RE-EMPOWERED

Renewable Energy EMPOWERing
European & InDian Communities

Deliverable 6.1: Engagement Status Report

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EXECUTIVE SUMMARY

Community engagement is of paramount importance for the sustainability of local energy systems. The objective of this document is to present the progress regarding stakeholders' engagement of the RE-EMPOWERED project, as part of WP6. The report tracks the involvement and growth of stakeholders' participation across the demo sites, providing an analysis of key activities and milestones achieved.

RE-EMPOWERED project since its beginning has organized 27 stakeholder engagement events, in order to engage the local communities for the optimal and just implementation of the foreseen interventions. The events ranged from meetings with dozens of community members to meetings with high level officials (e.g. local Minister and Mayor). Most notably, the Cooperative Society of Keonjhar (India) demo-site was created in the framework of RE-EMPOWERED, which is a legal entity (with bank account etc) responsible for the management and maintenance of the microgrid. Moreover, an initiative for the participatory scheme of the microgrids in Gaidouromantra (Kythnos/Greece) and Ghoramara (India) demo sites was initiated.

This document starts with a social analysis of the demo sites, that has been conducted in order to determine the social status of the demo sites before the project. The social analysis has served as a guide to understand the special needs of the local communities of each demo site considering the differences between the European and Indian demo sites. Next, the stakeholders' engagement guide is presented, which was used as a guide from the beginning of the project in order to equip the demo site leaders with tools for engaging with the local communities. Moreover, a guide for the creation of an energy community is included. Next, the stakeholders' engagement activities in all demo sites throughout the project are reported. Finally, a stakeholders' analysis is conducted by categorizing the stakeholders' engaged in all demo sites, following the stakeholders' engagement guide.

KEYWORDS:

Local Energy Systems, Bornholm, Kythnos, Ghoramara, Keonjhar, Gaidouromantra, Kythnos, stakeholders, engagement activities, residents, local community, citizens, implementation of activities

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Acronyms

Acronym	Description
€	Euro
₹	Rupee
$	US dollar
AEC	Amelander Energie Coöperative UA
BEOF	Bornholms Energi & Forsyning Holding A/S
BESS	Battery Energy Storage System
BoD	Board of Directors
CEC	Creation of an Energy Community
CEC	Citizen Energy Community
CHP	Combined heat and power
CO2	Carbon dioxide
CP	Consortium Plenary
CRES	Centre for Renewable Energy Sources and Saving
DHN	District heating network
DKK	Danish Krone
DST	Department of Science and Technology
EC	European Commission
ECSC	Edinburgh Community Solar Co-operative
EU	European Union
EV	Electric Vehicle
GA	General Assembly
GoI	Government of India
GWh	Gigawatt-hour
Gram Panchayat	Indian local authority
h	Hour
ha	Hectare
HEDNO	Hellenic Electricity Distribution Network Operator
IMC	Internal Monitoring Committee
IPTO	Independent Power Transmission Operator
JTM	Just Transition Mechanism
km	Kilometre
km2	Square kilometre

Acronym	Description
kVA	Kilovolt ampere
kW	Kilowatt
kWh	Kilowatt-hour
kWp	Kilowatt peak
MW	Megawatt
MWh	Megawatt-hour
MWp	Megawatt peak
Nº	Number
NSAC	National Scientific Advisory Committee
NSRF	National Strategic Reference Framework
PPA	Power purchase agreement
PPC	Public Power Corporation
PU	Public
PV	Photovoltaics
R	Report
RAE	Regulatory Authority of Energy
REC	Renewable Energy Community
RES	Renewable Energy Sources
SAES	Ségala Agriculture et Energie Solaire
SERC	State Electricity Regulatory Commission
SME	Small and medium-sized enterprise
TV	Television
V	Version
W	Watt
Wp	Watt peak
WTP	Willingness-to-pay

1 Introduction

1.1 Purpose and Scope of the document

The current document is a report on the engagement status of the stakeholders in the demo sites of the RE-EMPOWERED project. Its purpose is to track all the activities and the achievements that the participants have accomplished so far, via presenting the events that took place in the demo sites. The stakeholders' engagement guide serves as a reference for all the engagement activities.

Information from the questionnaires of Task 8.1 "Business models" has been used to analyze the current social and economic state in India and the European Union with a specification in the demo sites. A careful mapping of the stakeholders and their role in the implementation of the RE-EMPOWERED project is undertaken, regarding all demo sites. Roadmaps for organizing workshops are presented, covering the process from preparation to evaluation, as well as guidelines for establishing Energy Communities. The guidelines extent from legislation to the practical operation and procedures of an energy Community, including analysis of actual case studies. All the community engagement events and activities of RE-EMPOWERED are reported.

1.2 Structure of the document

This document is structured as follows:

In Section 2, a social analysis of the demo sites has been conducted in order to determine the social status of the demo sites before the project.

Section 3 contains the stakeholders' engagement guide. This document has been used as a guide by the demo site leaders to engage with local communities.

Section 4 is dedicated to the reporting of all stakeholders' engagement activities in all demo sites throughout the project.

In Section 5 a stakeholders' analysis is conducted by categorizing the stakeholders' engaged in all demo sites.

2 Social analysis

2.1 Keonjhar

Ranipada, Nola and Kanheigola are small villages/hamlets in the Harichadanpur-Tehsil reserve forest in Keonjhar District of Odisha State at India. They are located 54 km south of the capital of Keonjhar. The Demo site of Keonjhar (Ranipada) counts a total population of 300 people and 75 households (mainly simple family houses). The area of the demo site is 2.02 km^2The population density of the demo site of Keonjhar is 148 people/ km^2.

In the local energy community of Keonjhar (Ranipada), only 25% of the inhabitants (75 people) has access to electricity.

The demo site is not connected to the grid. It has a local distribution network that often leaves the inhabitants of the 3 villages to face outages and congestion within the power system. The system consists of renewable energy sources at a 90% rate and the annual production is 100% RES. The main source is photovoltaic installations that have battery systems as a backup. The storage capacity of them though is limited. Biomass is another source of energy production with the inhabitants using the local forest as a fuel.

The produced energy of the system is currently provided to the people for free. No metering system is installed at the villages and therefore neither smart meters are. However, with the installation of the new photovoltaic panels and the smart meters, this business plan will come into change. Smart meters will be installed and as a result, residents are going to pay a small price for their energy consumption. Along with them, other needs of the community are going to be fulfilled, such as the extension of appliances used by the residents.

2.2 Ghoramara

Ghoramara island is located in India, 92 km south of Kolkata and more specifically at the Sundarban Delta complex of the Bay of Bengal. Compared to the large size of India, Ghoramara is considered a small island. It has a total area of 5 km^2. The population of the island is approximately 3,000 people (2016), which indicates a population density of 600 people/km^2 at the Ghoramara.

The number of households in Ghoramara reaches the number of 1,100. The dwellings are mostly single-family ones and are mud houses or huts. The businesses of the demo site are small shops such as grocery shops, tea stalls, photocopiers, toys and electronic shops. The number of these businesses is around 25-30. On the island there also operating two rice husking machines and one puffed rice mill.

Regarding the population of India, there is a low rate of urbanization, as only 34.93% of people live in urban regions (2020). Almost everyone has access to electricity, at a rate of 97.82% (2019) and about 41% of the people have access to the internet. Data about the literacy rate of India's population are provided in Table 2.1. According to it, the general literacy rate of adults is 74.37%, with males' rate higher than the one of females. However, this rate is expected to increase significantly in the next decades, since the younger population has a literacy rate of 91.66% and a much smaller gap between the genders.

Table 2.1 - Literacy rate of the population of India per gender and age[1]

Adult (population aged > 15 years old)	
Total	**74.37%**
Male	82.37%
Female	65.79%
Youth (population aged 15-24 years old)	
Total	**91.66%**
Male	92.99%
Female	90.17%

In Ghoramara, the economy relies on fishing, and agriculture, based on betel leaves and rice crops. By general consensus, the inhabitants are considered middle class to low income.

Ghoramara is not connected to the grid, and it has no conventional units for energy production. The electricity that is available on the island is produced by solar photovoltaic panels. However, there is a limited amount of them on the island due to constricted arid land, and thus, some inhabitants choose to install the panels on their rooftops. Ghoramara though, faces severe cyclonic storms every 5-10 years, that destroy the rooftop PV panels and lead many inhabitants to rely on kerosene lamps. Moreover, normally there is no access to the internet.

Electricity on the island is mainly used for home lighting. Approximately 60-70% of households use isolated solar-based home lighting solutions comprising of 60-100 Wp solar panels, charge controllers/inverters and battery systems. Other uses of electricity are mobile charging and watching TV (20% of households own a TV). The rest of inhabitants' needs are covered by other sources. Wood is used for cooking and diesel generators are used for the charging of e-rickshaws and family social gathering needs.[2]

In Ghoramara demo site, there was no centralized power grid before the launch of RE-EMPOWERED project. The contribution of RE-EMPOWERED project to the development of these communities will be vital and is expected to subsidize the energy cost at a point lower than the conventional energy supply cost of the main grid. The pricing is planned to be on a flat-rate basis, with no fluctuation according to the demand. A microgrid was planned to be constructed on the island, with the active participation of the local community supporting the expansion of the energy supply on the island and finally helping island's inhabitants to overcome the significant problem of energy poverty. Besides, the project will also contribute to the water supply and the communication of the island, since a solar-based water desalination plant will be installed, and electric vehicles will be provided. Solar power-driven electric boats for waterway communication, and electric four-wheelers for ground communication.

[1] Source: The World Bank Data. Information from 2020.

[2] Source: Questionnaires RE-EMPOWERED Task 8.1

2.3 Kythnos / Gaidouromantra

Kythnos is a Greek island, part of the Cyclades complex in the Aegean Sea. The island has a long tradition of sustainability and clean energy. In 1982, the first wind farm in Europe was constructed there.

The island of Kythnos has a population of 1,568 people[3], from which 1,456 live permanently in the island. In comparison, the population of Greece was 10.448 million people that live in Greece (2023)[4]. During the summer months, though, the population of the island can be multiplied 8 to 10 times due to the high tourism. Kythnos covers an area of 100.2 km^2 which indicates a population density of 14.5 people/km^2, while in Greece generally with an area of 131,957 km^2, there is a population density of 81.2 people/km^2.

In Kythnos there are around 630 households and 425 businesses. Tourism is the most important economic sector, employing the majority of the local residents, mostly during summer season.

Other economic sectors are agriculture, fishing and crafting of local products.

The microgrid in Gaidouromantra, a small settlement next to the coast, in the southern part of Kythnos, was also an innovation, as in 2001 the first microgrid in Europe has been built there. Since then, Gaidouromantra settlement has been a live testbed for advanced decentralized techniques and other smart grid technologies.

The demo site of Gaidouromantra covers an area of 0.56 km^2 and it has no permanent inhabitants. The 14 houses that exist in the demo site serve as vacation houses, mainly during summer. In the demo site, there are no businesses or any other buildings apart from these 14 family houses.

In Gaidouromantra, each house is equipped with a water pump, which is responsible for replenishing a water tank and in this way supplying water to the household. In addition, the residents use the water for some small-scale agricultural activities and gardening. The majority of the energy mix consumption in Gaidouromantra is electricity. However, cooking is covered by gas, which amounts to a small percentage of the total energy mix consumption.

In Greece 80.673% of the population lives in urban zones (2023)[5]. The electricity access rate of the population reaches 100% and the access rate to the internet is 8317%5. Regarding Kythnos and Gaidouromantra, the electricity and internet access is 100%. The literacy rate of Greek people is presented in

Table 2.2. Generally, the rate is above 97% and in younger generation is above 99%. The gross domestic product per capita of the country is 17,657.1 US$ (2019).

[3] Source: 2021 Population- Housing Census, Permanent population by settlement. Hellenical Statistical Authority.
[4] Source: World Economic Outlook: April 2024. International Monetary Fund.
[5] Source: The World Bank Data.

Table 2.2 - Literacy rate of the population of Greece per gender and age[6]

Adult (population aged > 15 years old)	
Total	**97,94%**
Male	98,51%
Female	97,39%
Youth (population aged 15-24 years old)	
Total	**99,16%**
Male	99,26%
Female	99,07%

2.4 Bornholm

Bornholm island (in Denmark) has a long history as "test-island" for energy technologies. The Demo site of Bornholm consists of three towns in the eastern part of the island, Østerlars, Østermarie and Gudhjem. The whole demo site is connected with a District Heating Network (DHN), with a total of 600 consumers. The main consumption for the District Heating Network comes from the local swimming pool, a church, public buildings, such as schools, businesses, and households. In Østerlars there is a 4 MW heat plant fueled by straw and several kW of rooftop PV panels. There are also some MW of electric and wood pellet boilers and a hot water storage tank .

Bornholm is interconnected with the Scandinavian electricity grid through a submarine power cable to Sweden, but it has also a CHP in Røne to run the electric system off grid. All urban areas are supplied with District Heating, and the heat is generated with biomass-boilers, fueled by locally produced woodchips and straw.

Bornholm has a total population of 39,229 people in the second quarter of 2024[7], out of which 2,500 people are inhabitants in the demo site. The Bornholm Island has an extent of 588.36 km^2 and the demo site 9.4 km^2, which indicates a population density of 68 and 266 people/km^2 respectively. Denmark has a high urbanization rate as 88.24% of its population lives in urban zones (2021 census).

The inhabitants of Bornholm have electricity access at a 100% rate. The electricity system of the island is considered to be resilient and reliable, with very few blackouts. In Denmark 97.86% of the population had access to the internet in 2022[8], and at the Demo area the rate reaches 100%. The literacy rate is up to 100%.

In Denmark the gross domestic product per capita is 59,861.612 US$ (2019). The average disposable income per capita is 267,335 DKK (35,929.82€) generally in the country and 226,145 DKK (30,393.89 €). The sectors that have the most employees in Bornholm are shown in Table

[6] Source: The World Bank Data. Information from 2018.
[7] Source: Statistics Denmark- Population at the first day of the quarter by marital status, age, sex, region and time.
[8] Source: The World Bank Data.

2.3. Although the average income in Bornholm is lower than the general average in Denmark the island is considered to have an energy poverty rate lower than the 3% of Denmark.

Table 2.3 Most important financial sectors in Bornholm (data from November 2022)[7]

Sector	No of employees
Residential care	2,461
Wholesale and retail trade	2,154
Human health activities	1,515
Education	1,152
Construction	1,131
Public administration, defense and compulsory social security	1,120

The demo site consists of households, a school, and a public swimming pool. The number of households at the demo area is approximately 600. All the buildings mentioned above are equipped with smart meters for electricity, district heating and water.

The DHN system that covers the areas Gudhjem, Østerlars, and Østermarie (part of the Demo site) is considered an energy community. The reason for that is that the inhabitants had to organize and coordinate the local community in order to gather sufficient support for the operation of the DHN. This has led to be considered a community with shared interests, regarding reliability and sustainable heating, shared goals, for lowering CO_2 emissions generated by the DHN system, and shared challenges, regarding the increase of the heating cost. This feeling of unit and alignment can be enhanced through RE-EMPOWERED project and the further development of energy communities.

The citizens of Bornholm have expressed their willingness to follow the EU policy regarding energy. Thus, they have expressed some degree of willingness to pay (WTP) for renewable energy in order to promote it and increase its large-scale investments. Main proof of this tendency is that Bornholm covers its electricity needs at 63% with renewable energy sources, and particularly, biomass, wind and sun in 2022[9]

[9] Source: Bornholms Varme A/S.

3 Stakeholders Engagement Guide

3.1 Purpose and scope of the guide

The purpose of this guide is to evaluate the interface of the project teams with the local population in each of the places where interventions are foreseen by the project programming. Throughout the document the main objectives of the interface with citizens and stakeholders in the local community are analysed, and some examples of workshops and seminars organised by the project teams in the past are presented. This guide refers firstly to the value of assessing the current situation in the local community and then expanding on the stakeholder mapping. The guide was used during the RE-EMPOWERED project as a tool for the engagement with local communities.

3.2 Methodology for stakeholders' and citizens' engagement

Assessment of local conditions

In order to successfully communicate information about the project, organise and conduct participatory workshops and ensure that local visits and interactions with the demo site will be appropriately carried out, it is important to first be aware of the specific conditions of the demo site.

Stakeholders mapping

Effective stakeholder participation requires systematic and thorough mapping of stakeholders and analysis of their level of involvement. Stakeholder dynamics can be expressed by specific bodies, organisations, groups, or individuals who can influence the project implementation process either positively or negatively. The stakeholder analysis presented in the following chapters aims to identify early characteristics of stakeholders that may influence the course of the project implementation.

A critical parameter for the successful completion of the planned actions is the correlation and linkage of each mapped stakeholder with the project objectives and the need and benefit of their involvement. It is worth noting that for each stakeholder there may be multiple engagement needs and multiple benefits related to the theme of the specific project, which should be considered during the preparation stage of the participatory actions.

