems.

At national level, countries benefit from connecting regions with complementary properties regarding electricity generation and demand (e.g. urban-rural or industrial-residential) which would lead to a better allocation of transmission grid capacities and generally a more efficient utilisation of the system. Member States also benefit from a reduction of the environmental impact and carbon footprint of the whole electricity supply system and promoting self-sufficiency. Exploiting the potential of cross-border regions for energy production from renewable sources helps Member States meeting their energy and climate objectives. Moreover, CBECs allow to strengthen border regions in different aspects, thus contributing to social, economic and territorial cohesion, and therefore to the goals of the Territorial Agenda 2030<sup>27</sup>, a Just Europe that offers future perspectives for all places and people, and a Green Europe that protects common livelihoods and shapes societal transition.

Concrete benefits of cross-border cooperation and CBECs for border regions relate to:

- Efficiency gains and economic benefits in terms of system cost savings linking distribution systems across borders. In particular, the complementarity of border regions can reduce systems costs and may provide cost-efficient integration of energy sources.
- New development opportunities in terms of jobs and business development in the context of the energy transition, RES, smart grids and related value chains.
- Reducing dependency on imports and centralised energy supply based on fossil energy source, while increasing self-sufficiency and the share of renewable energies in electricity and heat production and consumption.
- Tapping into better natural resource potential of the neighbouring country or reaching higher market values on the other side of the border.
- Pooling knowledge and technology resources in the cross-border region, which might help accessing better financing conditions and lower costs of capital, thus reducing overall project costs.
- Improved energy security and the access to the service with new production units added into the grid near the consumers.
- Wider and more diverse user base, including the consumers from both sides of the border, evening out the technical limitations of coherent consumption patterns (peaks of consumption).
- Lower barrier of entry for technologies that require critical mass of consumers (district heating networks for example).

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<sup>27</sup> [https://ec.europa.eu/regional\\_policy/en/information/publications/brochures/2021/territorial-agenda-2030-a-future-for-all-places](https://ec.europa.eu/regional_policy/en/information/publications/brochures/2021/territorial-agenda-2030-a-future-for-all-places)

- Promoting innovation and new business models to support communities across borders to run their own energy system in a self-sustaining and profitable way.
- Complementing directly or indirectly other cross-border cooperation initiatives, for example, in the transport or tourism sectors regarding specific needs for shared electricity or e-charging systems, or in industrial sectors regarding material and energy flows (e.g. heat).
- Fostering a sense of European identity and solidarity, based on trust and mutual understanding, given the strong European added value of these initiatives.
- Creating resilient and connected cross-border communities, able to act jointly not only on energy cooperation, but also in other contexts and against future shocks.

## 5. Challenges and obstacles

Barriers and obstacles to cross-border cooperation within the EU and between the EU/EEA and neighbouring countries have been extensively studied<sup>28</sup>. At the same time, several studies have analysed barriers for the development of energy communities in a domestic context<sup>29</sup>. However, a combined view on obstacles for cross-border cooperation on energy communities was missing so far. The research carried out for this Handbook has allowed to identify and examine the obstacles faced by cross-border energy initiatives.

In addition to general cultural and linguistic differences, there are three general categories of border obstacles emerging from local, regional, national or EU legislation as well as from different administrative practices, which are also relevant in the context of cross-border energy communities:

- (a) **Legal obstacles at EU level** due to existing but inadequate EU legislation on aspects relevant to cross-border energy cooperation, in particular, to the impossibility of establishing local cross-border direct connections at distribution system level, due to the restrictive definition in Article 2(1) of the Electricity Market Regulation 2019/943/EU (EMR) (i.e. only the interconnection of transmission systems across national borders is allowed). Other EU level obstacles relate to the doubts on the adequacy of the EGTC legal instrument for establishing a legal entity in charge of operating a CBEC (i.e. with too restrictive provisions on EGTC membership in the EU Regulation) and to the absence of EU level harmonisation of technical standards on gas quality.
- (b) **Legal obstacles at national/regional level** due to the Member States' inconsistent implementation of existing EU legislation on energy-related aspects or other energy-related policy areas mostly due to an incomplete transposition of EU legislation into national law. Examples are the lack of transposition of the optional provisions in Article 22(6) of the RED II and in Article 16(2)(a) of the IMED, stating that RECs and CECs may be open to "cross-border participation", the lack of transposition in some EU Member States of the mandatory provisions on "energy sharing" within CECs (Article 16(3)(e) of the IMED) and within RECs (Article 22(2)(b) of the RED II) as well as the lack of a general transposition of the optional provision allowing CECs to own, establish, purchase or lease distribution networks and to autonomously manage them (i.e. Articles 2(11)(c) and 16(2)(b) of

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<sup>28</sup> See, for example, European Commission, 2021a, Pucher et al., 2017 and Zillmer et al. 2021.

<sup>29</sup> See, for example, AEA, 2022, Energy Communities Repository, 2024 and Interreg Europe, 2022.

the IMED. Other obstacles at this level refer, for example, to uncertainty about the relevant national laws and regulations to be applied in a cross-border context, restrictions on feed-in tariffs/top-up payments and insufficient public financial support, which hinder all types of local cross-border energy cooperation or different national laws and regulations on national support schemes hampering the cross-border border energy transfer between neighbouring municipalities.

- (c) **Administrative obstacles** caused by the lack of cross-border cooperation between national administrations and/or specialised national agencies with energy policy responsibilities to bridge structural differences between neighbouring energy systems, incompatibility of data or procedures, different administrative cultures or working procedures/routines of national or regional public authorities and agencies, or overly complex and lengthy regional or local administrative procedures in energy-related matters.
- (d) **Physical or technical obstacles** relate, for example, to the lack of direct cross-border electricity connections at distribution grid level, technical challenges for the traditional distribution and transmission grids, the lack of adequate energy-related technical infrastructure, the incompatibility of existing energy infrastructures in the border region or the presence of a natural barrier at the border (e.g., a large river or lake, a high mountain range etc.), which makes energy cooperation more complicated or costly.

The analysis shows that socio-economic and socio-cultural obstacles are less important in terms of number, but they might also play a crucial role. They relate, for example, to limited or no access to "external" funding sources (e.g. national or regional support schemes; inability to access private or public funding on one or both sides of the border), a perceived lack of economic viability, leading to the suspension of further implementation of a cross-border initiative, a lack of knowledge about how to overcome legal obstacles, or a lack of local social acceptance of the joint development of certain RES potentials (e.g. biomass, geothermal energy).

The high share of legal obstacles (around 61 % of all obstacles) found during the study indicates that weaknesses in the existing legal framework at EU and national level are the main reason for the slow progress in establishing different forms of local cross-border energy cooperation (in particular CBECs, but also Q-CBECs or other initiatives). Administrative and context-related obstacles together are much less important than legal obstacles (i.e. representing the remaining 39 %). However, in many cases located in the same cross-border region, they are additional problems that amplify the negative effects of parallel legal obstacles rather than acting as independent obstacles that prevent cooperation on their own. No examples could be registered in the category of "governance or management obstacles", as no document-based descriptions/analyses of problems or difficulties in already operational CBECs or Q-CBECs could be identified. This is not surprising due to the very small total number of fully operational CBECs and Q-CBECs.

The legal obstacles identified during the research, depending on the root cause, refer either to all EU/EEA borders, all borders of a given country, the entire length of a bilateral border or a smaller segment of a bilateral border.

In the case of CBECs one important root cause for legal obstacles is related to the lack of a common legal framework for action. When RECs and CECs or other types of local energy initiatives are set up within a given country, the concerned actors can refer to a single and coherent national regulatory framework. This framework also offers a country-specific range of legal forms<sup>30</sup> within which these energy communities/initiatives can be established as

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<sup>30</sup> Depending on the country's legal framework, the legal form may be a cooperative, partnership, trust, foundation, not-for-profit association, limited company, public utility company, or a public-private partnership.



legal entities<sup>31</sup>. The choice of legal form depends on the needs of local actors and the purpose/objectives/actions of the energy community, which also means that governance structures, decision-making processes or liabilities may differ between RECs and CECs. The situation is very different when energy-related local cooperation takes place across the borders of EU and EEA Member States. In this case, the local actors involved must consider (and work with) two or even three national regulatory frameworks for energy policy and, in addition, need specific legal instruments to establish their initiative as a legal entity. The latter aspect is particularly important, if CBECs are to be established along the principles of CECs and RECs. This much more complex constellation shows that the existence (or non-existence) of alignment between national regulatory frameworks and the availability (or non-availability) of specific legal instruments for cooperation are key factors (or obstacles) determining the success (or failure) of local initiatives.

The root causes of legal and administrative barriers at national/regional level are often related to (i) overly complex and lengthy regional/local administrative procedures in energy matters, (ii) the incompatibility of existing regional/local administrative procedures in a cross-border context, (iii) a lack of administrative capacity or administrative know-how in the field of energy at regional/local level and/or (iv) inadequate regional/local energy policy frameworks or gaps in regional/local energy policy. Fortunately, some of the above-mentioned causes can be directly addressed by the regional or local actors concerned themselves, in particular by intensifying their mutual cooperation (and exchange) on energy-related issues.

The research shows that many cross-border initiatives still struggle to set up a CBEC. While several cross-border initiatives interested in the CBEC concept could be identified, the hurdles seem high to start a true CBEC. In addition, running a CBEC would be even more complex, in particular because of additional technical, as well as management and governance-related obstacles that would certainly arise, as the experience of the domestic energy communities shows.<sup>32</sup>

The variety of obstacles and different situations, depending on the border and the countries involved, confirms the conclusion that *“every solution must be found individually, since it is rooted in the specific legal and cultural framework of the territories involved, and is dependent on the competent authorities”*.<sup>33</sup>

While the creation of a CBEC is a more complex venture, it might be a solution to start developing an activity that follows the definition of a *quasi*-CBEC. The use of the Q-CBEC figure can serve as a first step to start cooperation activities in this field, although the full potential, i.e. structurally establishing a full CBEC, may not be reached (yet) in a given border area.

## 6. Importance of national enabling frameworks

To understand the current landscape for CBECs, a thorough analysis was conducted on the status quo of national enabling frameworks supporting their establishment. This involved a systematic review synthesising findings from literature, existing policy and transposition trackers<sup>34</sup> and data sources to assess the maturity of legislative frameworks for energy

<sup>31</sup> A legal entity, unlike a natural person, is a body created at the moment of legal incorporation, with a specific name and personality in the eyes of the relevant legal system.

<sup>32</sup> See for example Energy Communities Repository, 2024a.

<sup>33</sup> European Commission, 2021a, p.23

<sup>34</sup> e.g. <https://www.rescoop.eu/policy/transposition-tracker>

communities in different EU Member States. The analysis extended beyond evaluating national legislative frameworks to also examine existing cross-border energy projects and partnerships between EU Member States.

A detailed comparative assessment of EU Member States and border regions was carried out, taking into account the following categories and indicators<sup>35</sup>:

- **Adequateness of the National Electricity Network and the grid system**
  - Organization of the national electricity network
  - Electricity transfer and heat transfer
  - Congestion management
- **Legal provisions on Energy Communities (in general)**
  - Transposition status for energy community definitions
  - Financial support measures for energy communities
- **Legal provisions and support to Cross-Border Energy Communities**
  - Transposition status for cross-border energy community provisions
  - Administrative procedures for cross-border initiatives
  - Legal procedures for cross-border structures
  - Private/public financing instruments available
  - Existing cross-border partnerships or collaborations

By analysing these categories and indicators across neighbouring countries, a clear picture emerges<sup>36</sup>.

A key finding is that the reference to enabling cross-border cooperation, which was included in the EU Directives when introducing the concepts of RECs and CECs, was largely omitted from transposition into national frameworks across Member States. This lack of explicit provisions supporting CBECs results in an absence of delineated supporting schemes or mechanisms tailored specifically for CBECs and related initiatives.

More specifically, the analysis for the different categories shows the following results for the different EU border regions:

- With regard to the **electricity network integration**, the border regions France-Germany, Belgium-Netherlands, and Germany-Netherlands score the highest, reflecting well-developed infrastructure and coordination. At the lower end, there is more room for improvement in this area. This includes borders such as Hungary-Slovakia, Croatia-Hungary and Austria-Hungary.

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<sup>35</sup> The detailed results of the assessment for each EU border region can be found in Annex II ('Border Fiches'). It provides fiches for each border area in the EU that include an analysis of conditions/enabling factors for the establishment of cross-border energy communities in neighbouring Member States.

<sup>36</sup> See Annex 2 for the details of the assessment for the analysed EU/EEA borders.

- With regard to the **enabling framework for energy communities in general**, the border regions Belgium-Germany, Denmark-Germany, and Italy-Slovenia have the strongest national foundations, while Malta and some eastern European border regions score lower, suggesting the need for further policy and regulatory development.
- Some border regions, such as France-Germany and Belgium-Netherlands, have **supportive frameworks for cross-border cooperation on energy communities**, while lower-scoring regions like Hungary-Slovakia and Croatia-Hungary have less adequate frameworks in this field.

Overall, the current situation across Europe shows a rather unfavourable situation for CBECs: only three EU Member States<sup>37</sup> have made specific provisions for CBEC in their laws, while most countries have not inserted a specific mention of the cross-border element of energy communities. Several Member States have chosen to limit the geographical or ownership restrictions to national bodies/members only. Two Member States<sup>38</sup> explicitly prohibit cross-border connections for all or some energy communities CECs, directly hindering cross-border participation.

By synthesising the findings across these categories for each border region, using a numerical scale from 0 to 10 (low favourability to high favourability) for each category, a combined score has been assigned leading to a final integrated score to compare the relative state of preparedness for CBEC development in the EU border regions. The final score for each border region was calculated as the average of the individual scores across these three assessment categories.

Some countries are more advanced than others in supporting energy communities in general. For example, France, Germany, and The Netherlands have good systems for supporting energy communities within their borders, but they have not fully addressed how these communities could work across borders. Other countries, like the Czech Republic, are still working on their basic energy community laws. Romanian law technically allows for CBECs but does not provide any practical support to make it happen. Poland has taken the opposite approach, explicitly forbidding energy communities from connecting to other countries. This shows how national laws can range from passive barriers to active restrictions on cross-border cooperation. The situation becomes even more complex in regions where several countries meet – for instance, where Belgium, Germany, and The Netherlands share borders – each country has different rules and support systems. Furthermore, Switzerland does not apply EU energy law, which could pose additional challenges for cross-border initiatives involving Switzerland.

Even in cases where neighbouring countries both support energy communities, they often have different rules about how energy can be shared, what financial support is available, who can participate, and how the community should be organised, for instance. Some countries offer direct financial support for energy sharing within their borders, while others reduce grid charges or fees. However, these benefits usually do not extend to cross-border projects. The situation is particularly challenging in countries with regional differences. For example, Belgium has different regulations in its regions of Brussels, Flanders, and Wallonia, which makes cross-border cooperation even more complex. Meanwhile, countries like Ireland and Italy have more centralised approaches but still lack specific provisions for cross-border communities.

This widespread lack of coordination between countries is currently the biggest obstacle for CBECs. The absence of specific cross-border provisions in national laws, whether explicitly

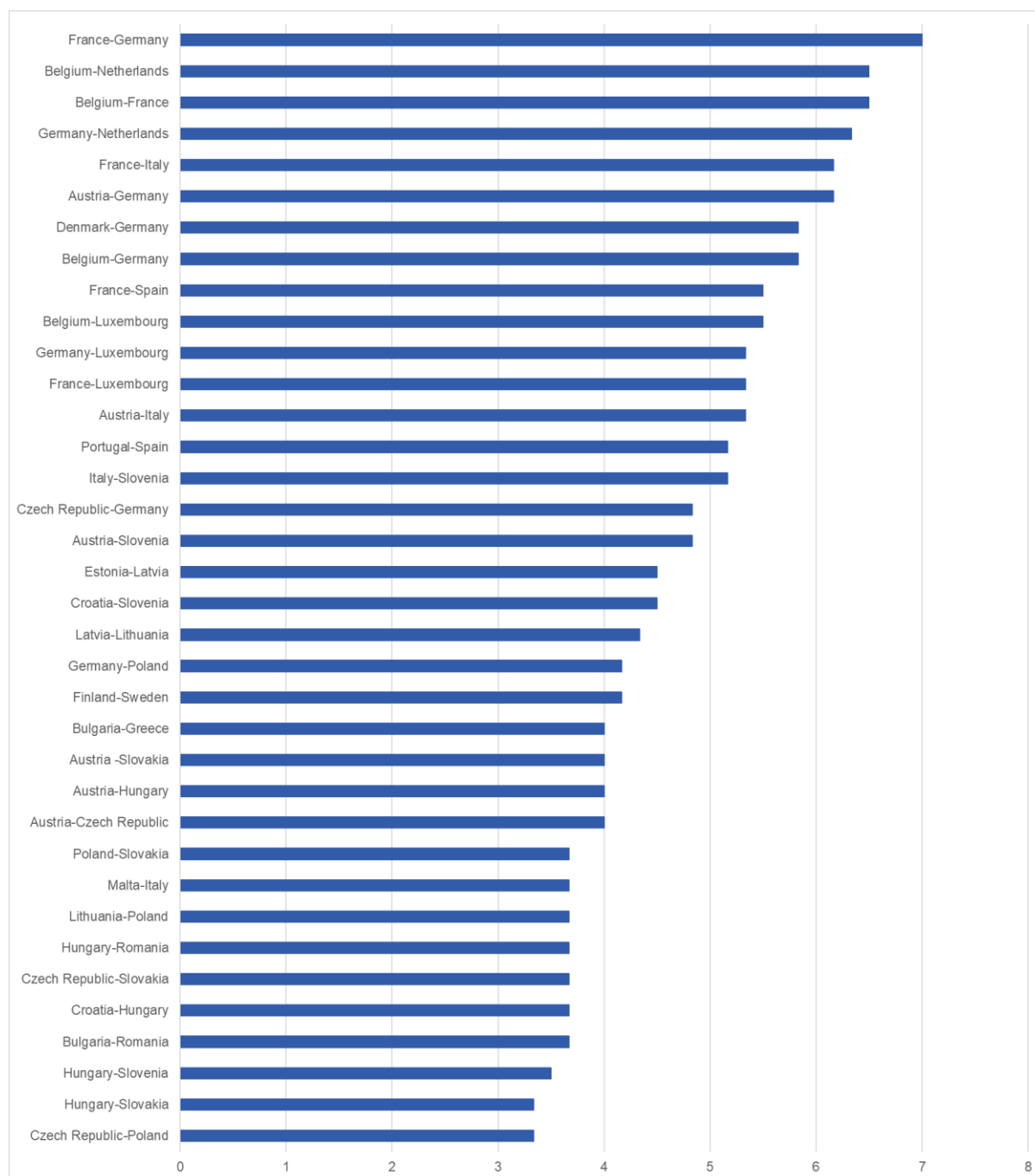
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<sup>37</sup> Croatia, Malta, Romania.

