European Commission

Clean energy for EU islands

From vision to action: how to tackle transition on EU islands?

Methodological Handbook

ENERGY

The Clean energy for EU islands secretariat is managed by the European Commission Directorate-General for Energy

Publisher Luxembourg: Publications Office of the European Union, 2022
Completed in: June 2022
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PDF ISBN 978-92-76-53776-2 | DOI: 10.2833/822820 | MJ-08-22-254-EN-N

Acknowledgement: Special thanks to our Clean energy for EU islands community for their input and support.

CLEAN ENERGY VISION TO CLEAN ENERGY ACTION

clean-energy-islands.ec.europa.eu

Zaklopatica, Lastovo (Croatia) Photography by Toma & Jelena Župančić, the winner of the first photography competition organised in 2021 by the Clean energy for the EU islands secretariat.

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EXPLORE
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INTRODUCTION TO THE NEW HANDBOOK

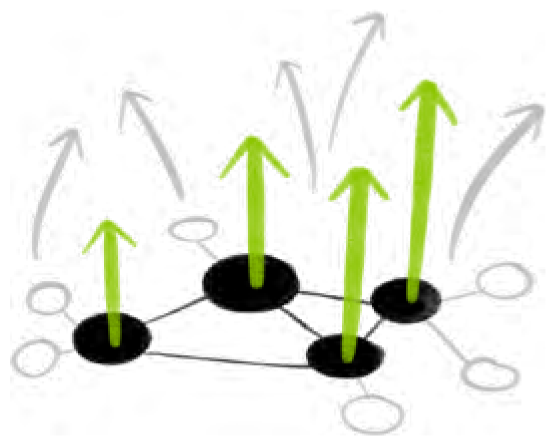
Welcome to the Islands Clean Energy Transition Handbook. This Handbook is an action-oriented guide to help islands navigate the transition toward clean energy.

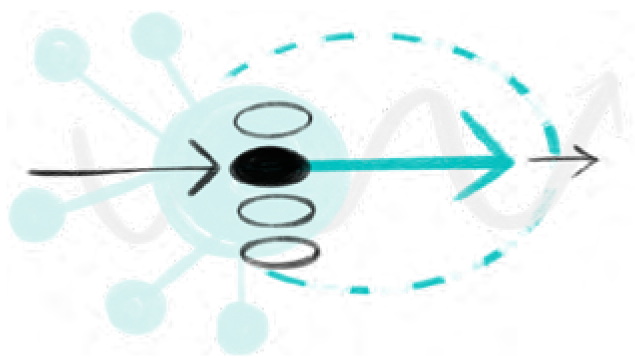
It follows a central methodology (**EXPLORE, SHAPE, ACT**) to cover ideas and projects in all stages of the clean energy transition. It also provides examples of European islands and includes references to key publications.

INTRODUCTION TO THE NEW HANDBOOK →
→

Glossary

CAPEX	Capital Expenditure
CETA	Clean Energy Transition Agenda
DEVEX	Development Expenditure
EPC	Engineering Procurement and Construction
ESCO	
IRR	Internal Rate of Return
NPV	Net Present Value
OPEX	Operational Expenditure
O&M	Operation & Maintenance
WACC	Weighted Average Cost of Capital





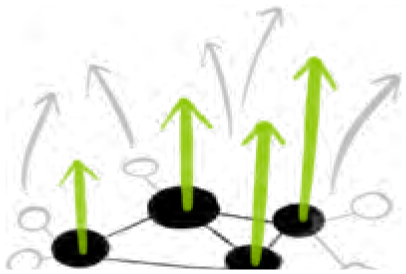
The **EXPLORE** part addresses islands that are just starting their clean energy transition. It guides the development of a Clean Energy Transition Agenda (CETA), i.e., a strategic roadmap to decarbonise the island.

