Renaissance

RENEWABLE INTEGRATION & SUSTAINABILITY IN ENERGY COMMUNITIES

D6.5 – Regulatory barriers analysis

Antje Nettelbeck, Maarja Meitern (Bax & Company)

Document Number	D6.5
Document Title	Regulatory Barriers Analysis
Version	1.0
Status	Final version
Work Package	WP 6
Deliverable Type	Report
Contractual Date of Delivery	31.08.2022
Actual Date of Delivery	10.08.2022
Responsible Unit	BAX
Contributors	VUB, SDM, ABB
Keyword List	Energy Communities, Regulation, Barriers, opportunities
Dissemination level	PU

This project has received funding from the European Union's H2020 research and innovation programme under the grant agreement No **824342**. This document reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.

RENAISSANCE Consortium

RENAISSANCE "Renewable Integration & Sustainability in Energy Communities" (Contract No. 824342) is a Collaborative project) within the H2020-LC-SC3-2018-2019-2020/H2020-LC-SC3-2018-ESSCC. The consortium members are:

1	VRIJE UNIVERSITEIT BRUSSEL	VRIJE UNIVERSITEIT BRUSSEL **(VUB)** 1050 Brussels, Belgium	Contact: Thierry Coosemans thierry.coosemans@vub.be
2	ATOS	ATOS SPAIN SA **(ATOS)** 28037 MADRID | Spain	Contact: Javier Valiño javier.valino@atos.net
3	ikerlan	IKERLAN S COOP **(IKE)** 20500 MONDRAGON | Spain	Contact: Aitor Milo Urkiola amilo@ikerlan.es
4	deepblue	DEEP BLUE Srl **(DBL)** 00193 ROME | Italy	Contact: Alessandra TEDESCHI Alessandra.tedeschi@dblue.it
5	ingeniería everis	EVERIS ENERGIA Y MEDIOAMBIENTE SL **(EXE)**	Contact: Miguel Fontela Miguel.Fontela.Martinez @everis.com
6	oca MANZANEDA ESTACIÓN DE MONTAÑA	ESTACION DE INVIERNO MANZANEDA SA **(MEISA)** 32780 A POBRA DE TRIVES | Spain	Contact: Gustavo Samartín direccion@manzaneda.com
7	circe RESEARCH CENTRE FOR ENERGY RESOURCES AND CONSUMPTION	FUNDACION CIRCE CENTRO DE INVESTIGACION DE RECURSOS Y CONSUMOS ENERGETICOS **(CIRCE)** 50018 ZARAGOZA | Spain	Contact: Andreas Munoz renaissance@fcirce.es

Horizon 2020 European Union Funding for Research & Innovation

8	DEMOCRITUS UNIVERSITY OF THRACE	DIMOKREITIO PANEPISTIMIO THRAKIS **(DUTH)** 69100 KOMOTINI | Greece	Contact: Pantelis Botsaris panmpots@pme.duth.gr
9	CERTH CENTRE FOR RESEARCH & TECHNOLO(HELLAS	ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS **(CERTH)** ANAPTYXIS 57001 THERMI THESSALONIKI | Greece	Contact: Nikos Nikolopoulos n.nikolopoulos@certh.gr
10	BAX & COMPANY/ VALUE FROM SCIENCE AND TECHNOLOGY	BAX INNOVATION CONSULTING SL **(BAX)** 08013 BARCELONA | Spain	Contact: Maarja Meitern m.meitern@baxcompany.com
11	sdm elektro	SDM-PROJECTS **(SDM)** 3090 OVERIJSE | Belgium	Contact: Ellen Vanderdood vanderdood@sdme.be
12	NAPE NATIONAL ENERGY CONSERVATION AGENCY	NARODOWA AGENCJA POSZANOWANIA ENERGII SA **(NAPE)** 00 002 WARSZAWA | Poland	Contact: Andrzej Wiszniewski awiszniewski@nape.pl
13	ABB	ABB OF ASEA BROWN BOVERI **(ABB)** 1930 ZAVENTEM | Belgium	Contact: W. Van Rysselberge wouter.vanrysselberghe@be.abb.com
14	Sunamp	SUNAMP LIMITED **(SUN)** EH33 1RY MACMERRY | United Kingdom	Contact: Tianyue Li tianyue.li@sunamp.com
15	GEMEENTE EEMNES	GEMEENTE EEMNES **(EEM)** 3755 ZH EEMNES | Netherlands	Contact: Wilma de Boer w.deboer@Eemnes.nl

Horizon 2020
European Union Funding
for Research & Innovation

Document change record

Version	Date	Status	Author (Unit)	Description
0.1	01/06/2022	Draft	A. Nettelbeck (BAX), M. Meitern (BAX)	[First Draft]
0.3	04/07/2022	Draft	S. Arapoglou (VUB)	[Internal review]
0.5	06/07/2022	Draft	Antje Nettelbeck (BAX)	[Integration of comments]
0.7	08/07/2022	Consolidated version	W. Brosius (VUB)	[Internal review]
0.8	10/07/2022	First version	Antje Nettelbeck (BAX)	[Integration of comments]
0.9	08/08/2022	Final version	W. Van Rysselberge (ABB), B. De Man (SDM)	[Final review]
1.0	10/08/2022	Submitted version	S. Arapoglou (VUB)	[Format update, Submitted version]

Horizon 2020
European Union Funding
for Research & Innovation

Executive summary

Energy Communities are being established across and beyond Europe to encourage individuals to take more control over their energy supply, energy efficiency and demand reduction while providing financial and social benefits to the community members by creating a legal entity [1]. Often, the regulations on a national level create barriers against such a sustainable development but remain the key to scaling up energy communities.

This deliverable presents an analysis of the current barriers to establishing energy communities resulting from a comparison of individual country reviews including eleven European and non-European countries as well as exchanges and validations with regulatory experts in the field.

The results include main key takeaways on general energy community regulation and how they are similar or different, resulting in a list of common problems for community initiators worldwide. A uniform scoring system based on KPIs also provides a lasting model to compare the energy community readiness within different areas and gives a tool to initiators and policymakers to improve regulations.

As a conclusion, improvements for energy community regulations are needed in many areas from legal transposition to organizational models to financial aspects and socio-economic aspects. The last two are the main enablers for a sustainable business case for communities beyond external funding and investment.

Horizon 2020
European Union Funding
for Research & Innovation

Table of Contents

Horizon 2020
European Union Funding
for Research & Innovation

List of figures

Horizon 2020
European Union Funding
for Research & Innovation

List of Tables

Horizon 2020
European Union Funding
for Research & Innovation

1. Introduction

The RENAISSANCE project aims to demonstrate highly replicable design and management approach for integrated local energy systems that achieve high participation of local consumers (15% – 20%), an increased use of renewable energy sources while decreasing the energy price for community members (5–10%).

The project has involved key energy vectors, and different actors and valorises flexibility services within and between energy communities and with DSOs. To demonstrate replicability and open the role to the market, the approach has been applied to 11 replication sites across the globe, including regulatory analysis of these countries.

1.1. Reference to Task 6.2

As stated in the Grand Amendment of the RENAISSANCE Project, Task 6.2 "Regulatory barrier analysis" has the main objective to analyse the obstacles and opportunities in the European regulatory landscape for the uptake of innovative decarbonized local energy systems.

The Analysis covers the member states where four demonstrator sites are located. Secondly, the countries, where eleven Replication Sites are located are included in the analysis as well. In total, 12 countries were covered as can be seen in Figure 1, namely the following:

Greece, Netherlands, Belgium (Flanders), Spain, Poland, Italy, India, Uganda, Chile, Colombia and Argentina.

Horizon 2020
European Union Funding
for Research & Innovation

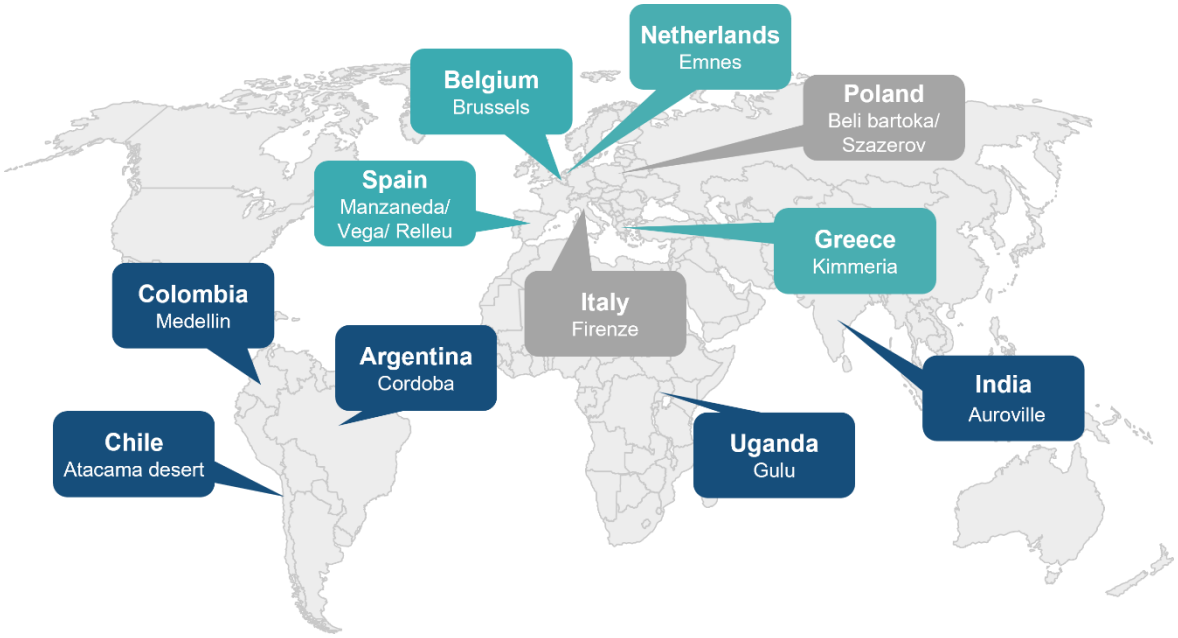

Figure 1 – RENAISSANCE Pilot- and Replication Sites

This deliverable therefore includes 11 analysis reports on regulatory barriers, a heatmap showing the readiness of the regulation on energy communities worldwide and the transposition of the European Directives and proposals for regulatory changes.

A comprehensive view of energy community regulation and its status in different countries is provided. Comparability is further ensured by the heatmap and the innovative approach of developing KPIs to assess energy community regulation readiness. This provides a sound basis for the development of urgent regulatory changes that should be focused on by the European Commission.

1.2. Approach

The approach for the development of this deliverable is oriented at the necessary results and is summarized in Figure 2.