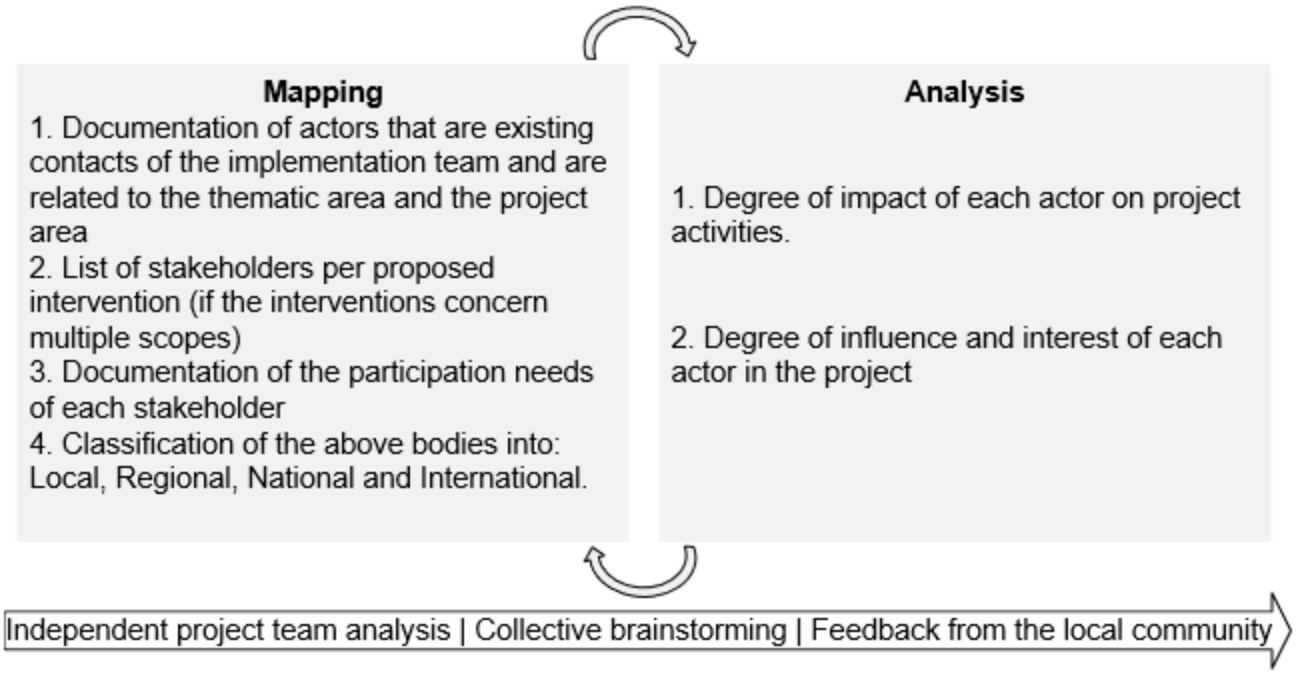

Figure 3-1 Stakeholder mapping and analysis methodology

In the initial stage of stakeholder identification and mapping, tables of stakeholders at local, regional, national, and international level are drawn up. These lists include stakeholders directly or indirectly affected by the interventions proposed by the project. Particular emphasis is placed on identifying local stakeholders, as they are the ones most affected by the project interventions and their commitment to participating in the various stages of implementation is critical.

The end goal of this action is it to create a comprehensive stakeholders list containing both the contact details of each stakeholder as well as the reason why they should be engaged. The importance of each stakeholder in the implementation of the project and the accomplishment of its final goal can be also mapped. This process contributes to the identification of information gaps and participation deficits by helping to pinpoint blank spots. It also activates the recognition of the communication channels through which each stakeholders' group will be reached.

Stakeholders can be identified by the following three ways:

- independent analysis. collective brainstorming.
- asking feedback from local key persons.

Actors, such as the municipality and local community members, that can take an active role in the participatory processes should be definitely included in the stakeholders list. Apart from actors that will take an active role, entities that can have an advisory role should also be included. Parties interested in the development of new infrastructures and services relevant to RE-EMPOWERED solutions who want to capture the potential acceptance of innovative proposals should be identified within this step. Finally, interested parties involved in projects of public interest, that

want to exploit best practices from the engagement techniques and lessons learnt by the RE-EMPOWERED pilots, can be also included in the stakeholders' list.

Individual stakeholders have different reasons to be engaged and each will bring their perspective to the transition process. Through their participation, stakeholders will contribute to increase the awareness of the process, leadership, resources, expertise, and other skills. The key to a successful transition lies in having a balanced stakeholder representation.

Table 3-1 Stakeholder mapping template [CE4EUI Islands Transition Handbook]

Organisation	Reason for involvement
Entities interested in participatory planning	
Entities interested in the evaluation of the RE-EMPOWERED solutions and practices	
Local / Regional public authorities	
Directly involved and/or responsible for the planning / implementation	
Policy makers	
Energy operators / Suppliers	
Private investors	
National Authorities	
Neighbor municipalities/ not relevant municipality departments	
Public and private operators / companies	
Relevant municipality departments	
Tourists / Visitors	
Universities / Research centers	
Project promoters	
Specific citizens associations	
Representatives of Local companies (tourism, commerce, services, agriculture)	
Local community / Citizens	
Touristic agencies	
Region planners	
Representatives of the civil society	
Environmental / Energy associations	
Financial partners	
Knowledgeable persons	

Stakeholder Analysis

The compilation of the above stakeholder tables allows for an initial assessment of the importance of each stakeholder's involvement for the success of the project and the relative influence, impact, and interest of each party.

In a next step, a two-level stakeholder analysis is required:

1. Degree of impact on the project.
2. Degree of influence and interest in the project.

In the analysis, the following questions are asked for each actor:

- What are the expectations of each stakeholder for the project?
- In what ways and resources could each stakeholder contribute?
- To what extent can each actor commit to their involvement?

Level of Stakeholder Influence and Interest

Following the previous categorisation of the mapped stakeholders, at this stage, their profiles are analysed in terms of their level of influence and interest in the project. Interest in this case is assessed based on whether the group in question is influenced by the project, or interested in its subjects. Influence, on the other hand, refers to the power that an individual has in relation to the implementation of the project. Influence and interest can be either internal or external to the project's subject matter and the area of implementation.

This analysis will guide the choice of the strategy to be followed at the planning, decision-making and implementation stages. The choice of strategy will largely depend on the scale of interest of each party in the interventions to be implemented and the degree of influence it has on the success of the completion of the interventions, thus highlighting the role and degree of involvement of each group of actors. As shown in the table below (Table 3-2), the analysis will lead to the formation of four stakeholder groups.

The influence/interest structure is presented below and the following stakeholders are assigned to each quadrant.

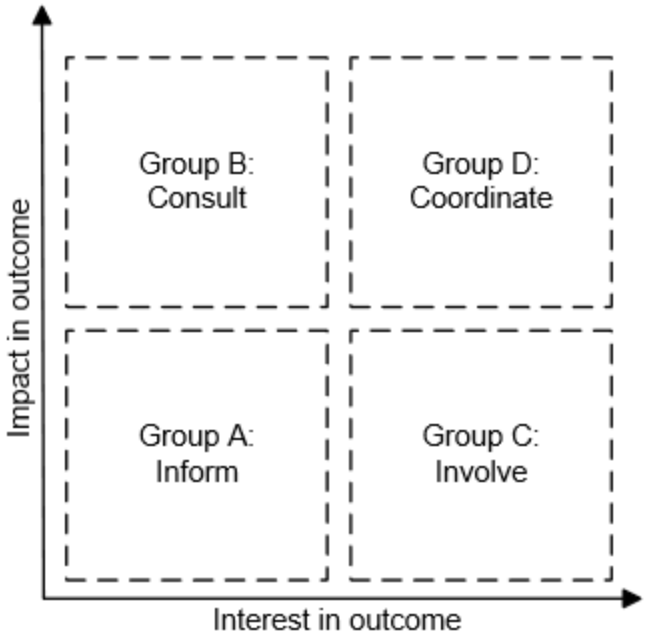

Figure 3-2 Stakeholders can be mapped according to their impact and influence to determine their role in the process

Table 3-2 Analysis of the four stakeholders' groups

Stakeholders' group	Level of influence	Level of interest	Role	Degree of involvement
A	low	low	Monitoring	Information and education
B	high	low	Consulting	Information and feedback
C	low	high	Involving	Involvement and participation
D	high	high	Coordinating	Coordination of actions

A. Those with **low influence** and **low interest** should have a supervisory role and be informed about the progress of the project but are not expected to influence or change the course of the project implementation. Because of their low interest, communication with these stakeholders should be limited and targeted.

B. Those with **high influence** and **low interest** should have a supportive role and be informed so that they can provide feedback at different stages. It is important to ensure that their lack of interest does not undermine the implementation process.

C. Those with **low influence** and **high interest** need to be systematically informed to ensure that their interest is maintained and who will take part in the participatory actions of the project. Also, those stakeholders with high interest can act as multipliers by communicating the project to their existing networks and contacts.

D. Those with **high influence** and **high interest** will have broad active participation. Their continuous information and active presence during the implementation of project activities is essential.

The category of "key stakeholders" as identified at the previous stage falls under group D, the category of "principal stakeholders" under groups B and C, and the category of "secondary stakeholders" under group A, according to the present analysis. This mapping is not absolute, and discrepancies may arise.

According to the **Covenant of Mayors** the stakeholders' groups can be engaged in participation with the tools presented in the following tables.

Table 3-3 Stakeholders' engagement tools depending on degree of involvement

Stakeholders' group	Degree of involvement	Tools
A	Information and education	Brochures, newsletters, social networks, advertisement, local media, open events.
B	Feedback	Telephone, website, public meetings, surveys and questionnaires, surveys.
C	Participation and consultation	Workshops, focus groups, forums, open discussions.
D	Broad active participation	Community advisory committee.

Stakeholders engagement approach

Each stakeholder group, as identified and analysed within the previous actions will have a different level of engagement and for this reason, a different engagement approach will be applied. Each approach described in the Table 3-4 is a valid method of stakeholders' engagement, but more suited to one or the other stakeholder.

Table 3-4 Stakeholders' engagement approach per group [adapted from]

Engagement approach	Stakeholders' group applied	Description
Partnership	D	*Two-way engagement* Shared accountability and responsibility. Joint learning, decision making and actions.
Participation	C	*Two-way engagement* Part of the team, engaged in delivering tasks. Limited responsibility.
Consultation	C, B	*Limited two-way engagement* Involved, but not responsible. Team asks questions and they answer.
Push communications	A	*One-way engagement*

Engagement approach	Stakeholders' group applied	Description
		Team may broadcast information to all stakeholders or target particular groups.
Pull Communication	A	*One-way engagement* Information is made available and stakeholders choose whether to engage or not.

Case of Kythnos Island

In the framework of past projects, interaction and information actions have been carried out for the local community **on the island of Kythnos**. For these actions, the methodology described herein was followed and the stakeholder tables for the island of Kythnos is presented below, in order to serve as an example for the purposes of RE-EMPOWERED and the interaction of the project with all the demo sites.

It is important to note that the following stakeholder mapping was developed for the purposes of a project aiming at a multifaceted upgrade of the island's infrastructure (transport electrification, smart cities, smart waste & water management etc.) and therefore the Reason for Involvement is not always applicable to the present project. Nevertheless, it is included as such for the purpose of extensive analysis and better understanding.

Local Stakeholders

Table 3-5 Local Stakeholders list for Kythnos demo site

A/A	Stakeholder	Reason for involvement
1	Municipality of Kythnos	Horizontal support of all project activities at technical, permitting, and promotional level. Communication channel between partners and local stakeholders. Key role in the creation of an Energy Community for the ownership and future management of the interventions.
2	Municipal Technical Service	Provide technical support and information.
3	Municipal Public Benefit Corporation of Kythnos	
4	School committees	Information and training in schools on project interventions, energy and water saving and waste management.
5	Parents and guardians' associations	Feedback on end use of specific interventions
6	HEDNO Kythnos	Ensure provision of adequate power increase and approval of installations where required
7	Agricultural Cooperative	
8	Livestock farmers	

A/A	Stakeholder	Reason for involvement
9	Slaughterhouses	Inventory of existing water, waste management needs and problems, End users of proposed solutions.
10	Wine producers	
11	Cheesemakers	
12	Beekeepers' Association	Consultancy, Information.
13	Association of Tourism and Allied Professions	End-users, Participation in Smart Branding.
14	Hotel Association	
15	Tourist Accommodation Association	
16	Association of Merichas (port of Kythnos) Professionals	Feedback on the impact of the interventions on the activities they carry out, recording of needs.
17	Car rentals	Implementation of the electric vehicle charger management model, Establishment of energy community.
18	Restaurants	Participation in separate collection of bio-waste.
19	Country Cultural Association	Evidence of existing situation and traditional practices relevant to project interventions.
20	Association of friends of the Museum	
21	Women's association	
22	Banks	Participation in Smart Branding.
23	Technical Companies	Information on possible contribution to the interventions to be implemented.
24	Local press	Promotion and dissemination of project progress.
25	Permanent residents	Mapping of local needs, end-users of all proposed interventions, feedback on project progress.
26	Seasonal residents	Needs assessment and feedback on project progress.
27	Residents of Gaidouromantra	Identification of problems/needs, end-users of interventions (IP3) Establishment of an EC.
28	Associations of Island regions settlers	Feedback, Information on current situation and specific needs.
29	Local Thermal Station of Kythnos	End User.
30	High School of Merichas	End User.

Regional Stakeholders

Table 3-6 Regional Stakeholders list for Kythnos demo site

A/A	Stakeholder	Reason for involvement
1	Regional Authority of South Aegean	Licensing of charging stations.
2	Water Directorate of South Aegean	Authorization for interventions in the water management system.
3	Syros Port Fund	Technical support for the installation of charging stations in port areas.
4	Cyclades Town Planning Department	Information on the siting areas & on the buildings of the "Kythnos Smart Centre" and related permitting.
5	Department of Antiquities of Cyclades	Information on the zoning areas.
6	Neighboring Municipalities	Implementation of corresponding smart solutions – replication.
7	Cyclades Development Company	Information and networking.
8	Decentralized Administration of the Aegean	Licensing & zoning.
9	Solid Waste Management Agency of the Aegean	Data on the current state of waste generation & management.
10	Protected Areas Management Body of Cyclades	Information on siting areas.
11	University of the Aegean	

National Stakeholders

Table 3-7 National Stakeholders list for Kythnos demo site

A/A	Stakeholder	Reason for involvement
1	Ministry of Environment & Energy	Legislation, licensing.
2	Ministry of Infrastructure and Transport	Licensing of charging stations.
3	Regulatory Authority of Energy	Legislation, licensing.
4	PPC / PPC Renewables	Wind turbine repowering, end user of energy storage units.
5	HEDNO	Provision of energy consumption data end user, recording of impact of interventions on the Kythnos Electric System.
6	IPTO	Demand response regulatory framework, impact of future interconnection on interventions.

A/A	Stakeholder	Reason for involvement
7	Hellenic Recycling Utilization Company	Communication on existing recycling system.
8	Tourist agencies	Information on arrivals on the island
9	Shipping companies	Provision of energy consumption, information on arrivals on the island
10	Tourists/visitors	Contribute to the vision "Kythnos Smart Island".
11	Technology Providers	Collaboration for the provision of appropriate equipment and networking.
12	CRES	Consultancy, Networking.
13	ICCS- NTUA	
14	Association of Kythnos Originators	Feedback and promotion.

International Stakeholders

Table 3-8 International Stakeholders list for Kythnos demo site

A/A	Stakeholder	Reason for involvement
1	Tourists/visitors	Contribution to the vision.
2	Smart Islands Initiative	Consulting & Networking.
3	Clean energy for EU islands	Networking.
4	FEDARENE	Networking.
5	Greening the islands	Networking.

The above identified stakeholders are analysed below in terms of their level of influence and impact on the project and their interest in the project.

The first level of analysis concerning the impact of stakeholders on the project leads to the categorisation of stakeholders into 3 main categories: key, main and secondary stakeholders. More specifically:

- Key stakeholders:

  Stakeholders such as local government and Kythnos residents. These stakeholders can use their knowledge, skills, or position to have a significant impact on the implementation of the project. In addition, individuals who have a significant influence on the local community are classified as key stakeholders. This group of stakeholders has an active role in decision making.

- Principal stakeholders:

Actors who may i) be directly affected by an intervention, either as beneficiaries or consumers, ii) gain or lose power and privileges, iii) be negatively affected by the project in some other way.

- Secondary stakeholders:

  Actors indirectly or temporarily affected by the project (e.g., tourists and visitors).

Stakeholders mapped in the previous stage may fall into one or more categories.

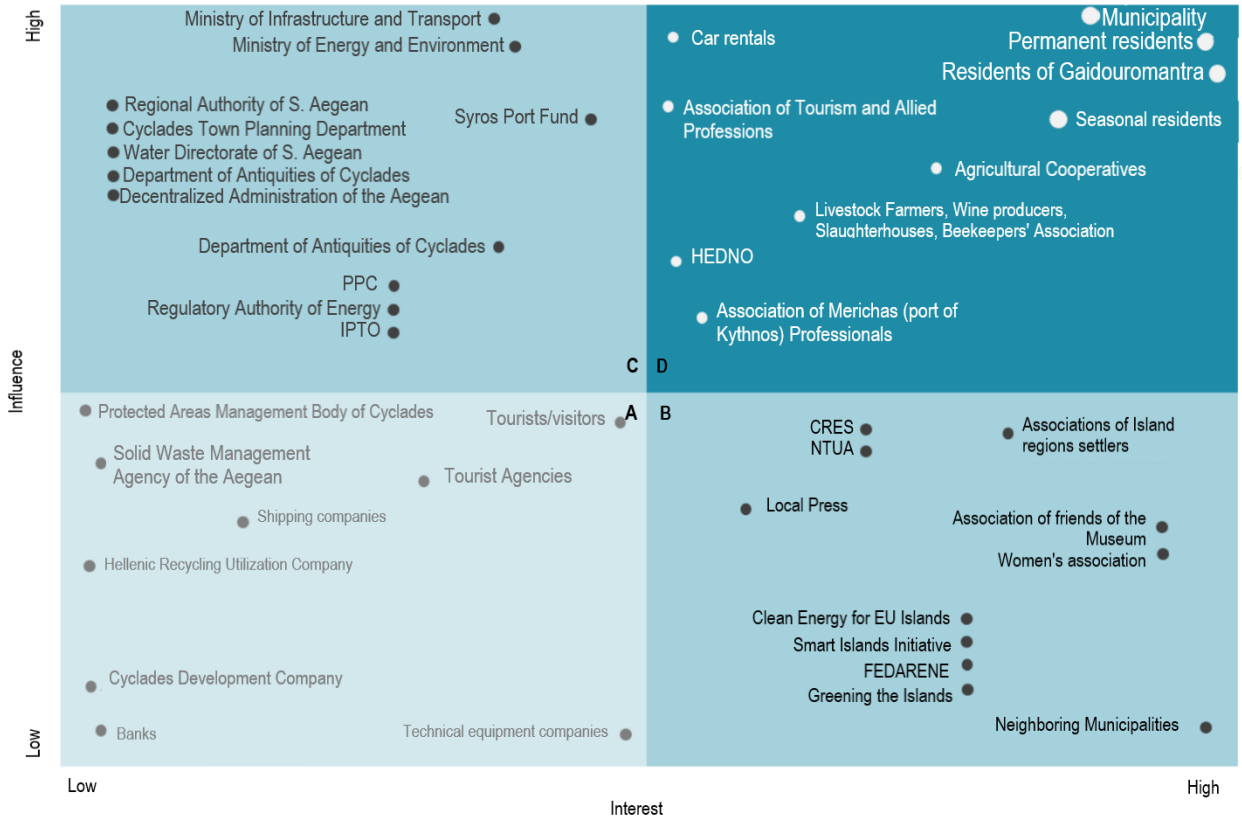

Figure 3-3 Influence/Interest Grid for stakeholders of the project "Kythnos Smart Island"

Initial mobilization of local actors

At this step, local and regional authorities will take all the necessary actions for the mobilisation of local actors. The term “local actors” concerns all the local stakeholders and citizens that are directly or indirectly affected by the interventions of the project and will be key players both in the planning and implementation phases. Within this action, all municipal departments expected to be involved and responsible for the planning and implementation of activities related to the RE-EMPOWERED project will be informed for the participatory process to be followed. Local authorities will ensure that all the required resources (financial, human) and administrative structures are in place.