<sup>38</sup> Poland for CECs and Hungary for all energy communities.

stated or implied, creates uncertainty and practical barriers for communities that could potentially benefit from working together across borders.

**Figure 1: Preparedness of EU border regions to establish CBEC**



Source: Consortium, 2024

Note: The score for preparedness takes into account the degree of legislative framework maturity and supporting enabling frameworks in the relevant EU Member States. Three categories and 10 indicators have been assessed. For each of the three categories, a number between 0 and 10 was assigned. As a first category, the Electricity Network Integration evaluates the integration of electricity networks across the borders based on three indicators: organisation of the national electricity network, electricity and heat transfer, congestion management. Second, the National Energy Community Frameworks is assessed through two indicators (i.e., transposition for energy community legislation and national-level policies, regulations, and programmes that enable the development of energy communities' initiatives). Third, the category on the CBEC provisions covers the regulations and infrastructure that facilitate CBEC projects between neighbouring countries. It includes five indicators: transposition for cross-border energy communities' notion, administrative procedures, legal procedures, financing instruments, partnerships already available among cross-border countries considered.

Despite the current challenges, there are promising signs for CBECs. The growing number of pilot projects and initiatives, even if limited in scope, demonstrates both citizen and public authorities' interest and the potential benefits of cross-border cooperation. Innovative energy initiatives across Europe are finding creative ways to collaborate across borders. Their pioneering initiatives not only demonstrate the strong desire for cross-border cooperation but also provide valuable lessons for future development. Practical examples highlight both current challenges and potential for solutions:

An **Italy-Austria District Heating Project** revealed an interesting challenge: Austria does not have a national authority to oversee district heating prices and taxes, while Italy does. This difference created an unbalanced situation where monitoring and regulation were only happening on one side of the border. For citizens, this meant uncertainty about fair pricing and proper oversight of the project.

**Germany and Luxembourg** have an agreement specifically designed to help border communities cooperate (the Karlsruhe Agreement). However, they define energy communities differently – "Citizen Energy Company" in Germany versus "Energy Community" in Luxembourg – which makes it difficult for communities along their border to work formally together.

Another practical challenge appears between **Germany and the Netherlands**: their renewable energy subsidy systems do not align well when energy is produced in one country but used in the other. This means that even if communities want to work together, the financial support systems do not match across the border.

The **Zusamme Solar Colmar project between Germany and France** is a success story. Despite challenges, French and German cooperatives managed to work together on the project through cross-border financial participation. This shows that cooperation is possible, even if it is currently limited to certain types of activities.

## 7. How to prepare the ground for CBEC

Based on the analysis, to facilitate cross-border cooperation on energy and CBECs, action needs to be taken at EU and Member State level. In particular, improving the national enabling frameworks to facilitate the set up and implementation of CBECs is crucial, but also local actors such as municipalities can carry out measures to facilitate CBEC projects.

EU legislation is generally open to cross-border cooperation on energy, with only few areas that need to be improved, for example, introducing CBEC and cross-border energy initiatives in the EGTC legal framework. A general recommendation would be to continue taking into account cross-border cooperation and CBEC in upcoming amendments of EU energy legislation and introducing it in the so-called second-generation EU legislation for energy communities, for example, the revised Renewables Directive, Energy Efficiency Directive, Energy Performance of Buildings Directive, the Social Climate Fund and the revised Electricity Directive and Electricity Regulation<sup>39</sup>. It might be helpful, given the complexity of setting up and running a fully-fledged CBEC, to introduce the concept of "Quasi cross-border energy communities" (Q-CBEC) in the corresponding EU legislative frameworks. It can be expected that this would also have a positive impact on national and regional legal frameworks and probably could also benefit the design of Interreg A programmes and Calls.

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<sup>39</sup> See also <https://www.rescoop.eu/toolbox/second-generation-eu-legislation-for-energy-communities>

National and regional legal frameworks on energy need to be updated to adjust to the goals of the EU Energy Union in general and to facilitate cross-border cooperation on energy. Further areas for improvement within the national and regional enabling frameworks relate to the alignment of policies, regulations, and financial support mechanisms for energy communities between adjacent countries. Several guides exist to support national and regional policymakers on creating a favourable environment for energy communities<sup>40</sup>. However, they barely define the needs and opportunities from a cross-border perspective.

A general recommendation to prepare the ground for CBECs is to enhance the exchange of knowledge and experiences between players dealing with cross-border cooperation, including the Interreg community, EGTCs, cross-border research institutes<sup>41</sup>, and stakeholders dealing with energy policy in the different countries, including the initiatives supporting community energy all over Europe.

Additional factors to be taken into account at national and regional level are:

- **Developing a supportive legal and administrative framework.** This needs to consider and allow for cross-border joint energy activities and CBECs, particularly in the fields of taxation and public incentives. Tax structures can pose challenges for cross-border energy investments and revenue sharing. Addressing tax treatment on shared energy, investment returns, and equitable revenue distribution can help create a fair and appealing environment for investors and participants.
- **Improve cooperation on joint spatial planning.** This would help to better steer the installation of infrastructures and equipment for energy generation (in particular windmills, regional hydrogen hubs), energy distribution, supply, transmission and storage, enhance the efficiency of networks and grids and to avoid conflicts in the border regions.
- **Revising existing bilateral or local agreements on cross-border cooperation.** These should explicitly include the possibility to set up CBECs and initiate further cooperation on energy issues.
- **Developing national guidance on energy communities, featuring also cross-border cooperation in this field.** This can include the alignment of organisational structures particularly around the legal forms and recognition of cross-border entities. Energy communities may take various forms, such as cooperatives, non-profits, or foundations, and having a framework that recognises and supports these structures across borders will empower more communities to participate. Additionally, clarifying membership rules and decision-making processes for cross-border initiatives can foster inclusive governance and representation.
- **Adapting technical standards to cross-border transmission and distribution.** Equipment specifications, installation protocols, and grid connection standards must be compatible across borders to ensure smooth and safe energy transfer. Standardising communication protocols for energy sharing and ensuring that metering systems are interoperable can also facilitate accurate energy measurement and billing, building trust and operational efficiency. Technical compatibility will ensure that infrastructure investments across countries are functional and future-proof.

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<sup>40</sup> For example, Energy Communities Repository, 2024b, Interreg Europe, 2022, Kerneis and Thalberg, 2024, REScoop.eu, 2023 and REScoop.eu et al., 2023.

<sup>41</sup> For example, the institutions connected through the [Transfrontier Euro-Institut Network](#) (TEIN).



- **Providing public finance and capacity building for CBEC.** National and regional authorities might foresee domestic funds for supporting CBEC initiatives to unlock the potential of cross-border areas in the energy transition: on the one hand for cross-border initiatives in the field of community/citizen energy and green transition, on the other hand for energy cooperation in the field of cross-border activities and agreements.

With regard to funding of cross-border activities in the field of energy, there are several EU funding instruments that can support the development of CBECs. While there is a good body of knowledge on the availability of funds for the support of energy communities in general<sup>42</sup>, the most relevant programmes<sup>43</sup> concentrate usually on funding projects within a given country.

However, various funding instruments are specifically well-suited to support the development of cross-border energy initiatives, including CBECs:

- **Interreg** programmes provide funding for cross-border, transnational, and interregional cooperation projects across Europe. These programmes aim to tackle common challenges and promote sustainable development in border regions, making them well-suited to support CBEC initiatives, notably thanks to Policy Objective 2 for a Greener Europe, and other community-led local development (CLLD) and territorial instruments, such as small-scale projects, Small Project Funds, and the possibility to work on better cross-border governance aspects (Interreg Specific Objective 1). In addition, the **Interreg Europe Policy Learning Platform** as the second pillar of the Interreg Europe programme aims to boost EU-wide policy learning and builds on good practices related to regional development policies.
- The **European Urban Initiative (EUI)** for urbanised cross-border areas with its support of innovative actions, capacity building and support of knowledge building, territorial impact assessments, policy development and communication.
- The **LIFE** programme, particularly through its Clean Energy Transition sub-programme, offers opportunities for developing research and implementation of CBECs. This programme is especially relevant as it addresses multiple aspects crucial for CBEC development: it can support the establishment of policy frameworks that enable cross-border cooperation in energy transitions, particularly valuable where national regulatory frameworks need alignment. Through its focus on accelerating technology roll-out and new business models, the programme can fund research into innovative operational models for CBECs, including digital solutions for cross-border energy sharing and management. Its emphasis attracting private finance and supporting local investment projects can help develop sustainable financing models for CBECs, addressing the particular challenges of cross-border financing structures. Furthermore, the programme's dedication to citizen empowerment in energy transition makes it particularly well-suited for researching and implementing effective community engagement strategies in cross-border contexts, including studying how to overcome cultural and linguistic barriers in community energy projects.
- The **Connecting Europe Facility-Energy (CEF-E)** supports cross-border renewable energy projects, such as the GreenSwitch project involving Austria,

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<sup>42</sup> REScoop.eu et al., 2023 and <https://www.rescoop.eu/policy/financing-tracker>

<sup>43</sup> Including, for example, the Recovery and Resilience Funds (NextGenerationEU), including the REpowerEU funding, the European Regional Development Fund (ERDF) and the Modernisation Fund in central and eastern European countries.

Croatia, and Slovenia or the connection of the district heating grids in Görlitz (DE) and Zgorzelec (PL).

In case of specific questions, actors in cross-border regions can turn to the expert advice offered within the "**b-solutions**" initiative<sup>44</sup>. Funded by the European Commission, it is specifically designed to address legal and administrative obstacles in cross-border cooperation. Through dedicated calls for proposals, b-solutions provides public authorities and cross-border entities with expert legal advice to systematically identify and resolve regulatory barriers that might impede cross-border energy community development. This expertise is particularly valuable given the complex regulatory landscape that CBECs must navigate, spanning multiple national jurisdictions and EU level frameworks.

Despite the need to create enabling national frameworks and develop supportive enabling conditions for CBECs, there is also a lot that can be done by local stakeholders such as municipalities and local authorities, citizens, SMEs and interest groups to start working on a CBEC initiative.

There are already several guides for local actors on local energy communities and on community energy in general<sup>45</sup>. However, most of them are lacking the cross-border perspective.

The second part of this Handbook offers a step-by-step methodology and relevant information on how to start developing and implementing cross-border energy community initiatives, to different extents and readiness levels depending on the specific cross-border region.

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<sup>44</sup> <https://www.b-solutionsproject.com/>

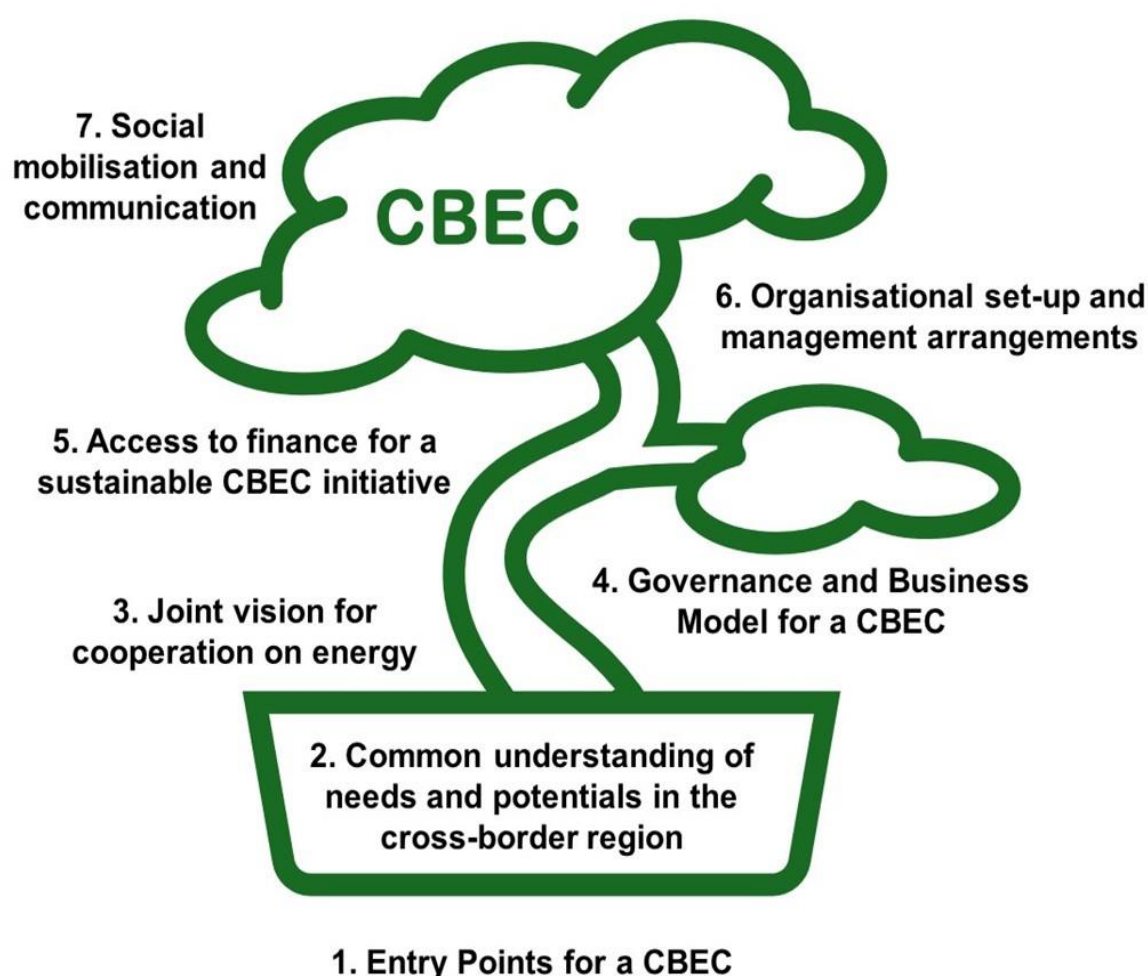
<sup>45</sup> See, for example, European Commission, 2022a, 2022b and 2024d, Friends of the Earth, REScoop.eu and Energy Cities, 2020, Hinsch, 2023, Kerneis, 2024, REScoop.eu and ZEZ, 2022, REScoop.eu and Energy Cities, 2022a, REScoop and Energy Cities, 2022b and UKEN, 2023.



## Part II – Practical information on how to establish a CBEC

The second part of this Handbook provides a practical step-by-step methodology for setting up a cross-border energy community and for developing its activities. The step-by-step methodology is presented along the following building blocks as illustrated in Figure 2. While the building blocks follow a logical structure, they may not always be solely considered along a one-way road but may also include revisiting of one or another building block at different moments of the setting up of a CBEC.

**Figure 2: Building blocks for setting up a CBEC**



Source: Consortium, 2024

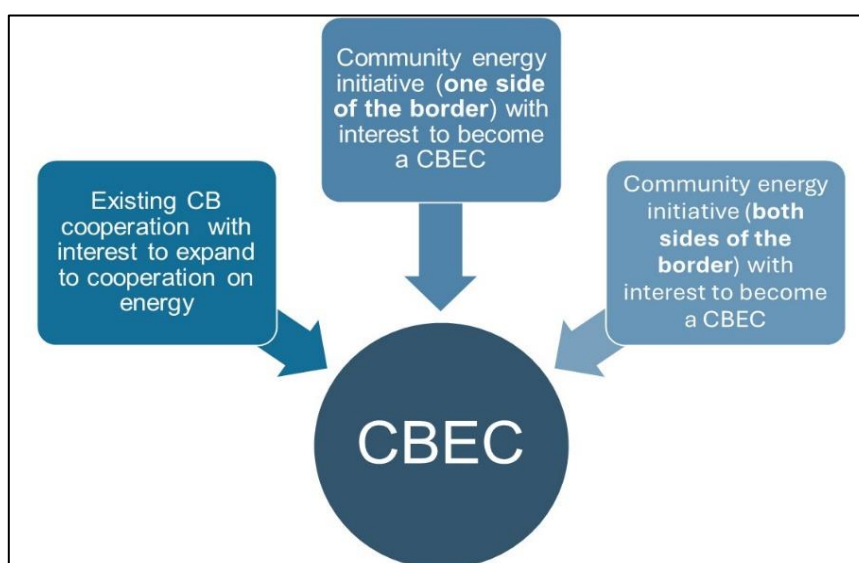
## 1. Entry points for a CBEC

Cross-border energy initiatives and CBECs in particular can be considered socio-technical innovations. On the one hand, they are linked to existing cross-border cooperation patterns between cities and regions, often already institutionalised via Euregions, EGTCs or other forms of formal cooperation schemes, in addition to Interreg programmes. On the other hand, they are "social innovation" initiatives, linked to community-based or community-led actions, niche cooperations, community energy, community-owned energy (storage) systems, renewable energy cooperatives, local energy transitions, social movements, local energy initiatives, co-creation, co-production, shared renewable energy systems, and collective energy initiatives<sup>46</sup>.

Thus, a first way to develop a CBEC or related initiatives can emerge from specific needs and potentials identified by already existing cross-border cooperation entities. In this case, they can rely on a history of cooperation in various sectors, providing a fertile ground for energy community projects. Existing collaborations can serve as benchmarks, offering lessons on effective stakeholder engagement, funding management, and technology selection. But open questions might exist in the fields of deciding on a concrete energy activity, identifying solutions for physical-technical barriers, e.g. grid connection, the adequate legal form for a CBEC or specific organisational and management considerations.

A second way to work on a CBEC or related initiative is to be based on local actors on one (or both) side(s) of the border who have a strong interest to build up decentralised and/or renewable energy activities. Some initiatives might even already function on one side of the border but want to join forces to increase their market, offer similar services on both sides of the border, become more efficient, accessing additional natural resources, pooling knowledge or balance differences between energy demand and supply. In this case, the technical foundations of the activity might be already clear in addition to first ideas on the legal and organisational set up of the CBEC. What might be lacking is the cross-border component in the community governance, the business model and the technical area.

**Figure 3: Entry points for a CBEC**



Source: Consortium, 2024

<sup>46</sup> Dall-Orsoletta et al., 2022

This shows that different situations might exist before there is a cross-border initiative to cooperate on energy or to create a CBEC. Also combinations of the different entry points are possible, when relevant stakeholders meet along the process. As a general rule, in cross-border regions with a high intensity of cooperation across the border, institutionalised forms of cooperation or cooperation in many areas, involving people-to-people projects, it is more likely for energy-related cross-border initiatives to emerge as well.

In many cases analysed for this Handbook, the cross-border energy initiatives have been developed in the context of existing cross-border governance structures such as Euregions or Eurodistricts, an EGTC or border towns.