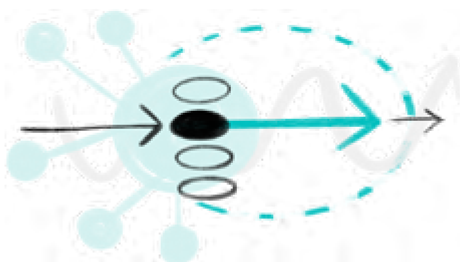
The **SHAPE** part aims to bring forward the potential solutions suggested in the CETA to shape them into a pipeline of bankable clean energy projects. The project idea needs to be first developed, followed by studies assessing the feasibility of the projects, and the development of the business case.

The **ACT** part focuses on further developing the projects so that they are ready to be implemented on the ground, including finding the right funding and financing, developing the business plan, and setting up the required partnerships for implementation.

This new handbook is built on the first version developed during the pilot phase of the Clean Energy for EU Islands secretariat, which ran between 2018 and 2020.

While the previous version of this handbook focused on the **EXPLORE** part, the **SHAPE** and **ACT** parts have now been added. The **EXPLORE** part has also been modified to include lessons learned from the Technical Assistance provided to islands.





STAGE			OUTPUT	
EXPLORE	Stragetising the clean energy transition	Committing to decarbonisation; Understanding the island's dynamics (CETA Part I); Agreeing on the island's vision and pathways (CETA Part II)	Clean Energy Transition Agenda	EXPLORE
SHAPE	Building a pipeline of feasible clean energy projects	Developing the project's idea; Assessing the feasibility of the project; Business development	Bankable, developed clean energy projects	SHAPE
ACT	Developing projects for implementation on the ground	Setting up the collaboration with partners; Obtaining the right funding and financing	Projects with available financing ready to be implemented	ACT

↑ The Islands secretariat uses the **'EXPLORE, SHAPE, ACT'** methodology to represent different stages in the transition to clean energy.

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PART I – EXPLORE

Islands in the **EXPLORE** phase have decided to start their transition towards net-zero but are still planning the process. For these islands, the secretariat has developed a methodology to bring about their clean energy transition and set up a roadmap: the Clean Energy Transition Agenda (CETA).

A CETA has two main parts: the first focuses on understanding the current island dynamics, i.e., identifying the main stakeholders and developing an energy and emissions baseline.

In the second part, the stakeholders look to the future: they set a vision and start defining the pathways that will bring the island from the present to the desired situation. The sections below develop the CETA concept and describe in detail how to build such a strategy for the clean energy transition on islands. A template for the CETA is available in eight different languages on the Islands secretariat's website.

Between 2018 and 2020, the Clean energy for EU islands secretariat supported 26 islands in developing their CETAs. The final published documents are available on the Island pages here.

During its second phase, the Islands secretariat continues helping islands with their CETAs through Technical Assistance.

CETA

Project support

Stage

EXPLORE

Stragetising the clean energy transition

Committing to decarbonisation

Understanding the island's dynamics (CETA Part I)

Agreeing on the island's vision and pathways (CETA Part II)

Output

Clean Energy Transition Agenda

EXPLORE

on page 22

on page 52

1. Introducing the Clean Energy Transition Agenda and The Pledge

Before starting the CETA exercise, several concepts such as the Transition Team or the Island Transition Community, need to be defined and adapted to the specific context of the island. In addition, it is recommended to sign The Pledge and submit it to the Clean energy for EU islands secretariat. This will allow for the island stakeholders to formally commit to each other, and it will give visibility to the island's efforts.

By submitting The Pledge, the island officially engages with the secretariat and gets a dedicated Island Page on the secretariat's website.

1. 1. Key concepts and definitions

In the **EXPLORE** Part of this Handbook, several terms are used to refer to different concepts related to the CETA and the Island's secretariat Pledge. Individually, these definitions may seem abstract. It is therefore recommended to use and redefine these terms with your island context in mind.

Clean Energy Transition Agenda (CETA)

The Island Clean Energy Transition Agenda (or CETA) is a strategic roadmap for an island's energy transition process. A CETA is an organic document that may evolve and adapt as the transition process is implemented.

As a first exercise, the CETA starts examining the current dynamics on the island – understanding the islands' context, geography, population, and energy system is crucial to identifying the focus areas for decarbonisation.