3.3 Workshop facilitation

Each demo sites' local authority should organise an open local event with the active participation of local stakeholders and citizens before the deployment and planning of new systems and infrastructures. The event will be communicated at all stakeholders' groups already mapped. During this event local authorities will provide the opportunity to openly discuss stakeholders' and citizens' concerns about new investments. The acceptance and cooperation of local actors with the deployment of the interventions will be ensured prior to the development of an action plan.

Before the Workshop

Before organizing workshops in the place where the project interventions will be carried out, it is important that stakeholders are divided on the engagement strategies to be used for each. The choice of the engagement strategy of stakeholders and citizens depends on the scale of each party's interest in the interventions to be implemented and their degree of influence on the success of the project. As stated in the context of the stakeholder mapping and analysis for the project, stakeholders are divided into four categories from which different degrees of involvement of each group emerge. These categories are:

- Category A: Information
- Category B: Feedback
- Category C: Participation and consultation
- Category D: Broad active participation

The main objectives of involving stakeholders and citizens in the planning and implementation of a project are the following.

Objective 1: Exchange of information

One of the most important objectives of stakeholder participation is the exchange of information in order to diagnose local problems and needs, to structure alternative solutions/scenarios, to increase the stock of knowledge and understanding of issues under consideration and to recognize the local community's lived experience of the issues under consideration.

Objective 2: Communication - Dissemination

Informing stakeholders and citizens about the scope of the project, its objectives, and its progress in order to develop trust and confidence between the project implementers and the stakeholders involved in the project.

Objective 3: Awareness raising

Giving citizens and stakeholders the opportunity to intervene on issues that have an impact at the local level increases their awareness, contributing to solving local problems. It also increases the willingness to participate in project activities.

Objective 4: Conflict management

Conflicts between social groups due to different views, visions, interests, etc. may arise during project implementation. Through the participatory process it is possible to facilitate the smoothing of conflicts and prevent the creation of conflicts between stakeholders.

More particularly, for projects and interventions carried out in EU Member States, written consent is also required from the parties concerned for the collection, processing and publication of personal data, in accordance with the General Data Protection Regulation (GDPR).

During the Workshop

Participatory design workshops aim to ensure that different groups can participate on an equal basis in decision-making processes. This also ensures that planning and decision-making is done with a fuller knowledge and understanding of local issues and needs. The final objectives of the workshops correspond to three implementation phases. The first phase is Planning and Visioning, the second phase is Implementation and Monitoring and the third phase is Evaluation and Follow-up.

Table 3-9 Workshop's implementation phases and final objectives

Implementation Phases	Final Objectives
1st phase: Planning and Visioning	• Participatory mapping of the current situation. • Identification of local needs and key issues. • Assessment of relevant past projects. • Co-design of future interventions. • Securing consensus. • Transparency in planning.
2nd phase: Implementation and Monitoring	• Development & evaluation of alternatives. • Conflict management. • Ensuring vision implementation. • Accountability should be assigned.
3rd phase: Evaluation and Follow-up	• Feedback. • Raising awareness in the local community. • Ensuring continuity.

For the three phases of the engagement actions, a different approach to participatory tools is foreseen.

In the **first phase**, which concerns *Planning and Visioning*, it is necessary to organise open workshops with the mapped local stakeholders. Participatory planning workshops aim to ensure that different groups can participate on an equal footing in decision-making processes. This also

ensures that planning and decision-making is done with a fuller knowledge and understanding of local issues and needs. It is also important to organise Open Events, which should be properly communicated to stakeholders in order to achieve the highest possible participation rate. As part of the first phase, information events are organised to raise awareness and information and to pursue project support from stakeholders. At the same time, working meetings should be foreseen in all work phases. For the first phase, the working meetings are focus group meetings, where a target group of 8 to 15 people participate in a discussion on a predefined topic related to the project. The meeting is led by a team member and a representative of the project team and is used to assess the feasibility of the project and the needs of stakeholders in relation to the project. In the first phase it is also important, when carrying out the actions, to distribute questionnaires regarding the project. With these questionnaires citizens and stakeholders are asked about their views and attitudes. At the same time, they are encouraged to participate in developing solutions and monitoring the progress of the project.

During the **second phase**, which concerns the implementation and monitoring of the actions, it is recommended to organise open events in order to continue the information collection and to maintain the support of the stakeholders achieved by the actions of the first phase. In the same spirit, Exhibitions and Panels are organised where supporting and communication material is presented, providing information on the project, and raising awareness on specific issues. During the implementation and monitoring phase, it is proposed to organise field visits by the project team, meetings of project experts and roundtables where a discussion between decision-makers and interest groups on a central issue are held in order to find a commonly agreed solution (recommended for conflict resolution). During this phase the Citizens' Reports are prepared, where it is recommended to randomly select citizens who are invited to develop a report according to their own experience and knowledge, making recommendations and evaluating the progress of the project so far.

In **phase three**, Evaluation and Follow-up, forums and workshops or conferences, in addition to exhibitions/panels, are organised to monitor the performance of the project. Open Participatory Assessment, Monitoring and Evaluation events are also organised, where key stakeholders are actively involved in the process of collecting, processing and utilising information on the impact of the interventions and the findings of the process feed back to the project implementation team for corrective actions, if identified as necessary.

Table 3-10 Plan Implementation Tools and corresponding implementation phases

Open workshops	
Participatory planning workshops	1st phase: Planning and Visioning
Open Events	
Information events	2nd phase: Implementation and Monitoring
Exhibitions/Panels	2nd phase: Implementation and Monitoring 3rd phase: Evaluation and Follow-up
Forums/Workshops, conferences	3rd phase: Evaluation and Follow-up

Questionnaires	All implementation phases
Working meetings	
Field visits	2nd phase: Implementation and Monitoring
Meetings of experts	2nd phase: Implementation and Monitoring 3rd phase: Evaluation and Follow-up
Roundtables	2nd phase: Implementation and Monitoring
Focus groups	1st phase: Planning and Visioning
Open Participatory Assessment, Monitoring and Evaluation	2nd phase: Implementation and Monitoring 3rd phase: Evaluation and Follow-up
Establishment and meeting of a local project team	All implementation phases
Other actions	
Citizens report	2nd phase: Implementation and Monitoring 3rd phase: Evaluation and Follow-up
Questionnaires	1st phase: Planning and Visioning 2nd phase: Implementation and Monitoring
Online participation	All implementation phases

General guidelines for the implementation of participatory tools

In each case of application of the above tools it is advisable to take into account the following:

- Writing up reports and practices after the implementation of a participatory action to feed into the design of the next one.
- Use of visual media.
- Use of visual tools such as Slido, Mentimeter, Google Forms.
- Freedom for discussion.
- Limited duration of introductory presentations and more time for discussion.
- Provision of information material to participants so that they can refer to the information after the action has ended.
- The involvement in a participatory process of a group of participants with different characteristics and knowledge backgrounds may imply different understanding of issues. For this reason, careful presentation of the topic under consideration is required to ensure that unfamiliar concepts are understood by all participants.
- Conservative time estimation.

- Handy and simple writing material.
- Action planning in advance. During implementation, paying particular attention to ensure that the plan is followed.
- Appropriate selection of participants so as to ensure a plurality of views through the participation of all stakeholder groups.
- Seeking a climate of discussion by the facilitator to create.

Collecting opinion and feedback of stakeholders and citizens

Questionnaires should be distributed to register and evaluate the concerns and recommendations of the local stakeholders and citizens in relation to the interventions suggested in the scope of RE-EMPOWERED scope of work. The assessment of these questionnaires will deliver a set of demo site specific boundary conditions depicting the valuable feedback of local stakeholders and citizens on the application of the proposed solutions. Questionnaires can be distributed not only among the participants of the event but also among the broader island population to guarantee that all interests are considered based on preliminary aspects discussed during the first event. The broad distribution of questionnaires will also possibly enable the capture of negative views from locals.

At the end of the day collecting feedback and opinions of the local community members at an early planning phase will contribute to build support from them and give them the space to express their views and understand their potential role in the project.

Assessment of the initial engagement process

The initial engagement process will be evaluated in terms of level, quality and broadness of participation. This process will provide valuable feedback on the next steps of engagement, for example on providing insights on how to reach and capture feedback from the “hard to reach groups”. Moreover, the evaluation will provide information on the most appropriate times or venues for events and workshops. These actions should provide feedback to the future engagement process.

3.4 Energy Community Handbook

Participatory energy transition

Participatory Energy Transition and Energy Communities

The necessity to tackle climate change and reduce greenhouse gas emissions has led to a really quick transition on the energy sector from fossil fuels technology to renewable energy sources. The energy transitions that have happened in the past, had as a motive the total exploitation of the new energy resource, while also being up to bottom with no interest on the social and environmental changes it might cause.

Nevertheless, the current energy transition is defined by its urgency, the need for a holistic change of mentality and a larger social and economic impact on the lives of citizens. Meanwhile, the rapid development of Renewable Energy Sources has caused a lot of oppositions from the people being impacted by the installations, mainly because of their lack of involvement and perceived lack of direct (or indirect) benefit from these projects.

Thus, the energy transition cannot be fair or complete, without the direct participation of the local citizens. Participatory energy transition could provide multiple advantages in the immense need of the energy transition from fossil fuels:

- Relief of the increasing demands of large energy systems with decentralized and autonomous energy systems.
- Best use of the areas that are suited for renewable energy sources while taking into consideration the minimum damage to the local environment.
- General larger social acceptance of renewable energy sources projects.
- Better information of the people regarding sustainability.

Energy communities are the most effective way for citizens to be directly involved in the energy transition [1][2][3]. Local energy communities most often work as cooperatives of people, which engage with values as direct democracy, solidarity, and equality. Their main fields of activity can be the production of energy from renewable energy sources to cover local needs, the role of the aggregator in the electricity market, rational use of energy, energy efficiency, sustainable transport, and demand management. The energy community can efficiently manage the installed renewable sources over the long term, functioning as a self-sustaining group.

Energy Communities Legislation

In 2016, the European Union presented “Clean energy package for all Europeans”. The package includes many legislative proposals regarding the transition to a clean energy economy which have been adopted by the European Parliament in November 2018 and March 2019. These proposals are mainly centered around energy efficiency, renewable energy sources and regulative frameworks for the energy markets, while implementing a bottom-up model that encourages the participation of citizens, local stakeholders, and local government in the energy transition.

The legislative proposals of “Clean energy package for all Europeans” included two specific directives (Renewable Energy Directive and Electricity Directive) that encourage and set the basis for the establishment and participation in the electricity market of renewable energy communities and citizens, with the aim of creating a citizen-centered energy system.

Specifically, Electricity Directive introduces the schemes of renewable energy communities and citizens' energy communities and gives them the right to own, establish, purchase or lease network infrastructure either on the public grid or as operators of closed distribution systems or microgrids. The aforementioned Directive also focuses on the fair participation of citizens in energy communities, as well as their just treatment and behavior in the electricity system.

Renewable Energy Directive focuses on the importance of the role that Energy Communities (ECs) can play for the social acceptance of renewable energy projects through local participation and benefits, as well as the need to provide offsets to the difficulties around the location of projects. In particular, it is noted that Members States should consider provisions to support renewable energy communities with technical and financial aid and reduced administrative procedures, while taking into account the increased cost for the production of energy in small islands and outermost regions. Meanwhile, it stressed out through the directive the necessity to promote renewable energy communities in these regions in order to increase their energy autonomy and to serve as an example for the implementation of innovative energy technologies for the Union.

All the legislations and measures mentioned above are supported by the Just Transition Mechanism (JTM). JTM is a key tool to ensure that the transition to a climate-neutral economy is carried out in a fair and just way, with no one left behind. The EU will provide financial support and technical assistance to citizens, businesses, and regions most affected by the transition to a green economy through the Just Transition Mechanism. The JTM will help support those most affected by making investment more attractive and proposing a financial support package that will mobilize at least €100 billion of investment over the period 2021-2027 in the most affected regions to mitigate the socio-economic impacts of the transition.

Incentives for an Energy Community – Greece

In 2018, Greece became the first Member State of the European Union that created a complete legislative framework concerning Energy Communities. In 2021, there were 667 active Energy Communities in Greece, with most of them being based in the mainland and especially in the areas that will be most affected by the delignification process.

Two new legal entities have been established with the latest Law 5037/2023 (Government Gazette 78A/28-3-2023): the Renewable Energy Communities (REC) and the Citizen Energy Communities (CEC), which essentially replace the Energy Communities under Law 4513/2018 that existed so far.

The new law leads to harmonization of national law with EU Directives 2018/2001 and 2019/944, while also aims to address the misuse of the Energy Communities established by Law 4513/2018.

Legislative & Regulatory Incentives

The Law 5037/2023 provides the full legislative framework for the Energy Communities in Greece. The main legislative and regulatory incentives that are provided in this law are described in 3.11.

Table 3-11 Legislative and regulatory incentives in Greece

Renewable Energy Communities (RECs)	Citizen Energy Communities (CECs)
Issuance of Installation and Operation Licenses, examined as a priority	Have the right to manage within the community the electricity produced from the community's production units
Can be included in the respective development law, as a distinct form of cooperative organization, as well as in other programs funded by national or European resources	Have the right to own, establish, purchase, or lease distribution networks and autonomously manage them
By joint decision of the Ministry of Environment and Energy and, in each case, the competent Ministry, they can be included in subsidized programs for the installation of solar PV systems and storage systems from REC, to implement virtual energy netting	Have access to all electricity markets, either directly or through aggregated representation
Exempt from the obligation to submit a Producer Certification Guarantee Letter, from the application fee for Producer Certification at RAE (Regulatory Authority for Energy)	By decision of the Ministry of Environment and Energy, financial incentives and support measures for CEC can be established
The Physical Installation Space Reservation Fee and the Installation and Electrical Space Reservation Extension Fee are reduced by 50%	Regarding the consumption of self-produced electricity, CEC members are treated as active customers
Do not have the obligation to be registered the National Social Security Body with the status of a REC member	Do not have the obligation to be registered the National Social Security Body with the status of a REC member
Can define preferential charges and longer usage duration of the services of the Last Resort Aggregator	

It is pointed out that according to Law 4759/2020 (Art. 160) all energy communities from January 1st 2022 are prohibited from concluding operational support contracts outside of competitive bidding procedures, with the exception of the stations of the Special Program for the Development of Photovoltaic Systems in buildings. In addition, the same energy communities cannot, after July 1st, 2021, conclude more than two operating aid contracts for photovoltaic stations and for a total installed capacity of more than 1 MW, without the previous participation in a competitive bidding process. Excluded from this, for an additional year, are the energy communities in which local authorities of first and second grade participate and for the energy communities with more than 60 members, of which at least 50 are natural persons, with a maximum limit of 18 MW. The latter

exception is being considered for an extension. Finally, a member of energy community, which aims at the production of electricity from a RES station or CHP or a Hybrid Station, which is reinforced through an Operational Aid Contract, cannot be a member of another energy community that operates in the same Region and has the above purpose.

Funding methods

According to the Laws 4513/2018 and 5037/2023, Energy Communities may be treated and funded as Social Cooperative Enterprises, as well as in other programmes funded by national resources or European Union funds in relation to their objectives. Energy Communities can also be funded by banking organizations or even be self-funded.

The publication of the action for the financing of energy communities through the National Strategic Reference Framework (NSRF) with 25 million Euros for electrification, production of energy from RES and district heating, was announced in July 2019 which would concern investments of investment projects by 50% - 60%, with a maximum limit of 1 million Euros. This action was the exclusive source of subsidized funding for energy communities and to date 1462 energy communities have been established..

According to Law 5106/2024 through a new program named “Apollon” all of the 13 Regions of Greece are going to become energy communities in order to reduce their energy costs by 50%. The first energy community of this program is going to be one that will include all the vulnerable households and cover their energy needs for the next 20 years. This initiative will be funded with 100 million Euros from European Union funds as part of the National Recovery and Resilience Plan (NRRP) “Greece 2.0”.

With regard to bank financing, it is necessary to submit a business plan, with estimates of community revenue and therefore, some forecasts for parameters such as price developments in competitive processes. If the character of the community is for-profit and profits are presented, then it is easier to document the financial viability of the project, compared to the case where the benefits correspond to energy cost reduction.

Incentives for an Energy Community – Denmark

Denmark does not yet have a legislative framework that follows the Renewable Energy Directive and the Electricity Directive that were proposed by the EU in 2018 and defined the legal framework for the concept of Energy Communities. Nevertheless, Denmark has a long-history tradition in Energy Communities and cooperatives.

The oil crisis of the 70s led Denmark to make a turn to renewable energy and especially wind energy. This also gave birth to the first wind energy cooperatives in the country. Local energy cooperatives and self-production was supported in 1992 by a feed-in tariff program, interconnection and a power purchase at a “fair price” at 85% of retail rates. It is estimated that in 2002, 40% of the installed wind turbines were owned by energy cooperatives and that over 150,000 families were actively involved in wind power.

In 2002 there was a halt at the cooperatives rise in wind power market mainly because of the stop of the support from the state through the feed-in tariff program. Another factor was the repowering

of the old wind turbines with newer and bigger ones which allowed large companies and service providers to enter and dominate the market.

In 2002, there were recorded 1,109 energy cooperatives, while up to 2018 only the 12% of them were still active, including the energy communities on the islands of Ærø and Samsø. In addition, it is noted that energy cooperatives and communities play an important role in the district heating industry with most of the district heating installations being owned either by municipalities or consumer cooperatives.

Legislative & Regulatory Incentives

Denmark organizes public meetings at the local level, to promote and share expertise on energy efficiency and the use of renewable energy by homeowners. These meetings are organized and funded by the Danish Energy Agency with participants from SparEnergi.dk and the local municipality. The meetings especially contribute from oil boilers to heat pumps.

As part of the Danish commitment to comply with the Directive (EU) 2018/2001 article 18 a qualification scheme is managed by the Danish Energy Agency. The qualification scheme validates the qualification of the installer to ensure energy efficient installations and is promoted at the citizen-oriented homepage SparEnergi.dk and at local energy meeting for citizens.