Horizon 2020
European Union Funding
for Research & Innovation

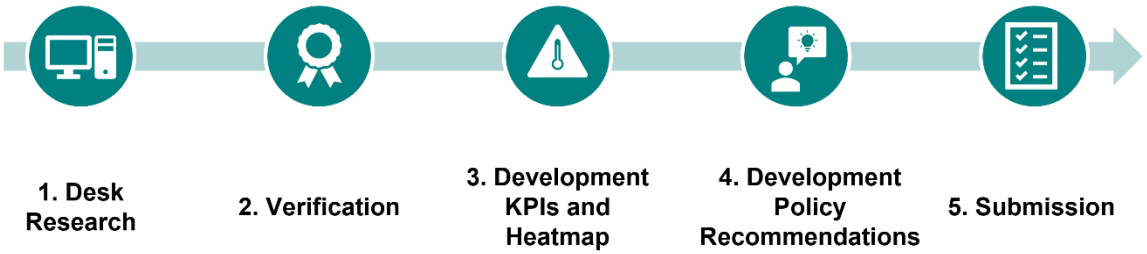

Figure 2 – Approach on policy recommendation development

Firstly, the research on the pilot- and replication site countries was conducted through extensive desk research. The findings were gathered in an excel sheet and reports were created for each of the countries. The gathered information was verified by the Stakeholders of the replication sites. Afterwards, a comparison was developed to gather key takeaways across the countries based on the individual reports as explained in chapter three. Building on the individual analysis and its comparison, KPIs were developed to aggregate the findings in a comparable way and summarized in a worldwide heatmap (chapter four). Results from the policy recommendations for energy community regulation were compiled and verified in an expert workshop (chapter five).

Horizon 2020
European Union Funding
for Research & Innovation

2. Methodology

The work for the RENAISSANCE project and this deliverable was conducted in the following methodological way.

To gather all relevant information for the individual country reports, an extensive desk research for each country was concluded. Relevant information was collected and aggregated in an overview file, which provides the advantage of being able to track down the sources of statements that were made in case questions arise.

For each country, an individual report was developed and sent to the leaders of the RENAISSANCE replication sites for verification and validation. When discrepancies were detected, these were discussed and cleared within individual validation meetings.

Based on the validated research results, a comparison of the individual country analysis was concluded and key takeaways were extracted. To provide a useful tool for policymakers and energy community initiators for looking at best practices of energy community regulation, KPIs based on areas of comparison were developed and a Heatmap was created. This assesses the different levels of energy community regulation readiness in a comprehensive way since the scoring is done based on a uniform methodology.

Because the KPI system is solely based on the areas of desk research it was validated in a workshop with experts in the energy community field. Possible further improvements to the system are stated in chapter 4.5 and should be included future research.

Furthermore, policy recommendations were developed based on the country comparison and the Heatmap. These were also clustered in the KPI areas and were validated and adapted in cooperation with the participants of the validation Workshop. They were aggregated in the policy framework that

Horizon 2020
European Union Funding
for Research & Innovation

was developed by MIT's international policy lab to provide concise summaries of information for e.g., policy makers [2].

Horizon 2020
European Union Funding
for Research & Innovation

3. Comparison of Country Reports

The structure of the individual country reports covers the following areas of regulation:

1. EU Status of Transposition
2. Possible Organisation Models
3. Technology, Tariffs and Requirements
4. Costs and incentives
5. Regulatory Barriers

This structure allows to compare these regulation areas and their cross-country relevance in this chapter. Key takeaways were concluded as a baseline for developing the KPIs for regulatory readiness of energy communities together with the policy recommendations that can be found in chapters four and five.

3.1. EU's Status of Legal Transposition

Regarding status of the EU with regards to the transposition, key takeaways can be drawn from Figure 3 and Figure 4, which compare this status within and beyond Europe.

Firstly, no European Country has fully transposed the European Directives on Energy Communities, but two different approaches of transposition exist. On one hand, defining CECs and RECs as separate organization models, and on the other with merging CECs and RECs under the concept of energy community with different sub-concepts.

Also, Poland and Spain are each missing the transposition of one of the Directives, the REC or CEC, as they have defined only one of them.

Additionally, most of the countries do not ensure civil participation within the regulative definitions.

Horizon 2020
European Union Funding
for Research & Innovation

Energy self-consumption is feasible in every country of the replication sites outside of Europe, but collective self-consumption is not feasible in Uganda, India or Columbia. However, other models exist due to their lack of grid coverage, like Isolated grid Systems or Micro/Mini Grid, that are built parallel to the main grid.

Overall, Energy Communities are supported by a legal framework within Europe but do not exist within the regulation in the replication site countries outside of Europe. Hence, energy communities must be based on self-consumption regulation or different models (India, Uganda).

	Flanders	Italy	Netherlands	Poland	Spain	Greece
Definition REC	→	✓	→	✗	✓	→
CEC	→	→	→	→	✗	→
Joint Definition	-energy communities that merge REC and CEC		-energy community that merges REC and CEC			-civil cooperative
Missing Transposition	-not defined if legal entities are allowed -citizen participation is not ensured	-lack of distinction between RECs and other concepts like collective self-consumption	-citizen participation is not ensured -no designated authority to oversee	-REC not defined yet -geography proximity requirement limit scope -purpose not clear	-no CEC definition at the moment -no clarity on legal entities allowed -citizen participation is not ensured	-citizen participation is not ensured -no differentiation of REC/CEC
Status	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing

Figure 3 – Status of Transposition European Countries

Horizon 2020
European Union Funding
for Research & Innovation

	Uganda	Argentina	Chile	India	Columbia
Definition of Energy Communities	✗	✗	✗	✗	✗
Self-Consumption/ Prosumers	✓	✓	✓	✓	✓
Collective-Self-Consumption	✗	✓	✓	✗	✗
Other models of Self-Consumption	Isolated Grid System	Distributed generation		Mini/Micro Grid	

Figure 4 – Status of Transposition non-European countries

Legend:

✓ Complete Definition
→ Partial Definition
✗ No Definition

3.2. Possible Organisation Models

Regarding the comparison of the viable organisational models for energy communities based on the available regulations, which can be seen in Figure 5 and Figure 6, the following key take-aways can be drawn: No cross-country wide standardized model can be found within any of the regulations for energy communities. Most Countries allow some kind of collective energy self-consumption upon which an energy community can be established.

Countries that do not have an extensive energy grid allow the establishing of independent, parallel energy grids that could be used as energy communities but are not specified as such.

Horizon 2020
European Union Funding
for Research & Innovation

Possible members can usually be natural or legal persons and sometimes the regulations also specifically allow for local authorities or SMEs to join the energy community or collective energy consumption scheme.

The possible activities are only vaguely specified (if at all specified) and range from the basic activities like production, consumption, storage and selling (less developed countries) to acting as energy suppliers, innovators and energy service providers (mostly in European countries).

	Flanders	Greece	Italy	Netherlands	Poland	Spain
Models	-green certificate policy allows CECs -no mandatory organizational model -private grid for neighbors possible	-civil cooperative (non profit or for profit)	-collective Self-Consumption -renewable Energy Communities	-collective energy self-consumption -white label construct -exemption models	-energy cluster (commercial) -energy cooperative (environmentally friendly energy)	-collective self-consumption with energy surplus (with compensation/ without compensation)
Members	Any citizen has the right to produce, store, sell and consume energy -must be registered in access register and must have valid energy contract	-citizens or local authorities -minimum number of 5 citizens	-Contact person is required -natural persons, SMEs, local authorities, municipal administrators, religious bodies	-all legal persons -industrial firms -Joint ventures	-Energy cooperatives: up to 999 -natural persons, scientific units, research institutes	-all natural persons -SMEs -local authorities including municipalities
Activities	Peer-to-peer trading, services, collective self-consumption, energy management system provision	-production, storage, own consumption, supply to members, …	Production, sale through trading agreements, storage, sharing	-energy production, consumption, selling -with exemption: supplier activities	Production, storage and selling of energy	-energy generation, supply, consumption, storage, aggregation, other energy services

Figure 5 – Organisation Models European Countries

Horizon 2020
European Union Funding
for Research & Innovation

	Uganda	Argentina	Chile	India	Colombia
Models	-Isolated Grid System	-User generator as a consortium of co-owners	-small distribution system	-prosumers -Micro/Mini grids	Self-generation
Members	-	Any user of the distribution network	-all end-users	-Prosumers: all current consumer categories -Micro/Mini Grids: residents of households, commercial customers, industrial and institutional setups	All natural or juridical person that produce energy to attend their own needs
Activities	Generation, distribution and sale to the primary grid	-	Generation, consumption, selling/injection to the national energy grid	-Micro/Mini grid: independent generation and distribution of energy, supply of excess energy, selling to the grid when connected -prosumers: independent generation and consumption, selling to the grid	Production, consumption, delivering of surplus energy

Figure 6 – Organisation Models Non-European Countries

3.3. Technology, Sizing and Requirements

Figure 7 and Figure 8 show the direct comparison between different aspects of technology, sizing or capacity and other requirements for energy communities resulting from regulations. Key take-aways are the following.

The most common compensation mechanism is net-metering for energy self-consumption but for a lot of countries other mechanisms that have different or no compensation depending on the organizational model are sometimes necessary.

Regarding the technology and capacities, the regulative specifications also differ a lot. Some countries have no technology specified, some specify the meter type that must be used, some the substation or distribution network that must be used and some have further requirements regarding supply or distribution licensing or agreements.

Overall, maximum capacities vary for different organizational models and countries from 3kW to 20MW. Only Flanders does not define the maximum capacity in its regulation.

Horizon 2020
European Union Funding
for Research & Innovation

	Flanders	Greece	Italy	Netherlands	Poland	Spain
Compensation Mechanism	-Net-metering (<= 10kW) -Prosumer tariff for only self-consumption	-getting money for selling surplus energy -virtual net-metering	-Premium tariff+ TRASE+ BTAU + avoided grid loss+ RID	- (collective) net-metering	-Cluster: like normal energy producer -Cooperative: net-billing	-with compensation: net-billing
Technology	-	-	-all must be based on renewable resources	-all and focus on renewable energies trough subsidies/exemptions	-only for energy cooperatives must come 70% from renewables	-
Technology Requirements	meter	-	RECs: same MV/LV substation	smart meter	Must use low voltage network (<110kV)	-LV substation
Capacity	Not defined	Depending on Scheme (<500kW or 500kW – 1MW)	200kWp (June 2022: 1MW)	-by connection points: 500/10 000 -10 000kWh/year	Clusters: no Cooperatives: 10MV	-with compensation: <100kW -without: >100kW
Others Requirements	License and Supply Contract	-	-CSC: must be located in same building	-supply license required	-Civil law Agreement for Energy Clusters -cooperatives must be located in rural areas	-distance between consumer lower 500m

Figure 7 – Technology, Tariffs and Requirements European Countries

	Uganda	Argentina	Chile	India	Colombia
Compensation Mechanism	-Purchase Power Agreement with Feed-In tariffs	-net-billing	-paid by DSO per kWh	Net-metering, net billing or gross-metering	-small-scale: Net-metering -large scale: market via agent
Technology	-	All renewable non-fossil energy sources suitable for sustainable use	Non-Conventional Renewable Energies: Solar, Geothermal, Biomass, Wind	-Micro/Mini grid: renewable energy-based electricity generation	From renewable energy sources
Technology Requirements	-	-	-connected to same public service concessionaire -one connection to grid	-Prosumers must have same point of energy supply	
Capacity	500kW, 2MW or up to 20MW	Small: 3kW Medium: 3-300kW Big: 300kW to 2MW	-up to 9MW	-Micro: below 10kW -Mini grid: above 10kW -most states have maximum of up to 1 MW	Small scale: up to 1MW Large scale: up to 5MW
Others Requirements	-supply energy to consumers that are not connected to the grid -depending on capacity: licenses, feasibility study, consumer service Agreement	-electricity generation contract	-contract must be signed	-license for Micro/mini grids	-large scale: must be represented in the wholesale market -network support contract must be established

Figure 8 – Technology, Tariffs and Requirements Non-European Countries

3.4. Costs and Incentives

The comparison of cost and incentives resulting from regulation can be seen in Figure 9 and Figure 10. Overall, all countries have somewhat the same

Horizon 2020
European Union Funding
for Research & Innovation

types of financial incentives including VAT or cost exemptions, loans, preferential charges and subsidies. Other existing financial incentives include preferred treatment regarding licensing and promotion funds.
These do remain vague however and do not give a precise indication of the amount of savings. Moreover, Flanders does not have any concrete financial incentives.
Chile is the only country to implement awareness seminars and a register for local installers and providers.
Also, four countries provide auctions for long-term contracts to provide increased certainty regarding the business case.
Network and other costs are usually not defined in regulations, other than that the energy communities or collective energy self-consumers must pay for them.