#### Origin of "Calorie Kehl-Strasbourg" (CKS)<sup>47</sup>

The cross-border heat transportation initiative, "Calorie Kehl-Strasbourg" (CKS), is a public-private enterprise established under French law to facilitate the utilisation of industrial waste heat from Badische Stahlwerke (BSW), a German steel plant, for heating of households in Strasbourg, France. CKS operates within the Eurodistrict Strasbourg-Ortenau, a long-standing area of cross-border cooperation. The idea of a cross-border transport of waste heat arose in 2018. The motivation to establish CKS stems from a combined objective of economic benefit and environmental sustainability as well as the efforts to shift away from fossil fuels and fossil energy sources. Before establishing CKS there were several initiatives that laid the foundation for its development. Notably, the preceding Interreg Oberrhein project, Wärmerückgewinnung BSW, laid the basis by conducting feasibility studies. After the Eurometropole Strasbourg and BSW gathered partners (Baden-Württemberg, the cities of Kehl and Strasbourg, Region Grand Est) the consortium started the complex process of identifying the most appropriate legal form to implement this project, ultimately resulting in the signing of a Memorandum of Understanding (MoU) concerning the implementation (2019). Together with an external consulting company, a study was conducted leading to the conclusion that a *Société d'économie mixte* (SEM) would be the most suitable legal form, realised in 2021 by the foundation of the joint company CKS.

#### Origin of the Görlitz and Zgorzelec district heating network<sup>48</sup>

In 1998, Görlitz (DE) and Zgorzelec (PL) declared themselves a European City to intensify the close, cross-border cooperation between the two municipalities for the benefit of both sides. Since then, international cooperation in all areas has formed the basis for the joint further development of the European City. After numerous successfully implemented projects and initiatives, both cities wanted to take the next step and combine their infrastructures for greater safety, efficiency and sustainability. Görlitz and Zgorzelec decided to connect their district heating networks to jointly supply their citizens with climate-neutral district heating. The aim is to save around 50,000 tonnes of CO<sub>2</sub> per year. Another advantage is the replacement of old heating systems. Along the new district heating route, new houses can be connected to the district heating network at the customers' request. This allows to replace old heating systems with modern, climate-neutral generation technologies and thereby also fulfil government requirements.

<sup>47</sup> Case study conducted for this Handbook, see also: <https://www.calorie-kehl-strasbourg.eu/fr/>

<sup>48</sup> Case study conducted for this Handbook, see also information at: <https://www.stadtwerke-goerlitz.de/privatkunden/unternehmen/ueber-uns/klimaneutrale-fernwaerme>

In some cases, as shown in the following example, there is a joint interest to develop community energy in a border region. However, in some cases, a first initiative is established on one side of the border, while the cross-border element still faces additional hurdles.

#### **Origin of Efi-Duero Energy<sup>49</sup>**

Efi-Duero Energy is a European Cooperative Society. It was launched in 2017 as European cross-border energy trading cooperative by the municipalities and the Duero-Douro EGTC in the Duero-Douro region (Portugal-Spain). Efi-Duero's business model is based on not-for-profit commercialisation of electricity, that guarantees supply at comparatively low prices. Activities started in Spain only, even if there has been a cross-border perspective from the beginning. Efi-Duero's motivation is a combination of economic and environmental/climate objectives. The society builds on the potential to generate solar energy in the border region between Portugal and Spain. It was established to foster economic and environmental benefits through efficient energy trading across the Spain-Portugal border, aiming to leverage the collective strength of municipalities and local entities to enhance energy sustainability and economic growth in the region. The cooperative also seeks to strengthen socio-cultural ties by promoting regional integration and cooperation, thereby supporting local communities in achieving greater energy independence and resilience.

In other cases, interest of local and regional stakeholders is first channelled into a joint project to further develop concrete ideas and activities. The next example shows how Interreg projects are often used to test first ideas on energy cooperation.

#### **Origin of Smart Energy Region Emmen/Haren (SEREH)<sup>50</sup>**

The SEREH Interreg project (2018-2022) co-funded by the DE-NL programme, aimed to foster Dutch-German cross-border energy cooperation between the municipalities of Emmen and Haren/Ems. The project sought to create a regional cross-border energy market for sharing sustainable energy resources, particularly wind and solar power. The two municipalities can look back on many years of cross-border cooperation with neighbouring municipalities. Both are experienced in implementing Interreg projects and in cooperation on smaller bilateral issues. The motivation to establishing the energy cooperation stemmed from a combination of economic and environmental factors. After receiving a target of the share of renewable energy in their consumption especially from wind power, the municipality Emmen with significant industrial activity and thus energy demand, looked across the border to its neighbouring city. Haren/Ems with a surplus of renewable energy resources from its wind park that continually had to be fed into the national grid, depicted an opportunity for mutually benefit through cross-border exchange by connecting the two wind parks. Due to regulatory conditions, however, a transfer has so far only been permitted and possible at the level of the extra-high voltage grid, currently blocking the vision of implementing the cross-border energy exchange. The current legal situation also prevents funding instruments from being utilised, as the respective national funding is not valid for cross-border projects.

In any case, even if there are different entry points, one of the first building blocks to establish a CBEC is a better understanding on both sides of the border on the energy needs and potential in a given cross-border region.

<sup>49</sup> Case study conducted for this Handbook, see also information at: <https://efiduero.com/>

<sup>50</sup> Case study conducted for this Handbook, see also information at: <https://sereh.eu/en/>

**Origin of the "Zusamme Solar! Colmar" initiative (France-Germany)<sup>51</sup>**

- The "Zusamme Solar Colmar" project is the result of a cooperation between the German citizens energy cooperative "Fesa Energie Geno e.G." (located in Freiburg) and the French local citizens energy cooperative "Énergies Partagées in Alsace" (located in Kingersheim), which was supported by the French national structure of energy cooperatives "Énergie Partagée". This durable cooperation is only generating and distributing electricity on the French side of the border but the joint venture is owned by German and French partners/shareholders.
- In 2014 "Altor-PV Sarl" was jointly created by the German cooperative "Fesa Energie Geno e.G." (DE) with 50% of shares, the French country-wide cooperative structure "Energie Partagée Investissement" (40 %) and the French regional cooperative "Energies Partagées en Alsace" (10 %). Altor-PV is a company set up for the purpose of cross-border community photovoltaic projects, but does not directly accept members. In order to invest in one of the projects of Altor-PV, interested persons/organisations must hold shares in one of the three partners. In 2014/2015, the joint company realised the project "Zusamme Solar Colmar". Four roofs were leased by Altor-PV, on which PV rooftop systems were subsequently installed. Three systems are located in Colmar and one in Wintzenheim (FR). A total of 2,600 m<sup>2</sup> of panels have been installed on the "shed roofs" of former textile factories. The rooftop installations consist of four 100 kWp photovoltaic systems, allowing a total production of 400 kWh per day.
- Since the end of 2014/beginning of 2015, "Zusamme Solar Colmar" has been supplying 100 % solar energy to the French grid. About ten years later, in 2024, the Franco-German cooperation project is expected to be profitable (after repayment of the bank loan) and is now considering how to share future profits between the three owners/shareholders of "Altor-PV Sarl".
- The initial motivation for the German cooperative "Fesa Energie Geno e.G." to launch an initiative in France was rooted in the concept of citizen energy, which has long been part of the culture on the German side. Located just 30 km from Colmar, across the border in Freiburg, it is one of around 800 German energy cooperatives. The cooperative was founded in 1994 by a group of renewable energy activists. The joint interest of partners across the border roots in the opposition to the Wyhl (DE) nuclear power plant planned in the 1970s, which was finally cancelled in the 1990s.
- Today, the initiative "Zusamme Solar Colmar" operates on a durable basis through the joint company "Altor PV Sarl". Major success factors for the initiative are the good and sustainable cooperation between the Franco-German partners, the guaranteed and indexed feed-in tariff in France and the above-average specific yields of solar plants in the border triangle DE/FR/CH (i.e. due to the high number of annual sunshine hours).

<sup>51</sup> Case Study Report based on <https://energie-partagee.org/projets/zusamme-solar-colmar/> and RES-TMO - Renewable Energy Sources in the Trinational Metropolitan Region Oberrhein (2020), WP4 – Action 4.2 – Working Paper – Challenges and Solutions for an Integrated Renewable Energy Market in the Upper Rhine Region: Socio-Cultural Issues and Actors' Interactions, November 2020 (Philippe Hamman, Marie Mangold, Maurice Wintz and Patricia Zander, UMR SAGE), pp. 12, 13.



## 2. Common understanding of needs and potentials in the cross-border region

CBECs or other cross-border energy initiatives require a common understanding of the framework conditions, needs and objectives for the energy or service provision. This understanding prepares the ground for all following CBEC development activities.

Already at this stage understanding the **context** of a potential cross-border initiative on energy can be useful. National borders have specific effects on the energy provision and energy flows. Assessing these effects from different points of view allows to develop a comprehensive overview of the border reality and supports a common understanding. This helps to identify the key challenges and opportunities for CBEC development. In particular, the context consists of:

- The **political and administrative context** referring to the presence of existing cooperation structures and agreements. Relevant is not only the level of integration in the EU internal market but the existence of bilateral agreements, cross-border strategies, cooperation initiatives and administrative traditions and cultures.
- The **physical and geographic context** is important to determine the current and potential future demand for and provision of energy. It entails the presence of geographic specificities, accessibility and connectivity of the cross-border area and population characteristics, such as population density and growth. The degree of urbanisation is important as the spatial density of energy demand in urban centres is higher than the demand in rural areas and it might also be higher than the capacity of energy production from renewables.
- The **economic context** provides insight into the potentials for business development around energy and for value chains that can be further explored within a CBEC. It refers also to actual economic features of the energy market (electricity and heating) in the border region, such as company structure, tariff conditions, conditions for grid use etc. The economic reality is also framed by specific economic aspects such as taxation, relevance of economic branches and research intensity as well as characteristics of current (domestic) community/citizen energy initiatives.
- The **socio-cultural context** describes the potential for citizen engagement. It refers, for example, to the acceptance of specific forms of community engagement such as cooperatives, associations or social enterprises. Furthermore, the analysis of the socio-cultural context requires assessing the level of a common identity in support of mutual trust, for instance through a common language, habits and traditions of service provision as well as the use and understanding of the role of public versus private services.

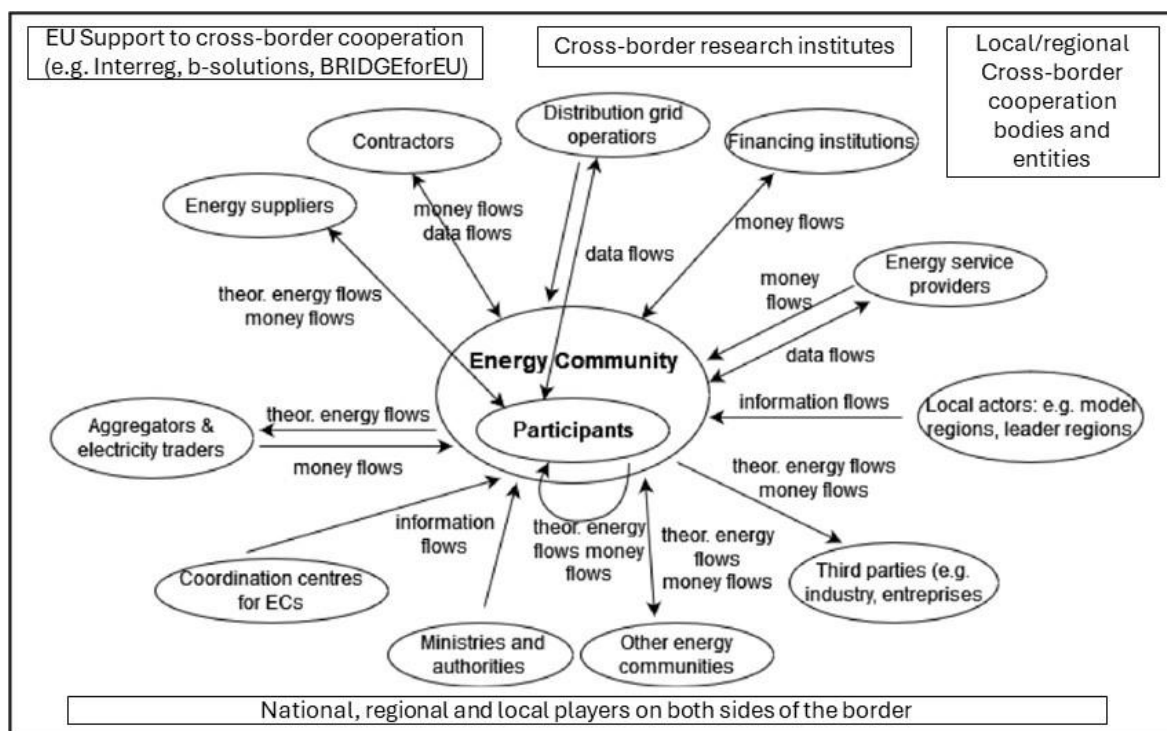
At this stage, it is important to examine how a local or regional energy initiative would embed into the **wider policy framework** and align with existing political and strategic plans. This would help to get a better understanding of the current cross-border issues and policy responses. It might also be positive to check the potential interest of the involved stakeholders and to raise awareness and interest among politicians and policymakers.

Relevant documents and plans to be considered at this stage include strategic documents such as national and regional energy and climate plans, strategies for the deployment of renewable energies, programmes of possible funding possibilities, such as Interreg or LIFE.

Another preparatory action would be to carry out a **stakeholder mapping** of relevant actors and related initiatives in the border region (see Figure 4 and Figure 5).

First, if not known already, initiatives can check for existing cross-border organisations, cross-border research and cooperation activities in their border region<sup>52</sup>.

**Figure 4: Stakeholders relevant for a CBEC**



Source: Adapted from Fina and Monsberger., 2023, p.5

It might be a good opportunity to check with regional or local energy agencies<sup>53</sup> to learn about their activities, any existing similar initiatives or possible funding opportunities.

On the technical side, it is necessary to get to know the established energy stakeholders such as electricity suppliers, energy service providers, aggregators and distribution system operators (DSOs) on both sides of the border. It might be interesting to check for any already existing cross-border activity within the border region regarding energy trade, transmission or distribution.

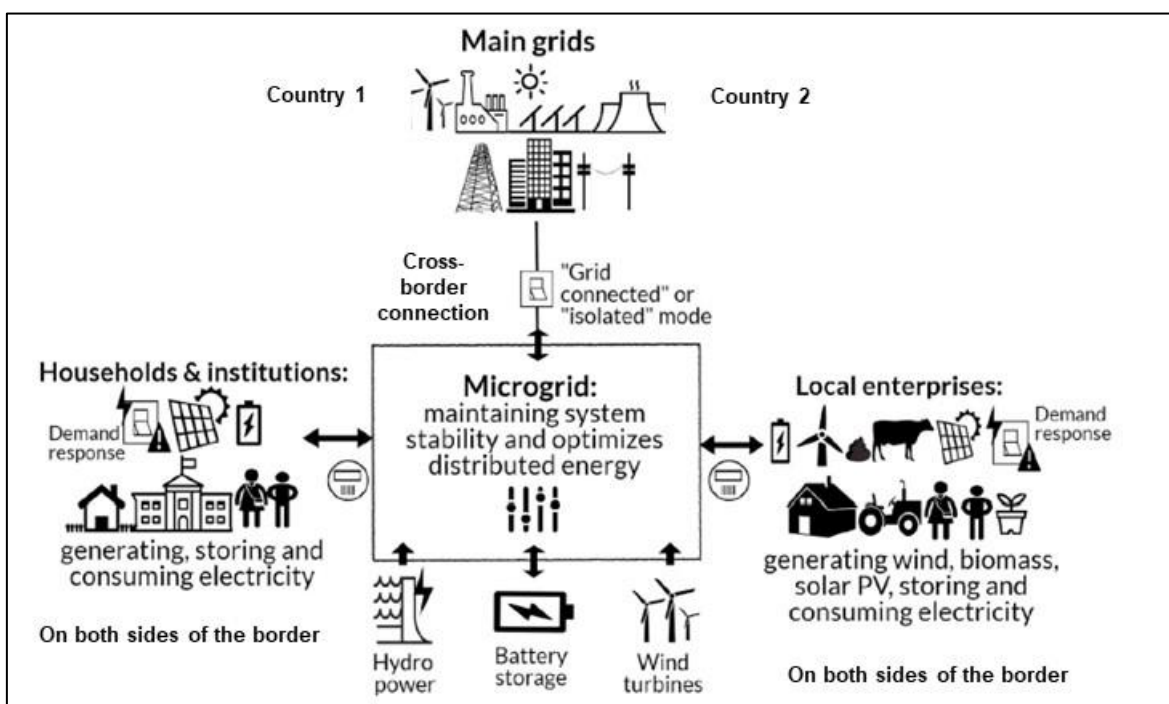
In addition, learning about existing energy communities<sup>54</sup> in the border region (or neighbouring domestic areas) might help to understand how energy communities work in a given regional and national context, which legal forms they use, which ownership structures they have and who are relevant stakeholders in this field.

Depending on the concrete initiative, a mapping of additional local/regional players for cross-border energy systems can be helpful to learn more about the relevant players and to identify concrete needs and opportunities in the cross-border region. This mapping should be done for both sides of the border to get a full picture of the cross-border region energy system.

<sup>52</sup> For EGTCs, this list is available: [https://cor.europa.eu/sites/default/files/2024-11/Official\\_List\\_of\\_the\\_EGTCs.pdf](https://cor.europa.eu/sites/default/files/2024-11/Official_List_of_the_EGTCs.pdf)

<sup>53</sup> See, for example: [https://managenergy.ec.europa.eu/managenergy-energy-agencies\\_en](https://managenergy.ec.europa.eu/managenergy-energy-agencies_en) or <https://fedarene.org/members/>

<sup>54</sup> See, for example: <https://www.rescoop.eu/network>

**Figure 5: Usual stakeholders in a local/regional cross-border energy system**

Source: Adapted from Lowitzsch et al., 2020, p.6

These preparatory steps – analysis of the context and stakeholder mapping – will lead to a better understanding of joint/shared needs in the cross-border region with regard to

- the potential of natural resources and alternative technologies,
- energy demand and supply (in particular, uneven distribution that might benefit from an integrated cross-border energy system),
- common goals with regard to energy efficiency, modernisation of energy systems, access to services, promotion of renewable energies, self-sufficiency of decentralised energy production, crisis response and new business opportunities through the development of local and regional energy value chains.

While these steps might be intensive for a domestic energy community, they might become even more challenging in the cross-border context. It may be helpful to involve local communities and citizens in the process at this early stage, as outlined by the example in the next box, to avoid misunderstandings and potential resistance, but also to communicate benefits and identify future allies for the planned initiative<sup>55</sup>.

#### **Step-wise approach to establish a common "Borderless energy region"**<sup>56</sup>

The two small rural municipalities of Ralingen and Rosport-Mompach together have a population of around 6,000. They are separated by the river Sauer but are directly linked by a bridge. Ralingen and Rosport-Mompach have been working closely together for many years on various issues of common concern (e.g. wastewater disposal, drinking water supply, sport, culture and leisure). It was against the background of their long-standing, trustful and intense

<sup>55</sup> See also Kerneis, 2024 and UKEN, 2023.