The second part of the CETA spells out a vision for the island and the pathways to reach it. This vision is the result of a participatory process and is shared by the island Transition Community. Island stakeholders can collectively work towards this shared vision, common goals and effective strategies by defining transition pathways.

CETA

Island Transition Community

The island Transition Community includes individuals, households, local government, and organisations with a drive and passion for decarbonising the island.

This community is invited to take an active role in the island's clean energy transition by providing input and feedback and confirming the CETA.

Transition Team

The Transition Team is the core team that drives the CETA process and has an important facilitation and coordination role.

It is composed of two to ten organisations that represent larger segments of the island's population and engage with the island's Transition Community. The Transition Team assumes the responsibility for the island's clean energy transition; hence, organisations and individuals need to be committed with time and resources.

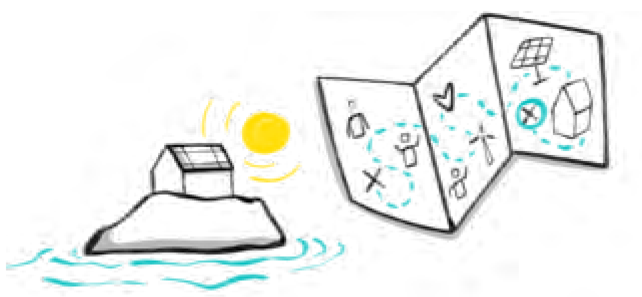
The Islands secretariat strongly recommends that the public authorities covering the island (municipalities, regions or similar) are part of the Transition Team. It is also encouraged to have representatives from local citizens' organisations, local businesses, and academia. In addition, expert individuals from inside or outside the community may be involved to strengthen the Transition Team whenever relevant.

Transition Dialogue

Frequent public meetings and hearings are required to ensure the transition process is locally anchored.

These transition dialogues ensure that all the relevant voices are heard and that the Clean energy transition is supported by the widest group of islanders possible.

The Transition Team **invites, prepares, facilitates, and reports** on the transition dialogue events, while the island Transition Community is asked to **provide input and feedback** on the visioning and pathways.



EXPLORE

1. 2. Committing to decarbonisation: The Clean energy for EU islands Pledge

↑ The energy cooperative "Apsyrtides" during a meeting in 2021. Photo © Walter Salković.

↑ Emporio, Chalki (Greece). Photo © Evaggelos Fragkakis, the winner of the second photography competition organised in 2022 by the Clean energy for the EU islands secretariat.

The Clean energy for EU islands Pledge is designed to formalise the commitments between the Transition Team, consolidating the journey for all involved.

The Pledge needs to be signed by a minimum of two parties, one of them being a public authority or civil society organisation. Including different island organisations together with public authorities ensures a broader outreach and possibilities for the CETA. This means that local associations, schools, and businesses have a say in the development of the island's strategic roadmap. Moreover, they can push the island's decarbonisation via civil society actions, school activities, or initiatives led by local businesses. The relevant stakeholder groups and their definitions can be found in Section "Stakeholder mapping" on page 42.

To ensure a steady workflow towards a clean energy future, the Islands secretariat recommends a target of one year for drafting a first version of the Transition Agenda from the moment the Pledge is signed.

Although one year might sound challenging for some, it is important to bear in mind that the CETA is a living document: it is meant to change and evolve throughout the process. The target is to have the first version of the CETA within the first year; however, new ideas and agreements may come up as the island moves on in its decarbonisation journey, which will be reflected in new versions of the CETA.

Signing the Pledge is also an official way of joining the Clean energy for EU islands network. Islands that have signed and submitted the Pledge to the Islands secretariat get a dedicated page on the Clean energy for EU islands website, gaining visibility to a wide audience of national and European organisations and other islands.

More information on the benefits, responsibilities and details of the Clean energy for EU islands Pledge can be found here.