	Flanders	Greece	Italy	Netherlands	Poland	Spain
Incentives - financially	-	-preferential charges -exemption from maintenance fee	-Premium Tariff -Refunds of losses (TRASE, BTAU, avoided grid loss tariff)	-subsidy Postcoderoosregeling) -subsidy SDE+(+) -VAT exemption	-provide low interest loans	-exemption of network fees
Other Incentives	-reduced requirements within the supply license process -lighter obligations compared to DSO	-preferred treatment regarding licensing	-	-	-auctions are held that provide long-term contracts	-
Network Cost	-network charges	-	-different fixed and variable cost depending on the size of installation	-	-connection cost must be paid to 50%	-
Other Cost	-	-	-	-	-	-

Figure 9 – Cost and Incentives European Countries

Horizon 2020
European Union Funding
for Research & Innovation

	Uganda	Argentina	Chile	India	Colombia
Incentives - financially	-favorable financial and fiscal regimes: tax exemption, credit mechanisms	-Funds to grant loans -no additional taxes on feed-in energy	-no VAT is charged	-loan: 90% financial support, only 10% must be paid back -subsidies for installations -time-of-the-day tariff to incentivize storage	-reduction of income taxes -VAT exemption -accelerated deprecation
Other Incentives	-promotion Program for renewable energies -GET FiT program	-tenders to win long-term PPA contracts	-offering free of charge seminars to raise awareness -registry to local installers and providers	-auctions for long-term contracts	-low-cost bidirectional meters -promoting fund -auctions for long-term contracts
Network Cost	-	-cost related to grid connection must be paid	-	-network cost must be paid	-cost for energy trading and system service must be paid
Other Cost	-	-	-	-	-

Figure 10 – Cost and Incentives Non-European Countries

3.5. Regulatory Barriers

In Europe, one of the biggest constraints is the lack of complete definition and transposition of the EU Directives because rights and duties are often unclear as is shown in Figure 11 and Figure 12.

An additional barrier is that some regulations limit the energy communities on a national level by implementing geographical boundaries: for example, the energy communities are limited to rural and urban-rural areas in Poland and members must be located within 500m in Spain.

In the non-European replication Site countries, the main constraint is the non-existence of regulation of energy communities. Only different forms of energy self-consumption can be used to establish energy communities.

All countries face the problem of administrative constraints and long procedures.

Most countries also face the problem of financial constraints including high initial costs, missing sufficient financial subsidies and limitations on profit and risk regarding the return on investment. Especially Greece has an additional barrier by only allowing the licensing to energy communities with a capital of at least 60.000 Euros. For Countries outside of the EU, the

Horizon 2020
European Union Funding
for Research & Innovation

importation of the PV systems and their installation raise the initial investment costs.

Awareness is another common constraint. Even in Europe, the model is widely unknown which is amplified in the other countries due to the wide lack of knowledge about renewable energies caused by a lack of motivation and interest from the public.

More specific country wide constraints appear in the less developed countries such as the absence of reliable infrastructure, theft of PV modules, low disposable income (Uganda), insecurities due to armed attacks (Colombia) and a fragmented energy grid due to topography (Chile).

	Flanders	Greece	Italy	Netherlands	Poland	Spain
Regulative Constraints	-lack of specific regulation: granting rights to become DSO -approval by VREG needed -member limitations due to employee regulation	-lack of transposition -specific regulation on members and locality -complex processes	-private distribution networks are not allowed -geographical limitations (substations) -contradictory laws -administrative hurdles	-uncertain legislation: no exact rights or duties -complex administration: receive license and taking up balancing responsibilities	-Lack of Definition -geographic requirements: rural/ urban-rural areas -limitation on members -administrative hurdles	-restriction on members: within 500m -specific, changing meters are required, must be LV network -administrative process
Financial Constraints	-cost of energy lines -no financial incentives	-lack of funding -limitations on profit -high initial investment required: license only for 60 000 Euro capital	-	-lack of initial funding/financing: non-profit nature of energy communities	-no complete compensation mechanism: only for 60% of fed-in energy	-no financial incentives
Cultural/ Country Constraints	-	-	-lack of social acceptance	-lack of awareness: uncommon	-	-
Other Constraints	-special meter requirements	-	-lack of relevant information from network operator	-lack of know-how: technical knowledge	-confusing models of energy clusters and cooperatives	-high knowledge requirements: participating in wholesale market

Figure 11 – Constraint Analysis European Countries

Horizon 2020
European Union Funding
for Research & Innovation

	Uganda	Argentina	Chile	India	Colombia
Regulative Constraints	-lack of regulation: no energy communities	-lack of regulation: no energy communities -administrative hurdles -unspecific compensation	-lack of regulation: no energy communities -procedural delays	-lacking regulation: no energy communities -administrative hurdles	-lacking regulation: no energy communities -infrastructure: not allowed to use -administrative hurdles
Financial Constraints	-high investment and installation cost	-limited access to finance, investors lack confidence -high costs: higher prices for residential users	-high financial risks: markets are not favorable -lack of financial incentives -high initial costs	-harder const structure for residential prosumers -no financial support for Mini/Micro grids -high risks due to long payback times and low returns	-high initial costs: due to import -sport market price: economically insufficient
Cultural/ Country Constraints	-lack of public awareness: generally, on renewable energies -absence of (reliable) infrastructure -low quality product on the market -low disposable income -theft of solar panels	-motivational hurdles: public sector shows lack of interest, lack of knowledge	-topography leaves certain places isolated: three unconnected grids	-limited product possibilities since companies focus on commercial sale -utilities see net-metering as a business threat -top down-market structure hinders benefits for prosumers	-low level of awareness -no specific regulation on zones without national grid -lack of geothermal and meteorological data -insecurity due to armed attacks and destroy of installations
Other Constraints	-lack of knowledge -lack of competence: only few reliable companies can provide installation	-lack of volunteer time of civilians	-lack of understanding: knowledge missing about renewables	-	-lack of knowledge regarding energy communities

Figure 12 – Constraint Analysis Non-European Countries

Horizon 2020
European Union Funding
for Research & Innovation

4. Regulatory Readiness Heatmap

In order to compare the regulations between the pilot and replication sites, a general evaluation method was needed. Therefore, KPIs were developed that can be used to assess the different aspects of the regulations for the establishment of energy communities and that can result in a list of best practices. After developing the KPIs, the scoring was done for the individual country reports and these scores were finally aggregated in the Heatmap.

4.1. KPIs

The KPIs were based on the areas of regulation from the previous chapter and their effects on society regarding the feasibility of establishing an energy community. The performance of an energy community is limited by existing regulations, the resulting feasible organizational models of energy communities, the financial incentives that are offered, the socio-economic context that results in the country and the sustainability of the energy community. The KPIs and their contents can be seen in Figure 13.

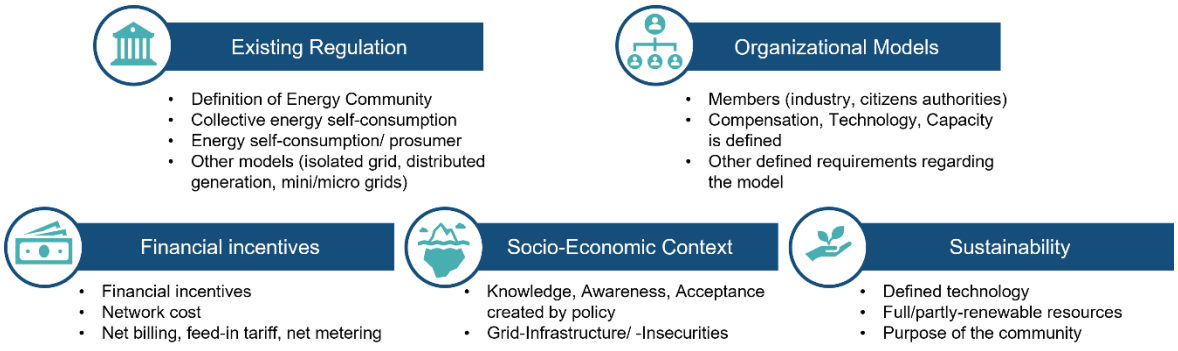

Figure 13 – KPIs for regulatory readiness assessment

It is important to state that these KPIs and the resulting scoring system are based on the European directives RECII and EMD and therefore it has to be kept in mind that the non-European countries do not fall under such

Horizon 2020
European Union Funding
for Research & Innovation

regulations. Nevertheless, related regulations in the non-European countries have been looked at and were compared to the European regulations. A detailed description of the scoring levels can be found in the following Figures.

The scoring of definitions of existing regulations focuses on the detail in content regarding the laws, ranging from no definitions to possible variations of Energy Communities as can be seen in Figure 14.

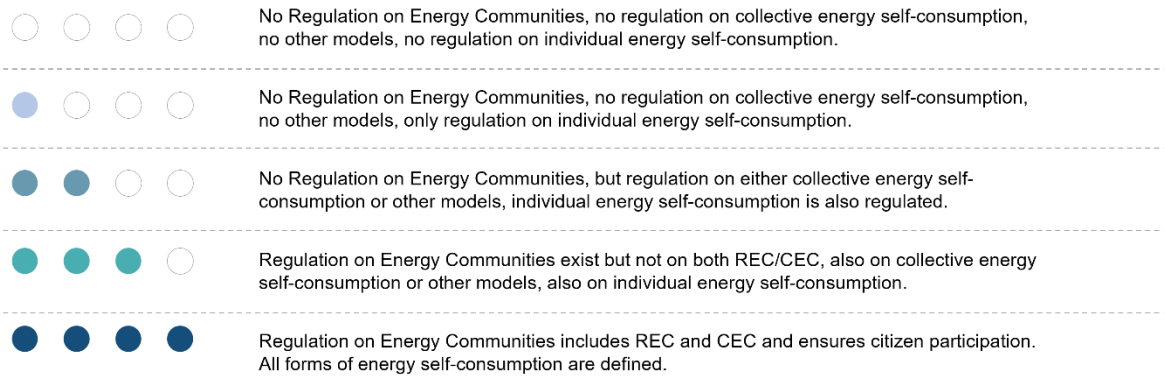

Figure 14 – Scoring Levels Regulation

Organizational models can be differentiated in scoring, as seen in Figure 15, by the resulting organizational models depending on specifications of members and activities up to specified models and additional requirements.