<sup>56</sup> Case study conducted for this Handbook, see also information in AEBC, 2024 and at: <https://grenzenlose-energieregion.eu/>



cooperation that the idea emerged in the two municipalities to work more closely together on the joint use of locally available RES. The two municipalities are planning to create a borderless energy region by 2025, with the ultimate aim of achieving an independent energy supply based on 100 % local RES (sun, wind and water). The energy produced from local RES will be made available primarily to the inhabitants of the two municipalities at fair conditions. During the preparatory phase (2023-2025), a participatory process is being carried out. Through a multi-annual citizen participation process with workshops during this phase, expert presentations and the adoption of a strategy, the inhabitants of both municipalities are actively involved in the development and organisation of the emerging energy region. The kick-off event for the cross-border citizen dialogue took place on 8 November 2023 and was attended by around 200 interested people from both sides of the border. On the technical side, the initiative is supported by the "Transfer Centre for Rational and Renewable Energy Use Bingen" (Transferstelle für rationelle und regenerative Energienutzung Bingen, TSB) in Rhineland-Palatinate, which accompanies energy projects from the initial on-site consultation through the preparation of tailor-made energy concepts and feasibility studies to implementation-oriented planning. The first activities to define the common understanding of needs and potentials in the cross-border region are funded by the Robert Bosch Foundation in Germany as part of the programme "Common Ground – co-designing across borders". In order to explore options (and obstacles) for the establishment of a legal entity for the future governance and business model of the borderless energy region, the municipalities were supported by legal advice in the framework of the *b-solutions* initiative of the European Commission, with the support of the Association of European Border Regions (AEBR). Next, the concrete definition of the technical project and the creation of a joint legal entity are planned.

In several cases examined in the context of this Handbook, Interreg funding was used to develop cross-border energy initiatives and to prepare for the next steps, i.e. to build on the initial common objectives and a shared understanding of needs and potentials. Interreg funding was used during joint cross-border projects to develop more detailed plans and studies, for example at a technical level or to define a business model (see the following two boxes). It is important to recognise that the preparation of concrete material for cross-border projects, especially after the preparatory steps, already requires a considerable amount of funding and commitment, as well as a high level of technical expertise and knowledge.

#### **Cross-border bicycle sharing system "Maria Valéria Bike" (Hungary-Slovakia)<sup>57</sup>**

A new form of public transport was established along the Slovakian and Hungarian borders in the towns of Štúrovo and Esztergom, which contributes to the connections of the two border towns and to the improvement of the level of social interconnection. The public bicycle sharing system called "Maria Valéria Bike" was jointly created by the municipalities of Esztergom and Štúrovo in the framework of the Interreg V-A Slovakia-Hungary Cooperation Programme between 2017 and 2020. Residents of Štúrovo and Esztergom and tourists are able to rent and use bicycles in the cities since February 2020. The municipalities of Esztergom and Štúrovo wanted to encourage residents and tourists to use environmental friendly solutions for their trips in the two cities. Within the framework of the project, 14 bicycle storage stations were set up in Štúrovo and Esztergom of which, six are located in Štúrovo and eight in Esztergom. The public bicycle sharing system includes 60 conventional and 45 electric bicycles. The common system allows residents of both cities, as well as tourists, to remove the rented bike from any dock and return it to any station. The stations are located near the

<sup>57</sup> Text (slightly adjusted) from the website: <https://www.skhu.eu/funded-projects/public-cross-border-bicycle-sharing-system-in-esztergom-and-sturovo> (Accessed 29 April 2024). Case study conducted for this Handbook, see also information at: <https://mariavaleriabike.eu/>

frequented sites in both cities. T-Systems Hungary Zrt. with its subcontractor Neuzer Kft. executes the bike sharing system.

### **ALDEALIX project: Promotion of biomass-based energy communities (Portugal-Spain)<sup>58</sup>**

The "ALDEALIX – Model villages" project started in July 2023 and lasts until the end of 2025. It is funded under the Interreg VI-A Spain-Portugal Cooperation Programme 2021-2027 and is located between the Spanish region of Galicia and Northern Portugal. The Galician Regional Development Agency coordinates the project. The ALDEALIX project shall address common problems of this rural cross-border territory: reduction of CO<sub>2</sub> emissions, revaluation of available forest masses, reduction of the risk of fires, fight against depopulation, prioritisation of innovative infrastructures for the promotion of renewable energies and the creation of quality jobs in rural areas, among other things. Thus, the main motivation of the project is to promote a social, economic and environmental model in which natural resources (biomass) that are produced locally will be used to generate energy, which will result in economic savings for the inhabitants while reducing the environmental impact and contributing to the creation of economic activity in the region. The project focuses on developing energy communities that utilise local forest biomass to satisfy local energy needs (complemented by photovoltaic electricity) with the aim at promoting self-sufficiency and economic savings for residents. Four pilot projects will be carried out as practical experiences of the energy solution: in the Spanish municipalities of Monterrei (Ourense) and Cerdedo – Cotobade (Pontevedra) and in the Portuguese municipalities of Vila Pouca de Aguiar and Arcos de Valdevez. Even though these energy communities will be legally independent, they will be connected through a unified cross-border management platform that will allow energy benchmarking, of the thermal consumption of the heat networks, and of the generation, storage and use of photovoltaic energy.

## 3. Joint vision for cooperation on energy

With a common understanding of needs and potentials in place, the concrete outlining of joint vision of a CBEC or a related cooperation in the field of energy can start.

The joint vision ideally embraces a long-term common strategic framework to guide the concrete action of the cross-border region in the field of energy in the future. This joint vision is usually linked to a concrete action plan and a business model which are tools to put the joint vision into practice.

However, given the specificities of the energy sector, some further reflections are necessary before the elaboration of a joint business model and a governance structure can take place.

The reflection refers to the current state of art of the legislative and technical framework for decentralised (community) energy initiatives. While this framework is already challenging for energy communities in the domestic context, it becomes more complex for CBECs. At least four aspects need to be taken into account:

<sup>58</sup> Case study conducted for this Handbook, see also information at: <https://aldealix.eu/> and <https://energylab.es/en/listado/aldealix/>

- legal considerations;
- technical considerations;
- economic considerations;
- potential focus of a CBEC with regard to activities and technologies.

## Legal considerations

The current legal framework puts several hurdles to the operation of CBECs.

First, this is due to the current outline of EU integration in the field of energy. The interconnection of electricity systems at transmission system level is a result of formal EU integration. *Historically, interconnections of electricity systems in Europe were seen as backup capacity for ensuring security of supply. The purpose of interconnections was extended with the aim to establish an internal energy market (IEM) in the EU as interconnection of electricity systems of EU Member States facilitates the physical exchange of electricity which is a necessary precondition for cross-border trade*<sup>59</sup>. At the same time, there is a *traditional top-down setting of the electricity sector, where large centralised production, mostly on the basis of fossil fuel energy sources, is connected to high voltage transmission systems transporting large amounts of electricity via long distances closer to the locations of final consumption*.<sup>60</sup> However, in recent years more and more decentralised local, small-scale production units, such as windmills or photovoltaic panels contribute to a much more "bottom-up" setting of the energy sector. *In this setting, the cross-border element, i.e. the integration of markets, is largely absent which is why EU energy law is less prescriptive*<sup>61</sup>, even if the EU legislation on CECs and RECs opens the door to decentral options, also in the cross-border context.

But still, cross-border cooperation at local level in the field of energy is still very rare due to the predominance of the traditional "top-down" thinking in energy policies at national level.

Second, while energy markets have opened up allowing for self-production and selling surplus electricity to the usual energy supplier, it is not yet legally possible for energy communities (and also not for CBEC) to operate distribution grids, to carry out community to community trading or to trade to third parties or at electricity markets.

These restrictions are examples of certain limitations for CBECs. They have to be considered when designing a CBEC as illustrated by the examples in the following boxes.

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<sup>59</sup> Stroink et al., 2022, p.2

<sup>60</sup> Ibid.

<sup>61</sup> Op.cit., p.3

**Borderless Energy Region Ralingen-Rosport-Mompach<sup>62</sup>**

**A legal obstacle limiting preferences for the legal entity:** A legal obstacle arises from the fact that the two municipalities cannot create a legal entity for their borderless energy region with the expected broad local membership structure using the legal instruments of the 1996 Karlsruhe Intergovernmental Agreement or the EGTC Regulation. The design of a common business and governance model based on public law by establishing a "local grouping for cross-border cooperation" (Karlsruhe Agreement) or an EGTC is hampered by the fact that both options entail significant restrictions for certain types of local actors who should become members of the CBEC. Article 2(1) of the Karlsruhe Agreement and Article 3(1) of the EGTC Regulation do not provide for the participation of individuals (i.e. citizens) and other private actors (i.e. local SMEs and/or non-profit associations) in the above-mentioned legal entities.

**Energy Park Herzogenrath-Kerkrade (Germany-The Netherlands)<sup>63</sup>**

- The German town Herzogenrath and the Dutch town of Kerkrade have a long tradition of cross-border cooperation. They founded a cross-border joint body (Eurode), which is, however, not involved in the efforts concerning the (cross-border) energy transition.
- The municipality Herzogenrath hosts the largest solar farm in North Rhine-Westphalia (DE), with a peak output of more than 14 MW on an old quarry. In the coming years, the solar park will be expanded into an energy park. The aim is to make Herzogenrath, with its approximately 47,000 inhabitants, the first medium-sized town in Germany to have a CO<sub>2</sub> and climate-neutral energy and heat supply by 2030. This initiative is complemented by a project "Energiepark" financed by EU funds and the national and regional level in the framework of the green transition of the former lignite area "Rheinische Revier". It foresees the distribution of waste heat from the glass producer Saint-Gobain in the neighbouring Dutch city Kerkrade. The glass producer Saint-Gobain signed a declaration of intent with the city of Herzogenrath and other actors on the use of industrial waste heat and the supply of district heating across the border to the municipality Kerkrade.
- **Legal obstacles related to electricity provision:** Based on the German Electricity Act of 1998, neighbouring municipalities are not allowed to regulate the supply and demand of electricity among themselves. In addition, there is no treaty between Germany and the Netherlands to make subsidies for wind and solar energy interchangeable.
- **Technical obstacles arising from the grids:** The city Kerkrade conducted a feasibility study with the conclusion, that 1) the connection of the Dutch and German electricity grids is technologically challenging but 2) the cross-border transport of heat is feasible after finding common solutions of initial investments and tax issues.

<sup>62</sup> Case study conducted for this Handbook, see also information in AEBR, 2024 and at: <https://grenzenlose-energieregion.eu/>

<sup>63</sup> Case study conducted for this Handbook, see also information at: <https://www.revier-gestalten.nrw/projekte/energiepark-herzogenrath>

## Technical considerations

Electricity grids are like vast networks of power lines connecting energy producers to consumers. However, sharing energy across national borders is complex. Each country has its own set of rules, technical standards, and market conditions for electricity. This is where CBECs face challenges. They need to navigate different regulations, deal with varying voltage levels and frequencies, and manage different pricing structures. When planning a CBEC, it is important to understand how energy markets are structured. Energy markets govern how electricity is bought, sold, and managed, and when two regions have different market rules, cross-border energy projects become more complicated. The following variables are important:

- **Market structures:** Some countries use what is called an "energy-only" market, where electricity is traded based solely on supply and demand. Others have "capacity markets", which reward energy producers not just for the electricity they supply, but also for ensuring they can provide power during times of high demand. When countries with different market structures cooperate, they need to find ways to make these systems work together so that electricity can flow easily across borders. There are mechanisms for cross-border participation in "capacity markets", which reward energy producers for being able to deliver power when it is most needed. Allowing energy producers from one country to participate in another's capacity market creates more flexibility and ensures a more secure energy supply. However, aligning these mechanisms requires cooperation between countries to ensure that all participants are treated fairly.
- **Gate closure times and trading intervals:** Gate closure times refer to the deadlines for submitting bids and offers in electricity markets, and trading intervals are the time frames during which energy is bought and sold. If two countries have different gate closure times or trading intervals, it can create barriers to trading electricity across borders. Harmonising these schedules allows energy to move more smoothly between markets, benefiting all participants.

Furthermore, it is important to understand how electricity moves across grids and the costs involved. The "energy highway" or grid, connects different regions, allowing electricity to flow where it is needed most:

- One of the main challenges is harmonising **grid access rules and transmission tariffs** between different countries. Each country has its own regulations for how electricity flows through the grid and what fees are charged for using it. For CBECs, these rules would need to be aligned so that participants in both regions have equal access to the grid and are subject to the same pricing structures.
- Another critical aspect is the allocation of **interconnection capacity** – the amount of electricity that can flow across the border through the interconnectors (the physical connections between the grids of different regions). This capacity is often allocated through market-based mechanisms such as explicit or implicit auctions. In explicit auctions, grid operators sell specific capacities at set prices, while implicit auctions integrate electricity trading with capacity allocation, ensuring the most efficient use of available space on the grid.
- Additionally, **congestion management** is an important issue that arises when the demand for electricity transmission exceeds the grid's capacity. When this happens, costs can increase, and energy flows may need to be rerouted. Managing congestion efficiently is key to minimising costs for the energy community while ensuring the reliable delivery of electricity.

- Finally, cross-border cooperation often requires **grid reinforcements**, such as upgrading interconnectors or expanding transmission capacity, to handle increased cross-border energy flows. Deciding how to allocate the costs of these upgrades is crucial. Communities and countries need to agree on how to share the expenses for necessary infrastructure improvements that benefit both sides.

Two neighbouring border regions usually can be connected via<sup>64</sup>:

- **Electricity Interconnectors:** Existing high-voltage lines crossing borders can facilitate large-scale energy sharing.
- **Direct Line Connection:** In this scenario, the electrical distribution networks of two regions are linked via a direct cable, but this connection is carefully regulated to prevent uncontrolled electricity flow between the two countries. The primary limitation is that electricity can only be transferred between local grids for self-consumption, without any power entering the other national transmission networks for a benefit in the foreign exchange. This ensures that unregulated energy transfers and cross-border electricity trading are avoided, maintaining the system's focus on local energy use rather than participation in international electricity markets. If the need of the community is satisfied by the production, the surplus part could be introduced into the national grids.
- **Microgrid Connection:** In the local grid scenario, the distribution grids of the border regions are combined to form a fully self-sufficient, islanded microgrid, meaning there is no connection to the national transmission networks on each side of the border. All local electricity needs must be supplied entirely by local renewable energy generation. To make this model possible, there is the requirement of meticulous management of renewable energy capacity. This scenario delivers a key message for the energy transition: a 100 % self-sufficiency approach, relying entirely on local energy resources without external grid support. However, this approach presents challenges, such as uncertainty arising from the lack of that connection to the national grid.
- **Local Grid Connections:** Some border areas have low or medium voltage connections that can be utilised or enhanced for community-level sharing.
- **Heat/Gas/Hydrogen Transport Systems:** Pipelines for the transportation of gas, heat or hydrogen are other connections that might already exist in border regions connecting two countries.
- Another form of cross-border connection, the "**switchable element**" was proposed by Stroink et al. (2022) with regard to the work within the "Smart energy region Emmen/Haren" project (see the box below for more detail).

#### Obstacle and solution proposed by the Smart Energy Region Emmen/Haren<sup>65</sup>

**Technical obstacle due to differences in voltage levels** between the German and Dutch transmission and distribution networks: While the Dutch network includes 380/220 kV and 110 kV levels, in Germany, only the 380/220 kV level is managed by transmission system operators, with the 110 kV level regulated as part of the distribution network. As a result, the distribution network of Emmen connects to the high-voltage grid at the 110 kV level, whereas

<sup>64</sup> See also: Puka and Szulecki, 2014 and Westphal et al., 2022

<sup>65</sup> Case study conducted for this Handbook, see also information at: <https://sereh.eu/en/>



Haren/Ems connects at the 380 kV level, posing challenges for cross-border energy exchange. However, this issue could be solved by an adequate technological solution.

**Solution proposed – the ‘switchable element’<sup>66</sup>:** *The most obvious option for a cross-border connection would be to connect distribution systems across national borders with a direct current (DC) which however would imply significant costs. [...] While this option seems to be most straightforward, it implies electricity flows between the two distribution systems which are hard to predict and control leading to operational challenges for the respective DSOs and TSOs. [...]*

*A somewhat more restricted option for a cross-border connection between two MS [Member States] could be the connection of a producer and a consumer by an islanded direct cable. Islanded here means that only one producer or consumer in one MS gets connected to a distribution grid in another MS. While such a setting is likely to be technically less problematic and less costly than connecting two distribution systems, also the potential benefits for solving congestion problems in the system by such a connection are very limited. [...]*

*A direct cable connecting a RES generation installation with a consumer would only extend the electricity grid of one MS to the territory of the neighbouring MS. [...] It only facilitates the integration of this single production site and does not contribute to solving the structural problem of congestion resulting from intensified use of the distribution system.*

*Considering the limitations of the mentioned options, this article proposes a novel approach, namely to link distribution systems via a ‘switchable element’. [...] This cross-border element can entail generation, (flexible) consumption, but also two-way flexibility assets (storage) and it has switchable connections to two different distribution systems, i.e. one for the connection to the distribution system of the region in MS 1 and another for the connection to the distribution system of the region in MS 2. In this way, the switchable element is shared between the two regions and thus both have the ability to use the flexibility present in the cross-border element. The exact location of the switchable element, i.e. whether it is placed exactly on the border or in one of the two MS, would not matter, as long as it can be connected to the distribution systems in both MS. In any case, this installation would not qualify as an ‘interconnector’ as established in EU legislation as this definition refers to the interconnection of transmission systems.”*

Creating **special cross-border infrastructures** can be necessary to enable effective energy cooperation between communities in different countries. While not always required, such infrastructures can significantly enhance the capacity for energy sharing and trading. Enhanced cross-border infrastructure could be:

- **Microgrids:** Creating cross-border microgrids with smart inverters and advanced metering can enable localised energy sharing.
- **Energy storage facilities:** Shared large-scale storage facilities, such as pumped hydro, battery installations or compressed air energy storage (CAES), can help balance supply and demand across borders.
- **Additional cold or warm heating networks:** These can be developed mostly in urbanised border areas.
- **Digital infrastructure:** While not physical, new systems for joint control, trading platforms, and collaborative grid management are often part of innovative approaches.

<sup>66</sup> This text is from Stroink et al., 202, p.4, whose authors were involved in the SEREH project.



Thus, while special cross-border infrastructure can significantly enhance energy cooperation, it is not always a prerequisite for starting a CBEC. Many regions can begin with existing interconnections and gradually develop additional infrastructure as the community grows and evolves.