On 2009, the Danish Renewable Energy Act entered into force. Its main goal was to increase the involvement of local citizens on renewable energy projects and to promote the acceptance of newer and bigger wind farm developments. The main impact of the Act was the obligation that all new wind projects with wind turbines that are at least 25 meters high, including both onshore and offshore installations, must offer at least 20% of their ownership to locals who live maximum 4.5 km from the installations.

The Act on Support for Utilization of Renewable Energy Sources (Consolidated Act No. 1791 of 2 September 2021) and the Electricity Supply Act nº984 of 2021 established the basis for energy communities in Denmark.

The Order BEK 2021/1069 developed the rules for energy communities, and transposed the European Regulation set in 2019. This Order differentiates between Renewable Energy Communities (RECs) and Citizen Energy Communities (CECs), following the definitions developed by the European Commission, however, nearly all rights and obligations are the same for both, and there is not a real differentiation. Energy communities are referred as *Energifælleskaber* (Energy Communities), rather than being differentiated as *Borgerenergifællesskaber* (Citizen Energy Communities) and *VE-fællesskaber* (Renewable Energy Communities)[10].

Electricity can be shared behind the meter or using the power grid. Electricity sharing behind the meter is restricted to a single building, for example, a housing cooperative with a rooftop solar PV. Electricity sharing using the power grid is more common.

Funding methods

[10] Source: https://pub.norden.org/nordicenergyresearch2023-03/denmark.html.

The Danish Renewable Energy Act provides subsidies and funding to wind energy communities or local groups and municipalities that are willing to install new wind turbines in their locality:

- Maximum subside of 67,000 € per project.
- 0.05 cent per kWh for 22,000 peak-load hours for each wind turbine.

It can be also mentioned that, in 2021, the Danish government and the Danish political parties decided to offer a grant pool of DKK 4 million, to support the development of energy communities in Denmark during the period 2022-2025. This fund is managed by the Danish Energy Agency, and the total funds were used in 2022.

Incentives for an Energy Community – India

Energy Communities in India first appeared in the 1950s mainly with small scale hydroelectric plants. Moreover, Energy Communities have reappeared lately by the form of micro/mini-grid projects, mini-renewables and stand-alone solar systems. This mainly due to the problem of electrification in the rural areas of India. Despite the extension of the main grid, in 2018 it was reported that 29 million households had none or unreliable access to electricity. Thus, the projects aforementioned carried by local energy communities provide an important solution to the problem.

Legislative & Regulatory Incentives

In 2016 in order to promote the establishment of 10,000 micro grids in India the Ministry of New and Renewable Energy published the “Draft National Policy on RE based Mini/Micro grids” [4] which mainly stated that:

- Entrepreneurs are not required to obtain a license to distribute electricity.
- State Electricity Regulatory Commissions (SERCs) cannot regulate electricity tariffs on the Mini/Micro grids.
- Mini grid entrepreneurs can set electricity rates.
- The responsible state authority (electricity board or development authority acting as the state nodal agency) can set the tariffs for mini grid project that have been subsided.
- In case of interconnection of the mini grid to the central grid it is offered to the mini grid to sell the electricity to the operator under a PPA.

In 2016 the Uttar Pradesh state published to the “Mini-Grid Policy 2016” [5] which stated that developers can start a mini-grid project and directly connect it to the central grid from the beginning, while it also offers special exit options to the operator of the mini grid project.

3.5 Roadmap for the creation of an Energy Community: Greece

Establishment of an Energy Community

The procedure for setting up an energy community (REC or CEC) follows the procedure for the establishment of a civil partnership and includes the drawing up of the articles of the constitution, the signing of it from the members, the deposit of it at the peace court and the registration in the Special Register of energy communities of the General Commercial Registry. On completion of this procedure, the energy community automatically becomes the beneficiary of the financial incentives and support measures provided for by the law.

Lastly, the Law provides for the possibility for the energy community of converting existing cooperatives and businesses to energy community status. The conversion procedure results from the combined application of Article 16 of Law No. 1667/86 and the relevant provisions of the provisions of the Law on the establishment of energy communities. Law 5037/2023 also provides the possibility for energy communities of Law 4513/2018 to be converted to RECs or CECs.

The basic prerequisites for the formation of the founding group of an energy community are:

1) **Shared values**: What ethical and political principles will govern the energy community? For example, will the purchase of raw materials be done by cooperatives and local producers or by the wider market?
2) **Common expectations**: The different personal expectations from participating in an energy community must be articulated clearly and honestly from the beginning and agreed collectively.
3) **Commitment to the cooperative operating framework**: Collective decision-making and solution-finding processes must be discussed from the outset. Will all members be actively involved? How will decisions be made (by consensus or by vote)?
4) **Skills / competences / knowledge**: It is important to describe all the relevant requirements in skills / competences / knowledge and to decide in time on a system of task allocation. 'Regional' tasks such as accounting, financial management, technical support, etc. must be adequately covered. Here assistance can be sought from other energy communities on how they carry out these activities. Also, training seminars can increase members' knowledge / skills / abilities. Finally, networking with other energy communities can address these regional needs horizontally through the creation of support structures (e.g., an energy community network can undertake the promotion actions of individual energy community members).
5) **Admission of new members**: It is necessary to set specific criteria and procedures for the entry of new members. Capital contribution requirements must also be decided for the approval of new members (e.g., equal to or greater than the original share, once or in instalments).
6) **Selection of employees**: It is necessary to set criteria for the selection of employees (members or not; With criteria of skills / competence / knowledge?). It is important to set up procedures to check each other at regular intervals, as well as procedures for withdrawal in case of systematic violation of the commonly accepted cooperation frameworks.

7) **Involvement of other partners or the local community:** It is important, for social and economic reasons, to cultivate from the outset the mutual support between the energy community and the local community. Equally important is networking at local, national, and European level (e.g., informal national networks, formation of a national federation, participation in the European Confederation of Energy Cooperatives RESCoop.eu) as it offers opportunities for training, exchange of experience and know-how, requests and access to investment funds. Besides, for example, a partnership with a public organization can increase its credibility to the local community. Similarly, working with an academic institution to analyse the environmental impact of a proposed project can help ensure local community support for the energy community's projects. Indicatively, categories of groups for cooperation could be: local authorities, educational institutions, professional chambers, network managers, individuals, companies for development and implementation of RES projects, environmental organizations, national and European bodies.

8) **Distribution of tasks for the establishment of the company**: The distribution should be as evenly balanced as possible and to avoid creating protagonists and accomplices of different speeds at the stage of establishment. Regular meetings are a useful feedback tool for the progress of the work undertaken by each subgroup, so they should be well organized in terms of subject matter and of a certain duration.

Purpose of an Energy Community

The purpose of the energy communities according to Law 4513/2018 is:

I. Promoting the social and solidarity economy and innovation in the energy sector.

II. Addressing energy poverty and promoting energy sustainability.

III. Production, storage, self-consumption, distribution and supply of energy.

IV. Enhancing energy self-sufficiency and security in island municipalities.

V. Improving energy efficiency in end-use at local and regional level.

According to Law 5037/2023, the primary purpose of REC or CEC is not financial profit, but the provision of environmental, economic and social benefits to its members and the local areas where it operates.

Activities of an Energy Community

RECs Activities

The activities of RECs as provided by Law 5037/2023, are divided into obligatory and additional activities. Energy communities must carry out at least one of the cores and any of the additional activities.

The obligatory activities of RECs include one of the following:

- Production.
- Consumption.
- Storage.
- and sale of energy from renewable sources.

Additionally, RECs may potentially engage in the following activities:

- Application of virtual energy net metering from RES (Renewable Energy Sources) stations with or without storage to meet the energy needs of their members, consumers living below the poverty line, and property of the REC.
- Management, especially collection, transport, processing, storage, or disposal of raw materials for the production of energy from biomass, biofuels, biogas, biomethane, or through the energy utilization of the biodegradable fraction of municipal waste.
- Installation and operation of water desalination units using RES.
- Development, management, and exploitation of alternative fuel infrastructure.
- Provision of energy services.
- Engagement in the activity of aggregated representation.
- Promotion of electromobility actions, including the activity of operating electric vehicle charging infrastructure.
- Public utility actions related to the sufficiency and supply of raw materials, energy, fuels, and water.

If a first- or second-degree local authority takes the initiative to establish an energy community, it will select, from the above, the activities that best meet the local needs.

CECs Activities

The activities of RECs as provided by Law 5037/2023, are divided into obligatory and additional activities. Energy communities must carry out at least one of the cores and any of the additional activities.

CECs are required to engage in at least one of the following activities:

- Production, self-consumption, or sale of electricity from renewable sources.
- Storage, distribution, and supply of electricity.
- Aggregated representation.
- Provision of flexibility and balancing services.
- Provision of energy efficiency services.
- Provision of electric vehicle charging services and other energy services to its members.

CECs may also engage in the following activities:

- Management or participation in programs funded by national or European Union resources related to promoting its purpose.
- Providing consultancy for the management or participation of its members in programs funded by national or European Union resources related to its purposes.
- Informing, educating, and raising awareness on issues of energy sustainability.
- Actions to support vulnerable consumers and address energy poverty for consumers living below the poverty line, regardless of whether these consumers are its members, particularly providing or offsetting energy, upgrading the energy efficiency of homes, or other actions that reduce energy consumption in the aforementioned homes.

- In the area they operate, they have the right to own, establish, purchase, or lease distribution networks and manage them autonomously.

➢ **CECs can additionally engage in the activities of RECs and enjoy their financial incentives and support measures.**

➢ CECs operate within one or more regions.

If a first- or second-degree local authority takes the initiative to establish an energy community, it will select, from the above, the activities that best meet the local needs.

Members of the Energy Community

RECs Members

Members of an REC can be:

- Natural persons.
- Local Government Organizations (first and second degree).
- Enterprises owned by Local Government Organizations.
- Small and medium-sized enterprises (SMEs).
- Agricultural and urban cooperatives.
- Legal entities of public or private law with a non-profit character.

The minimum number of members of an REC is:

- 30 members,
- or 20 members for islands with fewer than 3,100 inhabitants,
- or 15 members if exclusively SMEs participate,
- or 3 members if at least 1 Local Government Organization participates and the other 2 members are either enterprises of Local Government Organizations or Local Government Organizations themselves.

CECs Members

Members of a CEC can be:

- Natural persons.
- Local Government Organizations (first and second degree).
- Enterprises owned by Local Government Organizations, or associations of Local Government Organizations.
- Legal entities of public or private law with non-profit character.
- Agricultural and urban cooperatives.

The minimum number of members of a CEC is:

- 30 members,
- or 20 members for islands with fewer than 3,100 inhabitants,
- or 15 members if exclusively legal entities of private law or legal entities of public law participate,

- or 3 members if at least one Local Government Organization participates and the other two members are either enterprises of Local Government Organizations or Local Government Organizations themselves.

Locality of Energy Community members

At least 50% plus one of the members must be related to the place where the headquarters of the REC are located, namely:

- The natural persons - members to have full or partial ownership or usufruct in a property which is located within the Region of the headquarters of the REC or to be citizens of the municipality of this Region.
- Property ownership by members of an REC, as form of ownership other than those mentioned above, shall not be understood as a locality criterion for these members.
- However, if two natural persons have, a joint ownership one of them and the other a usufruct, on the same property, which is located within the district of the headquarters of the REC, then, unless otherwise stated, the locality criterion is met for both members.
- The legal entities members must have their registered office within the Region of the registered office of the REC (under review by the Ministry of Energy and Environment).
- Recently, there was introduced an additional restriction on the simultaneous participation of a member of in RECs, which is active in RES projects in the same Region.

A big difference with the aforementioned is that CECs can be active in one or more regions.

Cooperative portions

Regarding both RECs and CECs:

- Every member of the energy community must possess at least one cooperative share. Members may have more than one portion but with a maximum share of 20% of the total share.
- Local authorities of first and second degree or enterprises that are 100% owned by local authorities may exceptionally participate in the cooperative capital up to a maximum limit of 40%.
- The transfer of a cooperative share to a member or to a third party is only possible after the consent of the board of directors and provided that the same criteria continue to be met.
- Each member, regardless of the number of cooperative shares it holds, participates in the general assembly with only one vote.

Organization and operation of the Energy Community

The basic structure of an energy community consists of:

I. General Assembly (GA)

II. Board of Directors (BoD)

III. Supervisory Board

IV. Management

I. General Assembly (GA)

The General Assembly of the Energy Community is the highest body and consists of all members of the cooperative. It is the main reason for the existence of the Energy Community.

The GA has the right to continuously research for the best way to cover the needs of the members. It has also the right to be informed about economic, administrative and or business matters, the right to be educated and to educate in administrative issues and also the right for equality between the members.

The responsibilities of the GA are about electing the members of the BoD, the approval of the balance sheet and the decision making about the distribution of profit or surplus.

The GA is obliged to:

- Participate in the education procedures.
- Participate creatively in decision making procedures.
- Follow the provisions of the charter and the decisions of the cooperative.
- Be responsible and with no delays with its economic obligations.
- Contribute to the development of the Energy Community.
- Support and contribute to all the collective activities.

II. Board of Directors (BoD)

The BoD role is to provide the general directions and the control of the energy community to achieve the goals set by the GA. The need of a BoD is even more important in large energy communities where there are more responsibilities and an executive director is needed to organize the strategy, the representation of the energy community and other administrative and directive activities.

Because of the importance of the role, before the members of the energy community elect the members of the BoD, it is highly important to specify their characteristics, their evaluation, and the way these members can be revoked.

III. Supervisory Board

The Energy Communities that elect a Supervisory Board are being supervised and controlled by it. The Supervisory Board has the right to inform the BoD if it ascertains any kind of offences and irregularities.

IV. Management

The Management of the energy community is concerned with how to achieve the goals set by the BoD, which include financial management, business planning and proper internal organization.

Gaidouromantra's Energy Community: A case study

The small settlement of Gaidouromantra, in Kythnos island in Greece, can serve as an ideal case for the creation of an energy community. In 2001, an innovative microgrid was established in the settlement of Gaidouromantra, with the aim to cover of the electricity demands of an off-grid settlement with Renewable Energy Sources (Photovoltaic Arrays coupled with batteries) and diesel generators while providing decentralized energy production and energy autonomy. Since 2015, due to changes in the business model of the project, the innovative microgrid has become really difficult to maintain and sometimes even to operate.

The creation of a Citizens Energy Community (CEC) for the operation of the microgrid will be able to give new life to this innovative experiment and to provide social and economic benefits to the residents of Gaidouromantra.

During the course of RE-EMPOWERED project, an intense effort took place in order to create a CEC in Gaidouromantra demo site, however this has not yet been achieved. This discussion nonetheless, sparked the initiative to found the suitable business model and operation scheme for Gaidouromantra's microgrid.

The choice of CEC over REC is mainly due to the fact that CECs exclusively have the right to own, establish, purchase, or lease distribution networks and manage them autonomously, as it is the case with Gaidouromantra microgrid.

Establishment of Gaidouromantra's Energy Community

The procedure for the establishment of the CEC of Gaidouromantra will follow the aforementioned procedure for the establishment of a civil partnership. More specifically, the General Commercial Registry (and the relevant local competent Chambers) is responsible for the procedure. For the island of Kythnos and the Cyclades in general, the competent authority is the Syros Chamber of Commerce.

Purpose of Gaidouromantra's Energy Community

The CEC of Gaidouromantra will mainly have the objective of the production, storage, self-consumption and distribution of electricity in the settlement. In addition, through the values and the way of operating an CEC, it will aim at promoting social and solidarity economy and innovation in the energy sector, through the direct participation of the settlement's residents for the operation and the maintenance of the microgrid.

Activities of Gaidouromantra's Energy Community

The activities of Gaidouromantra's Energy Community will mainly be related to the operation and maintenance of the microgrid as well as the distribution and organization of the operating costs. The main activities of the energy community will be:

- The general operation and maintenance of the microgrid.
- The receiving of the microgrid, as it will result from new interventions.
- The replacement of equipment (photovoltaic panels/power converters) when required.
- The supply of diesel for the diesel generator and its maintenance.
- The metering of electricity consumption and the issuing of electricity bills.
- Finding new members for the energy community.

Members of Gaidouromantra's Energy Community

The energy community in the microgrid of Gaidouromantra will primarily consist of the residents and consumers of the grid. Members of the energy community can also be and are proposed to be device manufacturing and supply companies, technical experts, first and second tier local authorities, such as the municipality of Kythnos, and other investors.

The minimum number of members is 20 as Gaidouromantra is under Kythnos' Municipality which is an island municipality with a permanent population of 1,568 (<3,100).

Locality of Gaidouromantra's Energy Community

The local character of Gaidouromantra's energy community will be ensured through the active participation of the residents and consumers of the grid, as well with the participation of local authorities of Kythnos island. However, since other entities are expected to participate in the energy community, it should mention that according to the Law 4513/2018, at least 50% plus one of the members must be residents of a municipality belonging to the South Aegean region.

Cooperative portions of Gaidouromantra's Energy Community

Each member of the energy community of Gaidouromantra will be obliged to hold one cooperative share. In addition to this share, each member may hold more shares up to a maximum of 20% of the cooperative capital, with the exception of the Local authorities of first and second degree or enterprises that are 100% owned by local authorities which may participate in the energy community up to a limit of 40%.

Organisation and operation of Gaidouromantra's Energy Community

The organisation of Gaidouromantra's CEC will be done through the main basic structures of energy communities: the General Assembly (GA), the Board of Directors (BoD), the Supervisory Board and the Management.

Regarding the operation of the energy community, it should be noted that it will be supported by the "Pay-as-you-go" scheme. "Pay-as-you-go" is a model that will enable the residents/consumers of Gaidouromantra to buy each time the energy they intend to consume. This scheme, which is quite simple in its logic, with the appropriate unit pricing of the electricity consumed, can cover all

the costs of the energy community microgrid. In addition, depending on the pricing policy followed, it can reduce the operational costs of the microgrid by adjusting the consumption of electricity even more in line with its production. By avoiding the use of diesel generators as much as possible, one of the most important operating costs, which is none other than the purchase of oil, will also be avoided. In addition, the costs of the energy community microgrid can also be covered by the creation of a microgrid operation and maintenance fund, as well as by making use of funding and financial incentives offered by Law 4513/2018 and its subsequent regulations at the national level.