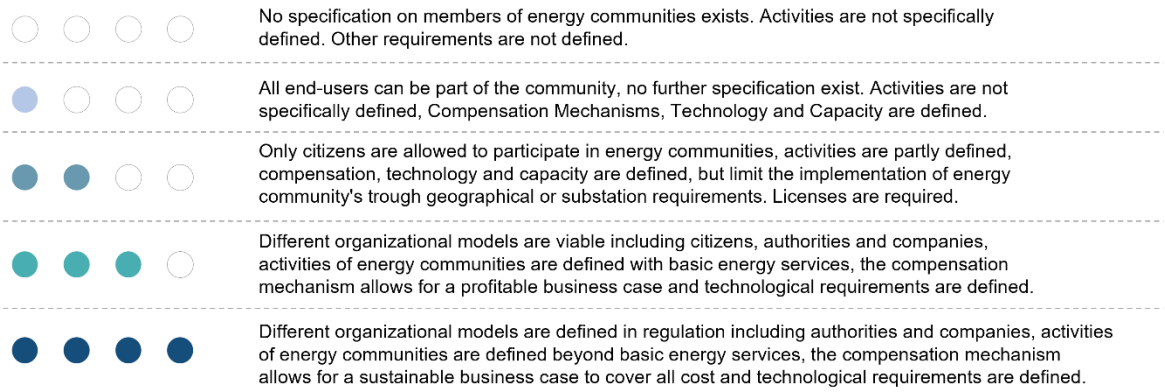

Figure 15 – Scoring Levels Organisational Models

Horizon 2020
European Union Funding
for Research & Innovation

The scoring of financial incentives resulting from regulations in Figure 16 shows that this goes from no incentives at all to having exemptions of e.g., VAT and granting loans or premium tariffs allowing for a long-term sustainable business case.

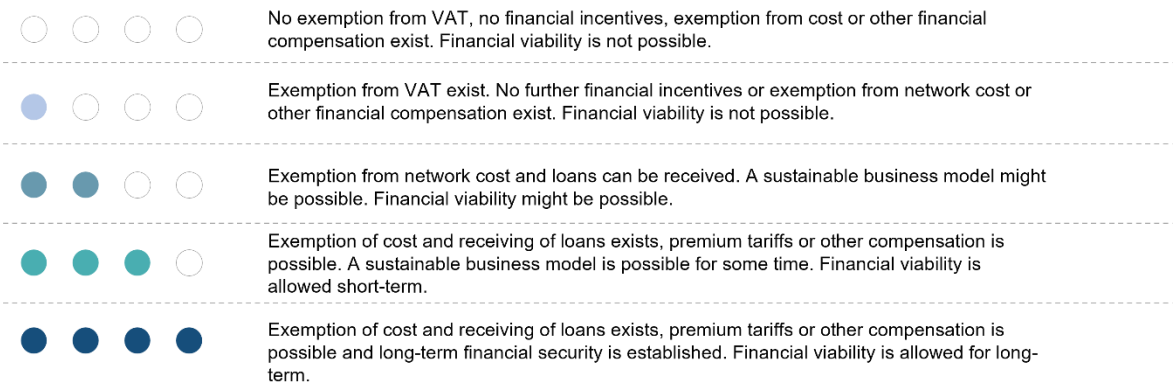

Figure 16 – Scoring Levels Financial Incentives

The socio-economic context can be scored by looking at the local awareness regarding energy communities, the technical know-how and insecurities or infrastructure limitations that might hinder the establishing of energy communities, as shown in Figure 17. The highest scoring in this category also includes the accessibility of relevant data and the willingness of stakeholders to share them as this is a relevant fact in the initiation of energy communities.

Horizon 2020
European Union Funding
for Research & Innovation

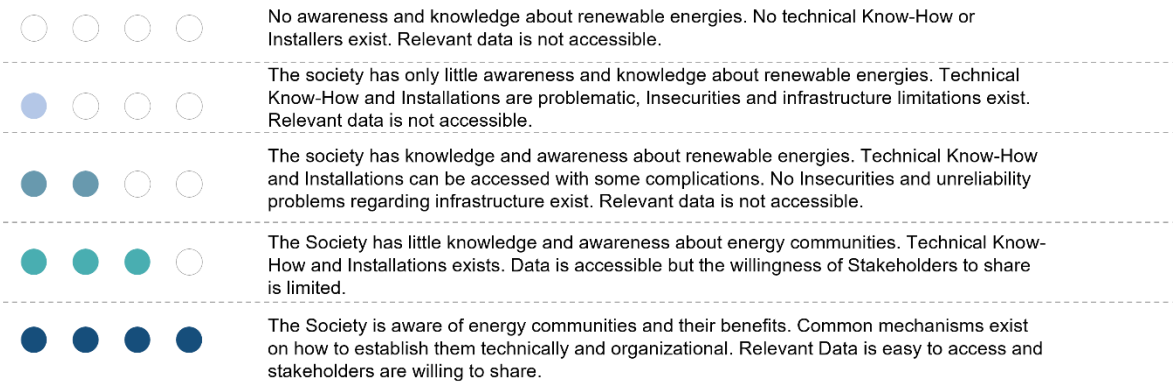

Figure 17 – Scoring Levels Socio-Economic Context

Finally, the scoring of sustainability resulting from regulations as seen in Figure 18, is on the one hand based on the requirement for renewable technologies in regulation for energy communities and on their social purpose for the community.

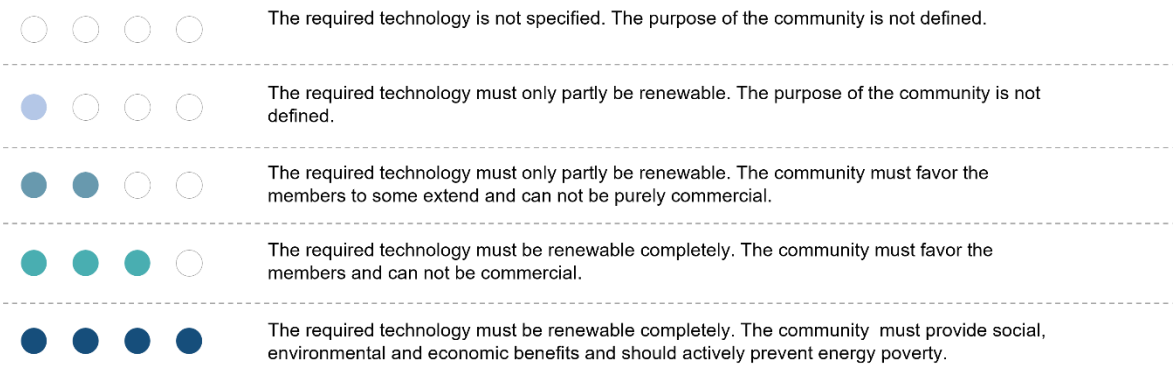

Figure 18 – Scoring Levels Sustainability

4.2. Scoring of Pilot- and Replication Sites

After defining the scoring levels for the KPIs, an initial scoring was done to test the usage of the KPI system based on the concluded desk research. The scored countries can be found in the following subsections. This was done based on the desk research and only partly validated with country regulation experts and should be re-evaluated in future research.

Horizon 2020
European Union Funding
for Research & Innovation

Spain has a high average scoring, shown in Figure 19, as the only main constraints and low scores are for the financial and socio-economic areas with little financial incentives and geographical and technical restrictions resulting from the organisational model, because members must be located within a 500m radius, and the capacity must remain below 100kW.

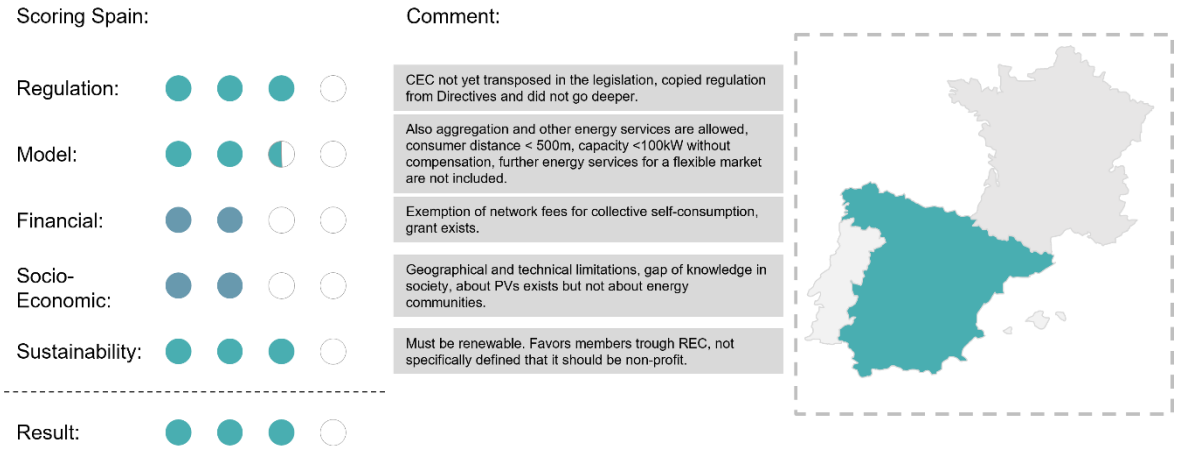

Figure 19 – Scoring Spain

Flanders scores close to the Netherlands with just half a point less due to high lack of financial incentives and missing aspects of the transpositions with unclear specifications regarding the renewable technologies and purpose of the energy community members as seen in Figure 20.

Horizon 2020
European Union Funding
for Research & Innovation

Figure 20- Scoring Flanders

Greece scores quite high as well, even though the main constraints here lay in the lack of transposed regulation, resulting in only allowing cooperatives that do not differentiate between RECs and CECs. The financial main barrier results from a financial capital requirement of at least 60.000 Euros that hinders the initial investments as seen in Figure 21.