Pantelleria Island, Italy: a transition team led by the university

Pantelleria is an Italian island southwest of Sicily and 60 km east of the Tunisian coast. In 2019, a transition team was set up, led by the Energy Centre at Politecnico di Torino and including representatives from all four stakeholder groups of the quadruple helix (as further explained in the Section "Stakeholder mapping" on page 42):

- The Municipality of Pantelleria assumed a central role in the governance of the energy transition, acting as the main point of contact with regional and national institutions.
- The National Park of Pantelleria, which covers 80% of the island and aims at preserving Pantelleria's ecosystem and landscape is among the greatest treasures of the island.
- S.MED.E. Pantelleria is the local electricity system operator charged to evaluate the impacts of the new energy generation and storage solutions on the electricity grid to ensure its stability.
- Resilea is a multidisciplinary civil society organisation based in Pantelleria that aimed to propose tools and solutions for the active involvement of the population in the decarbonisation process.
- Local wine producers are representing the local industry on the island.
- The Energy Centre from Politecnico di Torino is composed of a multidisciplinary research team that provides support for energy planning and the industrialisation of cutting-edge technologies. Politecnico di Torino has been supporting Pantelleria for several years.

The transition team met multiple times in the period between December 2019 and July 2020 to establish an island-wide vision, discuss the energy challenges on the island, establish the transition pathways and pillars and see how the CETA development could also help reach regional authorities to communicate about the island's energy transition plans. This proved to be a successful exercise to bring the island's community together and come up with a comprehensive strategic decarbonisation plan.

The draft CETA was presented in mid-July 2020 during a public meeting on the island. Many island stakeholders provided comments, showing their interest to be actively involved in the decarbonisation process. The final CETA is available here.

↑ Pantelleria © Photo by Ante Hamersmit on Unsplash.

The commitment to clean energy transition on La Palma

La Palma is the most north-westerly island of the Spanish Canary Islands archipelago, located in the Atlantic Ocean. The island has 14 municipalities and has a joint administrative island government called Cabildo Insular de La Palma.

In 2012, The Platform for a New Energetic Model (Px1NME) was set up on the island. Px1NME is a citizen platform run by volunteers that aims to empower citizens to make the clean energy transition happen on La Palma and to show the negative impacts of the way that energy is currently produced and consumed. In 2015, Px1NME launched the Ruta por la Soberanía Energética (Route for the Energy Sovereignty), a series of talks and meetings on energy transition in the island's 14 municipalities in which everyone could participate. In 2017 this led to the signature of the Electrón Manifesto by the 14 municipalities and the Cabildo Insular de La Palma, to indicate the commitment to clean energy and to show the strategic direction of the transition. The engagement of the Px1NME, supported by funds from the Cabildo, led to the establishment of La Palma Renovable, an initiative to promote sustainability on the island. La Palma Renovable is an important enabler to ensure the continuity of the activities on clean energy, led by a team of five people who manage projects on sustainability, organise stakeholder meetings and engage with the community.

In 2019, La Palma carried out its Clean Energy Transition Agenda. In order to reach out to the wider island community, the Transition Team collected signatures of groups, local administrations and companies to join the participatory project for the design and development of the Clean Energy Transition Agenda. About 100 organisations collectively signed up for a joint action to improve the sustainable welfare and resilience of the island's communities.

After signature, each organisation traverses its own transition agenda calculating their carbon footprint and making a decarbonisation action plan, with several goals to reduce their energy consumption and emissions. The carbon footprint of the whole island has been calculated and can be seen on ClimateView's website. Also, several SECAP are in process.

Recently, La Palma Renovable has been promoting the development of the insular energetic community Energía Bonita. Several renewable energy projects are planned summing up a total of 2MWp distributed photovoltaic collective self-consumption plants. Additionally, this energy community will have a fleet of shared electric vehicles to improve the efficiency and sustainability of citizen mobility across the island.

Other projects are carried out by La Palma Renovable include support and mentoring to domestic consumers to help reduce their electric bills. The dramatic rise of energy prices in the last months has deepened the damage to families with less resources, increasing energy poverty on the island. To tackle this problem, La Palma Renovable has developed the Oficina Verde service (Green Office), to provide support to those families needing help as well as technical support to the social services of municipalities of the island.