4 Reporting of stakeholders' engagement activities

Following the guide that was described above, the stakeholders of each demo site carried out engagement activities. The details of the activities are presented in this section.

4.1 Keonjhar

In Keonjhar, 8 engagement events have been conducted since 2021. All the details are described, including the purpose of the activities and the stakeholders that attended.

Discussion on foreseen microgrid installations

Date: 19th December 2021

Location: Ranipada Village Keonjhar Demo site

Description of activity: A discussion about the installation activities of the Microgrid and the needs of the villagers has been held. The stakeholders had the opportunity to meet with the villagers and explain to them the needs of energy they have and the difficulties they are facing with the current installed system. In this meeting, all the details of the plan of the RE—EMPOWERED project have been explained.

Participants:

- Prof. A. K. Tripathi (NSAC Member).
- Dr. Srinivas Bhaskar Karanki, Demo site Leader, IIT Bhubaneswar.
- Mr. Ashok Kumar Choudary, Deputy Director, OREDA.
- Sparanch of the Village and other members of Village (approximately 10).
- Research Scholars and field assistant from IIT Bhubaneswar.

Photos from the event:

Figure 4-1 Keonjhar demo site: Discussion on foreseen microgrid installations (1)

Figure 4-2 Keonjhar demo site: Discussion on foreseen microgrid installations(2)

Figure 4-3 Keonjhar demo site: Discussion on foreseen microgrid installations(3)

Preparatory discussion for the creation and operation of Cooperative

Date: 18th Nov 2022

Location: Ranipada Village Keonjhar Demo site

Description of activity: In this event, a thorough inspection of the existing 22 kWp Microgrid was conducted. Following this, there was a visit to the location of the upcoming 50 kWp Microgrid and a detailed analysis of the placement of the various equipment. Also, an enquiry was made about the forthcoming installation of a telecommunication tower in the village.

At this activity, a meeting with Gram Panchayat Pradhan (local authority) and villagers about Co-Operative formation and cow dung also took place, where Rice Husk collection methodology was discussed. The riverbed was visited and the suggestion of providing a water facility along with the proposed 50 kWp Microgrid setup was analyzed. To temporarily relieve the problem, a surface mounted pump with a solar inverter was handed over to the village community.

Finally, the rice huller mill was checked, since it stands as a potential commercial load.

Participants:

- Prof. A. K. Tripathi (NSAC Member).
- Prof. S. P. Gon Chaudhuri (NSAC Member).
- Dr. Srinivas Bhaskar Karanki, Demo site Leader, IIT Bhubaneswar.
- Mr. Balaram Mallik, Deputy Secretary, Department of Energy (Government of Odisha).
- Mr. Suresh Behera, Department of Energy (Government of Odisha).
- Mr. Sarana Kumar Das, Revenue Inspector (Government of Odisha).
- Mrs. Nalini Naik, Sarapanch, Ranipada Village, Keonjhar District.
- Mr. Ravi Ranjan (Research Scholar).
- Mr. Pragya Nand Singh (Research Scholar).
- Mr. Uttam Kumar Prusty (Field Assistant).
- Representatives and beneficiaries of village (50 in Number).

Photos from the event:

Figure 4-4 Keonjhar demo site: Preparatory discussion for the creation and operation of Cooperative(1)

Figure 4-5 Keonjhar demo site: Preparatory discussion for the creation and operation of Cooperative(2)

Knowledge exchange visit

Date: 14th Feb 2023

Location: Ranipada Village Keonjhar Demo site

Description of activity: A meeting of the village community and the EU partners that visited was organized, as part of the Knowledge exchange plan, alongside with an Indian Consortium. The team interacted with the villagers to understand their requirements and define the optimal way of integrating the existing system with the newly developed system by RE-EMPOWERED.

CMERI partners explained to the villagers the importance of electric vehicles to be deployed in the demo site and the plan for training activities.

Participants:

- Dr. Alexandros Paspatis, ICCS-NTUA
- Ms. Alkistis Kontou, ICCS-NTUA
- Dr. Srinivas Bhaskar Karanki, IIT BBS
- Dr. Santu Giri, CMERI.
- Dr. Ritesh Kesari, VNIT.
- Dr. Argya Mitra, VNIT.
- Mr. Ravi Ranjan, IIT BBS
- Mr. Pragya Nand Singh (Research Scholar).
- Mr. Uttam Kumar Prusty (Field Assistant).
- Representatives and beneficiaries of village (10 in Number).

Photos from the event:

Figure 4-6 Keonjhar demo site: Knowledge exchange visit (1)

Figure 4-7 Keonjhar demo site: Knowledge exchange visit (2)

Figure 4-8 Keonjhar demo site: Knowledge exchange visit (3)

Figure 4-9 Keonjhar demo site: Knowledge exchange visit (4)

Discussion on the smooth operation of the Cooperative

Date: 3rd June 2023

Location: Ranipada Village Keonjhar Demo site

Description of activity: National Scientific Advisory Committee (NSAC) members met with the "Ranipada Grama Shakti Samuha", the village energy committee and panchayat members. To ensure the smooth operation and maintenance of the microgrid, it was suggested that the panchayat sarpanch should be part of the committee or a proper resolution should be passed for the committee to be adopted by the panchayat.

A discussion followed, with the village people about the availability of fuels for biomass and biogas systems. They suggested the storage of the cow dung in a single place and the proper cover for them.

Emphasis was given to the importance of the village community and its functioning. The committee's role was clearly explained for the future sustenance of the developed microgrid.

Participants:

- Dr. J.B.V. Reddy, Prof. Rajendra Prasad, Dr. A. K. Tripathi, Dr. Ashok Chowdhuri.

Principal Ivestigators (PI):

- Dr. Srinivas Bhaskar Karanki.
- Mr. Ranjan Naik, Sarpanch, Ranipada Village.

Others:

- Mr. Bramhananda Tarei, Assistant Director, OEDRA (Representatives from Department of Energy, Government of Odisha).
- Mr. Debendra Mahanta, Revenue Inspector (Government of Odisha).
- Mr. Sidharth Majhi, Block Development Officer (Government of Odisha).
- Purusottam Hembram, Assistant Executive Engineer, Govt. Of Odisha.
- Mr. Shyam C, Husk Power Systems.

- Ravi Ranjan, Pragya Nand Singh, Research Scholars IIT Bhubaneswar.
- Uttam Kumar Prusty, Field Assistant, IIT Bhubaneswar.
- Around 40 Representatives and beneficiaries of the village.

Photos from the event:

Figure 4-10 Keonjhar demo site: Discussion on the smooth operation of the Cooperative (1)

Figure 4-11 Keonjhar demo site: Discussion on the smooth operation of the Cooperative (2)

Figure 4-12 Keonjhar demo site: Discussion on the smooth operation of the Cooperative (3)

Discussion on the financial model of the Cooperative (1)

Date: 6th October 2023

Location: Ranipada Village Keonjhar Demo site

Description of activity: In this event, the work progress was monitored on the Demo site. A thorough discussion happened about the financial contribution of the villagers for the electricity supplied by the Microgrid. Thus, **a Bank account** in the name of "Ranipada Grama Shakti Samuha" was set up, to gather the payments.

Participants:

- Dr. Srinivas Bhaskar Karanki, Demo site LeaderIIT Bhubaneswar
    - Husk Power Representatives.
    - Other members of Village (approximately 10).
    - Research Scholars and field assistant from IIT Bhubaneswar.

Photos from the event:

Figure 4-13 Keonjhar demo site: Discussion on the financial model of the Cooperative: presentation of the biogass plant

Figure 4-14 Keonjhar demo site: Discussion on the financial model of the Cooperative: presentation of the control room

Discussion on the financial model of the Cooperative (2)

Date: 27th Nov 2023

Location: Ranipada Village Keonjhar Demo site

Description of activity: In this event, an Internal Monitoring Committee Meeting (IMC) took place. A meeting was also held with the "Ranipada Gaaon Shakti Samooh" committee and panchayat members. To ensure smooth operation and maintenance of the grid, the committee member was advised to collect the money from December onwards as per the rates prescribed by the state government i.e., ₹ 80/- per month from each household. Since generation is much greater than demand, they were advised to increase the load by using fans, TVs, etc.

The Sarpanch has confirmed the work related to the telephone tower that was started in the 2nd week of Dec 2023 and the land has already been marked for this installation. This will ensure the remote monitoring of the Microgrid and the proper communication between the microgrid and other parts. It was also appraised to the committee by the Demo Site leader, that in case of any further delay in telephone tower commissioning, a temporary V-SAT provision will also be explored as a temporary solution.

The villagers expressed their anxiety to see the electric vehicles operate soon. The Sarpanch mentioned that 5 lakhs sanction existed for a community center and can be expedited to improve load in the village and improve quality of life.

Participants:

- Prof. A. K. Tripathi (Former Director, CPRI & Chairman IMC).
- Mr. Ashok Chowdhuri (Former Deputy Director, OREDA & IMC Member).
- Dr. Srinivas Bhaskar Karanki (Demo Site Leader, IIT Bhubaneswar).
- Ranjan Naik (Sarpanch).
- Husk Power Systems (L1 Vendor).
- Ravi Ranjan (Research Scholar).

- Uttam Kumar Prusty (Field Assistant).

Photos from the event:

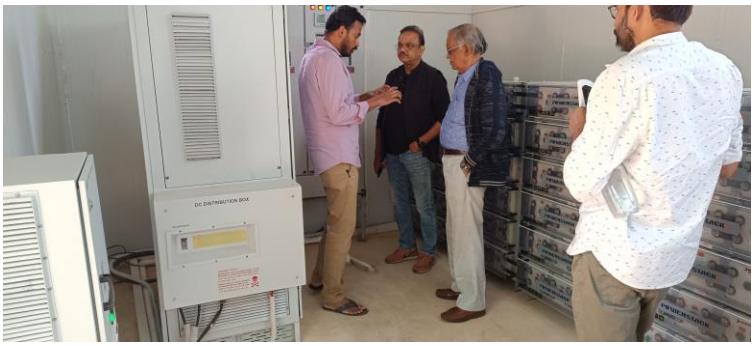

Figure 4-15 Keonjhar demo site, Discussion on the financial model of the Cooperative (1)

Figure 4-16 Keonjhar demo site, Discussion on the financial model of the Cooperative (2)

Figure 4-17 Keonjhar demo site, Discussion on the financial model of the Cooperative (3)

Figure 4-18 Keonjhar demo site, Discussion on the financial model of the Cooperative(4)

Consortium visit and engagement with the local community

Date: 4th Feb 2024

Location: Ranipada Village Keonjhar Demo site

Description of activity: The EU Team visited the Demo site. All the members visited the microgrid system where a 10-kW biomass plant, 30 kWp Solar PV system along with 180 kWh BESS have already been commissioned. They were informed that the installation of the biogas system (10 kW) is in progress. Subsequently, they met village people and discussed various issues related to the sustainability of the system. A demonstration has been also performed for the EU partners.

Consortium members had a detailed discussion with the “Ranipada Grama Shakti Samuha”, the village energy community, and interacted with the villagers about the operation of the microgrid and its benefits. After visiting the demo site, all the members moved to the IIT Bhubaneswar campus where the consortium plenary meeting was held on 5th Feb 2024. Subsequently, a meeting was arranged with the Head of School (SES) and the Director, followed by a visit to the lab.

Participants:

Indian Visitors:

- Dr. Srinivas Bhaskar Karanki (Demo Site Leader).
- Dr. Narsa Reddy Tummuru.
- Dr. Ritesh Keshri., VNIT
- Mahendra Gupta , IIT Delhi.
- Ravi Ranjan, IIT BBS.
- Pragya Nand Singh.
- Bikram Kumar Samanta, IIT KGP.
- Sujoy Jana,IIT KGP.
- Subhojit Das, IIT KGP.
- Uttam Kumar Prusty.

European Visitors:

- Prof. Nikolaos Hatziargyriou, ICCS-NTUA
- Prof. Bikash Pal, IMPERIAL
- Dr. Panos Kotsampopoulos, ICCS-NTUA
- Dr. Stratis Batzelis, IMPERIAL
- Petros Markopoulos, DAFNI
- Konstantinos Karanasios, DAFNI
- Firdous Ul Nazir, GCU

- **Photos from the event:**

Figure 4-19 Keonjhar demo site: Consortium visit and engagement with the local community, Biomass Power Plant (1)

Figure 4-20 Keonjhar demo site: Consortium visit and engagement with the local community, Biomass Power Plant (2)

Figure 4-21 Keonjhar demo site: Consortium visit and engagement with the local community, Bio-Engine (1)

Figure 4-22 Keonjhar demo site: Consortium visit and engagement with the local community, Bio-Engine (2)

Figure 4-23 Keonjhar demo site: Consortium visit and engagement with the local community, Solar PV Plant

Figure 4-24 Keonjhar demo site: Consortium visit and engagement with the local community, Meeting with village community

Figure 4-25: Meeting of Indian and EU partners at IIT BBS

Figure 4-26 Lab visit at IIT BBS

Figure 4-27 Meeting with the Director at IIT BBS

Progress monitoring

Date: 19th May 2024

Location: Ranipada Village Keonjhar Demo site.

Description of activity: In this event, the work progress was monitored on the Demo site. The villagers had the chance to enjoy an Eco Vehicle demonstration and to learn the fundamentals of its operation. The performance of the eco vehicle was conducted in hilly terrain. What is more, the modalities of the usage and tariff for the eco vehicle have been discussed with the village community.

A presentation followed, by the village community, of the commercial shops that started their operation with the contribution of the RE-EMPOWERED microgrid power supply.

Participants:

- Prof. A. K. Tripathi (Former Director, CPRI & Chairman IMC).
- Dr. Srinivas Bhaskar Karanki (Demo Site Leader, IIT Bhubaneswar).
- Husk Power Systems (L1 Vendor).
- Ravi Ranjan and Pragya Nand Singh (Research Scholar).
- Uttam Kumar Prusty (Field Assistant).
- Members from Village community (5 Members).

Photos from the event:

Figure 4-28 Keonjhar demo site, Progress monitoring (1)

Figure 4-29 Keonjhar demo site, Progress monitoring (2)

Figure 4-30 Keonjhar demo site, Progress monitoring (3)

Figure 4-31 Keonjhar demo site, Progress monitoring (4)

4.2 Ghoramara

Dissemination and informative session

Date: 13th November, 2022

Location: Ghoramara Demo site

Description of activity:

National Scientific Advisory Committee (NSAC) members visited Ghoramara and met with the project partners and the villagers. The smooth operation and maintenance of the microgrid was discussed. Emphasis was given to the importance of the village community and its role.

Participants: Prof. S. P. Ganchoudhury (DST), Dr. Suman Maiti (IIT KGP), Dr. Prabha Bhola (IIT KGP), Dr. Santu Giri (CMERI), other Project Members and Local People.

Photos from the event:

Figure 4-32 Ghoramara demo site, Dissemination and informative session

Discussion on the sustainability of RE-EMPOWERED project

Date: 5th February, 2023

Location: Kakdwip Island, Near Ghoramara Demo site

Description of activity: A cordial discussion took place among Dr. Suman Maiti, Dr. Santu Giri and Minister Bankim Chandra Hazra regarding sustainability of the RE-EMPOWERED Project.

Participants: Dr. Suman Maiti, Dr. Santu Giri, Bankim Chandra Hazra (Sundarban Development Minister) and others.

Photos from the event:

Figure 4-33 Ghoramara demo site, Discussion on the sustainability of RE-EMPOWERED project wit the Sundarban Development Minister

Discussion on foreseen installations

Date: 4th March, 2023

Location: Ghoramara Demo site

Description of activity:

A land survey was completed for the installation of PV panels, and two sites were selected for the control room building, pending soil tests for suitability and safety. Discussions were held on the installation of the Mail Feeder Pillar (MFP) and Distribution Feeder Pillar (DFP), as well as the routing of service lines to individual houses. The need for load limiters in each house was also addressed. Further discussions focused on distributing the majority of cables underground. For the electric vehicle (EV) charging station, the Panchayat Pradhan proposed installing PV panels on the rooftop of a building opposite **the Panchayat Office, with the control room housed in the same building.**

Participants: Dr. Suman Maiti, Local Panchayat People, RE-EMPOWERED Project Members, Local village people.

Photos from the event:

Figure 4-34 Ghoramara demo site, Discussion on foreseen installations

Discussion on financial model and the operation of the microgrid

Date: 26th March, 2023

Location: Ghoramara Demo site

Description of activity:

A Bhumi Puja and Coconut Ceremony was held, marking an important cultural event. Villagers engaged in discussions about electricity tariffs, with the Panchayat Pradhan noting that submeters should be installed in every house, and tariffs will be set after the formation of a co-operative. The duration of electricity supply, both during the day and night, was also discussed, with some villagers expressing concerns about nighttime supply, particularly those with individual solar panels. Villagers raised questions about power availability during the rainy season when solar generation is low, to which Swastik Chowdhury explained that while wind energy is available as an auxiliary source, its capacity is limited and will not fully compensate for reduced solar output.

Participants: Dr. Suman Maiti, Local Panchayat People, RE-EMPOWERED Project Members, Local village people.

Photos from the event:

Figure 4-35 Ghoramara demo site, Discussion on financial model and the operation of the microgrid

Discussion on the maintenance and sustainability of the microgrid

Date: 27th May, 2023
Location: Ghoramara Demo site

Description of activity:

A meeting was held at the Ghoramara Gram Panchayat office with representatives from DST, the RE-EMPOWERED project, and local authorities. Prof. S. P. Ganchoudhury provided a detailed presentation on the facilities to be deployed on the island, including a 160 kW PV power plant, a charging station, dimmable street lights, electric loaders, and an electric boat. Discussions covered plant maintenance, with AGNI responsible for the first three years and the cooperative system managing it thereafter, funded through revenue generated from flat-rate tariffs, the electric boat, and loaders. The installation of a high-mast light in the market area was also discussed, with CMERI handling procurement and AGNI managing commissioning. A flat tariff system was proposed, with load limiters ensuring equal electricity consumption across homes. It was decided that electricity would only be supplied to willing households, allowing for increased supply to those participating.

Participants:

- DST: Dr. J. V. B. Reddy, Prof. S. P. Gonchowdhuri, Prof. Rajendra Prasad, Prof. A. K. Tripathi.
- IIT KGP: Dr. Suman Maiti, Dr. Prabha Bhola, Sujoy Jana (Project Assistant), Panab Bisai (Technical Assistant), Tapan Kumar Chakraborty (Field Engineer), Mr. Gour Mondal (Field Assistant).
- CMERI: Dr. Santu Giri, Sayantan Hatui
- Local people: Panchayat Pradhan, Upa-Panchayat Pradhan, Ghoramara High school President, and few villagers (around 10)
- AGNI: Swastik Chowdhury (site manager), Arup Mahanta (Director).