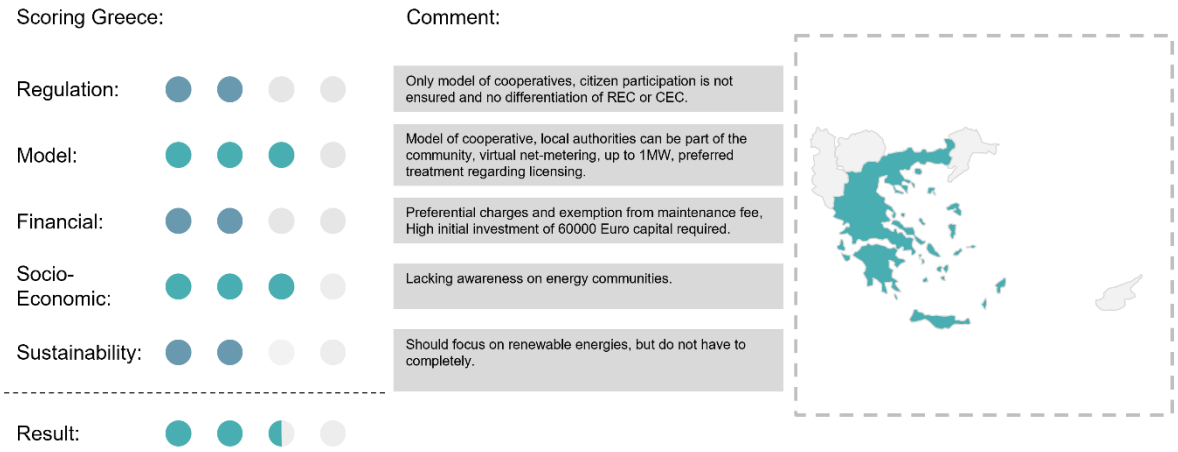

Figure 21 – Scoring Greece

Horizon 2020
European Union Funding
for Research & Innovation

Italy is one of the most advanced countries regarding regulations on energy communities as can be seen in the scoring of Figure 22.

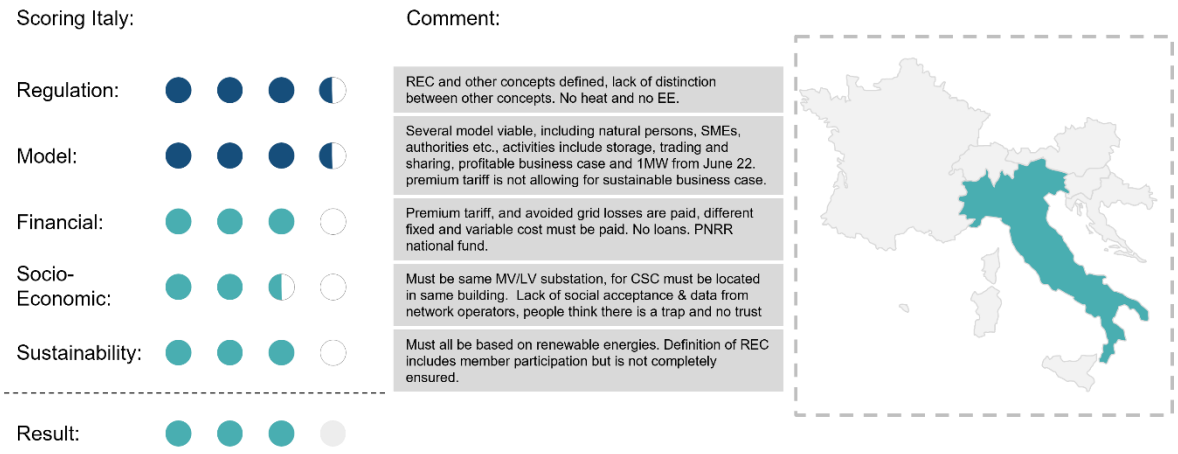

Figure 22 – Scoring Italy

Also, a very high scoring can be seen in Figure 23 for the Netherlands. They allow for energy communities to offer supplier services and have a high awareness for renewable energies and energy communities as a lot of citizens want to live sustainably which also results in high subsidies towards local green energy production.

Horizon 2020
European Union Funding
for Research & Innovation

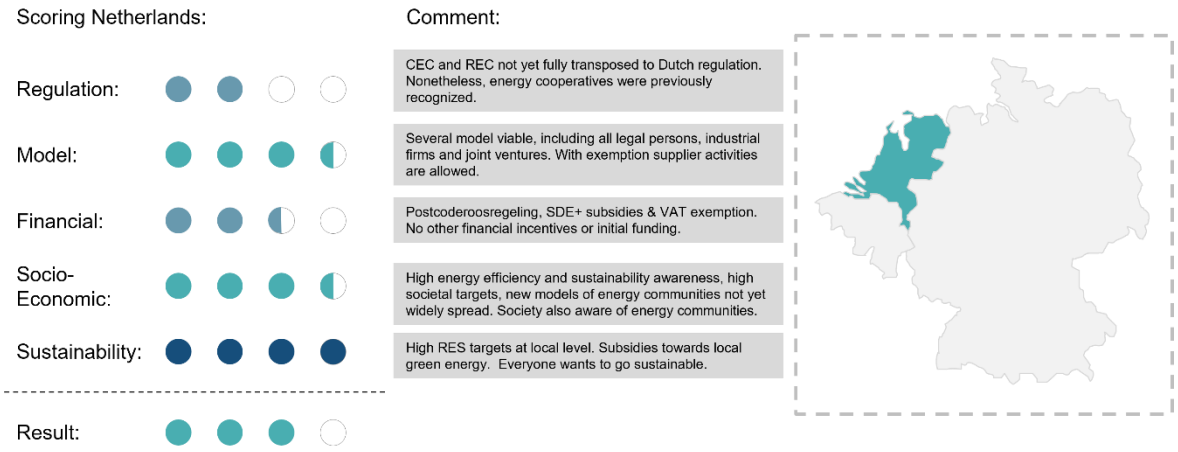

Figure 23 – Scoring Netherlands

Of the European countries, Poland has the lowest scoring since the prosumers are only partly compensated for feed-in energy and the energy communities must be located in rural or urban-rural areas. Furthermore, as seen in Figure 24, only 70% of the technologies must be renewable and a commercial purpose can be possible.

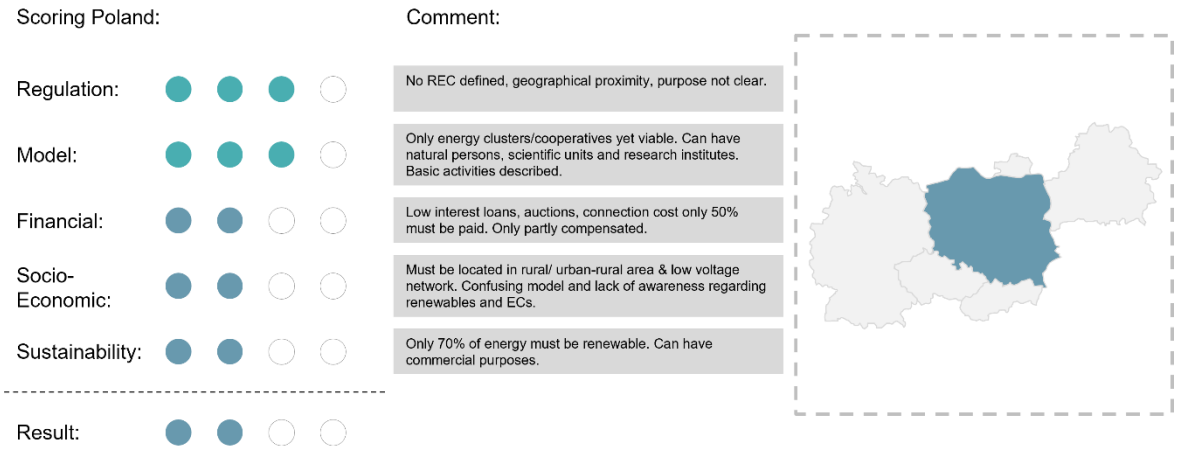

Figure 24 – Scoring Poland

Uganda has one of the lowest average scorings as regulation is overall not yet advanced enough regarding collective energy-consumption. The main

Horizon 2020
European Union Funding
for Research & Innovation

barriers include the limitation to isolated grid-systems, lack of awareness and low-quality products and insecurities resulting from possible theft, as seen in Figure 25.

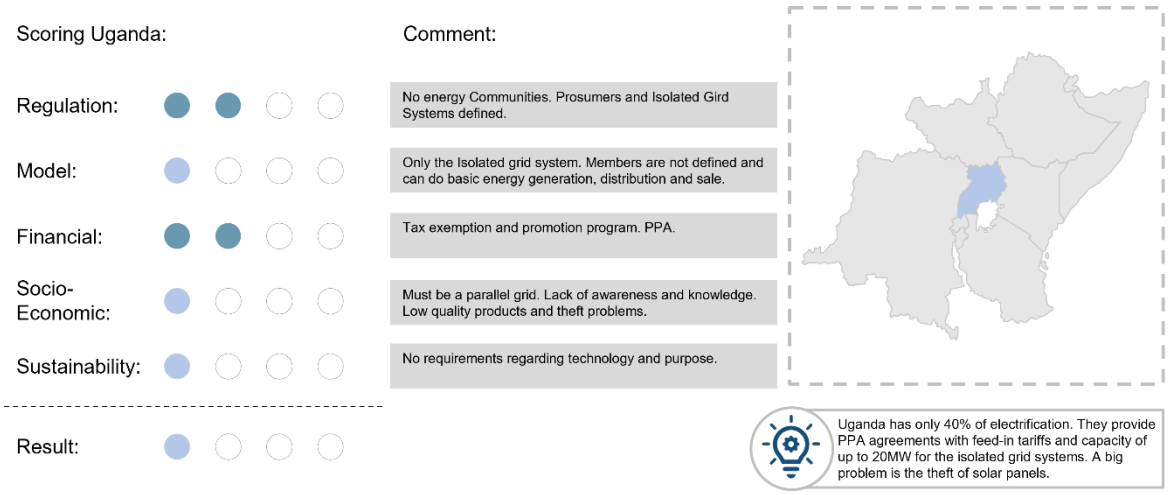

Figure 25 – Scoring Uganda

In Figure 26 the scoring of Argentina shows that its main regulative barriers include a lack of feasible models, only allowing for collective self-consumption as a prosumer with a consortium of co-owners, but also a lack of interest of the public sector.

Horizon 2020
European Union Funding
for Research & Innovation

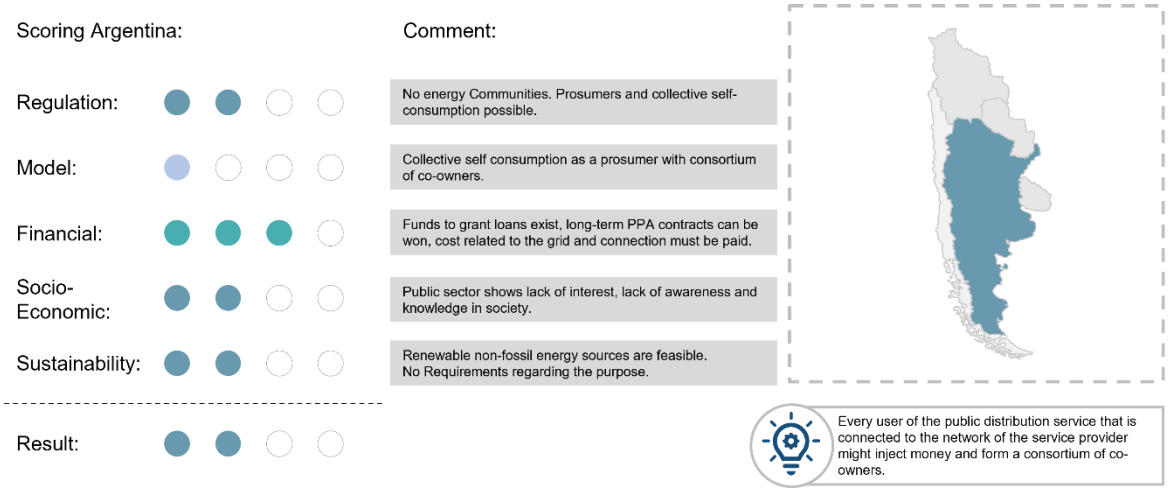

Figure 26 – Scoring Argentina

Chile scores low on the regulation for energy communities as models are limited and financial incentives are low, and cost are high as seen in Figure 27.