In conclusion, understanding the technical details of energy markets and infrastructure is crucial before starting a CBEC. In some cases, there are administrative and technical procedures in place, required for setting up an energy community project. Good knowledge of these procedural requirements and routines forms the foundation for the technical development. It may require preparation of technical designs, spatial planning, applications for the grid operator for the grid compatibility, technical specifications for the facility, its technology and the infrastructure used, municipal specifications for the facility, applications for the building/operation permissions etc. Due to the vast amount of technical know-how and specific technical requirements, early involvement of technical experts should be suggested on both sides of the border. After finalising the project, the technical knowledge and skills are continually required for proper maintenance and regular monitoring of the facility and its systems.

The situation seems easier for the connection across borders with district heating pipelines compared to electricity grids as illustrated by the first example in the box below. However, the second example shows that also cross-border district heating can be hampered by different regulatory systems.

#### **Cross-border district heating system Flensburg-Padborg (DE-DK)<sup>67</sup>**

The Flensburg (DE) local energy supplier "Stadtwerke Flensburg" supplies around 2,000 households in the Danish border community of Padborg with environmentally friendly district heating from combined heat and power generation since 1983. Already back then the proximity to Denmark inspired the expansion of renewable energy provision (wind energy) and district heating in Flensburg. In May 2021, the Danish municipality of Padborg and the Stadtwerke Flensburg, extended the supply contract for a further five years. The distance from the Flensburg Combined Heat and Power (CHP) plant to Padborg is around 10 kilometres. In Germany, the district heating grid belongs to the Stadtwerke Flensburg and on the Danish side the grid belongs to "Padborg Fjernvarme". The city of Flensburg is the sole shareholder of the company "Stadtwerke Flensburg". "Padborg Fjernvarme" is co-owned, i.e. the consumers own the plant with more than 1,730 cooperative members/heat consumers. Historically relying on heat from an oil-fired plant, today part of the heat supply for Padborg comes from a large solar collector plant and from Arla (surplus heat from wastewater). The remaining heat is surplus heat from the electricity production at Stadtwerke in Flensburg. Sales are expected to increase over the next few years. This is due to the plans of "Padborg Fjernvarme" to expand its district heating network in the medium term to connect the Danish municipality of Kruså.

<sup>67</sup> Case study conducted for this Handbook, see also information at: <https://www.padborgfjernvarme.dk/firmaprofil/vaerkets-historie/> as well as <https://www.stadtwerke-flensburg.de/foerderpost/presse/groesster-fernwaermekunde-verlaengert-liefervertrag>

**Cross-border district heating system Pramollo-Nassfeld area (AT-IT)<sup>68</sup>**

In the last decades, this Austrian-Italian border region has developed a strong connection through tourism, labour exchange and local markets. The establishment of the "Euregio Senza confine" EGTC was a sign for the integrative character of the region. The two communities Hermagor and Pontebba share the skiing arena of Nassfeld and the connected tourism infrastructure with the majority of it being located on the Austrian side. The proposed cross-border district heating project between Austria and Italy is an ambitious initiative to deliver renewable heat from a biomass power plant in Austria to consumers on both sides of the border. Managed by "Nahwärme Nassfeld Pramollo GmbH" (naNa) on the Austrian side, this system has been supplying about 80 % of Nassfeld's heating needs since 2012. The idea of expanding this network to serve hotels in the Italian town of Pontebba reflects the region's shared economic interests, particularly in the Pramollo-Nassfeld ski area – a cross-border tourism hub shared by Hermagor in Austria and Pontebba in Italy. However, the project faced regulatory, administrative, and structural challenges due to different energy frameworks. Austria's district heating sector lacks a national regulatory body, operating without centralised oversight, while Italy's energy sector is governed by ARERA (Autorità di Regolazione per Energia Reti e Ambiente), which monitors prices and taxation in district heating. This regulatory asymmetry complicates cross-border energy collaboration, requiring coordinated solutions to reconcile these differences. To date, the initiative is not further developed.

**Economic considerations**

Several principal economic considerations might affect CBECs. Some refer to the complexities related to the lack of compatibility of national taxation and subsidy frameworks. Others refer to the consequences for CBECs of entering the energy market as economic player with the corresponding need to understand the rules of energy trading, in particular at electricity markets<sup>69</sup>.

Several cases examined for this Handbook have shown that it is not easy to launch a CBEC, also because of its economic implications. When initiatives cover activities in more than one country it is usually difficult to be eligible for national or regional subsidy schemes. That is why EU funding and coordination of subsidy schemes between countries are ever more important for CBECs and related initiatives.

One of the most crucial factors when establishing a CBEC is to understand how electricity prices vary across regions and how these price differences affect electricity flows and local markets. Electricity is not traded in isolation. In contrast, it is part of a dynamic system influenced by multiple factors, including supply and demand, energy generation sources, government policies, and market regulations. When these elements differ across borders, it creates variations in electricity prices, which, in turn, impact the way energy flows between countries and how local markets function.

In cross-border energy trade, electricity price differentials play a crucial role in shaping energy flows and local market dynamics. Key considerations include the magnitude and consistency of price differences, which influence the strength and stability of cross-border

<sup>68</sup> Case study conducted for this Handbook, see also information at: <https://www.klimaundenergiemodellregionen.at/assets/Uploads/B971703-konzept.pdf>

<sup>69</sup> An overview on the relevance of different approaches to electricity tariffs and energy market models in the EU Member States is included in BRIDGE Project, 2021.

energy trade. Larger, more stable price gaps create stronger incentives for sustained energy cooperation, while volatile price differences add risks.

With regard to energy trading, in some countries there are exemptions for energy communities of necessarily having the status of an electricity supplier for electricity trades. It will be necessary to check if this applies to both sides of the border. However, as soon as electricity would be sold to a third party (sales beyond the energy community or on electricity markets), the energy community, and probably also a CBEC, would need the official status as a supplier, which is connected to several complex obligations. In addition, the actual procurement and *sale of electricity on the energy markets require extensive know-how of the markets and financial resources to handle collaterals, high prices and/or losses or possibly high subsequent imbalance settlement payments*<sup>70</sup>.

Depending on the technical solution and the concrete activity of a CBEC, there can be important system cost savings and economic benefits of the cross-border electricity connection at distribution system level. However, as mentioned above, this can only be fully exploited when the legal set up of the CBEC allows for a clear distribution of losses and benefits. However, more detailed work on this is required when later defining the business model for the CBEC. At this stage, it is important to remember that economic considerations need to be taken into account.

## Potential focus of CBEC activities

Some cross-border energy initiatives have already a certain activity in mind, when they decide to develop a common project, energy community or common structure/service. This can be a certain activity (e.g. energy generation, distribution, supply and consumption, storage, electric charging services or energy-related services) or a certain energy or technology (e.g. solar, wind, biomass, hydrogen, district heating, local generation and supply systems, e-charging systems). Potential activities are presented below.

### Renewable energy generation

By focusing on renewable energy generation, CBECs can address these limitations while unlocking significant benefits. Firstly, it fosters increased energy independence for border communities, reducing their reliance on centralised power systems and potentially volatile energy markets. This localised approach to energy production enhances resilience and security of supply. Secondly, the shift towards RES contributes substantially to the reduction of carbon emissions and overall environmental impact. Lastly, renewable energy projects create valuable economic opportunities through local job creation in installation, maintenance, and related services, as well as attracting investments that can stimulate regional economic growth.

### Energy distribution

CBECs can bridge systemic gaps and create a more integrated energy landscape. This approach leads to improved grid reliability and resilience in border regions, ensuring a more stable energy supply even in the face of potential disruptions. It also enhances energy security by diversifying distribution channels, reducing dependence on single points of failure and allowing for more flexible energy routing. Furthermore, shared infrastructure across borders presents opportunities for significant system cost savings.

### Energy supply and consumption

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<sup>70</sup> Final and Monsberger, 2023, p.8

CBECs can increase competition in energy markets, potentially leading to lower prices for consumers and businesses alike. They also provide greater choice for consumers in energy suppliers, empowering them to select options that best suit their needs and preferences, whether based on cost, sustainability, or other factors. Moreover, diversified supply options enhance overall energy security in border regions, reducing vulnerability to supply disruptions or price fluctuations in any single market. This multifaceted approach to energy supply not only improves affordability and accessibility but also contributes to the resilience and sustainability of border regions.

### Pooling knowledge and management resources

By pooling knowledge, resources and production capabilities, CBECs can significantly enhance the position of smaller energy generators. The collective approach increases the market power of small producers, allowing them to compete more effectively with larger entities and negotiate better terms in energy markets. It also contributes to enhanced grid stability through coordinated energy management, as aggregated resources can be more reliably dispatched and balanced to meet grid needs. By leveraging economies of scale and shared resources, aggregation in CBECs not only empowers local energy producers but also contributes to a more resilient, flexible, and inclusive energy system in border regions.

### Energy storage

By implementing storage solutions, CBECs can significantly enhance the integration of RES, smoothing supply fluctuations and ensuring a more consistent power supply. This leads to enhanced grid stability and reliability, particularly crucial in border regions where grid infrastructure may be less robust or interconnected. Furthermore, energy storage opens potential for energy arbitrage, allowing communities to store energy when prices are low and sell when they are high, creating additional revenue streams.

### Electric vehicle charging services

Especially in cross-border functional areas, seamless networks of charging services for e-mobility are not always easy to achieve. By developing cross-border charging networks, CBECs and related initiatives can increase e-mobility options in these areas, making **electric vehicle use** more practical and appealing for both residents and travellers. This infrastructure also presents opportunities for integration with RES, potentially allowing for charging stations powered by local, clean energy. Such integration can further enhance the environmental benefits of e-mobility and contribute to grid stability. Moreover, the development of charging services for electric vehicles opens up new business opportunities in the e-mobility sector, stimulating local economies and creating jobs. Aspects that need to be considered for CBECs are the standardisation of charging protocols and systems, strategic placement of charging stations, load balancing and grid management and the need for corresponding mobile applications. Another significant area of development is **cross-border bike- and e-scooter-sharing** as described in the box below.

#### Cross-border e-mobility system between Italy and Slovenia<sup>71</sup>

EGTC GO is an Italian public authority with legal personality, founded in 2011 by the municipalities of Gorizia, Nova Gorica and Šempeter-Vrtojba, with the aim of tackling the shared challenges in the cross-border area located in the Friuli-Venezia Giulia region of Italy and the west of Slovenia (Goriška). EGTC GO, in cooperation with the two municipalities of Nova Gorica and Gorizia, collaboratively decided to improve and integrate the cross-border cycling infrastructure, aiming to create better conditions for local and visitor cyclists and

<sup>71</sup> Case study conducted for this Handbook, see also AEBR, 2021 and information at: <https://euro-go.eu/en/notizie-ed-eventi/news/il-gect-go-collaborazione-con-i-due-comuni-di-nova-gorica-e-gorizia-sta-predisponendo-un-sistema-di-bike-sharing-transfrontaliero/>

preparing the area to be a truly cross-border European Capital of Culture in 2025. Their plan included establishing a cross-border bike-sharing system.

In 2021, Nova Gorica (SI) introduced its EU co-funded bike-sharing system, GO2GO. Approximately half of the 89 bikes stationed at 20 locations are electric. In November 2022, the system was expanded across the border with the establishment of three GO2GO docking stations in Gorizia (IT).

Facing several challenges before being able to integrate the system across the border, in 2021, EGTC GO submitted a proposal to *b-solutions*. In this context, EGTC GO asked for support to address specific regulatory and administrative differences between Italy and Slovenia, in particular, with regard to:

- the national law applicable to the public tender procedure;
- the choice between public procurement, public-private partnership or concession of services;
- the integration of the two existing bike sharing systems of the Municipality of Gorizia and Mestna občina Nova Gorica;
- the elements of the contract between the EGTC GO and the economic operator.

Helpful advice was provided and since 2022 the system GO2GO, operated by the Slovenian company NOMAGO, is truly cross-border.

## Smart grid management and development

The development and implementation of **smart grid technologies** across borders can optimise energy flow and balance supply and demand more effectively. This cooperation can enhance grid stability, increase the integration of RES, and improve overall energy security for participating communities. It also provides a testing ground for innovative grid management solutions that could be scaled up to national or European levels. One of the fundamental aspects of successful smart grid integration is the harmonisation of grid codes and operational standards. Another element is the joint development of demand response systems. These systems enable utilities to manage energy consumption by creating incentives for users to reduce or shift their electricity usage during peak demand periods. Lastly, the coordinated management of distributed energy resources is essential for optimising energy generation and consumption. By sharing data and insights on distributed energy resources across borders, communities can improve the overall efficiency and reliability of their energy systems, further promoting the use of RES.

## Other energy-related services (advice, consulting, funding)

With a focus on developing and implementing advanced energy services, CBECs can increase the availability of cutting-edge energy solutions, as communities on both sides of the border can collaborate on developing and implementing new energy technologies and services related to renewable energy, decentralised technical solutions or the management of CBECs.



**TRION-climate e.V. (DE-FR-CH)<sup>72</sup>**

TRION-climate e.V. is a German-French-Swiss network of energy and climate stakeholders in the Upper Rhine region. The non-profit association was founded on 13 March 2015 by the Upper Rhine Conference. Its founding members are the federal states of Baden-Württemberg and Rhineland-Palatinate, the Région Grand Est and the Département Bas-Rhin, as well as the cantons of Basel-Stadt, Basel-Landschaft and Jura. Since its foundation, numerous cities, companies, chambers and associations have joined the network. The purpose of the association is to promote environmental protection through the cross-border bundling of synergy effects in the field of climate and energy in the tri-national metropolitan region of the Upper Rhine. For this purpose, the network organises events, training courses, visits and similar activities in the field of climate and energy, which promote the cross-border exchange of knowledge and experience. The office of TRION-climate e.V. is located in the competence centre for cross-border cooperation in Kehl, in the immediate vicinity of Strasbourg. A trilingual team realises the network's activities and is available to members and interested parties for questions and information.

**Potential technological focus of a CBEC**

In the context of energy transition and decentralised local bottom-up energy systems, CBECs will most likely rely on RES, efficient technologies and digital energy solutions. Before choosing a specific technology, a CBEC will need to think about the available options. Examples are:

**Solar Photovoltaic (PV) Systems:** Solar energy, harnessed primarily through PV technology, stands out as a cornerstone of renewable energy solutions. Its remarkable scalability allows for diverse applications, from small-scale rooftop installations to expansive solar farms. This versatility empowers individual households to generate their own electricity, promoting a decentralised energy landscape, while also enabling the development of large-scale projects in sun-rich border regions to produce substantial energy outputs.

**Wind Energy:** Wind power emerges as a highly efficient renewable resource, playing a crucial role in the energy mix of CBECs. Its versatility allows for on- and offshore installations, each offering unique advantages for transnational energy cooperation. CBECs will most probably rely on onshore solutions. These installations provide a cost-effective solution for large-scale electricity generation, leveraging natural geographical features that frequently transcend national boundaries. Wind energy can easily complement solar energy generation. A disadvantage of wind energy installations is the need of land use permits. In addition, larger wind parks need to be considered in spatial and territorial planning instruments.

**Biomass:** Biomass technology enables the conversion of organic waste into useful energy, providing both electricity and heat. In the context of CBECs, biomass and biogas installations can leverage a wide range of feedstocks, including agricultural residues, forestry by-products, and municipal organic waste. This ability to utilise local resources not only promotes energy self-sufficiency but also fosters a circular economy approach within border regions.

**District heating systems:** They play a crucial role in CBECs, offering an efficient means of providing thermal energy across national borders. These systems, powered by RES such as geothermal, biomass, and industrial waste heat, distribute thermal energy to urban areas

<sup>72</sup> Case study conducted for this study, see also: [www.trion-climate.net](http://www.trion-climate.net)

and industrial complexes through centralised infrastructure. In CBECs, district heating networks enable the sharing of heat resources across borders, and contribute to reducing wasting energy, enhancing the integration of heat production and consumption. District heating system at cross-border scale refer mostly to larger district heating systems and the utilisation of industrial by-products for mutual benefit. By giving excess thermal energy from manufacturing processes a new purpose, neighbouring regions can tap into this resource. This approach not only reduces waste but also fosters a circular economy mindset, where one community's surplus becomes another's valuable input.

#### Feasibility study for a cross-border district heating grid (AT-DE)<sup>73</sup>

The EU funded CEF-E project "Eneregio SOBOS" (2022-2024) investigated the heat potential and heat demand as well as the feasibility of a supra-regional supply of district heating. The scope of the feasibility study covered southern Germany (Bavaria) and Austria (Upper Austria and Salzburg). The studied cross-border heating system would be supplied by waste energy from local industry, geothermal and bioenergy plants. The project area is situated in the area of the Malmkarst, which allows the use of hydrothermal deep geothermal energy. There is also a high industrial density with waste heat potential from industry, biogas CHP plants and large heat sink potentials in the building stock of towns and villages. Overall, the suspected potential of the supra-regional district heating could lead to over 2 TWh of heat consumption being supplied from sustainable sources, reducing regional reliance on fossil fuels, and reducing greenhouse gas emissions. The Eneregio SOBOS study relied on data collection of heat sources and sinks/heat demands in industry and customer sectors. Based on the collected data, feasibility as well as costs and benefits of the cross-border renewable district heating project have been assessed. To complement these activities, Eneregio SOBOS engaged stakeholders and disseminated its results. As a result of the Eneregio SOBOS study, a cross-border renewable energy project will be defined. If put in place, the transnational network of heat sources and heat sinks from different processes via a district heating transport system will tap into the geological potential for renewable energy deployment and bring multiple benefits. The targeted region has large energy demand for agricultural food production and other heat-intensive industrial production processes. This applies to the border region in Bavaria and Austria – especially in the federal states of Upper Austria and Salzburg. A coupling of the sectors should be achieved through the targeted arrangement of heat storage systems in the district heating transport system. As a result, heat generation and heat demand can be linked and taken through seasonal storage throughout the year and made available to customers. This enables the cross-border and year-round use of CO<sub>2</sub>-free heat for the supply of entire districts, the diversification of the heat supply and the reduction of the dependence on energy imports from outside the EU.

**Digital solutions:** The transition from centralised to decentralised energy systems requires changes in infrastructure and networks. Part of the transition are digital solutions, such as smart bi-directional meters, smart devices, the integration of digital tools, which are linked to the innovative role of "consumers as prosumers". One example of a digital solution is the **Virtual Power Plant (VPP)** describing a digital platform that enables its users to share and trade electricity and other energy resources, i.e. providing flexibility, which is usually operated by an aggregator. A platform provides its users with data on available energy, energy prices, weather conditions, etc., and thus enables them to participate in markets, sell the excess or buy needed electricity, or share the energy with other members of a community. An inspiring example of this approach is envisaged for the "Borderless Energy Region Ralingen Rosport-Mompach" project between Germany and Luxembourg. This initiative wants to bundle various renewable energy producers in the two municipalities across the border by setting up a VPP.