Further reading on La Palma Renovable.

↑ Launch of the Insular Plan for a New Energy Culture
© La Palma Renovable.

↑ Electron Plant on La Palma.
© La Palma Renovable.

2. CETA Part I: Understanding the island dynamics

The first part of the CETA aims at analysing in detail the island's present situation. The clean energy transition can only be successful if the island's starting point is understood. By identifying the key sectors that contribute to the island's CO_2 emissions and quantifying these emissions, the areas that need to be prioritised to effectively decarbonise the island's energy system are put in the spotlight.

The activities in this phase are carried out by the Transition Team, who will be responsible for gathering the data, researching, interviewing stakeholders, etc. The CETA template can already be used to structure and format the findings.

CETA

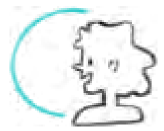
↑ © Photo by Damir Babacic on Unsplash.

2. 1. Geography, Economy and Population

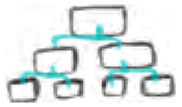
Describing the island's geography, economy and population provides context to the island's CETA, enabling readers to understand the specificities of the island.

As part of this section, the following topics should be included:

→ **Geographic situation of the island:** size, location, distance to mainland, etc.



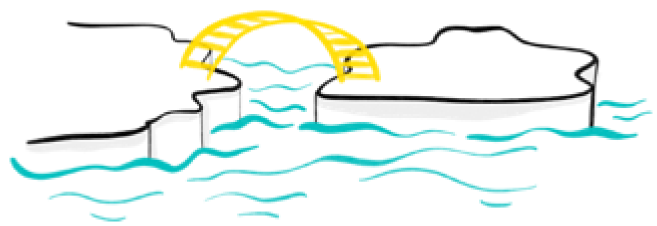
→ **Demographic situation:** permanent population, changes in population throughout the year (for example during summer, high season)



→ Structure of the **local government**

→ **Economic activities** on the island, mentioning (if known) their impact on the island's greenhouse gas emissions

→ **Connection to the mainland:** describe the island's relation to the mainland including physical connections like ferry routes, bridges, or electrical cables. Details on the ferry's fuel consumption or the amount of electricity imported by the interconnection cable are to be further developed in the Energy System Description section.



2. 2. Energy System Description

An important part of exploring the island dynamics is to investigate the island's current energy system.

Having a comprehensive picture of how energy is produced and consumed on the island supports the Transition Team in determining the priorities for the switch to clean energy.

A complete analysis of the island's energy system is recommended as input to develop the rest of the CETA. Such a description of the island's energy system allows one to better understand its present situation, and to set a baseline for referral and future comparison.

The scope of the energy system description in the Transition Agenda depends on the available resources and data. For islands with limited time and information, the focus will lie on gathering the data that the Transition Team can easily obtain. Depending on the available information, the data that cannot be found for a specific sector may be estimated, extrapolated, or omitted. Islands with more accessible resources and capacity can go further and include a detailed diagnosis of the energy system, including technical, economic and climate aspects. In general, writing an energy system description as thoroughly and exhaustively as possible is recommended.

Apart from tables and figures, the Energy System Description should include descriptive elements that outline the technical and economic aspects of the system, thereby efficiently informing the island's Transition Community.

The energy system description is not meant to be a compilation of data but rather a part of the CETA that tells the energy story of the island.

Collecting accurate, detailed, and up-to-date data requires effort and can take a significant amount of time. It will likely involve outreach to instances both on and off the island. The energy system description refers to annual consumption; thus, ideally, data from the previous year would be included. If this is not possible, data from the most recently available year is recommended. Focusing on the most recent data available is strongly suggested unless that year is not representative.

Several methodologies exist to analyse energy consumption and production. The following subsections give guidance on an appropriate scope for the analysis, possible sources of data, how to interpret the data, and how to estimate it whenever it is not available. Islands are asked to refer to the material developed by the Covenant of

PART I – EXPLORE → CETA Part I: Understanding the island dynamics
→ Energy System Description

EXPLORE

Mayors for detailed guidance on developing a final energy breakdown and baseline emissions inventory.