Photos from the event:

Figure 4-36 Ghoramara demo site, Discussion on the maintenance and sustainability of the microgrid

Discussion and feedback from the local community for foreseen installations

Date: 17th December, 2023

Location: Kakdwip Island, Near Ghoramara Demo site

Description of activity:

A discussion was held about the rusting of the fencing cross wire, with AGNI agreeing to replace it with new GI wire and apply paint. The connection of PV modules to the 150kW inverter was also addressed, with plans to install an SMB box to monitor module health and power generation, using 6 sq.mm wires for connection. AGNI reported that the battery system is ready for inspection by IIT KGP on December 19, 2023, after which it will be dispatched if it meets the tender specifications. Plans for installing two 5.1kW wind turbines were discussed, with one to be placed behind the control room and the other near the latrine. A 2.5 kW wind turbine for research purposes will replace a damaged turbine at the cyclone center, with CMERI managing the replacement. Concerns over the long-term viability of the cooperative were raised, leading to a decision to transfer the power plant and equipment to Ghoramara Gram Panchayat, with an MoU to be signed with IIT Kharagpur. Finally, power plant security was discussed, with CCTV cameras in place and Ghoramara Gram Panchayat taking responsibility for overall security.

Participants: Prof. S. P. Gonchowdhuri, Dr. Suman Maiti, Dr. Santu Giri, Panchayat Pradhan, Upa-Panchayat Pradhan, Ghoramara High school President, Swastik Chowdhury, Bikram Kumar Samanta, Sujoy Jana, Subhojit Das, Panab Bisai, Sanjay Mandal, Tapan Kumar Chakraborty, and few villagers.

Photos from the event:

Figure 4-37 Ghoramara demo site, Discussion and feedback from the local community for foreseen installations (1)

Figure 4-38 Ghoramara demo site, Discussion and feedback from the local community for foreseen installations (2)

Figure 4-39 Ghoramara demo site, Discussion and feedback from the local community for foreseen installations (3)

Consortium visit and engagement with local community

Date: 2nd and 3rd February, 2024
Location: Ghoramara Demo site and IIT KGP
Description of activity:

EU Partners visited Ghoramara demo site and IIT KGP labs along with the Indian Partners.

Participants:

Indian Visitors:
Dr. Suman Maiti, Dr. Srinivas Bhaskar karanki, Dr. Santu Giri, Dr. Ritesh Keshri, Mahendra Gupta, Bikram Kumar Samanta, Sujoy Jana, Subhojit Das, Ravi Ranjan, Tapan Chakraborty, Pranab Bisai.

European Visitors:
Prof. Nikolaos Chatziargyriou, Prof. Bikash Pal, Dr. Panos Kotsampopoulos, Petros Markopoulos, Konstantinos Karanasios, Firdous Ul Nazir

Photos from the event:

Figure 4-40 Ghoramara demo site, Consortium visit and engagement with local community

Figure 4-41 Meeting of EU and Indian partners with IIT KGP academic staff (1)

Figure 4-42 Meeting of EU and Indian partners with IIT KGP academic staff (2)

Figure 4-43 Meeting of EU and Indian partners with IIT KGP academic staff (3)

Figure 4-44 Lab visit and ecoTools presentation to EU-Indian partners at IIT KGP (1)

Figure 4-45 Lab visit and ecoTools presentation to EU-Indian partners at IIT KGP (2)

Figure 4-46 Lab visit and ecoTools presentation to EU-Indian partners at IIT KGP (3)

Figure 4-47 Lab visit and ecoTools presentation to EU-Indian partners at IIT KGP (4)

Field visit and discussion on deployment timetable

Date: 24th February, 2024

Location: Ghoramara Demo Site

Description of activity:

FMC members conducted a field visit to review the progress of the Solar Power Plant installation, Control Room construction, and the deployment of other hardware and software. A meeting was held at the Cyclone Rescue Centre on Ghoramara Island with representatives from DST, the RE-EMPOWERED project, and vendor AGNI to discuss key project aspects, including the distribution lines. A discussion on CO2 emission reduction led to a suggestion to calculate the emission differences before and after charger installation. Additionally, it was recommended to create a checklist for each component being deployed on the island to ensure accurate timelines and effective follow-up with relevant institutes.

Participants:

DST: Dr. Anita Gupta, Dr. J. V. B. Reddy, Prof. K.V. Pillai, Prof. S. P. Gonchowdhuri, Prof. Rajendra Prasad, Prof. A. K. Tripathi, Dr. P. Koley

IIT KGP: Dr. Suman Maiti, Subhojit Das, Bikram Kumar Samanta, Sujoy Jana, Pranab Bisai, Tapan Chakraborty, Gour Mondal.

AGNI: Swastik Chowdhury, Sanjay Mondal, Suman Das.

Photos from the event:

Figure 4-48 Ghoramara demo site, Field visit and discussion on deployment timetable (1)

Figure 4-49 Ghoramara demo site, Field visit and discussion on deployment timetable (2)

Figure 4-50 Ghoramara demo site, Field visit and discussion on deployment timetable (3)

Figure 4-51 Ghoramara demo site, Field visit and discussion on deployment timetable (4)

4.3 Kythnos/Gaidouromantra

Preparatory discussions for the business plan of Gaidouromantra microgrid

Date: July and August 2023

Location: Kythnos Town Hall

Description of Activity: In the summer of 2023 (July and August) several preparatory meetings took place in Kythnos island for the creation of an energy community in Gaidouromantra or any other business plan for the operation and maintenance of the microgrid. The meetings involved discussions with local stakeholders (municipality officials, local technicians) and the residents of Gaidouromantra. The content of the discussions was mainly the identification of the needs of the residents, their feedback on the installations for the upgrade of the microgrid, as well as insights regarding the preparation, the creation, and the business plan of an energy community on the settlement of Gaidouromantra. The format of the meetings was either in small groups (e.g., with local authorities) or one-to-one informal meetings with residents or technicians who could be involved in the future maintenance of the system.

Participants:

- Mayor of Kythnos (Stamatis Garderis).
- Members of the Municipality of Kythnos Council.
- Local technicians.
- Residents of Gaidouromantra.
- DAFNI (Kostas Komninos, Petros Markopoulos, Kostas Karanasios).

Photos from the event:

Figure 4-52 Kythnos demo site, Preparatory discussions for the business plan of Gaidouromantra microgrid, Meeting with the mayor

Discussion on wind turbine installation with local community

Date: 30th September 2023.

Location: Gaidouromantra Settlement

Description of Activity: A local workshop took place about the maintenance of the wind turbine installed, with the participation of residents, students of the National Technical University of Athens, local technicians of the municipality and DAFNI. Alongside the workshop, a meeting was conducted with residents of Gaidouromantra, local technicians and DAFNI, where the installation of the wind turbine was discussed, also covering any other problems or concerns of the residents. The future operation and maintenance of the microgrid and the role of RE-EMPOWERED in this were also discussed with the residents of Gaidouromantra.

Participants:

- DAFNI (Kostas Karanasios, Stefania Ventouri, Panos Amprachamian)
- ICCS - NTUA (Kostas Latoufis)
- NTUA students
- Local technicians of the Municipality
- Residents of Gaidouromantra

Photos from the event:

Figure 4-53 Kythnos demo site, Discussion on wind turbine installation with local community, (1)

Figure 4-54 Kythnos demo site, Discussion on wind turbine installation with local community (2)

Consortium visit and engagement with local community

Date: 27th June 2024

Location: Gaidouromantra Settlement.

Description of Activity: In the framework of the consortium visit in Athens and Kythnos for 6th plenary meeting, a visit to Gaidouromantra Demo site took place. Alongside with the site visit, the consortium had the chance to discuss with residents of Gaidouromantra's settlement. The discussion was mainly focused on RE-EMPOWRED project, the future plans for the operation and maintenance of the Microgrid and the integration and use of the ecoCommunity tool.

Participants:

- Consortium partners (EU and India).
- Residents of Gaidouromantra.

Photos from the event:

Figure 4-55 Kythnos demo site, Consortium visit and engagement with local community (1)

Figure 4-56 Kythnos demo site, Consortium visit and engagement with local community (2)

Figure 4-57 Kythnos demo site, Consortium visit and engagement with local community (3)

Figure 4-58 Kythnos demo site, Consortium visit and engagement with local community(4)

Discussion with local technicians for the integration of ecotools in Kythnos power system

Date: 27th June 2024.

Location: Local thermal power station.

Description of Activity: In the framework of the consortium visit in Athens and Kythnos for 6th plenary meeting, a visit to the local thermal power station took place in 27th June 2024. During the visit and the demonstration of the operation of the power station, the consortium had the chance to discuss with local technicians of the Public Power Corporation (PPC) and the operators of the station. The discussion was mainly focused on the integration of ecoTools (ecoEMS, ecoPlanning) of RE-EMPOWERED project in the electrical system of Kythnos and how they can be best exploited.

Participants:

- Consortium partners (EU and India)
- Local technicians
- Operators of local thermal power station (PPC).

Photos from the event:

Figure 4-59 Kythnos demo site: Discussion with local technicians of the power station for the integration of ecotools in Kythnos power system

Meeting with the mayor about the exploitation of RE-EMPOWERED project

Date: 28th June 2024.

Location: Kythnos' town Hall.

Description of Activity: In the framework of the consortium visit in Athens and Kythnos for 6th plenary meeting, a visit to Kythnos' town hall took place in 28th June 2024. The consortium had a meeting with the mayor of Kythnos and with members of the municipal council. The discussion was mainly about the progress of RE-EMPOWERED project and the maximum exploitation of its results.

Participants:

- Consortium partners (EU and India).
- Mayor of Kythnos (Stamatis Garderis).
- Members of Kythnos' municipal council.

Photos from the event:

Figure 4-60 Kythnos demo site, Meeting with the mayor about the exploitation of RE-EMPOWERED project (1)

Figure 4-61 Kythnos demo site, Meeting with the mayor about the exploitation of RE-EMPOWERED project(2)

Figure 4-62 Kythnos demo site, Meeting with the mayor about the exploitation of RE-EMPOWERED project (3)

Figure 4-63 Kythnos demo site, Meeting with the mayor about the exploitation of RE-EMPOWERED project (4)

4.4 Bornholm

Table 4-1 summarises the engagement activities that took place in Bornholm. Details regarding the category of the stakeholders and the methods applied are provided. Also, the stakeholders that took part in these activities are mentioned.

Table 4-1 List of events carried out in Bornholm

No	Date & Location	Description (Methods)	Participants
1	14.06.2024 Folkemødet 2024	Project representation at the democracy festival. Participated as part of a "human library" where guests could borrow a human to talk about a topic of interest.	Citizens on Bornholm Industrial decision makers Politicians
2	January 2024 Gudhjem Swimming Pool	Presentation of project and how the project will influence the project participants	Active Demo participants
3	December 2023 Gudhjem Swimming Pool	Meeting with technicians and employees at the swimming pool. Project presentation and introduction to new equipment	Active Demo participants
4	November 2023 Friskolen i Østerlars (School)	Meeting with the employees from the school	Active Demo participants
5	November 2023 Østerlars Rundkirke (Church)	Meeting with the employees from the church	Active Demo participants
6	January 2023 Gudhjem Swimming Pool	Meeting with the private households. The project was presented and the impact on the participants was discussed.	Active Demo participants

Presentation of RE-EMPOWERED project at "Democracy Festival"

Date: 14th June 2024

Location: Allinge, Bornholm, at the annual Danish "Democracy Festival" (Folkemødet)

Description of Activity: In the framework of the annual Danish "Democracy Festival" one of the events was a public presentation of the RE-EMPOWERED project, with emphasis on the

Bornholm Demo. The visitors had the chance to discuss with the project managers from the Danish partner settlement. The discussions were mainly focused on RE-EMPOWRED project - the goals with the tools and demo activities, and the future plans for the operation.

Participants:

- Project managers from the Danish Partner (BV): Christian N. Sørensen, Emilie Marker and Torben Jørgensen

- Visitors on the Democracy Festival: Several citizens from Bornholm and other parts of Denmark, Politicians – local and National.

Photos from the event:

Figure 4-64 Bornholm demo site presentation of RE-EMPOWERED project at "Democracy Festival" in Bornholm

Discussion on the active participation of Public Swimming Pool

Date: 10th January 2024

Location: Public Swimming pool in Gudhjem, Bornholm.

Description of Activity: Meeting with active participants in the Danish Demo of the RE-EMPOWERED project: The Public Swimming Pool in Gudhjem is in itself a project operated by the local citizens and also hosts the District Heating pump station for the supply of Gudhjem. The

discussions were mainly focused on the Public Swimming Pool's active participation in the RE-EMPOWRED Demo – the goals with the Tools and Demo activities, and the future plans for the operation.

Participants:

- Project manager from the Danish Partner (BV): Christian N. Sørensen
- Chairman of the Board of The Public Swimming pool in Gudhjem:

Meeting with local technicians and employees for future installations in Public Swimming Pool

Date: 18th December 2023

Location: Public Swimming pool in Gudhjem, Bornholm.

Description of Activity: Meeting with technicians and employees from active participant in the Danish Demo: the Public Swimming Pool in Gudhjem. The discussions were mainly focused at the technical installations for the Demo in the Public Swimming Pool, and the goals with the Tools and Demo activities, and the future plans for the operation.

Participants:

- Project manager from the Danish Partner (BV): Christian N Sørensen
- Technicians and employees from The Public Swimming pool in Gudhjem

Meeting with local technician for future installations in school

Date: 10th November 2023

Location: Local, private, school in Østerlars, Bornholm.

Description of Activity: Meeting with Technician from active participant in the Danish Demo in the RE-EMPOWERED project: Local, private, school in Østerlars. The discussions were mainly focused at the technical installations for the Demo in the School, and the goals with the Tools and Demo activities, and the future plans for the operation.

Participants:

- Project manager from the Danish Partner (BV): Christian N. Sørensen
- Technician from Local, private, school in Østerlars

Meeting with Daily Manager of Round-Church for the installations

Date: 6th November 2023

Location: The Round-Church in Østerlars, Bornholm.

Description of Activity: Meeting with Daily Manager from active participant in the Danish Demo in the RE-EMPOWERED project: The Round-Church in Østerlars. The discussions were mainly focused on the technical installations for the Demo site in Round-Church, and the goals with the Tools and Demo activities, and the future plans for the operation.

Participants:

- Project manager from the Danish Partner (BV): Christian N. Sørensen
- Daily Manager from The Round-Church in Østerlars

Presentation of the impacts of the project on participants

Date: 19th January 2024

Location: Swimming Pool in Gudhjem, Bornholm.

Description of Activity: Presentation of the project for all the private district heating customers who have agreed to participate in the project. Presentation and discussion were focused on the project as a whole and the direct impact the project will have on the participants.

Participants:

- Project manager from the Danish Partner (BV): Christian N. Sørensen
- Daily Manager from Swimming pool in Gudhjem
- Participating citizens

5 Stakeholders' Analysis

An extensive analysis of all the stakeholders follows. For every demo site, all the stakeholders are going to be described, based on the level of influence and the level of interest each one has for the project. This process will accurately place each stakeholder in the appropriate category, in accordance with the categorization explained in section 3.2. The stakeholders are also categorized in tables by their jurisdictional levels.

5.1 Keonjhar and Ranipada Gram Shakti Samooh

5.1.1. Keonjhar

In Keonjhar, most of the local stakeholders have a great interest in the evolution of the project. Regional and national stakeholders share the maximum level of influence for the conduction of this project, with the last ones having the most interest in the successful completion of this initiative. International stakeholders focus on networking.

It should be noted that a dedicated Section (5.3) describes the formed Cooperative Society.

Local Stakeholders

Table 5-1 Local Stakeholders list of Keonjhar

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Gram Panchayat (local authority)	3	4	B	Communication channel between partners and local stakeholders. Central role in the creation of an energy community for the ownership and future management of the interventions.
2	Farmers	1	2	B	Cow dung and rice husk supplier.
3	Rice Huller Owners	1	3	B	Husk supplier & end users
4	Ranipada Gram Shakti Samooh	2	4	D	An energy community for the ownership and future management of the microgrid.

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
5	Local Residents	1	4	C	End users
6	Financing agents and institutions	1	1	A	Saving Accounts of the Energy Community
7	Business owners	1	2	B	They will be paying the electricity bill under commercial applications.
8	EV Drivers	1	3	B	Implementation of the electric vehicle charger management model

Regional Stakeholders

Table 5-2 Regional Stakeholders list of Keonjhar

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Tehsil Office	2	1	B	Regional Administrator
2	Odisha Forest Department	2	1	B	Granted Permission for Land Acquisition
3	Department of Energy-Government of Odisha	4	3	C	Legislation licensing, Considered as project support
4	Odisha Renewable Energy Development Agency	5	3	C	Owner of the existing microgrid.

National Stakeholders

Table 5-3 National Stakeholders list of Keonjhar

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Department of Science & Technology-GoI	5	5	D	Financial Sponsor
2	IIT BBS	5	5	D	Consultancy, Demo site leader
3	BSNL	3	1	C	Internet Provider
4	Husk Power Solutions	3	3	C	Implementation agency and micro grid maintenance up to 3 years

International Stakeholders

Table 5-4 International Stakeholders list of Keonjhar

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Mission Innovation	1	4	B	Networking

A more illustrative representation of the group to which each stakeholder mentioned above belongs is provided in the following figure.

Figure 5-1 The distribution of the stakeholders in groups (Keonjhar)

5.1.2 Ranipada Gram Shakti Samooh – The Energy Community of Keonjhar

As a result of the initiatives of the RE-EMPOWERED project an energy community (Cooperative Society) was created at Keonjhar demo site. The details about the structure and the operation of this energy community are analyzed in this section.

Members and organization

The Energy Community named “Ranipada Gram Shakti Samooh” consists of 75 members. The current office bearers are:

- Head of the Committee: Nalini Nayak (sarpanch).
- President: Mohan Dehury.
- Secretary: Madhusudan Dehury.

Business Plan of the Energy Community in Ranipada Village:

<u>Energy Infrastructure:</u>

The capacity and the type of the energy infrastructures that were installed in the energy community are presented in the Table 5-5.