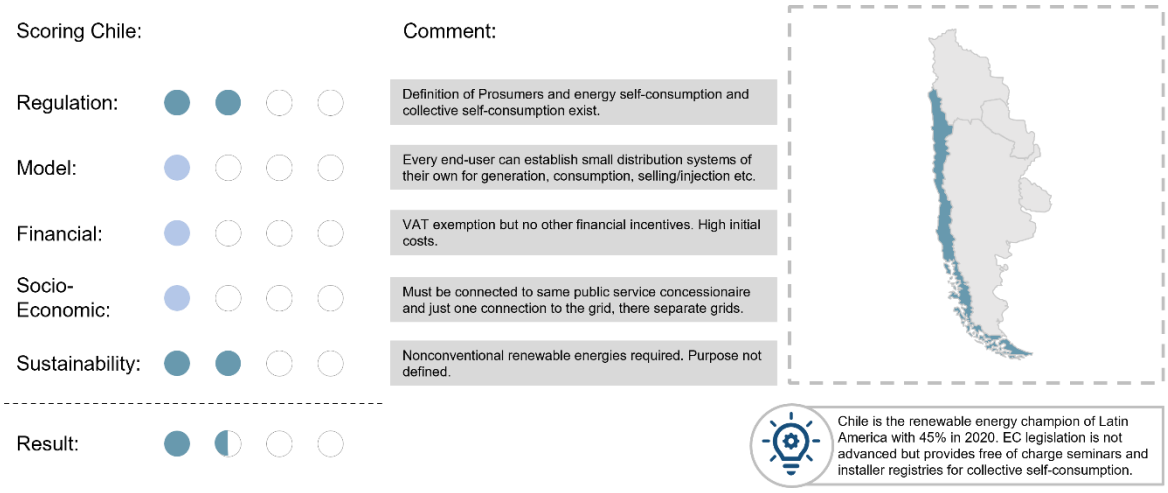

Figure 27 – Scoring Chile

India has an average scoring, since they allow for Mini/Micro grids parallel to the main grid that can be used to establish energy communities upon them, which can be seen in Figure 28. Main barriers are that prosumers must have the same point of energy supply which is a geographical

Horizon 2020
European Union Funding
for Research & Innovation

constraint, and a hindering top-down market structure exists limiting the scaling of the energy communities.

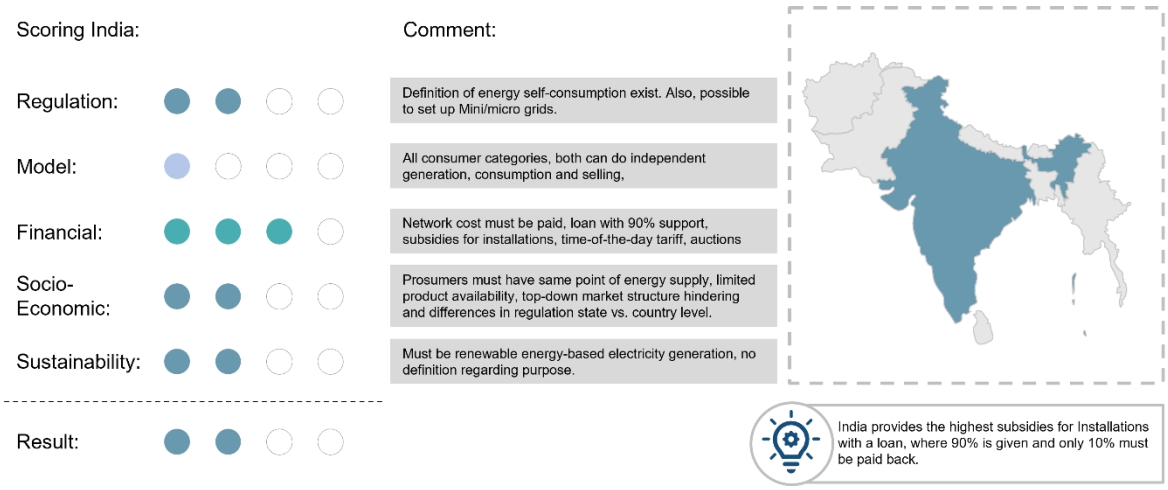

Figure 28 – Scoring India

Colombia also scores fairly low as only energy-self consumption exist in regulation and results in few feasible energy communities as seen in Figure 29. Further main barriers include a low level of awareness and the risk of armed attacks.

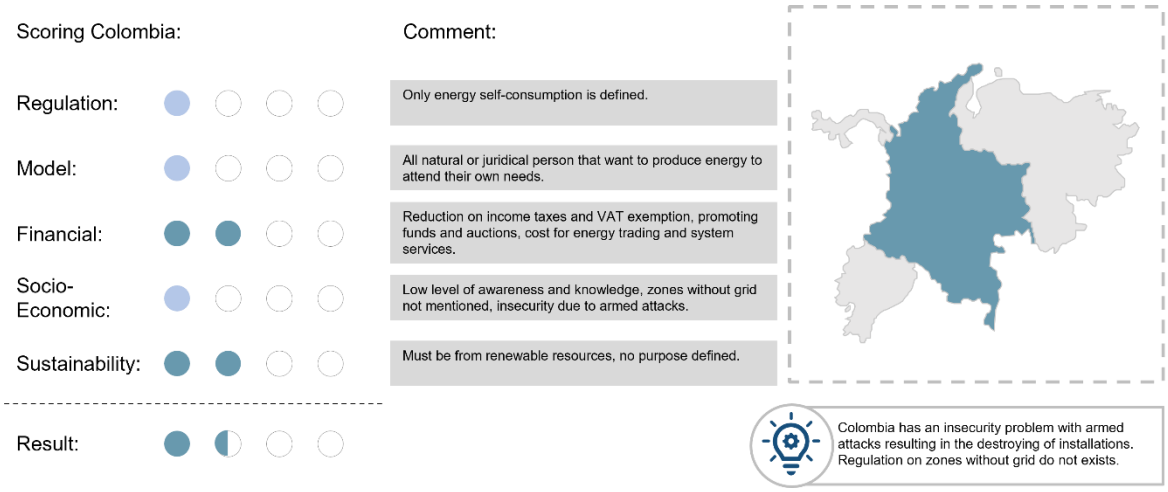

Figure 29 – Scoring Colombia

Horizon 2020
European Union Funding
for Research & Innovation

4.3. Heatmap

All individual scorings result in a World Heat Map that shows the regulatory readiness regarding energy communities of RENAISSANCE pilot- and replication sites. Table 1 gives an overview of the total scorings for each country that were described in 4.2 and shows the related colour legend that can be found in the actual heatmap in Figure 30.

Country	Total Scoring	Colour Legend Heatmap
Spain	3	
Flanders	2,5	
Greece	2,5	
Italy	3	
Netherlands	3	
Poland	2	
Uganda	1	
Argentina	2	
Chile	1,5	
India	2	
Colombia	1,5	

Table 1-Total Scoring RENAISSANCE Countries

Horizon 2020
European Union Funding
for Research & Innovation

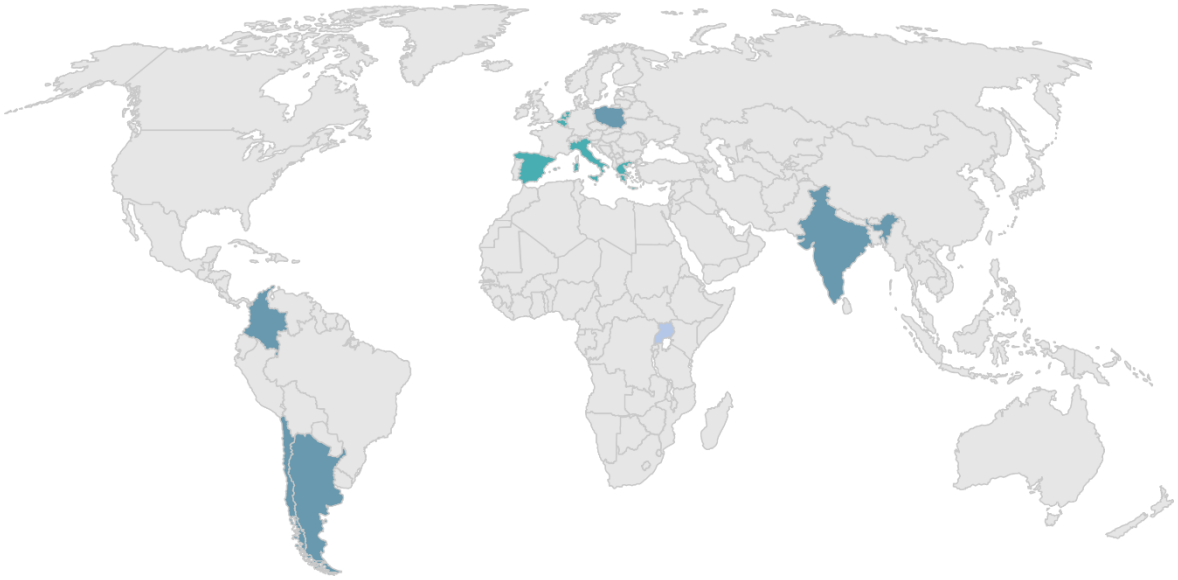

Figure 30 – RENAISSANCE regulatory Heatmap

This shows that energy communities and their regulatory foundations across the world are in differing stages of readiness. In most European countries the regulations are somewhat more advanced compared to non-European countries due to the ongoing transposition of the European Directives. Still, also European countries have differing levels of regulatory readiness as can be seen in Poland, which has currently less detailed regulations on energy communities compared to other countries. Non-European Countries can show that they have fundamental regulations in place to develop energy communities like prosumer laws and collective energy consumption regulations.

4.4. Critical Review

As this development of KPIs to assess regulations on energy communities is the first draft, a critical review is in order.

1. The current scoring **weighs all KPIs as having the same importance**. The averaged result might therefore lead to a different scoring if more

Horizon 2020
European Union Funding
for Research & Innovation

weight would be awarded to specific aspects of energy communities. For example: “is the community aspect stated in regulation?”, “Can there be a sustainable business model?”.

2. For comparison of countries, the **averaged results shown in the heatmap are therefore generalized**. The individual scoring can be more relevant for comparison purposes. A different form of diagram might be more suitable to do so.
3. The KPIs could be extended with a new KPI: **access to data.** However, this is not yet included. The willingness of stakeholders to share data is essential to building valid business models and could be an obstacle for energy communities.

4.5. Future Research

For improving the KPI scoring model and the heatmap itself as a tool for energy community initiators and regulators, the following future research options might be helpful:

1. Assessment of regulatory aspects that are the most important to allow a sustainable business model.
2. Accessibility of data and the willingness of Stakeholders to share data should be assessed and incentives should be evaluated to support that.
3. DSO cooperation and incentives to allow for more collaboration.