In order to acknowledge the special needs and challenges of islands, the energy system description is classified according to the following sectors:

- → Electricity generation and consumption
- → Transport on the island
- → Transport to and from the island
- → Heating and cooling
- → Other

The outcome of the energy system description should not be used to compare different islands. In fact, the proposed classification for energy vectors serves as a guideline, but there might be cases where allocating the consumption from a specific sector, device or technology is not obvious. For example, for an island connected via a bridge to the mainland, transport to and from the island by car may be easier to include in road transport on the island instead of separating it. To avoid misunderstandings, these nuances should be highlighted in the CETA.

CETA

Technology solutions booklet

↑ Technology solutions booklet provides an overview of energy technologies that are currently commercially available for islands to advance in their clean energy transition. Innovative technologies at early stages of development have not been included as they have not yet been proven to be implementable.
© Photo by Clean energy for EU islands.

Electricity generation and consumption

How electricity as a vector is analysed in the energy system description varies, depending on whether:

- → The island is connected to the mainland via a cable that provides the required electricity.
- → The island locally produces part (or all) of the electricity that it consumes, either through engines or through solar PV, wind, etc.

On an island connected to the mainland without any auto-production, all electricity is sourced from the national grid. In this case, electricity is purely analysed from a final energy consumption viewpoint – the key data to be collected corresponds to the total electricity consumed on the island by end-users, such as households, industry, and agriculture. Whenever available, it is recommended to classify this data per sector, e.g., residential, primary sector (agriculture, forestry, mining, and fishing), industries (secondary sector, manufacturing), tertiary sector (services including tourism), transport on the island, and transport to and from the island. Besides the annual electricity consumption, an interesting additional data point may be the recorded consumption at the point of interconnection on the mainland.

Where there is some degree of auto-production on the island, apart from final electricity consumption, it is also necessary to consider the local electricity generation.

The following **indicators** can be collected for a complete system description:

- → Total installed **capacity per technology** (whether this might be an engine generator, wind, or solar energy, etc.).
- → **Total energy produced** per technology and year (at least in the last year; if historical data is available, it may also be included to show the evolution).
- → For a technology that requires any type of fuel (like fossil fuels, biomass, etc.) the **annual fuel consumption** (i.e., the primary energy consumption of the electricity sector on the island).

Possible sources where the required information may be found are:

- → **Electricity companies** operating on the island
- → **Transmission and Distribution** System Operators
- → **Statistics agency** in the country/region, either through databases, annual reports, etc.
- → **Municipalities or civil society** organisations
- → Municipalities.

Technology solutions booklet

PROBLEM:	POSSIBLE SOLUTION:
Only aggregated data is available. For example, there is only a value of electricity consumption for a specific region (to which the island belongs) or for the archipelago of which the island is a part.	If uniform electricity consumption patterns apply to the whole region for which data is available, the island's consumption can be estimated based on its population, i.e., proportionally scaling down the aggregated value. If this is not the case, e.g., tourism on the island is larger than in the rest of the region, the corresponding proportion of the final electricity consumption would not be accurate enough and the estimation would need to consider these aspects.

PROBLEM:	POSSIBLE SOLUTION:
No final electricity consumption data is available, but the island is small with no industry or any other relevant sector with significant energy consumption.	The final electricity consumption can be estimated assuming a value for the annual electricity consumption per dwelling (or hotel, based on its capacity) and multiplying it with the number of dwellings/hotels on the island. The Odyssee-Mure European project (see Resources) publishes databases on several energy indicators, one of them being the average electricity consumption per dwelling and country. This could serve as a first estimation for this case if no other data is available.

The off-grid Scottish Islands: How the Energy System Description can help to focus toward decarbonisation

The off-grid Scottish Islands are a group of six islands, two in the North of Scotland (Fair Isle and Foula) and four to the West (Canna, Rum, Eigg and Muck).

They all have in common that their electrical systems are not interconnected to the mainland. Given their small size and shared challenges and interests, they teamed up in 2019 to write a joint Clean Energy Transition Agenda.