Table 5-5 Energy infrastructures of the Ranipada Gram Shakti Samooh

Type of Power Plant	Capacity
Solar Power plant	30 kW
Biogas Power plant	10 kW
Biomass Power Plant	10 kW

Financial Management:

A community bank account has been opened in "BANK OF INDIA" to manage the financial aspects of the energy infrastructure. The funds collected through electricity charges and other sources will be deposited into this account and it will be jointly managed by both the President and the Secretary and used for maintenance and other operational costs.

Electricity Charges and Financial Contributions:

The village comprises 75 households, each contributing ₹ 80 per month for electricity charges (₹ stands for approximately 0.011€). Additionally, a diesel-operated rice huller machine has been converted to an electric-operated machine, using a 5 H.P. electric motor. The owner of this machine will pay ₹ 50 per hour for its usage. This amount is also going to be deposited into the community account.

Monthly Contribution by Households:

- Number of households: 75.
- Monthly charge per household: ₹ 80.
- Total monthly contribution: 75 households x ₹ 80 = ₹ 6,000.
- These fees are expected to be increased by 10% yearly.

Revenue from Commercial Clients:

- Number of microenterprises: 25.
- Total yearly income: ₹ 144,000.
- This income is expected to be increased by 10% yearly.

Revenue from the renting of e-3 wheelers:

- The total incomes from renting the e-3 wheelers will amount to ₹ 270,000.

Revenue from the use of solar pumps:

- The total incomes will amount to ₹ 35,000 per year.

Revenue from Electric Rice Huller Machine:

- Charge per hour: ₹ 50
- Usage hours: Approximately 4 to 5 hours /day.
- Total monthly usage hours: 30 x 4 = 120 hours.
- Monthly revenue: 120 hours x ₹ 50 = ₹6,000.
- Yearly revenue: 12 months x ₹ 6,000= ₹ 72,000.

Other Possible Revenue (Electric Loader for Passenger Transport):

- The Electric loader used for passenger transport will generate revenue through the EV charging stations. This amount will also be deposited in the community bank account. The rates for this are yet to be determined.

Maintenance Costs

The primary use of the funds collected will be for the maintenance of the solar power plant. After the completion of the vendor's contract period of 3 years, the members of the energy community will have to cover these expenditures by themselves. These include:

- Regular cleaning and other maintenance actions in solar panels.
- Replacement of faulty components, such as AC and DC cables, and battery.
- Consumables.
- Maintenance costs of the inverter.
- Labour costs.
- Fuel costs (Rice Husk, Cow Dung) for biomass/biogas as and when required.
- Maintenance of biogas and biomass plants.
- Maintenance of Electric loaders and EV charging stations.

Activities Carried Out by the Energy Community:

- Regularly monitoring the performance of the energy plants and EV charging stations.
- Daily wise logbook maintenance.
- Regular cleaning and maintenance of the solar power plant.
- Maintenance and operation of the biogas and biomass power plants.
- Routine checks and repairs for power plants & the EV charging stations.
- Coordinating the transportation of cow dung to the biogas plant using one electric loader and collecting husk from rice huller machine to the biomass husk storage room and if required purchasing the husk from the nearest rice mill.
- Managing the passenger transport service between Ranipada, Badapalaspal, and Harichandanpur using the second electric loader.
- Collection of monthly electricity charges from each household (₹ 80 per household) and business (₹ 144,000 per year).
- Collection of usage fees from the electric rice huller machine (₹ 50 per hour).
- Collection of the payments from the electric loader charging used for passenger transport.
- Management of the community bank account.
- Maintaining detailed records of income and expenses.
- Organizing community meetings to discuss the financial status and operational needs.
- Reporting to the community members on the financial health and operational status of the projects.
- Encouraging community members to contribute with ideas for improving energy and transportation services.

- Enhancing awareness about the benefits of sustainable energy and community management.
- Coordinating with the Demo site Leader Institute for future innovations.

Logistics in Ranipada Grama Shakti Samuha: Operation of the Biogas Station

Value chain of cow dung

Every procedure and all the steps, from the production of the cow dung to the usage of the byproducts of the biogas production, are explained in the following section.

Producers:

- Local farmers and households in Ranipada village are the primary producers of cow/buffalo dung.
- Cow/buffalo dung is collected from household cattle and small-scale dairy farms.

Collection and transportation:

- Multiple collection points were established within convenient distances for all households.
- Each household contributes a specified amount of dung on a daily or weekly basis.
- The cow dung is transported from the producers' collection points to the biogas plant using the designated electric loader.
- The electric loader ensures efficient and eco-friendly transportation of the biomass.

Conversion to biogas:

- The collected cow dung is directed into the biogas plant.
- Through anaerobic digestion, the cow dung is converted into biogas, a clean and renewable energy source.
- The process also produces a byproduct, known as digestate, which can be used as a high-quality organic fertilizer.

Utilization of biogas:

- The generated biogas is used to produce electricity via a 20 kVA generator, contributing to the village's energy needs.

Sale of biomass and byproducts:

- The digestate, a byproduct of the biogas production process, is sold to local farmers as an organic fertilizer.
- This creates an additional revenue stream for the community and promotes sustainable agricultural practices.

Figure 5-2 Illustration of the value chain of cow dung

5.2 Ghoramara

Local Stakeholders

Table 5-6 Local Stakeholders list of Ghoramara

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Gram Panchayat (Local authority)	3	4	D	Communication channel between partners and local stakeholders. Central role in the the ownership and future management of the interventions.
2	Local Residents	1	4	C	End users
3	Ghoramara High School President	2	2	B	Communication channel between local people and partners. Permission for

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
					installation around High School.
4	Business owners	1	2	B	Payment of the electricity bill under commercial applications.
5	EV Drivers	1	3	B	Implementation of the electric vehicle charger management model
6	Eboat operators	1	3	B	Implementation of the e boat charging model

Regional Stakeholders

Table 5-7 Regional Stakeholders list of Ghoramara

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Government of West Bengal	2	1	B	Regional Administrator
2	West Bengal Forest Department	2	1	B	Granted Permission for Land Acquisition
3	Department of Power Government of West Bengal	4	3	C	Legislation licensing, Considered as project support
4	West Bengal Renewable Energy Development Agency	5	3	C	Owner of the existing microgrid.

National Stakeholders

Table 5-8 National Stakeholders list of Ghoramara

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Department of Science & Technology (DST)-GoI	5	5	D	Financial Sponsor
2	IIT KGP	5	5	D	Consultancy, Demo site leader
3	AGNI	3	3	C	Comprehensive maintenance of the microgrid for the first three years

International Stakeholders

Table 5-9 International Stakeholders list of Ghoramara

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Mission Innovation	1	4	B	Networking

A more illustrative representation of the group to which each stakeholder mentioned above belongs is provided in the following Figure 5-3.

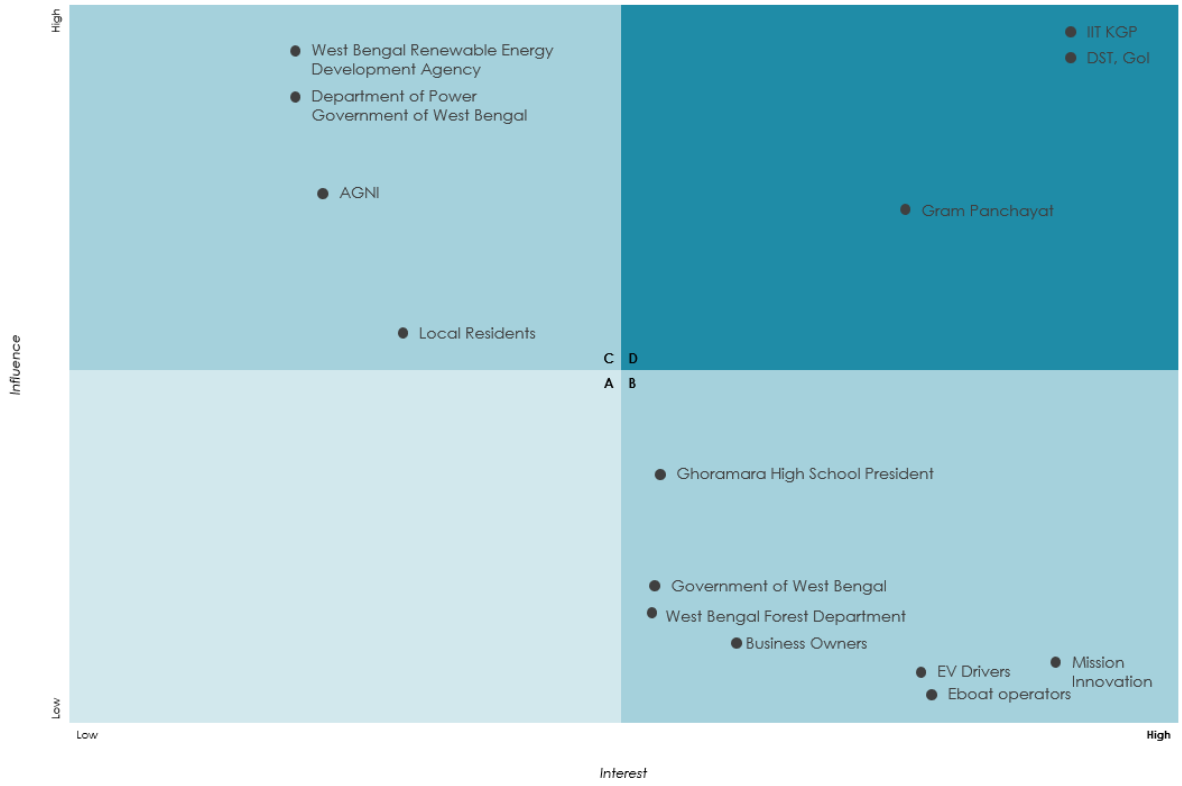

Figure 5-3 The distribution of the stakeholders in groups (Ghoramara)

5.3 Kythnos/Gaidouromantra

In this section, the stakeholders' engaged in the course of the RE-EMPOWERED project for Kythnos demo site and Gaidouromantra are analysed. The stakeholders with the maximum interest and influence on the project are as expected the local ones, with a major role of the Municipality of Kythnos and the residents of Gaidouromantra.

Local Stakeholders

Table 5-10 Local stakeholders list of Kythnos/Gaidouromantra

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Municipality of Kyhtnos	5	5	D	Horizontal support of all project activities at technical, permitting, and promotional level. Communication

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
					channel between partners and local stakeholders. Central role in the creation of an Energy Community for the ownership and future management of the interventions.
2	Municipal Technical Service	5	4	D	Provide technical support and information. Training for the integration and use of ecoTools.
3	Municipal Public Benefit Corporation of Kythnos	5	4	D	Provide technical support and information. Training for the integration and use of ecoTools.
4	School committees	2	2	A	Information and training in schools on project interventions.
5	HEDNO Kythnos	*3*	*4*	*D*	Provide technical support and information. Approval of installations where required. Possible end user of ecoTools.

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
6	Technical Companies	*2*	*2*	*A*	Information on possible contribution to the interventions to be implemented
7	Local press	2	3	B	Promotion and dissemination of project progress
8	Permanent residents	3	3	D	Mapping of local needs, end-users of all proposed interventions, feedback on project progress
9	Residents of Gaidouromantra	5	5	D	Identification of problems/needs, end-users of interventions and ecoCommunity, Members in the possible establishment of an Energy Community.
10	Associations of Island regions settlers	1	1	A	Feedback, Information on current situation and specific needs
11	Local Thermal Station of Kythnos	3	4	D	Possible end User of ecoPlatform and ecoEMS. Provide technical information
12	High school of Merichas	2	3	B	Integration and installation of ecoMonitor

Regional Stakeholders

Table 5-11 Regional stakeholders list of Kythnos/Gaidouromantra

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Regional Authority of South Aegean	2	1	A	Information on current situation and development plans
2	University of the Aegean	2	1	A	Technical information
3	Regional press	4	2	B	Dissemination and communication

National Stakeholders

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Regulatory Authority of Energy	4	1	C	Legislation
2	PPC / PPC Renewables	3	4	D	Owner of local thermal power station. Possible end User of ecoPlatform and ecoEMS. Provide technical information
3	HEDNO	4	2	C	Provision of energy consumption data, end user, recording of impact of interventions on

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
					the Kythnos Electric System.
4	IPTO	4	2	C	Demand response regulatory framework, impact of future interconnection on interventions
5	Ministry of Environment & Energy	*3*	*1*	*C*	Legislation

International Stakeholders

Table 5-12 International stakeholders list of Kythnos/Gaidouromantra

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Clean energy for EU islands	4	2	B	Networking
2	FEDARENE	3	1	B	Networking
3	Greening the islands	3	1	B	Networking

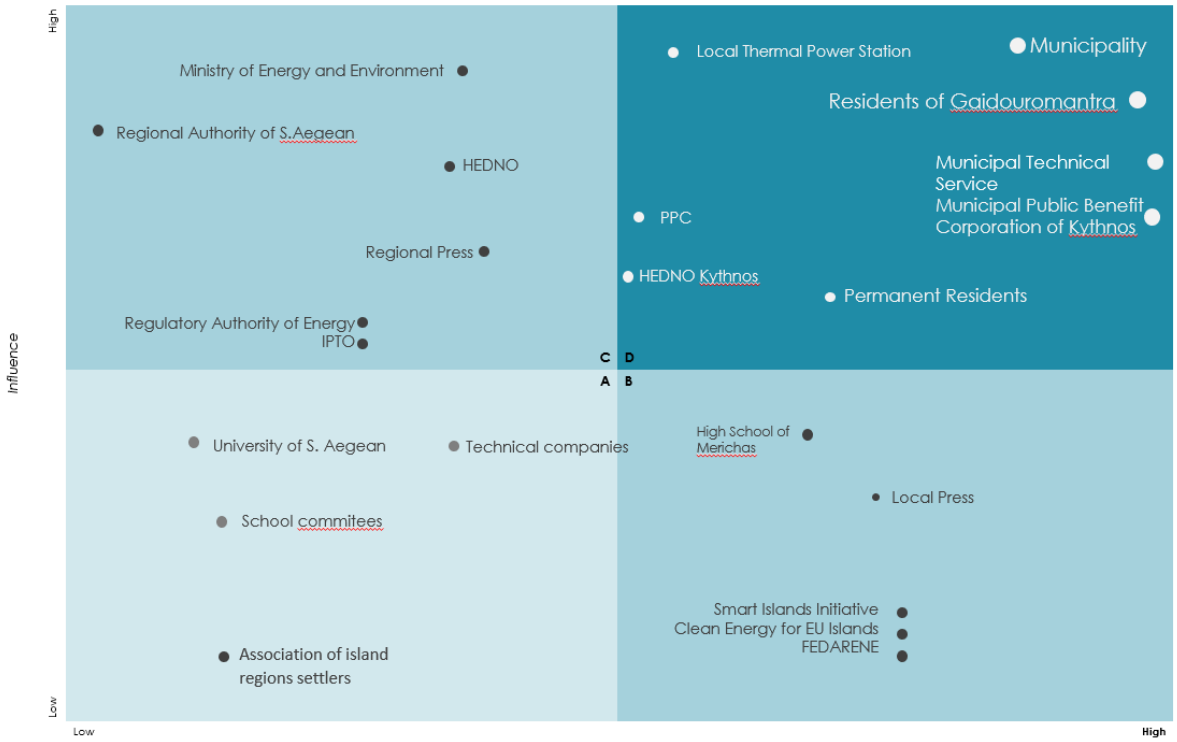

Figure 5-4 The distribution of the stakeholders to groups (Kythnos/Gaidouromantra)

5.4 Bornholm

In Bornholm, the most prominent group of local stakeholders, are the owners of buildings connected to the local District Heating Network (DHN) of Østerlars, Østermarie and Gudhjem – they have actively participated in the process of developing the DHN and the Heat plant in Østerlars: They have freely supported the project by signing a contract with the municipal owned heating company (Bornholms Varme A/S) to be connected if enough participants could be committed (> 60% of the heated buildings in the area). The development of the project has been in close cooperation, with the citizens organisations in Østerlars, Østermarie and Gudhjem, where the many different issues was discussed in regular meetings. This group of stakeholders have cooperated in forming the energy-community solution for heating of buildings, and thereby replacing the individual diesel-based heating with locally produced biomass for heating: Straw from the fields nearby the new heat plant. This transition is not only green but also a significant improvement of the local circular economy.

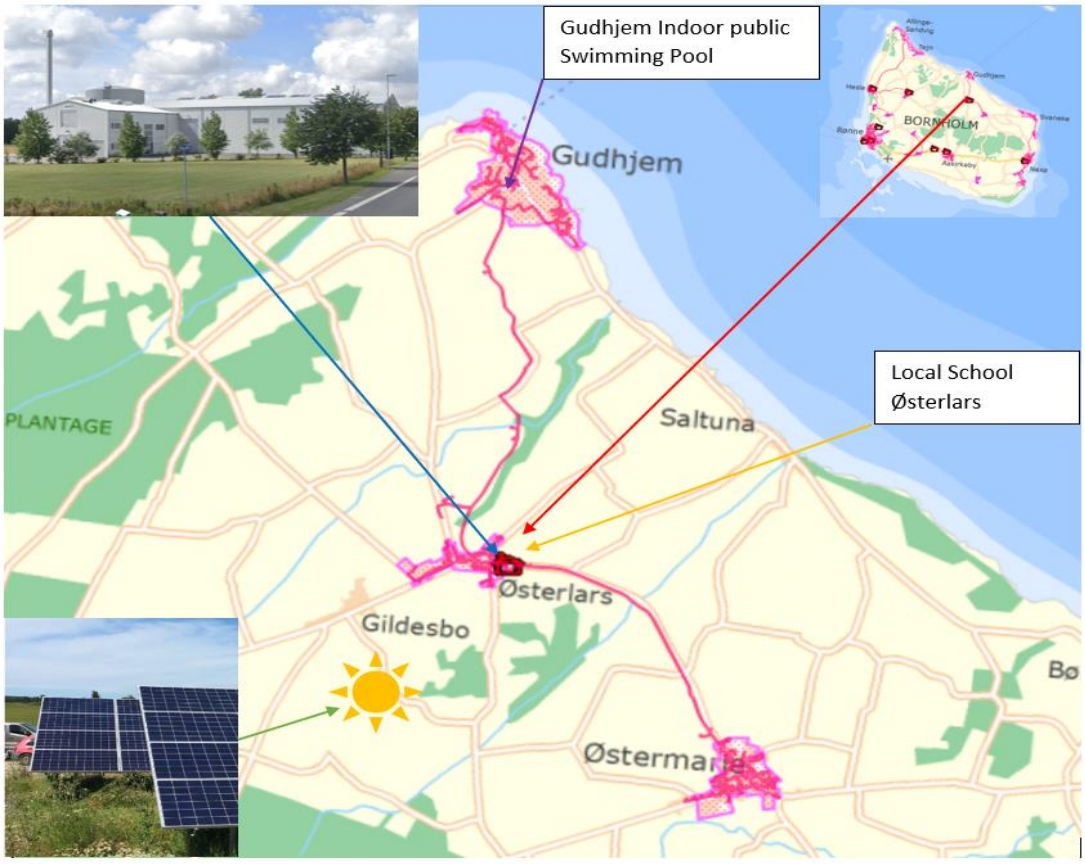

Figure 5-5 Mapping of facilities in Bornholm

The district heating consumers all have remote read digital meters, enabling detailed analysis of data about consumption, temperatures, and flow in the grid. The consumers are also equipped with identical “heat-units” containing 100 Liter hot water storage tanks, and Danfoss ECL computes controlling the charging of the tanks, and temperature level of incoming water to the household radiator system.