<sup>73</sup> Case study conducted for this Handbook, see also information at: <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/projects-details/43251567/101080990/CEF2027> as well as <https://r-cr.de/reader/eneregio-sobos-energieregion-suedostbayern-oberoesterreich-salzburg.html>



**Innovative trading arrangements:** RED II specifically states that *RECs can sell renewable electricity directly to natural or legal persons through power purchase agreements (PPAs)*.<sup>74</sup> PPAs can vary across several dimensions, including duration (from short to long term), pricing structure (fixed, floating, or indexed), and revenue certainty (such as through take-or-pay arrangements). Peer to Peer (P2P) trading is defined as the *sale of renewable energy between market participants on a bilateral basis by means of a contract with pre-determined conditions governing the automated execution and settlement of the transaction*.<sup>75</sup> Despite P2P trading is not explicitly envisaged for communities in the directives, but only for self-consumers, it can occur between all market participants and thus communities could use these digital forms to conduct transactions with other market participants on pre-agreed conditions. P2P trading can be conducted either directly between market participants, in which case two parties agree on the volume and price of energy, or indirectly through a certified third-party market participant, such as an aggregator who coordinates the trading. The full potential of P2P can be utilised only by using digital platforms or so-called VPPs.

**Blockchain technology:** It presents an additional solution for managing the complex transactions and regulatory landscapes inherent in CBECs. At its core, blockchain is a distributed ledger technology that ensures data integrity through cryptographic methods and consensus mechanisms. A crucial feature is the integration of decentralised identity solutions, which provide secure, interoperable user authentication across borders. This is particularly valuable in a cross-border context where traditional identity verification methods may be challenging. By leveraging these features, blockchain-based systems offer CBECs a transparent, immutable, and efficient method for managing energy transactions.

To sum up, after these preparatory steps and having gained a common understanding on potential activities and technologies for a planned CBEC initiative, the next step regards setting up an adequate governance scheme and a business model for the planned CBEC.

## 4. Governance and business model for a CBEC

Two elements are crucial in the process of establishing a CBEC and also during the operational phase. These are the:

- governance framework, and the
- business model.

Business models do not develop or operate in isolation. In contrast, they are shaped by broader elements of social and technical systems and by the governance framework of the CBEC or related cross-border activity. To understand the business model, decisions on the governance framework of a CBEC need to be taken.

### Governance framework

The governance framework sets the scene for the organisational structure of a CBEC. It puts specific emphasis on interactions and cooperative arrangements with different partners spanning a network for delivering value to customers. In the context of a CBEC it has implications on the coordination of processes, on managing the relationships with partners

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<sup>74</sup> Article 2(17) and Article 22(4) RED II

<sup>75</sup> Article 2(18) RED II.

and stakeholders on both sides of the border as well as on planning the division of tasks between partners.

At the early stage of a CBEC, the governance framework is influenced by different factors, such as the stakeholders engaged, institutional alignment and values (e.g. motivations, benefits). These factors may change over time in line with the community development. The key elements of a governance framework are<sup>76</sup>:

- **Partnership formation:** Partners to be involved, balance between regions and countries, size of the actor network (including both local and regional agents and secondary agents), extent of formal and informal interactions;
- **Institutional alignment:** formal institutions (e.g. rules, laws, regulations), informal institutions (e.g. values, responsibilities), political institutions (e.g. policies, strategies);
- **Shaping of expectations:** Shared visions and expectations (converging into shared visions for development), expectations based on tangible results from (previous projects and pilot actions, externally formulated expectations (e.g. social media);
- **Learning process:** individual learning, organisational learning (e.g. on techno-economic optimization, technical and social alignment), systemic learning, self-governance.

To assess the appropriateness of a proposed governance framework, four qualitative indicators can be used. Guiding questions can be used to assess to what extent the governance context is supportive or restrictive for the CBEC development process:

- **Extent:** Are all relevant aspects taken into account? Is the scope of actors and stakeholders involved complete?
- **Coherence:** Are the elements of the dimensions of governance reinforcing the proposed goal of the CBEC?
- **Flexibility:** Have different pathways (social, technical) been analysed and assessed to reach the goals, depending on opportunities and threats as they arise? For example, has a SWOT analysis been conducted for this purpose?
- **Intensity:** How intense will be the involvement of stakeholders in the CBEC? Can there be different forms of partnership, membership or shareholders? What are the expectations or interests?

Reflection on these questions is important at an early stage, before defining the business model. Decisions taken at this point will feed into the development of an organisational set up and corresponding management rules for the CBEC.

In principle, CBECs can involve various stakeholders, such as residents, local authorities, academics, businesses, associations and NGOs. These stakeholders are able to create new forms of cooperation and contribute towards the development of the CBEC. Because of this diversity, a wide variety of governance frameworks, leading to different organisational and legal forms can be used, which makes it difficult to classify them.

Cross-border leadership is an important element that should emerge already in this phase. While the previous steps in building a CBEC could be easily handled by a cross-border

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<sup>76</sup> Adapted from Jain et al., 2020.

partnership or a group of citizens/organisations, the following steps require already a strong level of commitment, communication capacities, expert knowledge on certain technical and business-related aspects. For CBECs, this role can be taken over by a cross-border organisation, to ensure the cross-border dimension from the beginning. At the same time, there might be also other regional actors, such as local or regional development/energy agencies, local authorities or local associations/NGOs, that would take the leadership for the creation of a CBEC business model. Effects of the lack of a corresponding strong cross-border leadership may be illustrated by the example in the box below.

#### **Obstacle perceived by the Smart Energy Region Emmen/Haren<sup>77</sup>**

**Governance obstacle:** The lack of a cross-border organisation responsible for developing and continuing the activities of establishing a cross-border energy grid complicated the efforts and perspectives. The initiative is currently not continued.

## **Business model**

To ensure that CBECs are viable and successful, they require a well-developed business model that accommodates cross-border complexities, stakeholder needs, and financial sustainability. A business model describes how a CBEC uses its resources and opportunities to create economic value.

In general, energy communities rely on diverse business models, depending on a) the energy activity and technology chosen, b) the organisational and membership structure, c) the ultimate goal to set up a CBEC, e.g. local ownership of energy production, cheaper prices, green energy, independence from larger energy suppliers or fossil energy.

Possible business models for CBECs are based on general business models for energy communities. They include, for example<sup>78</sup>:

- Local/regional electricity generation and trading – individual producers group together for the purpose of jointly producing and selling electricity, both under market mechanisms and existing support schemes;
- producer-consumer communities, where groups of producers and consumers come together in a local energy market;
- local or regional balancing pool, mostly led by a local energy supplier. Various producers pool the local generation to match electricity consumption of retail customers who live in the area covered by the balancing pool. The value proposition of this model is seen in the regional focus with regional generation and regional consumption;
- peer-to-peer models, where retail customers can purchase an electricity tariff directly from electricity plant operators. The P2P model relies on an internet platform as a market-place to bring renewable plant operators and retail customers together;
- energy positive neighbourhoods with residential and commercial facilities that operate their own energy supply chain;

<sup>77</sup> Case study conducted for this Handbook, see also information at: <https://sereh.eu/en/>

<sup>78</sup> See dena 2022a and 2022b. Further information on business models of energy communities can be found here: De Vidovich et al., 2023; Ehrtmann et al., 2021; Fina and Monsberger, 2023 and Reis et al., 2021

- joint utilities – production, supply, grid operation controlled by citizens (e.g. cooperatives);
- shared e-mobility platforms, where consumers or a member-owned organisation also manages the platform and the service.

Apart from the governance structure – which has been described above, due its importance for CBECs – the business model framework for CBECs typically consists of the following components:

- **Value proposition:** The value proposition is the primary reason why a community, customer, or stakeholder will participate in or support the CBEC. It could range from offering cheaper, locally produced, or renewable energy, the shared ownership of resources, contribution to positive social impact, environmental commitment, self-sufficiency or more independence from fossil energy or from larger energy suppliers. Specific benefits from the cross-border cooperation, such as, enhancing the market, balancing demand and supply across the borders, more efficient access to resources, sharing resources, can be identified at this stage.
- **Target Groups and Customers:** The success of CBECs depends on identifying and engaging specific customer segments on both sides of the border. The target groups, depending on the planned activities and technologies can be residential consumers, local businesses, municipal or regional authorities aiming for sustainable development or third parties (e.g. industrial companies, energy suppliers, other energy communities).
- **Cost structure and revenue streams:** Defining the cost structure is key to understand the economic dimension and feasibility of the CBEC. Developing reliable revenue streams is essential to the long-term sustainability of a CBEC. Key revenue sources could include membership fees or community shares, sale revenues from selling energy or services to members or external markets, revenue from energy storage services or trading excess energy. Additional income might come from public finance (subsidies, fees), financial instruments, traditional loans or community resources such as crowd-funding or donations<sup>79</sup>.
- **Infrastructure and resources:** Depending on the foreseen activities and technologies, a CBEC might need to build and maintain its own energy production facilities (e.g., solar, wind), manage energy flows and distribution networks, participate in energy trading, develop and promote digital management and trading solutions or storage systems.

Based on these considerations, the following box summarises the key questions stakeholders should consider when defining their CBEC business model.

#### Key questions to define the business model of a CBEC

- Value proposition: What is the value proposition for the customers, why should they pay for what is offered?
- Customer segments: Who are the customers that are mainly addressed?
- Customer relationships: How will the engagement with the customers work?

<sup>79</sup> See Chapter 5 for more information on "Access to finance".

- Channels: Which channels are used to reach out to the customers?
- Cost structure: What costs come along with the CBEC?
- Revenue streams: For what and how much are the customers willing to pay? Are there other funding sources that can be used?
- Infrastructure: Which infrastructure and equipment is needed? Does this need to be owned by the CBEC or by its members?
- Resources: Which other resources (personnel, software, rooms/buildings) are needed to start the CBEC and to carry out the activity?

The development of a business model should also take into account specific challenges. In the case of CBECs, and as already mentioned above, different challenges and obstacles need to be considered. These include differences in national energy markets and energy/climate policies, in regulatory frameworks, in cultural preferences, and financing/taxation conditions. Here are some considerations that are subject to the specific differences:

- **Regulatory and policy differences**

Different countries may have varying policies regarding energy production, distribution, and taxation. When structuring the business model:

- conduct a regulatory analysis to understand compliance requirements in each country;
- design a flexible model that can adapt to policy changes, allowing for varying tariffs, subsidies, and legal structures.

- **Cultural and language barriers**

Cross-border projects may involve diverse communities with different languages, cultural attitudes, and energy usage patterns. To address these differences:

- engage in community outreach and participatory planning sessions in each country;
- tailor communication and marketing strategies to suit local contexts.

- **Funding opportunities and tax conditions**

Multiple funding opportunities can vary between countries and regions. For some funding sources, such as subsidy schemes or financial instruments, they might be only accessible for organisations in one of the involved countries. For CBECs also the existence of the national taxation regimes can be important. To mitigate risks:

- check for taxation regimes on both sides of the border and for different types of organisations;
- seek funding mechanisms that are suitable for cross-border projects, such as EU grants, green bonds, or crowd-funding platforms targeting international investors;

- check the need to work with different currencies. This makes the financial model more complex.

- **Technology and infrastructure compatibility**

Integrating different energy grids and storage technologies across borders requires careful planning. Ensure compatibility by:

- using smart energy management systems to optimise energy production and distribution across borders;
- collaborating with technical partners with sufficient knowledge about infrastructure requirements and challenges in each participating country.

## 5. Access to finance for a sustainable CBEC initiative

Energy cooperation across borders involves important economic decisions. This chapter provides assistance to key economic considerations that come into play when defining the financial model of a CBEC.

The definition of the cost structure and revenue streams within the business model of the CBEC has probably allowed to define the need for capital to start the activity planned within the CBEC.

Agreeing on a cost structure requires taking into account:

- capital costs for new infrastructure like interconnectors or shared energy generation facilities, along with operational costs for maintenance and energy losses;
- economic benefits, such as improved market efficiency, reduced price volatility, and potentially lower energy prices;
- additional social and environmental costs and benefits, like the inclusion of vulnerable groups or people, job creation, emissions reductions, or local disruptions;
- the distribution of costs and benefits across stakeholders in both countries.

Thoroughly weighing these factors helps communities make informed decisions about the economic viability and broader impacts of cross-border energy initiatives.

Once the cost structure has been defined, the CBEC should decide on the financial resources needed for investments and the revenue streams to cover operating costs. There are several sources of funding that can be considered, depending on the CBEC's business model:

- Revenues for selling on the energy markets
- Member contributions
  - Member (co-operative) capital
  - Fees
- Private funds

- Family and friends
- Cooperative funds
- Donations
- Grants from foundations or other NGOs
- Crowd-funding
- Commercial funds
  - Traditional bank loans
  - Leasing arrangements
  - Financial Instruments
- Equity finance
  - Risk capital
  - Business angles as shareowners
- Public Sector Support
  - Public sector participation in the CBEC (local or regional authorities)
  - Subsidies and grants/loans from funding programmes
  - Funding for innovative pilot actions and research
- EU instruments and funds for CBEC
  - ERDF and Joint Transition Fund (JTF) programmes at regional or national level
  - Interreg
  - LIFE
  - CEF
- Other
  - Third-party financing
  - Public-private partnerships, contracting.
  - Emerging market-based solutions (carbon markets and cross-border energy infrastructure bonds).

Securing adequate financing is a critical challenge. The different financing sources have different advantages and challenges:

**Community-based financing:** These methods rely on direct involvement from community members and supporters. Member contributions offer a direct and engaging way for individuals to invest in their shared energy future. This approach typically takes two forms:



(i) membership fees, which might be a one-time joining payment or recurring contributions, and (ii) investment shares, allowing members to become co-owners of the initiative. The benefit of this model lies in its simplicity and its ability to foster a sense of ownership and commitment among community members. However, it is crucial to strike a balance between financial input and democratic governance. A well-designed CBEC ensures that all voices are heard equally, regardless of the size of individual contributions. This approach not only aligns with the core principles of energy communities but also encourages diverse participation, from those able to make substantial investments to those contributing smaller amounts or even non-financial resources like time and skills. By embracing this inclusive model, CBECs can build a strong, committed membership base that is invested in the project's long-term success. **Crowd-funding** involves raising small amounts of money from a large number of people, typically via online platforms. This method can take various forms, but the most effective approaches for creative, community-driven projects and local empowerment typically include donations or platform-based crowd-funding.

**Equity finance:** In cases of equity finance investors purchase shares or equity in the initiative, becoming co-owners. This model is particularly suited for community members who want to retain decision-making power and alignment with the initiative's values. Indeed, those investors gain a financial stake, and in return, may also have a say in the management.

**Donations and grants from NGOs or foundations:** These can play an important role in financing projects with specific social or environmental benefits, such as CBECs. To attract these contributors, associations should foster personal relationships, demonstrate their positive impact through achievements, and tailor engagement to donor interests. Individual donations provide for greater flexibility in operational expenditures and programme creation, whereas corporate donations might result in considerable contributions that correspond with company goals. Angel donors, who are frequently wealthy individuals, provide flexible funding with no strings attached and may also provide continuous guidance and support.

**Traditional Financial Instruments:** These are conventional financing methods that can be used by CBEC initiatives. Traditional Bank Loans usually provide up to 80 % of the necessary funds, requiring the community to secure the remaining resources with other solutions. Engaging traditional banks can be challenging due to the perceived risks associated with innovative and community-driven projects. However, successful projects often present strong business cases, demonstrating robust financial planning and potential for stable revenue streams. Communities must prepare detailed financial projections and risk assessments to secure bank loans. While this option is one of the most reliable in terms of trustworthiness of the institution, it can also be the most expensive due to the high interest rates applied to community-based initiatives subject to this uncertainty. Leasing renewable energy installations offers CBEC a strategic approach to implementing clean energy projects with reduced initial financial burden. This financing model involves renting equipment from a third-party provider, allowing communities to access cutting-edge technology without the substantial upfront costs typically associated with outright purchases. Key benefits include lower initial costs, flexibility, and reduced risks related to maintenance or obsolescence, effectively eliminating unexpected expenses. While leasing offers an appealing entry point for many community-based energy cooperatives, it is essential to thoroughly assess the long-term costs in comparison to other financing options, as well as to carefully consider the complexities of the contract terms.

**Public finance<sup>80</sup>:** Government bodies at various levels can provide crucial public support. Local authorities can offer guarantees, seed funding, and even become partner in energy communities. They can also create revolving funds for community projects, offering additional credibility to hesitant investors. Municipalities can provide space for community energy projects, such as rooftops for solar installations. Additionally, they can allocate staff

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<sup>80</sup> See also REScoop.eu et al., 2023

resources to support project development. Moreover, local government involvement helps navigate regulatory challenges and offers long-term strategic guidance. This partnership ensures that community projects align with broader municipal objectives while benefiting from public sector resources and expertise. However, one of the significant challenges is the bureaucratic processes, which can complicate project implementation and prolong timelines. Several countries offer support to energy communities and/or cross-border cooperation via their national or regional ERDF or JTF programmes. Also within the Recovery and Resilience Facility (RRF) or the Modernisation Fund (for the central and eastern European countries) funding is available for the green transition. Beyond funds from cohesion policy, RRF and Modernisation Fund, national governments might have set up financial schemes using domestic finance for energy communities (as for example in Ireland, the Netherlands, and Germany) or for cross-border cooperation on energy. Furthermore, at national and regional level there might be additional support to carry out green transition projects for which CBEC initiatives can be eligible. The example below shows the need for different funding options.

#### **Funding needs perceived by the Smart Energy Region Emmen/Haren<sup>81</sup>**

The regulatory obstacle encountered by the project stems from European regulations, specifically EU Regulation 2019/943/EU, which currently prohibits the establishment of a direct line to connect electricity distribution grids. Through its findings, the SEREH Interreg project underscored the challenge of sustaining renewable energy plants without access to national or regional funding, such as that provided by the Renewable Energy Sources Act. This emphasised the critical need for bilateral agreements between Member States to enable subsidies and facilitate cross-border electricity supply, thereby addressing the regulatory impediments.

**EU funds and instruments** are a valuable source for cross-border projects. Interreg cross-border programmes offer funding to promote regional cooperation and European integration across borders between different Member States. These cooperation programmes enable the financing of projects, including small-scale and people-to-people initiatives, that address shared issues, such as economic development, environmental sustainability, and social inclusion. They seek to increase cross-border cooperation and further EU cohesion by encouraging collaboration between a variety of stakeholders, including local, regional, and national governments, as well as enterprises, research institutions, and civil society organisations, among others. Through Cohesion Policy Objective 2 for a *Greener Europe*, they allow the financing of cross-border energy projects and CBECs. Furthermore, through Interreg Specific Objective 1 for *Better Governance*, they allow to enhance cross-border governance and work on legal and administrative border obstacles. The example in below box shows how such programmes can even develop calls dedicated to energy related projects.