Horizon 2020
European Union Funding
for Research & Innovation

5. Policy Recommendations

The areas of regulations that were used to define the KPIs and what should be looked at when assessing the readiness of regulations also serve as the areas for providing policy recommendations. These are formulated from the individual country analysis, the comparison of countries and the heat map. Additionally, participants and their expertise regarding the regulations for energy communities in a validation workshop were considered (chapter 5.2). The recommendations are summed up in policy memos [2] which serve as an easy-to-read and structured depiction of policy recommendations bundled under each one of the areas. As the recommendations are based on a cross-country comparison of verified desk-research they are made on a general level and not national. They could be useful for each country but should be adapted to the different existing regulations.

5.1. Policy Recommendations

5.1.1. Regulative Settings

Regulative changes have accelerated the development of Energy Communities. In order to enhance the Energy Transition from the bottom up, these changes need to be **amplified quicker and with clear provisions**.
The two directives by the European Commission have pressured EU member states to transpose regulation on Energy Communities in their national legislation. The transposition has been very time consuming and, in many cases, delayed. In addition, the directives where not in all cases adjusted to the local socio-economic or regulative contexts. In the following the recommendations on the regulative setting are listed:

1. **Accelerate the Transposition**

Unclear, complex and frequently changing policies appear in all analysed countries e.g., Poland and Spain just have one of the directives transposed.

Horizon 2020
European Union Funding
for Research & Innovation

New regulations are set to appear in the coming years, causing uncertainties for the creation of energy communities. Accelerated transposition of the directives would provide more certainty for initiators of energy communities once the laws are set for the future and stop changing.

2. **Enable standardization of terminologies across EU**

The terminology may change cross-country or -state making it hard to compare and standardize the forms of energy communities and learn from each other e.g. cooperatives, communities, clusters. This is caused by the adaption to the existing regulation in each country while transposing the directives.

3. **Ensure that no geographical limits may appear**

Requirements such as having to connect to same substation or having to be in rural areas limits the scalability and growth of energy communities, e.g., in Spain, community members must be located within a radius of 500 meters to the energy production plant.

4. **Ensure citizens participation**

More emphasis should be put on citizens participation in national legislation, to ensure the directives focus on energy democracy and benefits for citizens.

To conclude, the Energy Transition is a complex matter, but citizens are more and more eager to participate. Therefore, the adoptions in regulations that provide easier and more standardized developments of energy communities and as well ensure civil participation should be enforced at an increased pace

Horizon 2020
European Union Funding
for Research & Innovation

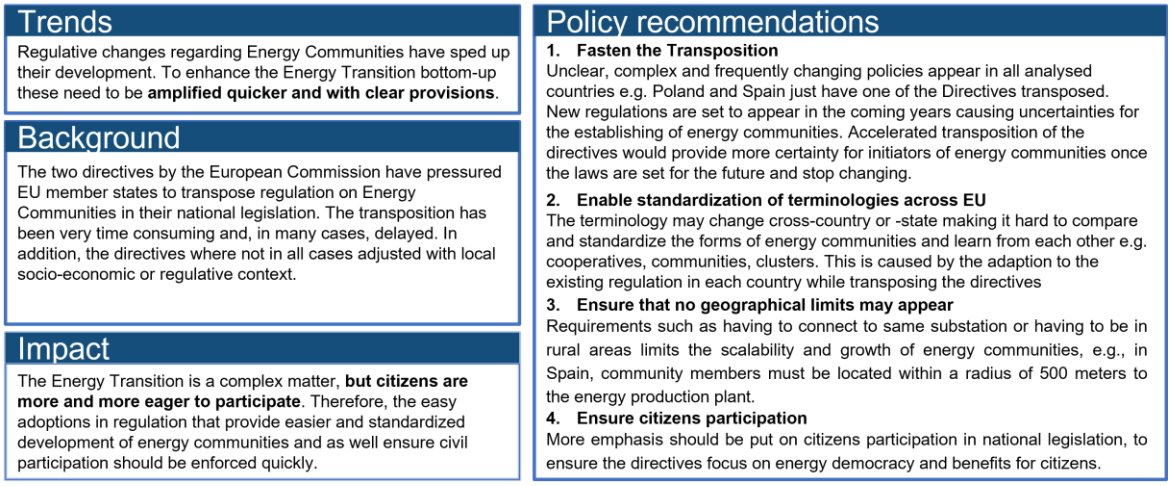

Figure 31 – Policy Recommendations on regulative Settings

5.1.2. Organizational models

As Energy communities are self-organized and often **based on voluntary work or fundings,** the establishment and maintenance processes should be made easier in order to provide more independency.

Most energy community initiators state that deep knowledge of the energy market must be gained to participate in the market and to reach feasible business. The resulting recommendations are listed below:

1. **Develop standardized organisational models**

Often, unclear definitions of activities and members are given, e.g. “citizens or local authorities” (Greece), “all legal persons” (Netherlands). Also, the interpretation of these definitions by the countries is often very different and gets fragmented into various existing local laws resulting in complex legal structures.

2. **Reduce Administrative Hurdles**

Initiators lack knowledge of administrative processes of the energy market e.g. connecting to the grid or applying for supply licenses. These should be made easier for energy communities.

Horizon 2020
European Union Funding
for Research & Innovation

3. **Design open organisational models**

Regulations determine the legal form that an energy community can take, which can result in barriers to community growth, e.g., a non-profit requirement may limit the long-term financial stability. Therefore, the purpose must be defined but the form or model of the community should be kept open as much as possible. Another form of energy communities that focuses on B2B could enhance energy communities that have more investment powers.

4. **Expand the possible roles to participate in energy markets**

Due to limited roles or activities that energy communities can take in most countries; the trading models are limited. This results in limited access to wholesale or ancillary services causing limited ability to create revenue streams. Energy communities need to be able to take the same roles as competitors to really compete, including aggregator and flexibility services. In summary, standardized and open models, easier administrative and maintenance processes and extended roles within the local energy markets can provide long-term operation for energy communities and could lift up their establishment (see Figure 32).

Horizon 2020
European Union Funding
for Research & Innovation

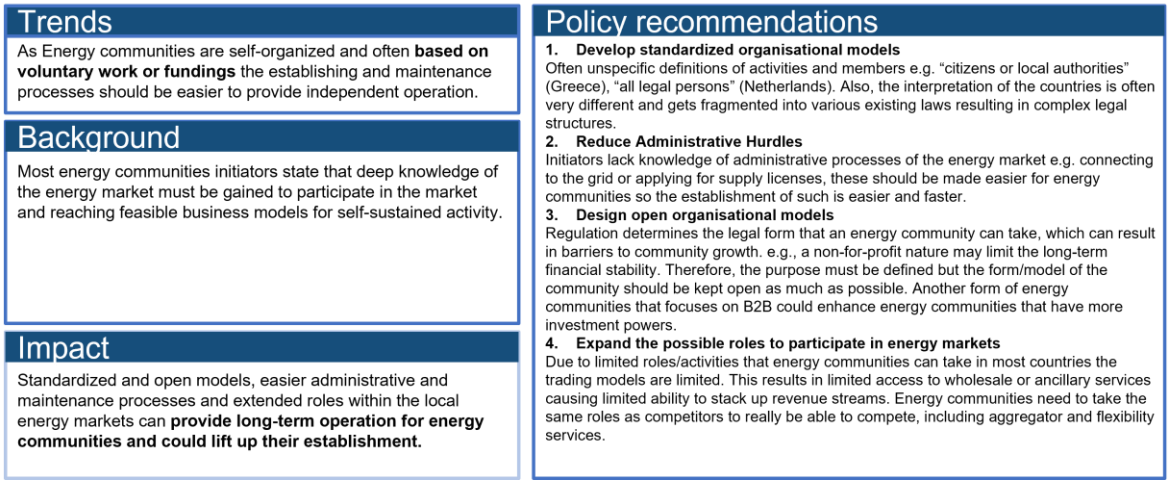

Figure 32 – Policy Recommendations on organizational Models

5.1.3. Financial Barriers

Currently, the financial incentives are very limited in most European countries resulting in **financial uncertainties** for energy communities.

The establishment of energy communities comes with several costs. The initial capital and installation costs of small-scale renewables are typically high in relation to traditional, centralized energy systems in terms of €/kW. The resulting recommendations are listed below:

1. **Provide long term financial stability**

Due to differing compensation mechanisms that are subject to uncertainties, no long-term business case can usually be applied as most countries provide fee exemptions, e.g., Greece (maintenance fee), The Netherlands (VAT) and Spain (network fees) that are not sufficient for ensuring long-term financial stability. Therefore, long term compensation mechanisms should be provided to increase financial forecasting stability (reduce long term risk). Additional energy services should be supported such as peer-to-peer trading to allow a better business case.

2. **Reduce Initial and Network Cost**

Horizon 2020
European Union Funding
for Research & Innovation

Besides the lack of incentives and high initial capital costs, energy communities must usually also pay network costs. As energy communities do not focus on profit like economic competitors but on community benefits, the reduction from network cost could help them become financially stable and to provide more benefits to their members that they are established for (or allowing to provide grid services). Subsidies could also be granted for additional costs such as technical assistance or notary fees.

In conclusion, only financial incentives, stability and cost reductions can overcome the financial risks for citizens to be able to set up energy communities.

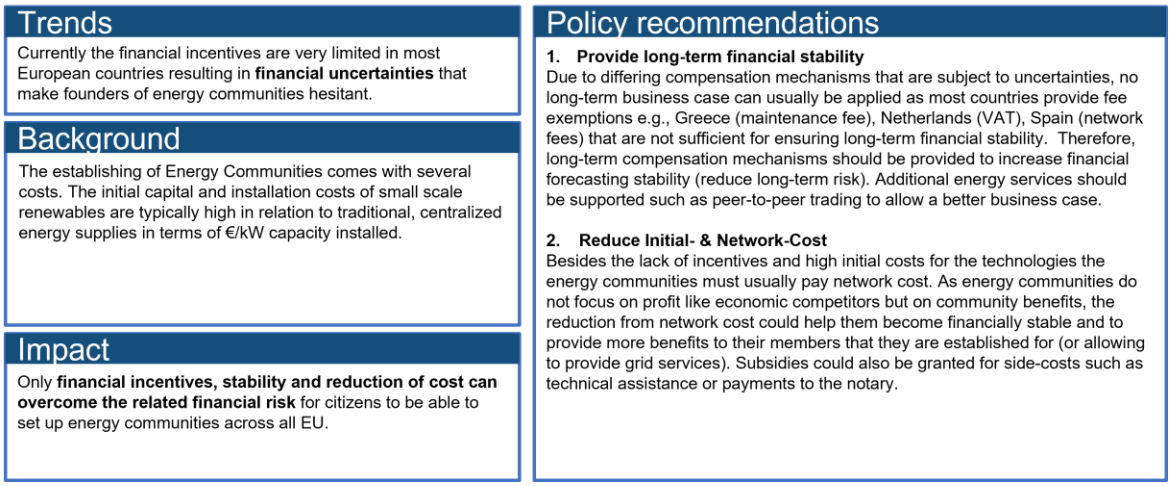

Figure 33 – Policy Recommendations on financial Barriers

5.1.4. Socio-Economic Barriers

Innovative Technologies that solve energy management problems are available in the market. However, many communities state that they have a lack of knowledge and skills to access and use these technologies. The recommendations are listed below:

1. **Provide no minimum and no maximum Capacities**

Horizon 2020
European Union Funding
for Research & Innovation

The maximum capacities differ from 100kW to 10MW cross-country, which allows for very different economic possibilities. (e.g., Spain up to 100kW, e.g., Poland up to 10MW). No matter where located, energy communities should have the same possibilities resulting from capacities.