Several consumers in the demo site have been recruited for the demo, and upgraded with remote controls, to provide access to data-exchange, demand-response, and peak shaving in the heat grid: Four households, and three larger consumers - The public indoor swimming pool in Gudhjem, the local school in Østerlars, and the big medieval round-church in Østerlars. These represents the most direct and active stakeholders in the project and belong to the highest category (D).

Local Stakeholders

Table 5-13 Local stakeholders list of Bornholm

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A,B,C or D)	Reason for involvement
1	Local Citizen's organisations	3	2	D	Representing the community members
2	Consumers connected to the DHN	2	2	A	Members / consumers
3	Gudhjem public Swimming Pool	4	4	D	Active Participant in demo site
4	Østerlars Rund-Church	4	4	D	Active Participant in demo site
5	Local, private, school in Østerlars	4	4	D	Active Participant in demo site
6	Private Demo participants	4	4	D	Active Participant in demo site
7	Bornholms Varme A/S (Municipal heating company)	1	2	D	Owner and operator of heat plant and DHN
8	Electricians and plumbing (BEOF)	4	1	D	Responsible for the daily operation
9	Data team (BEOF)	5	2	B	Responsible for data integrations
10	Risk and compliance department (BEOF)	1	4	B	Demonstration must not interfere with daily operation
11	Farmers supplying Straw	2	3	B	Suppliers of fuel (straw)
12	Local Farmers organisation	3	2	C	Suppliers' organization

Regional Stakeholders

Table 5-14 Regional stakeholders list of Kythnos/Gaidouromantra

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A,B,C or D)	Reason for involvement
1	Bornholms Regional Municipality	1	2	A	Owns the heating company / local energy strategy
2	Press and media	1	2	A	News

National Stakeholders

Table 5-15 National stakeholders list of Kythnos/Gaidouromantra

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A,B,C or D)	Reason for involvement
1	Dansk Fjernvarme (Danish District Heating Association)	4	2	C	District heating interest organisation
2	Neogrid A/S (technology provider)	2	5	B	Supplier of equipment and software
3	Verdo (technology provider)	2	1	A	Software and consulting

International Stakeholders

Table 5-16 International stakeholders list of Kythnos/Gaidouromantra

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
1	Clean energy for EU islands	4	2	B	Networking
2	FEDARENE	3	1	B	Networking

A/A	Stakeholder	Level of Influence (1-5)	Level of Interest (1-5)	Stakeholders' group applied (A, B, C or D)	Reason for involvement
3	Greening the islands	3	1	B	Networking

Figure 5-6 The distribution of the stakeholders to groups (Bornholm demo site)

Key messages to stakeholders about the Demo:

- Flexible district heating customers support the goal of lower prices and less CO2 emissions.
- By creating awareness around the flexible district heating customer, we can reduce peak loads and a more efficient network
- Participants contribute directly to the green transition
- Knowledge about sector coupling and flexible heating customers adds value to the entire value chain

- BEOF is gaining knowledge to develop a robust and smart heating system of the future
- Supports BEOF's digital foundation (data platform) – Data is used for better analyses, insights and qualitative decisions for the district heating system of the future
- The integration between systems has focus on both data security (cyber-attacks) as well as proper management of GDPR.

6 Conclusions

One of the main visions of RE-EMPOWERED project was to upgrade the social standards of the local communities of the demo sites, through implementing upgrades on their energy system with the integration of the ecotoolset. In order to maximize the participation of the local stakeholders in the demo sites, Task 6.1 focused on the method for the engagement of local communities.

As it was described in this document, over 27 stakeholder activities took place over the course of the project timeline, involving several types of stakeholders and leading to several positive outcomes and most notably the creation of the Cooperative Society in Kenjhar: Ranipada Gram Shakti Samooh. The stakeholders engagement guide provided valuable guidance to the demo-site leaders to implement the engagement activities.

Furthermore, despite not being able to create Energy Communities in Gaidouromantra and Ghoramara demo sites, the engagement of the local community through RE-EMPOWERED project can be seen as a really successful step forward in order to find and implement the best operational and participatory schemes for the successful operation of the microgrids. A procedure for the establishment of an energy community at Gaidouromantra is included in this document.

In a nutshell, following the Stakeholders' Engagement Guide, demo site leaders managed to increase acceptability and participation of the project's implementation, customizing the methodology for the diverse needs of each demo site. It should be noted that the training activities at the demo-sites will be reported in D6.2: "Training activities report", while the feedback from local communities on the use of the ecoTools will be reported in D6.4: "Feedback from local communities".

Annex

A review of successful energy communities in the EU follows. This was part of the stakeholder's engagement guide in order to inspire the actions of the partners.

Energy Communities in EU

Energy communities in Europe emerged through various historical, social, and economic circumstances. Most of the energy communities in Europe were created in the 1990-2000s and are focused on generating and supplying renewable electricity, supplying renewable heat through district heating networks and making use of biomass resources. Among the largest and most well-known energy communities in Europe are BeauVent (2000) and Ecopower (1992) in Belgium, Enercoop (2005) in France, Elektrizitätswerke (EWS) Schönau (2009) in Germany and Som Energia (2010) in Spain. Currently, at least 2 million people in the EU are involved in more than 7,700 energy communities. Energy communities have contributed to up to 7 % of nationally installed capacities, with estimated total renewable capacities of at least 6.3 GW. On a conservative estimate, they have invested a total of at least 2.6 billion EUR.

Energy communities today are more diverse than ever and are likely to continue to act as incubators for pioneering initiatives involving almost all aspects of energy. Energy communities have become a common practice in the European Union in recent years and are already a necessary tool for the transition to low carbon energy production. As a result, Europe has become a world leader in energy communities development. Some European countries have identified and recognized the benefits of energy communities more quickly, and several EU Member States now provide examples of good practice for such projects. The countries with the largest share of energy communities in the EU are Germany, Denmark, Belgium and Spain.

The Belgian Ecopower, which started operating in 1991, is a typical example of a multi-shareholder company that now has more than 50 thousand members. Its total investments in hydroelectricity, biomass, wind and solar photovoltaic reaches 65 million euros. It has been an energy provider since 2003 and covers 1.5% of the market. A percentage of its profits are reinvested, mainly by financing projects in need of financial support, and the rest is distributed to members.

Similarly, the Spanish Som Energia, founded with the support of the University of Girona and soon spread to the Catalan region, reached 27,000 members and 37,000 customers in 2016, and can cover the annual energy needs of 3,200 households.

Bioenergy Village Jühnde, Germany

The village of Jühnde with 800 inhabitants, in Lower Saxony, Germany, is officially recognized as a "bioenergy village" and in fact produces twice as much power as it consumes. The basic idea was the utilization of the 450 cows that the village had.

So, in 2005, a cooperative was set up and built a biogas plant powered by silage and manure. The gas from the plant is burned in a communal cogeneration plant that provides electricity and heat to village buildings, while a wood-burning boiler in the district heating system provides additional heat in winter. The heating is distributed through district heating network and is provided to 145 households. Electricity is fully supplied to the grid. The total heat production is 6,500 MWh

/ year and the electricity production is 5,000 MWh / year. The idea of the Jühnde model is a complete conversion from fossil fuels to renewable biomass from local agriculture and forestry for the whole village.

For the planning of the project and for the acquisition of the necessary investment subsidies, the village established a cooperative. More than 70% of the residents are members of the cooperative, while each member paid at least € 1,500 to acquire voting rights and invested money to connect their home to the district heating network. Thanks to the combined production of electricity and heat, 3,300 tons of carbon dioxide and 400,000 liters of oil per year are avoided.

In addition, the bioenergy plant leads to positive environmental and economic results and promotes quality of life in the village, namely: odor emissions from manure storage and application in the sector are reduced, farmers and foresters in the village have a regular customer for their products and many local service companies, e.g., craftsmen have found a new income. Following the successful implementation and operation of the bioenergy unit, villagers are now discussing using the Jühnde to implement new technologies, e.g., biogas fuel cells, which increase energy efficiency.

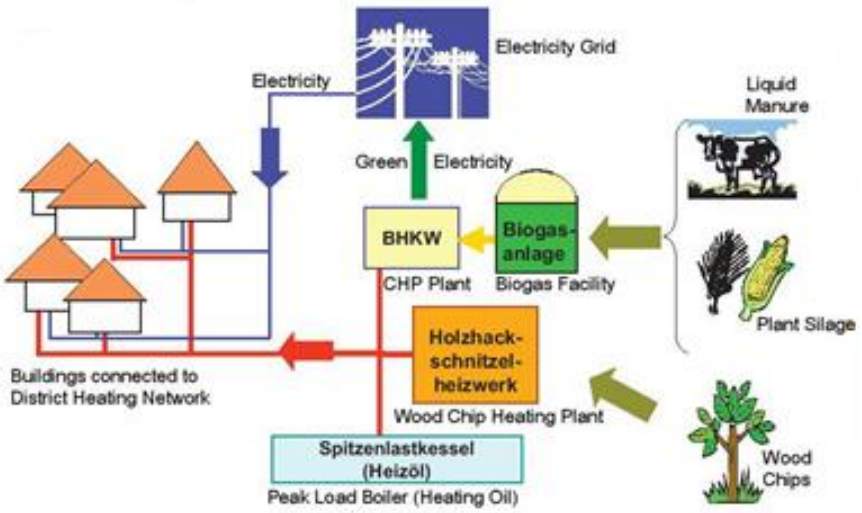

Figure 0-1 The production of energy in the "bioenergy village" Source: (snapshotsfromberlin.com, 2014)

Feldheim Village, Germany

The village of Feldheim with a population of just 150 inhabitants near Berlin produces 100% of the energy consumed by RES. The project started in 1995 with the installation of 4 wind turbines on land owned by the local agricultural cooperative. In collaboration with the local RES company Energiequelle, they expanded the wind farm to 55 wind turbines with an installed capacity of 122.6 MW. 99% of the energy produced by the wind farm is sold in the energy market.

Based on the success of the wind farm, the agricultural cooperative, which was facing problems with low selling prices of its agricultural products and high energy costs, decided to diversify its activities by building a biogas plant. The biogas plant processes agricultural products and manure producing biogas which feeds a cogeneration unit and is used to heat the residents, thus saving 259,000 litres of oil per year. In 2008 a solar photovoltaic park was built which today has been expanded to 2.25 MWp. In addition, in order to be completely independent of energy companies, a private electricity network and district heating network were built, which belong to the community.

The networks were financed through loans, EU grants, and from the participation of the residents with € 3,000 each. Feldheim also installs a 10 MW battery that can store enough electricity to power the village for two days. Residents now pay 30% less for electricity and 10% less for heating than before. In addition, it has almost zero unemployment as most residents work in the biogas plant, the solar photovoltaic park, and the wind farm.

Figure 0-2 Fladheim Source: (Feldheim, 2016)

SAS Ségala Agriculture et Energie Solaire

(SAS SAES) Fermes de Figeac is an agricultural cooperative located in the North of the Lot, in the foothills of the Massif-Central, in a territory of 80,000 ha where cattle breeding dominates (Le Pays de Figeac). The 650 farmers who are members of the cooperative represent 9% of the active population of the territory.

The Fermes de Figeac cooperative created the SAS Ségala Agriculture et Energie Solaire to develop solar photovoltaic systems on the roofs of livestock buildings in its territory. Through values of solidarity, cooperation and mutualization, 6.9 MWp of photovoltaic roofs have been implemented on 110 farms between 2009 and 2010. The installation generates around 7,200 MWh every year.

Fermes de Figeac proposes a project of agricultural and territorial cooperation that responds to several challenges, including the preservation of ecosystems, the maintenance of a living agriculture and the development of quality food in the region.

This project gives meaning to the very spirit of cooperation, which consists in finding together added values that one could not imagine alone. It is "naturally" part of the social and solidarity economy movement.

Figure 0-3 SAS Ségala Agriculture et Energie Solaire Source: (Fermes de Figeac 2022)

Edinburgh Community Solar Co-operative (ECSC)

Edinburgh Community Solar Co-operative (ECSC), legally known as Edinburgh Community Solar Limited, was formed in December 2013. A registered society under the Co-operative and Community Benefit Societies Act 2014, it consists of 683 members and generate electricity from solar power at 30 host buildings across Edinburgh.

Edinburgh Community Solar Co-operative owns and operates 30 solar panel installations throughout Edinburgh with a total generating capacity of 1.38 MW. Their panels are installed on Edinburgh Council schools, community centres and leisure facilities. Each year they generate approximately 1.1 GWh of clean, renewable electricity for these buildings and the wider grid. After providing a fixed return on their member's investments, excess profits are invested in community projects throughout Edinburgh that promote sustainability and renewable energy.

Figure 0-4 Edinburgh Community Solar Co 2022

Energy Communities in island regions are considered of high interest due to the geographical and local characteristics and peculiarities of the islands. In Europe, there are more than 2,000 inhabited islands, where around 4% of the citizens live. The energy systems of the islands are characterized by:

- high dependency on fossil fuels,
- the need for autonomy due to missing interconnection, what leads to a higher difficulty to install variable renewable energy sources.
- high energy costs and
- energy poverty of the inhabitants

Nevertheless, small and medium islands are considered ideal regions for the development of local energy communities due to

- the locality of energy markets
- the locality of the economies
- the high potential of RES in the regions

Samsø, Denmark

Samsø is an island in central Denmark with a population of 5,000 people which attracts more than 110,000 visitors each year thanks to its natural and cultural heritage. In the northern and eastern part of the island, there are protected areas. In 1997 its inhabitants decided to make Samsø an island 100% fuelled by RES.

The islanders took part in discussions about the island's energy transition to RES, followed by a ten-year period with investments in RES facilities and energy efficiency solutions. The island has a total of 34 MW of wind (10 terrestrial and 11 offshore wind turbines) and 1.3 MWp of solar photovoltaic, facilities that meet its electricity needs. In addition, 70% of the heating is covered by a district heating network powered by a biomass unit (7 MW) plus individual heating solutions in some houses. Thus, Samsø now has a negative carbon footprint of minus 3.5 tonnes of CO_2 per capita. The use of fossil fuels on the island is limited to the transport sector, however the clean energy extracted from the island to the mainland exceeds the energy content of the fossil fuels imported to the island.

Furthermore, Samsø enjoys a worldwide reputation as an energy independent island and is an important tourist destination in Denmark. Recently, a new vision has been formed for a fossil fuel-free Samsø, where residents are invited to participate again in discussions about the further development of the island, complete detoxification from fossil fuels and the development of recycling infrastructure by 2030.

Eigg Island, Scotland

The island of Eigg in Scotland with a population of 100 inhabitants is an isolated electricity grid based mainly on RES energy production and is a good example of both harnessing the potential

of RES and the way remote communities can support themselves. The basic idea was to pursue a sustainable way of producing energy avoiding the use of fossil fuels. The local community sought to utilize RES and more specifically wind, solar and hydroelectric power instead of connecting the island with mainland Scotland which had prohibitive costs.

On the island there is a prepaid use system, which has a maximum of 5 kW instantaneous maximum demand power for small businesses and residents and 10 kW for large businesses. Residents do not usually exceed their prepaid limit and, therefore, this system allows further cost savings, as there is no need to use diesel generators which are put into operation during periods of reduced RES production and / or increased electricity demand. In addition, a traffic light system at the pier allows the community to know how the system works - green means everything is normal, red means the Eigg grid is close to its limits, and yellow means it is somewhere in the middle.

The total installed power of the system is 184 kW (110 kW hydroelectric, 24 kWp wind, 50 kWp photovoltaic and two spare diesel generators 128 kW). Renewable energy sources provide around 95% of the island's electricity since the scheme was first switched on in 2008, while the rest 5% is covered by the diesel generators. The energy system of the island is also supported by 96 4-volt batteries which are capable of providing power to the island for 24 hours.

Figure 0-5 Eigg Island, Scotland Source: (Chmiel and Bhattacharyya, 2015)

Amelander Energie Coöperatie, Netherlands

The Amelander Energie Coöperatie UA (AEC) is a co-operative company founded with the aim of supplying Amelander energy users with sustainable electricity and CO_2 compensated emissions at attractive rates. It was founded in 2009, it is comprised by 310 members and its objectives is the self-sufficiency of the island and the sustainability through solar energy and other options such as geothermal and tidal energy.

In 2017, the AEC installed a photovoltaic park with 5.98 MWp total installation of PV panels. Each year, these solar panels harvest approximately 5.6 million kilowatt hours of sustainable energy, equal to the annual energy needs of 1,500 households. During the off-season of this popular tourist island, these solar panels generate enough energy to fulfil the needs of the entire island, which makes Ameland fully self-sufficient during these periods.

Figure 0-6 Amelander Energie Coöperatie UA (AEC) Source: AlfenElkamo

Marstal Fjernvarme, island of Ærø, Denmark

The Marstal Fjernvarme Energy Community is one of the oldest Energy Communities in Europe and is consists of 1,600 members.

Marstal District was established in 1962 , however, since 1994, Marstal Fjernvarme has gradually started transitioning to a renewable energy system. Nowadays, the company provides heat to the settlement of Marstal from 100% renewable energy sources, of which 50-55% comes directly from the solar heat collectors, 40% from wood chips, 2-3% from a heat pump. The annual production of the network is about 32,000 MWh.

Figure 0-7 Marstal Fjernvarme Energy Community Source: SolarMarstal

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