Moreover, LIFE 2021-2027 offers the possibility to fund projects in different countries. The LIFE Programme is the EU's funding instrument for the environment and climate action. The LIFE Clean Energy Transition sub-programme aims at breaking market barriers that hamper the socio-economic transition to sustainable energy. Projects typically engage multiple actors including local and regional public authorities and non-profit organisations, as well as consumers.

The new Connecting Europe Facility (CEF) programme provides an enabling framework of financial support to foster EU Member State cooperation in the field of renewable energy and introduces the concept of cross-border projects in the field of renewable energy (CB RES projects). CEF-E are financial programmes to promote cooperation among EU Member States in the renewable energy sector. Other relevant funding schemes are

<sup>81</sup> Case study conducted for this Handbook, see also information at: <https://sereh.eu/en/>

available via EU financial instruments delivered, for example, through the European Investment Bank.

### **Funding for cross-border energy projects under Interreg Meuse-Rhine<sup>82</sup>**

In order to support innovative energy projects, the Interreg A Euregio Meuse-Rhine programme opened a special call for projects with an energy focus on 17 August 2021. In the border region between Germany, the Netherlands and Belgium, 13 cooperating regional partners are working together on the funding programme. The programme supports cross-border projects and is part of a network of EU funding programmes. The EUR 5 million in European funding is supplemented by a further EUR 5 million in national and private investment. This call for projects was open to initiatives that contribute to a more efficient use of resources in SMEs by developing solutions in the fields of green hydrogen, energy communities, the use of low-voltage direct current technology or solar energy. Energy information exchange projects were also possible to stimulate the energy transition and create synergies between the programme countries.

Innovative and partnership-based solutions involve collaborations or novel approaches to financing: **Third-party financing** involves agreements in which established cooperatives or financial entities provide capital to new projects, which are not the user or customer. This model is particularly beneficial for emerging CBECs that need initial capital to start operations. Repayment is typically tied to the project's performance, offering significant flexibility for the community. As the project gains visibility and community support, repayments are structured to ensure a clear pathway to financial stability for new initiatives. These agreements leverage the credibility and financial strength of established entities, creating opportunities for diversification and attracting potential new funding sources.

**Public-private partnerships** bring together government and private sector companies to invest in infrastructure. The private sector provides upfront financing in exchange for long-term revenue-sharing agreements, making it particularly suitable for large-scale CBECs, such as transmission lines or energy storage facilities. This approach can enhance efficiency by leveraging specialised expertise, facilitating access to capital, and generating positive spillover effects in areas like public infrastructure investment. However, these partnerships also involve complex contracts and the potential for misalignment of interests. These challenges can be addressed through strong public accountability and full transparency.

Other **novel sources for capital** include financing through Carbon Markets and Emissions Trading Schemes, in which regions or nations participating in CBEC may look into carbon pricing techniques such as carbon credits or cap-and-trade systems. Revenue from these programmes could be reinvested in energy infrastructure, particularly renewable energy initiatives and CBEC. Furthermore, Cross-Border Energy Infrastructure Bonds or Shares may be issued by local cooperatives, community-owned infrastructure, or a group of local governments and stakeholders. These bonds would allow citizens to directly fund and gain profit from CBECs and collateral initiatives. This model can attract individuals who are interested in supporting the project while also seeking a modest return on their investment.

An essential takeaway is the importance of spreading financial inflows across various sources, loan types, and investment opportunities. This strategy is key for minimising risk and enhancing financial stability. Financing cross-border energy communities involves a combination of innovative financial models, regulatory harmonisation, and community engagement. By leveraging diverse funding sources – such as crowd-funding, cooperative

<sup>82</sup> See information at <https://www.interregemr.eu/nachrichten/5-millionen-eur-europaische-mittel-fur-energielosungen-in-unserer-region>

funds, public-private partnerships, and EU programmes – communities can secure the necessary investments to develop and sustain cross-border initiatives.

Figure 6 summarises the different aspects of the financial planning in the course of CBEC development.

**Figure 6: Tips for CBEC financial planning**



Source: Consortium, 2024, adapted from Friends of the Earth Europe, REScoop.eu, Energy Cities (2020)<sup>83</sup>

## 6. Organisational set up and management arrangements

Various organisational models enable citizen and community participation in energy community initiatives in general. Depending on the legal form chosen, the governance structure, decision-making and liabilities differs. Domestic energy communities are usually constituted via cooperatives, partnerships, companies with a community interest, foundations, non-profit organisations, or associations and trusts, also depending on the national legal context and the history and culture of community and citizen participation in energy initiatives in the country. Legal forms and ownership structures of domestic energy communities have been widely studied<sup>84</sup>.

In the case of CBECs, the situation is more complex due to differences in the national legal systems of the neighbouring countries and other administrative obstacles. Thus, it is difficult to recommend adequate legal forms without knowing the concrete border context. Given this uncertainty, the organisational set up and decision on management arrangements should cover several phases:

- analysis of the national enabling frameworks in the concrete case of a border;
- analysis of possible legal forms;

<sup>83</sup> Friends of the Earth Europe, REScoop.eu, Energy Cities (2020): COMMUNITY ENERGY - A PRACTICAL GUIDE TO RECLAIMING POWER; <https://www.rescoop.eu/toolbox/community-energy-a-practical-guide-to-reclaiming-power>

<sup>84</sup> See for example: Caramizaru, and Uihlein, 2020; De Vidovich et al. 2023; Energy Communities Repository, 2024b and Friends of the Earth Europe et al., 2020.

- creating minimal regulatory conditions to carry out initial activities, pilot actions and other emerging initiatives;
- formally decide on the creation of a CBEC organisation (or unit).
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### **Analysis of the national enabling frameworks in the concrete cross-border case**

The legal formalisation of local cross-border energy cooperation, which is mandatory for CBECs (established as CECs or RECs) and optional for other types of local cross-border energy cooperation, requires careful analysis and planning. In fact, the local actors involved have to take into account (and work with) two national legal and energy policy frameworks. As local actors are quickly confronted with the need to establish their CBECs as legal entities along the lines of CECs or RECs, the question arises as to which legal instrument(s) and which specific legal form(s) they should (or can) choose.

Unlike in a national context, the availability of appropriate legal instruments and the choice of legal forms is clearly more limited in a cross-border context. As the summary analysis shows, the EGTC legal instrument and other legal instruments foreseen in the five existing intergovernmental agreements only allow cross-border energy cooperation between public actors, but not cooperation directly involving other local private actors (e.g. SMEs, associations, NGOs) and individuals as members of a CBEC. In case the recommendations of the previous chapters have been followed, a potential CBEC or related initiative has already conducted a thorough analysis of common needs and potentials, a joint vision of a cross-border energy activity or service and even a first governance and business model.

At this stage, concrete legal obstacles probably have been identified that prevent an easy "off-the-shelf" creation of a new organisation. Further legal advice, consultations at EU, national and regional level might become necessary. An "ad-hoc" solution for this specific case might be needed.

#### **Borderless Energy Region Ralingen-Rosport-Mompach<sup>85</sup>**

The promoters of the cross-border initiative "Borderless Energy Region Ralingen-Rosport-Mompach" are the municipalities of Ralingen and Rosport-Mompach. However, it is not yet clear whether the energy region will (or can) be established as a cross-border REC or as a cross-border CEC. Both municipalities are currently exploring different options and legal forms to establish a legal entity for the future governance and business model of the borderless energy region. In order to explore the available options (and obstacles), the municipalities were supported by a legal advisory mission carried out in the framework of the *b-solutions* initiative of the European Commission, through the support of AEBR.

A first assessment of the existing legal obstacles shows that the creation of a legal entity for the joint governance and business model based on public law (i.e. EGTC, Karlsruhe Agreement) always involves significant restrictions for certain types of local actors who should become members of the borderless energy region. It therefore makes sense to establish a legal entity based on a private law solution.

In principle, two other EU legal instruments are suitable for this purpose: the EEIG and the SCE. Both legal instruments allow for the direct and democratic participation of a wide range of different local actors from both sides of the border (e.g. municipalities, local SMEs, associations, and individual citizens).

<sup>85</sup> Case study conducted for this Handbook, see also AEBR, 2024.



At this stage, the municipalities of Ralingen and Rosport-Mompach may need to commission a study by one or more experts in the field of company law to explore/compare possible advantages or disadvantages of both legal forms and to provide practical advice for the actual steps of the respective foundation processes. These aspects and other issues will be explored and clarified in a follow-up project, for which a proposal has been submitted to the Interreg VI A Greater Region programme (2021-2027).

### Analysis of possible legal forms of a CBEC

During the preparatory phase, an informal partnership can serve as a vehicle to bring various stakeholders together. Cooperation projects, for example, under Interreg, LIFE, HORIZON or CEF-E can offer possibilities to test a collaboration scheme with partners from different countries and from different areas, such as local and regional authorities, companies, research institutes, service suppliers, NGOs as well as national or EU networks.

A Memorandum of Understanding (MoU) can define the terms of cooperation between a municipality and a community group. A MoU is a non-legal commitment that clearly establishes expectations and responsibilities of each partner in view of a common objective, such as a community energy project.

Numerous European cities and municipalities have signed the Covenant of Mayors<sup>86</sup> network and have a Sustainable Energy and Climate Action Plan (SECAP) in which they express their ambition to reduce the energy consumption and CO<sub>2</sub> emissions on their territory. In the framework of this network, they might already have established partnerships with other cities and regions or with partners in neighbouring countries.

These informal or short-term partnerships can help to prepare the analysis of possible legal forms for a long-term and durable commitment within a cross-border energy initiative or a CBEC.

Several of the cases studied for the preparation of this handbook have chosen the legal form of a private company (see the example in the box below) because of the difficulties associated with other legal forms in the context of the activities envisaged.

#### **e-Bike sharing network between Germany – Belgium and The Netherlands<sup>87</sup>**

Velocity Aachen was Velocity's first e-bike sharing system. The project started in 2013 as part of a spin-off from RWTH Aachen University. The project quickly met with enthusiastic support, so the company was founded in 2018. The Velocity system currently has over 100 stations and more than 250 e-bikes.

In the Interreg Euregio Meuse-Rhine project "EMR-connect" (2017-2023) and with support of the Dutch investment programme Regio Deal Parkstad Limburg, 20 Velocity e-bike sharing stations were built throughout Parkstad. Moreover, the extension of the Velocity network to Belgium was analysed. In 2019, first efforts were made to create a cross-border e-bike sharing structure with the Städteregion Aachen (DE). In the context of *b-solutions*, a study was carried out examining obstacles of establishing such infrastructure for the four northern municipalities of the German-speaking community of Belgium.

Apart from establishing a private company, cross-border energy initiatives can also adopt other legal forms.

<sup>86</sup> <https://eu-mayors.ec.europa.eu/en/about>

<sup>87</sup> Case study conducted for this Handbook, see also <https://avv.de/de/ueber-uns/projekte/emr-connect> and <https://www.velocity-limburg.nl/de/> and <https://velocity-aachen.de/>



To establish a CBEC, in principle, the possibility exists to extend the activity of an EGTC as an existing EU legal form for cross-border cooperation.

### **European Grouping of Territorial Cooperation<sup>88</sup>**

An EGTC allows public entities of different Member States to come together under a new entity with full legal personality. Through an EGTC public authorities from at least two Member States can set up a single joint structure to implement projects, investments or policies in the territory covered by the EGTC, whether co-financed by the EU budget or not. An EGTC is unique in the sense that it enables public authorities of various Member States to team up and deliver joint services, without requiring a prior international agreement to be signed and ratified by national parliaments. Member States must however agree to the participation of potential members in their respective countries. The law applicable for the interpretation and application of the convention is that of the Member State in which the EGTC is registered.

However, during the elaboration of this Handbook a pitfall of using the EGTC legal form for a CBEC was identified. The EGTC legal instrument and other legal instruments foreseen in the five existing intergovernmental agreements only allow cross-border energy cooperation between public actors, but not cooperation directly involving other local private actors (e.g. SMEs, associations, NGOs) and individuals as members of a CBEC. This is because Article 3(1) of the EGTC Regulation does not provide for the participation of individuals (i.e. citizens) and other private actors (i.e. local SMEs and/or non-profit associations) in an EGTC.

Other EU legal forms to be used to establish a CBEC can be a "European Economic Interest Grouping" (EEIG) or the "European Cooperative Society" (SCE). Both legal forms allow for the direct and democratic participation of a wide range of public and private local actors from both sides of the border (e.g. municipalities, local SMEs, associations, and individual citizens).

### **European Economic Interest Grouping<sup>89</sup>**

The EEIG is a transnational legal instrument for cooperation between entrepreneurs in the EU. The EEIG was conceived after the example of the French company form called G.i.e. (groupement d'intérêt économique).

### **European Cooperative Society<sup>90</sup>**

An SCE is an optional legal form of a cooperative. It aims to facilitate cooperatives' cross-border and trans-national activities. The SCE is required to unite residents from more than one EU country. An SCE might be founded by five or more natural persons, by two or more legal entities, or by a combination of five or more natural persons and legal entities. Other alternatives are a merger of two or more existing cooperatives or the conversion of an existing

<sup>88</sup> See: [https://ec.europa.eu/regional\\_policy/policy/cooperation/european-territorial/european-grouping-territorial-cooperation\\_en](https://ec.europa.eu/regional_policy/policy/cooperation/european-territorial/european-grouping-territorial-cooperation_en)

<sup>89</sup> See: <https://www.libertas-institut.com/uk/EWIV/BasicScriptEN.pdf> (European EEIG Information Centre at <https://www.libertas-institut.com/en/eeig-information-centre/> )

<sup>90</sup> See: [https://single-market-economy.ec.europa.eu/sectors/proximity-and-social-economy/social-economy-eu/cooperatives/european-cooperative-society-sce\\_en](https://single-market-economy.ec.europa.eu/sectors/proximity-and-social-economy/social-economy-eu/cooperatives/european-cooperative-society-sce_en)

cooperative which has, for at least two years, been established or has a subsidiary in another EU country.

Despite their suitability, there is little practical evidence so far. One example is summarised in the box below, which interestingly shows the benefits of combining different EU legal instruments.

### **Efi-Duero Energy – a European Energy Cooperative Society**

**Efi-Duero Energy SCE** is a European cross-border energy trading cooperative launched in 2017 in the Duero-Douro region (Portugal-Spain). It consists of the Duero-Douro EGTC and 26 Spanish and Portuguese public entities (mostly villages), forming the first European energy cooperative based on the SCE legal instrument. This initiative illustrates how an EGTC structure can be an important element in launching cooperation on energy issues, even if the final organisational structure for the cross-border energy activity is then another one, in this case a European cooperative society.

Another theoretical possibility for a CBEC legal form would be that of a cross-border association<sup>91</sup>. Usually, non-profit associations are faced with legal uncertainty and additional administrative burden and costs, when they want to operate across borders. This is because national laws – except for a few cases – do not generally include rules on cross-border aspects or address them in a different way. For this reason, the European Commission adopted a proposal for a Directive COM(2023) 516/4 on 5 September 2023. This aims to remove legal and administrative barriers for non-profit associations that operate or wish to operate in more than one EU Member State. It also intends to facilitate the recognition of their legal status across the EU. This is by introducing the additional legal form of a **European cross-border association (ECBA)** in national legal systems, which is specifically designed for cross-border purposes. However, it is not clear if a ECBA would be the adequate form for a CBEC or related initiative as it would need to be not-for-profit.

For specific cross-border energy initiatives, when a specific service or product, such as a cross-border e-mobility charging and rental system, will be contracted out to a private company or organisation, this will be organised via a public procurement procedure and a contract with the winner of the procurement. In this case, the adequate platform to manage the initiative and organise the procurement and contracting processes can be a cross-border entity, such as an EGTC.

EGTCs and similar cross-border organisations can also be a good platform to start a cross-border energy initiative, i.e. to carry out the first steps, raise awareness, engage relevant stakeholders and prepare the ground for a CBEC. Usually, this happens in the context of Interreg projects as illustrated below.

### **PANNON EGTC and the REHEATEAST project<sup>92</sup>**

The Interreg Danube Region 2021-2027 project "REHEATEAST – Building local partnerships for reducing the fossil energy demand of district heating systems in the Eastern Danube Region" is coordinated by the Pannon EGTC. Implementation started in January 2024 and will last until 2026. The project aims to reduce the fossil energy demand of district heating systems and to integrate renewable energy and waste heat. REHEATEAST aims to facilitate this by encouraging multi-stakeholder inter-sector cooperation by developing, testing and

<sup>91</sup> See: [https://single-market-economy.ec.europa.eu/sectors/proximity-and-social-economy/social-economy-eu/associations\\_en](https://single-market-economy.ec.europa.eu/sectors/proximity-and-social-economy/social-economy-eu/associations_en)

<sup>92</sup> Case study conducted for this Handbook, see also information at: <https://www.pannonegtec.eu/reheateast>

disseminating applicable solutions that support public-private cooperation and the implementation of large-scale building and system rehabilitation programmes. The project brings together the complementary knowledge and skills of 11 partners and 27 associated partners from 11 countries in the Danube region. The developed models are tested in pilot actions, which can be national or cross-border.

### Creating minimal regulatory conditions to carry out initial activities and pilot actions

There might be cases when it is too complex to find a solution for the creation of a CBEC in the given regulatory framework of two neighbouring countries. In the case of domestic energy communities, similar difficulties were identified, proposing as a solution the use of "experimental regulations" or "regulatory sandboxes". Experimental regulations and regulatory sandboxes are not a replacement for national legislation. They are *a complementary tool that provides a path towards a more stable regulatory framework that fits with the innovative activities energy communities are starting to undertake*<sup>93</sup>.

#### Experimental regulation in Italy<sup>94</sup>

In Italy, initial legislation, which also included a basic REC definition, called for a "Pilot Regulation" by the national Regulatory Authority for Energy, Networks and Environment, ARERA, along with the development of a support scheme. ARERA then adopted an experimental regulation to facilitate smaller sized collective self-consumption projects and RECs between 2020-2022 until a more permanent regulation could be developed.

Under a second approach, regulatory sandboxes can be used to allow testing of new concepts without changing the existing regulatory framework. They are operated for a limited time and in a limited part of a sector or area. The purpose of a regulatory sandbox is to learn about opportunities and risks that a particular innovation carries and to develop the right regulatory environment to accommodate it. Experimentation clauses are often the legal basis for regulatory sandboxes.<sup>95</sup>

The EU Commission recently published guidance on regulatory sandboxes in the energy sector.<sup>96</sup>

#### Regulatory Sandboxes in the energy sector in The Netherlands and Spain<sup>97</sup>

**The Netherlands:** Under an Executive Order (experiments with decentralised, sustainable electricity production), a sandbox was set to allow cooperatives to operate without a supply permit and with derogations from rules around transparency and liquidity of the energy market. The Executive Order ran for four years and influenced the subsequent draft Energy Act that proposed to exempt "smaller energy communities" from having to obtain a supplier license.