2. **Strengthen the support and access to innovative technologies**

Over the last decade, innovative technologies in the fields of generation, distribution, storage (also EVs) and control systems have become cheaper and more available. Still, governments do not provide support or easy access on a civil level, which hinders the abilities to use them to uptake energy-communities.

3. **Reduce Split Incentives**

Costs and benefits might be allocated unfairly between members when social housing sectors or rental properties are part of the community (e.g. in the Netherlands). This could be solved by defining a balanced bill calculation for more equal compensation.

4. **Enhance Economies of Scale**

The number of members and types of technologies are limited in most countries resulting in hindering the economies of scale.

To conclude, energy communities could provide fair, economic and feasible solutions to democratize energy. To exploit their potential, the relevant knowledge and skills need to be made accessible and maximum capacities and geographic limitations should allow for economies of scale (see Figure 34).

Horizon 2020
European Union Funding
for Research & Innovation

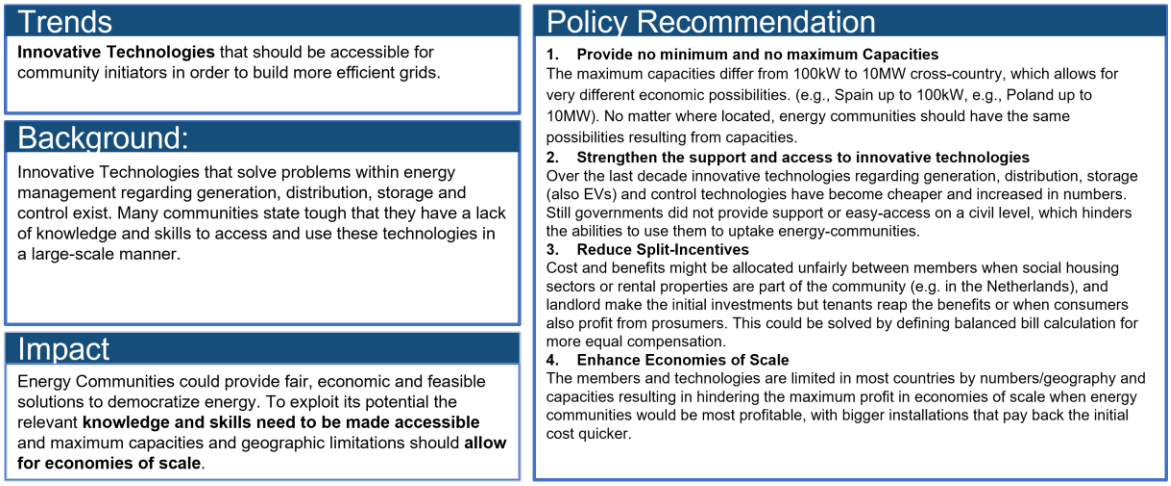

Figure 34 – Policy Recommendations on socio-economic Barriers

5.1.5. Sustainability

Due to the **climate crisis**, the shift from fossil fuels **renewable energy sources needs to focus more on** citizens 'participation.

Half of all European Union citizens could be producing their own electricity by 2050, and meeting 45% of the EU's energy demand (2016 estimation).

Related recommendations are listed below:

1. **Ensure Community Benefits**

Many regulations have not yet defined the degree of citizens participation and how the financial benefits should be reinvested in the community, e.g. in Flanders, the Netherlands, Spain and Greece (Rescoop).

2. **Enforce the focus on renewable energies for all market parties**

Some countries only define the renewability of the used technologies to produce energy partly e.g. Poland for 70%, reducing its sustainability potential. The policy should then urge that all actors have the same sustainability goals. As the climate crisis is proceeding, the only option for energy communities should be a REC.

Horizon 2020
European Union Funding
for Research & Innovation

In summary, to ensure sustainability regarding social equity and environmental protection, regulation needs to stimulate renewable energy use and citizen participation

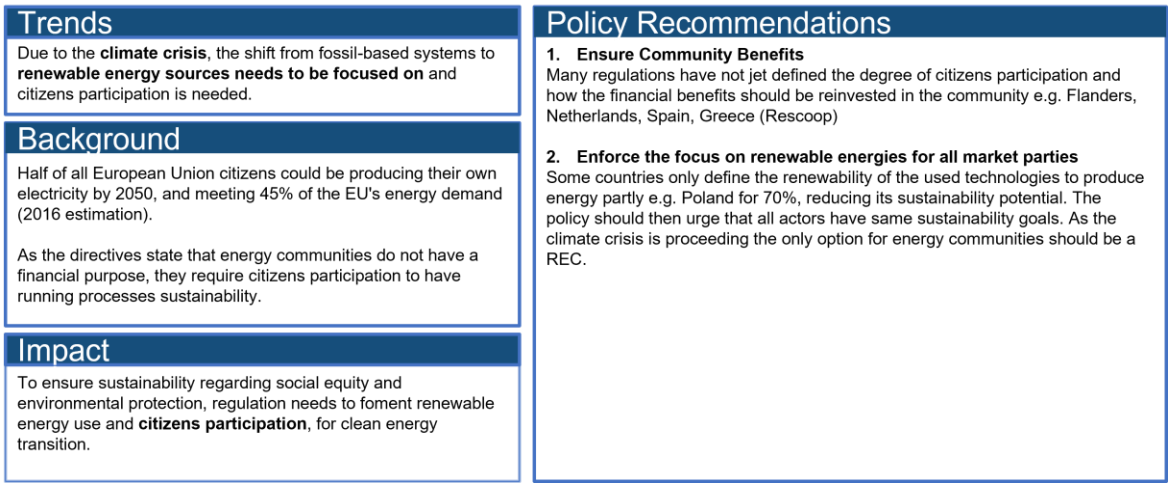

Figure 35 – Policy Recommendations on Sustainability

5.2. Validation Workshop

The RENAISSANCE results regarding policy recommendations and the development of KPIs for assessing policy readiness were validated with experts of the energy community field to validate the project results and to further develop them.

The Workshop took place on May 31st, 2022, in Brussels on the VUB Campus from 13:30pm to 15:30 pm. A range of participants from different countries attended the workshop, in total being 12 participants from Belgium, Italy, The Netherlands, Ireland and Spain. The workshop agenda consisted of an Introduction to the RENAISSANCE Project by VUB, a presentation of the comparison of the individual country analysis and the heatmap with its KPI system and a final presentation of the developed policy recommendations. Additionally, the participants were asked to score the countries of which

Horizon 2020
European Union Funding
for Research & Innovation

they have knowledge about energy community regulation with the KPI system and write down aspects that need to be improved.

5.2.1. Comparison of individual Country Analysis

After sharing the insights in the comparison of the individual country analysis, the participants had two remarks. Firstly, they thought it was interesting that similar problems occurring across the different countries. Secondly, they found it interesting that the definitions of energy communities are very different on country levels compared to the European Directives. This is probably because they have to fit into the specific regulative background of each individual country and have to be matched with existing laws.

5.2.2. Presentation of KPIs and Policy Recommendations.

The first main point of improvement regarding the KPI system that the participants recommended was concerning the building of an average result after the scoring. This might lead to a misleading total scoring of the country regarding regulations because some essential aspects of energy communities should be taken into account more strongly. As an example, one participant mentioned that the aspect of civil participation to the energy community should be weighted more deeply as it is essential by definition in the European Directive.

Another important point was about the access to relevant data and data management as these are of great importance in order to develop sustainable business cases that ensure the longevity of energy communities beyond their funding. This was already incorporated in the socio-economic scoring area as seen in Figure 17.

A third insight of the workshop that all participants could agree on was the need for sustainable business models in general. The financial incentives are not yet sufficient to guarantee long term financial stability for the investors and participants of energy communities. More incentives are

Horizon 2020
European Union Funding
for Research & Innovation

needed such as technical assistance, payments for relevant services like notaries and the access to new technologies like storage to provide flexibility energy services and being able to compete in the energy market. Also, when discussing the European Directives and their implementations in country regulations, the participants came to the conclusion that the stated sentences of the directives can be interpreted very differently and therefore various models of energy communities are allowed in different countries, making cross-country comparison difficult. An aspect of this is that the relevant laws for energy communities are often fragmented into different community laws that might be outdated.

Figure 36 – Participant of the policy recommendations workshop in Brussels

Horizon 2020
European Union Funding
for Research & Innovation

6. Conclusion

This deliverable summarizes the results of the RENAISSANCE project task 6.2. It presents the main constraints in the European and non-European regulatory landscape for the establishment of energy communities based on an analysis of eleven countries from the project pilots and replication sites. Additionally, this deliverable proposes a uniform and useful scoring system to assess energy community regulations. Finally, it also provides the most urgent policy recommendations to support the uptake of local renewable energy systems into energy communities.

These results were achieved through extensive desk research during several months, in collaboration with project partners and the replication sites. The proposed methodology was successfully used to provide detailed insights into the current state of energy community regulations in Europe and beyond.

From the creation of the individual country analysis and the cross-country comparison of regulations on energy communities, the following results can be presented:

- The main constraints for establishing energy communities are the same within European and non-European countries. They include on one hand the lack of complete legal transposition into local laws and on the other hand too specific regulations, e.g., regarding geographic limitations. In general, administrative and financial constraints and a lack of awareness limit the number and sustainability of energy communities beyond their initial funding phase. Non-European countries encounter additional and more specific problems such as the absence of reliable infrastructure, insecurity, lower disposable income and non-existing regulatory models.

Horizon 2020
European Union Funding
for Research & Innovation

- A KPI system with a homogeneous scoring model helps to rate the readiness of energy community regulations in different areas and can therefore show best practices and rate progression of each country.

- The regulatory heatmap shows the readiness of energy community regulations and that all countries can still improve their energy community policies in various areas. It can be agreed that it is very important that a sustainable business case is assured for energy communities, including access to data and collaboration with DSOs, allowances to provide or use energy flexibility and innovative technologies as well as subsidies for e.g., notary expenses to be competitive.

- The proposed policy recommendations show the required improvements for all regulatory areas. This provides a basis that could allow for supporting an easier and financially safer initiation of energy communities to scale up.

Horizon 2020
European Union Funding
for Research & Innovation

References

[1] C. E. England, «What is Community Energy & Why Does it Matter?,» https://communityenergyengland.org/files/document/41/1494517990_What-is-Community-Energy.pdf, 2014.

[2] D. D. Pomeroy, «Policy Memo,» MIT's International Policy Lab, https://mitcommlab.mit.edu/broad/commkit/policy-memo/, 2015.

Horizon 2020
European Union Funding
for Research & Innovation