**Spain:** In 2022, the Spanish government established a general framework for a regulatory sandbox to promote research and innovation in the electricity sector (Royal Decree 568/2022

<sup>93</sup> Energy Communities Repository, 2024b, p. 37

<sup>94</sup> Ibid.

<sup>95</sup> German Federal Ministry for Economic Affairs and Climate Action (2022). Regulatory Sandboxes – Testing Environments for Innovation and Regulation

<sup>96</sup> EU Commission. Staff Working Document on Regulatory learning in the EU: Guidance on regulatory sandboxes, testbeds, and living labs in the EU, with a focus on energy. SWD(2023) 277/2 final.

<sup>97</sup> Energy Communities Repository, 2024b, p. 38

of July 11, Article 7). This was passed in conjunction with Spain's Recovery, Transformation and Resilience Plan, in order to develop participation of new actors (producers, suppliers and consumers, storage operators, and aggregators) and a more agile and adaptable regulatory framework.

### Formal decision on the CBEC organisational set-up

Eventually, when all legal obstacles have been solved and an appropriate legal form has been chosen, the final step for creating a CBEC corresponds to the formal act of establishing the legal entity, the governance structure, statutes and rules for decision-making and sharing responsibilities and profits. The exact outline of the CBEC organisation depends then on the legal figure and the rules that have been agreed by the parties involved.

#### Organisational set up of "Calorie Kehl-Strasbourg"<sup>98</sup>

From the first project idea in 2017, several years of preparation were needed for the joint heating company to be set up with the participation of the German and French local authorities for the construction and operation of the CKS connecting pipeline.

Before establishing CKS several initiatives laid the foundation for its development. Notably, the preceding Interreg A Upper Rhine project, "Wärmerückgewinnung BSW" (2020-2022) developed the basis for the establishment of CKS by conducting feasibility studies regarding the construction of a heat transport pipeline and accompanying the process of the foundation of a legal body. Mainly due to time considerations and the possibility to include enterprises as members, the foundation of a mixed economic enterprise under French law (SEM) was preferred. This choice allowed for the participation of foreign local authorities and private partners while ensuring majority public ownership. This mixed ownership model (85% public and 15% private according to the members of CKS) ensures a balance of interests and promotes effective decision-making within the governance framework of CKS.

Regarding the legal and administrative framework of energy transport between France and Germany, waste heat and district heating appear to be less regulated than other forms of energy, simplifying the efforts of CKS. The CKS governance structures include an Administration Board that determines the strategic direction. Besides the mayor of Strasbourg representing the Eurométropole Strasbourg as Chairwoman of the Administration Board (President), other members are two representatives of the Eurométropole Strasbourg (mayors or deputy mayors within the Eurométropole), a representative of the Ministry of the Environment, Climate and Energy Baden-Württemberg, the Lord Mayor of the city of Kehl, a representative of the region Grand Est, the regional director of the Instituts Banque des Territoires of the Eurométropole Strasbourg and a representative of the Badische Stahlwerke GmbH. The Administration Board is controlled by a General Meeting/Steering Committee to which the shareholders delegate representatives. The management is carried out by an appointed Managing Director.

To sum up, there is no perfect recipe for a legal form and an organisation structure for a CBEC or a related initiative as such. However, experience from recent research and analysed case studies, as illustrated above, have shown several good-practices to approach CBEC or at least initiate cross-border energy-related activities.

<sup>98</sup> Case study conducted for this Handbook, see also information at: <https://www.calorie-kehl-strasbourg.eu/de/>

## 7. Social mobilisation and communication

Active participation and continuous engagement of local communities are crucial for the success of CBECs. These communities not only benefit from the shared resources and collaborative spirit inherent in border regions but also thrive on the energy, ideas, and commitment of their members.

Mobilisation, engagement of people and organisations and animation of processes for CBECs and related energy initiatives is comparable to similar activities in other community-building processes, for example in energy communities in general<sup>99</sup>, or in rural energy communities<sup>100</sup>. It is important to be aware of the cross-border element within the mobilisation and animation activities. As a general rule it is important to have reliable partners for mobilisation on each side of the border, in particular, regarding cultural and linguistic competence as well as knowledge of networks and informal relationships.

Engagement refers to the involvement of **local public authorities** but also to the private sphere addressing citizens, private companies, interest groups and NGOs.

Especially in border regions, local authorities have a key role in ensuring that they consult on their activities with a broader circle of stakeholders, also beyond the border. Ensuring the support of local authorities would be an important step to gather the support of further actors such as decision-makers and sponsors. Involvement of public authorities may be in certain cases a prerequisite to receive technical or financial support. Furthermore, the support of political actors at different levels may be necessary, e.g. to check the legal and administrative context, get permissions, negotiate exemptions, understand differences between national frameworks, disseminate best practices and gain visibility.

**Private actors** need to be involved at an early stage, not only to see if there is an interest for active (or passive) participation in the community initiative, but also to increase the social acceptance of a project and reduce the likeliness of social conflicts.

In 2023, the European Commission's **Pact for Engagement**<sup>101</sup> was adopted involving relevant stakeholder organisations as part of the EU Action Plan for Grids. It aims to ensure early, regular, and meaningful stakeholder engagement in grid development to address potential public opposition and ensure the highest standard in stakeholder engagement, crucial for an efficient deployment of energy networks. In 2024, **Ten Guiding Principles for early Public Engagement for the Development of Energy Infrastructure Projects**<sup>102</sup> were developed by the stakeholders of the pact and endorsed by the Commission. The principles address stakeholders who are involved in the development of energy infrastructure on the ground, such as developers of energy infrastructure projects and decision-makers, including regulatory and permitting authorities, as well as commercial industrial stakeholders, who benefit from the expansion of energy infrastructure.

While not all CBEC initiatives involve energy infrastructure, these guiding principles are valid for the development of cross-border energy projects in general.

<sup>99</sup> See also Friends of the Earth Europe et al., 2020; Hinsch, 2023; REScoop.eu and ZEZ, 2022; REScoop.eu and Energy Cities, 2022a; REScoop.eu and Energy Cities, 2022b and UKEN, 2023.

<sup>100</sup> European Commission, 2022a; European Commission, 2022b and European Commission, 2024d.

<sup>101</sup> [https://energy.ec.europa.eu/topics/infrastructure/public-acceptance-infrastructure-projects\\_en](https://energy.ec.europa.eu/topics/infrastructure/public-acceptance-infrastructure-projects_en)

<sup>102</sup> European Commission, 2024e

**Ten guiding principles for early public engagement for the development of energy infrastructure projects<sup>103</sup>**

- Early involvement
- Education and awareness
- Transparency
- Accountability
- Meaningful engagement, inclusiveness and local benefit sharing
- Mutual respect and trust
- Consistent application
- Long-term commitment
- Conflict resolution
- Continuous improvement.

CBECs can be considered social innovation projects. As outlined by Mikkonen et al. (2020)<sup>104</sup>, social innovation projects relate to each other. Energy projects are closely linked to the general social and civic dynamics in a given place. Thus, also CBECs go beyond the energy sector and create spill-over effects from and via other social innovation initiatives. Energy initiatives are also linked to local and regional land use and industrial systems, thus influencing the types of actors to be involved and building on existing relationships between stakeholder groups.

Existing guidance refers to three cornerstones of energy community projects that are also relevant in cross-border initiatives:

- creation of trust and mutual understanding,
- good governance and
- social acceptance.

Trust and mutual understanding are the basis for cross-border cooperation and community development. Trust is the underlying factor that strengthens the relationship between good governance and social acceptance. The creation of trust in a cross-border energy project can happen through several mechanisms, e.g. formalising political support with appropriate legal instruments (letters of support/intent, MoU etc.), creating a multi-level information and feedback loop process between stakeholders in both countries, ensuring a symmetrical information flow between the involved countries. Other mechanisms to build trust are: establishing regular community meetings or forums to discuss project updates, decisions, and future plans; utilising stakeholder engagement platforms that are accessible to the

<sup>103</sup> European Commission, 2024e

<sup>104</sup> Mikkonen et al., 2020, p. 54.



majority, such as face to face meetings in town halls, online webinars, or community newsletters. Once trust is built, it needs to be carefully maintained. Regular and consistent practices that uphold transparency and accountability help in maintaining and deepening this trust<sup>105</sup>.

Public involvement in decision-making and true participation of actors on both sides of the border are key for the acceptance of projects by the community. Key principles are the use of local resources, emphasis on inclusion, action at the local level and relationship-oriented planning and development<sup>106</sup>.

Good governance helps to build trust through participation, representation, transparency, accountability and legitimacy. Good governance is also closely linked to social acceptance. Social acceptance can often make or break an energy initiative, affecting its financing, implementation and sustainability. Clear and well-managed decisions are likely to increase the community's sense of involvement and acceptance, laying the foundation for increased support for energy projects. In essence, good governance can lead to public support, ensuring that projects are both successful and sustainable to create lasting impacts<sup>107</sup>.

Features like participatory decision-making, transparent communication, equitable sharing of benefits and the use of conflict resolution mechanism are key assets to engage stakeholders, attract new members and supporters and keep them motivated.

The following practical steps are recommended for mobilising local communities in cross-border areas and ensuring their ongoing involvement in cross-border energy initiatives.

## **Mobilising the community**

### **Starting small and building momentum**

Initiating a cross-border energy community often starts with small, manageable projects that can demonstrate success and build trust within the community. Examples include installing solar panels on local schools or launching neighbourhood energy-saving programmes. These initial projects serve as tangible proof of concept, encouraging broader community acceptance as people witness their benefits and operational success.

One practical approach is to launch a pilot project that involves visible and immediate benefits, such as a shared solar installation or an energy efficiency campaign. As seen in various successful energy cooperatives, once the first project is operational, it becomes easier to attract more participants and investments for subsequent, larger projects. This incremental approach not only helps in managing resources effectively but also fosters community trust and enthusiasm.

### **Outreach to citizens and other stakeholders on both sides of the border**

Cross-border entities such as EGTCs, Euregions, Eurodistricts or twin border cities play a pivotal role in supporting and promoting CBECs. Identifying and collaborating with relevant municipal officials responsible for energy and sustainability can provide critical support and

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<sup>105</sup> See European Commission, 2024d.

<sup>106</sup> See UKEN, 2023.

<sup>107</sup> See European Commission, 2024d.

legitimacy to the project. Reviewing and aligning with the municipality's SECAPs<sup>108</sup> can also ensure that the community energy project supports broader local and EU climate goals.

Engagement with municipal authorities should be strategic and collaborative. Initial meetings can be used to understand their energy plans and explore potential synergies at cross-border level. Subsequent participatory workshops can bring together community members and local officials to co-create a shared vision for the cross-border energy community, ensuring alignment and mutual support<sup>109</sup>.

### **Campaigning for commitment**

Securing a public commitment from local authorities and cross-border entities to support renewable energy initiatives is crucial for the project's credibility and success. Organising participatory workshops to engage the broader community can help in garnering widespread support and political backing. These workshops should aim to create a shared vision for the cross-border community's energy future, incorporating input from diverse stakeholders.

### **Being transparent on critical issues**

Especially at the beginning and in a cross-border context, it is important to prepare a narrative and open room for discussions with local communities on critical issues, such as environmental questions around the project, social impact, inclusion of vulnerable or marginalised groups or territories within the border area. Another question to be discussed would be how costs and benefits will be distributed between countries, stakeholders and within the territory.

### **Inclusion of vulnerable groups**

CBEC, as energy communities in general, can have an important role to play in engaging citizens in the clean energy transition. Communities can help citizens to collectively implement sustainable energy projects while providing environmental, economic or social community benefits for their members. They can also mobilise private investments in clean energy technologies and increase the public acceptance of renewable energy projects. In certain cases, a cross-border energy initiative might address also specific vulnerable groups that suffer from energy poverty or face a lack of capacity or funds to take the steps towards more efficient energy and heat technologies. CBEC can take an active role in supporting these groups and households with specific measures to reach out and engage specific vulnerable groups or neighbourhoods with specific measures of communication, engagement and empowerment. There is a wide repository of knowledge on citizen engagement available, such as the Energy Poverty Advisory Hub – EPAH.<sup>110</sup>

## **Continuous involvement and empowerment**

Sometimes it is easy to get started but it takes important efforts to ensure the continuous involvement of stakeholders, scaling of a successful initiative and to become more effective and efficient in management and decision-making.

Cross-border entities are crucial to help cross-border initiatives becoming alive and run operations, also in times when public finance is scarce or not available. They can at least

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<sup>108</sup> Sustainable Energy and Climate Action Plans

<sup>109</sup> See also Friends of the Earth Europe, REScoop.eu, Energy Cities, 2020.

<sup>110</sup> See European Commission, 2024f and also <https://energy-poverty.ec.europa.eu/>

help keeping discussions and projects alive, they can support the attraction of funding and make valuable connections at national level (in both countries) and at EU level. They are also useful to remind policymakers about the necessity to tackle persisting administrative and legal obstacles for cross-border cooperation.

They are also key to strategies for extending CBECs and energy initiatives to other areas of the border region or to other communities.

According to other guides<sup>111</sup> the focus in this phase of consolidation of a CBEC should be on the following aspects:

- professionalise the management of the CBEC (i.e. financial, operational, project related);
- attain and manage the diversity of members;
- hold regular dialogue with members and residents on both sides of the border;
- reflect on a shared vision;
- revise the rules for decision making;
- monitor and evaluate the achievements and success of the initiative; and
- recruit new members.

In general, sustaining community involvement requires ongoing communication, transparency, and opportunities for active participation. Regular updates, meetings, and feedback sessions can keep community members informed and engaged. Ensuring that all members feel heard and valued is essential for maintaining their commitment and enthusiasm. It is important to take into account that on-going communication and support needs to be provided in the languages used in the border region on both sides of the border to ensure inclusiveness and accessibility to information and activities.

### **Capacity building**

Incorporating training sessions and continuous learning on management and strategic topics can empower CBEC members, partners and staff. By participating in thematic networks at cross-border, regional, national or EU level CBEC members can enhance their understanding of renewable energy concepts and the specific technologies involved in the project.

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<sup>111</sup> See, for example: European Commission, 2022b

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## ANNEX I: LIST OF CASES

The cases listed in the table below have been identified in the course of the research for this Handbook. They include different types of cross-border energy projects and initiatives. This refers to their progress, legal status as well as type(s) of activities etc. Due to the challenges for setting up a CBECs fully, as per its definition, most of these represent also Q-CBECs, potential CBECs and other cross-border energy initiatives and related activities. For some of them, it is not yet clear whether they will become a continuous initiative or remain at the stage of a trial or project. Depending on the availability of related information, some cases identified have been analysed more in detail than others.

**Table 1 – Cases studied for this Handbook**

Name	Legal entity or status of the initiative	Energy focus	Countries involved
Herzogenrath-Kerkrade cooperation on heat and energy provision	Declaration of intent on cross-border cooperation on heat and energy provision signed	District Heating	DE-NL
Cross-border heat transportation 'Calorie Kehl-Strasbourg' (CKS)	Mixed economic stock company based on French national law (société d'économie mixte - SEM)	District Heating	DE-FR
EfiDuero	European Cooperative Society	Solar	ES-PT
Zusamme Solar! Colmar	Altora-PV Sarl, limited company under French law (SARL)	Solar	DE-FR
Smart Energy Region Emmen/Haren (SEREH)	former cross-border cooperation (Interreg D-NL) project	District Heating	DE-NL
Ralingen (DE) and Rosport-Mompach (LU) Energy region	Not yet decided / established (community is in the planning phase)	Joint energy region (various activities)	DE-LU
Model Renewable Energy Region of the islands of Usedom and Wolin	Not established beyond project consortium	Joint energy region (various activities)	DE-PL
Esztergom (Hungary) and Štúrovo (Slovakia) cross-border community bike rental system	The public bicycle sharing system	e-mobility (bikes)	HU-SK
Garveland	Not established beyond project consortium	e-mobility (cars)	ES-PT

Name	Legal entity or status of the initiative	Energy focus	Countries involved
Project 'Sustainable Urban Electric Tourist Transport' (T2UES)	Not established beyond project consortium	e-mobility (cars)	ES-PT
Euregio Inntal – Hydrogen Network	Not yet established	Hydrogen	AT-DE
KEM Ökoenergieland Güssing	Not yet established, informal cooperation	Biomass	AT-HU
Energy Region Southeast Bavaria-Upper Austria-Salzburg – Cross-border district heating grid	Das Regionalwerk Chiemgau-Rupertiwinkel gKU – community association (not yet cross-border)	District Heating	AT-DE
Cross-border climate-neutral district heating in the European city Görlitz Zgorzelec	Not yet in place, probably continuation of separate entities providing heat (see below Members/Partners)	District Heating	DE-PL
Network TRION – climate e.V.	Registered voluntary association (e.V.) in Germany	Services, Networking (general energy)	DE-FR (and CH)
Project REHEATEAST	Not established beyond project consortium	Joint energy region (various activities)	Various countries in the Danube region
Collaboration of 8 counties in the RO-HU border region	Unclear	Solar	HU-RO
Cross-border district heating system Pramollo-Nassfeld area between Austria and Italy	Not yet established	District Heating	AT-IT
Nova Gorica (Slovenia) and Gorizia (Italy) cross-border bike-sharing system.	Under the coordination of EGTC GO	e-mobility (bikes)	IT-SI
German-Speaking Community Belgium (e-bike sharing)	Not yet established	e-mobility (bikes)	BE-DE
Velocity Mobility/Velocity Aachen; Parkstad Limburg	Not yet established	e-mobility (bikes)	DE-NL
Horizon 2020 project: DECIDE4Energy	Not established beyond project consortium	Services (specific for EC set up and advice)	Various Countries

Name	Legal entity or status of the initiative	Energy focus	Countries involved
ENBRO (energy provider acting as broker)"			
Haparanda (SE) and Tornio (FI) district heating network	Separate entities on both sides of the border	District Heating	SE-FI
Cross-border district heating systems between Frankfurt/Oder and Stübice (DE-PL)	Separate entities on both sides of the border	District Heating	DE-PL
District heating from Stadtwerke Flensburg to Padborg	Separate entities on both sides of the border	District Heating	DE-DK
Cross-border hydrogen region Saar-Lorraine	Unclear, private initiative, so far	Hydrogen	DE-FR
ALDEALIX - Model villages: Integration of biomass into the local production model through an energy community in Galicia and Northern Portugal	Cross-border cooperation project under Interreg Spain-Portugal Programme (POCTEP 2021-2027)	Biomass	ES-PT

Source: Consortium, 2024.

Complementing the summarising analysis of Chapter 6 in Part I, the border fiches provide more detailed insights from the cross-border comparisons of the indicators describing a country's preparedness for CBECs, energy communities in general and general national provisions necessary for the effective development of CBECs. In order to obtain a detailed understanding of the bilateral preparedness, this comparison has been conducted for each EU Member State border. Consequently, each border fiche refers to one such border relation.

Please see the annex document on the border fiches.

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