All six off-grid Scottish Islands had already acted towards decarbonisation and largely deploy renewable energies to produce their electricity (solar PV, wind and hydro), combined with batteries for electricity storage. Diesel generators are only used as a backup.

The same assumptions and parameters were used for the Energy System Description of all six islands. This exercise helped the islands to identify the critical areas on which they need to focus in order to continue with their energy transition.

The results pointed out that the main source of energy consumption for the islands on the West is transported to and from the island, with 70%-90% of final energy consumption. This is predominantly attributed to fuel consumption associated with the 'MV Lochnevis' ferry that connects the four islands with the mainland. The off-grid Scottish Islands are already looking into ways of decarbonising maritime transport by, for example, turning their ferries into hybrid electric-diesel engines. The main ferry provider has successfully deployed such vessels on one or two other routes in the Scottish Highlands.

Heating and cooling are the second major contributor to CO_2 emissions, with households making use of a variety of fossil fuels like propane, kerosene, coal, heating oil and natural gas.

Finally, transport on the islands minimally contributes to CO_2 emissions, given their small size and population (ranging from 19 to 83 inhabitants).

↑ Off-grid Scottish Islands © Photo by Bjorn Snelders on Unsplash.

EXPLORE

Transport on the island

Depending on the size, geography and culture, islanders and visitors use different ways of moving around the island. In the energy system description, an overall picture of the different means of transport and their energy consumption in the last (or the most recently available) year should be provided. As for the rest of the vectors, the more detailed the data, the more accurate the picture will be.

For example, whenever possible, it is recommended to include the type of vehicle, the type of fuel it consumes, its size, average mileage, etc.

The modes of transport that could be described in this section are:

- **Passenger cars** for private use (if possible, further classified into electric, hybrid, petrol, diesel, etc.). Additional information as to whether there is infrastructure in place for electric vehicles or whether there are plans to install them in the future should also be included here.
- **Vans** (if possible, further classified into electric, hybrid, petrol, diesel, etc.).
- **Public transport** (buses, minibuses, etc.).
- **Bicycles** (transport share, explain whether there is a public sharing scheme).
- **Other micro-mobility options** such as scooters (promotion measures in place, existence of a public sharing scheme).

↑ © Photo by Photoholgic on Unsplash.

PART I – EXPLORE → CETA Part I: Understanding the island dynamics
→ Energy System Description

The energy consumed by transport on the island may be calculated by following two different approaches:

- If **fuel import data** (further broken down into, e.g., petrol and diesel for vehicles), or data on fuel sales in petrol stations is available, it can serve as a very good estimator for the energy consumed by vehicles on the island (see example box on La Palma).
- Otherwise, **data relative to the vehicle fleet** on the island may also serve to appraise energy consumed by road transport (see example box on Cres-Lošinj). In particular, the following indicators are desired:
  - The total number of permanent vehicles on the island, classified per type and fuel
  - Estimation of the average mileage per year,
  - Estimation of the fuel economy (i.e., on the consumption every 100 km, for example) per vehicle type.

Possible sources for the required information are as follows:

- **Statistics agency** in the country/region, either through databases, annual reports, etc.
- **Municipalities**
- Organisations in charge of the **technical inspection of vehicles**.
- Official **websites providing information** about electric vehicle infrastructure.

↑ E-mobility ecosystem explained further on page 110 © Clean energy for EU islands

EXPLORE

La Palma, Spain

The regional government of the Canary Islands collects **detailed fuel supply data**, both aggregated at a regional level and for each one of the islands. Fuel supply is further classified between petrol and diesel sales in petrol stations. This value was taken as an **estimate for road transport consumption**.

In order to complete this data and to provide a full picture of transport on the island, the following information was also collected and included in the section as a description of this vector:

- → Data from the Statistics Agency in the Canary Islands was consulted to retrieve the number of registered vehicles on the island, per vehicle type and per fuel used.
- → Data from infrastructure for electric vehicles was retrieved from a local organisation that allows users to book only electric vehicle chargers.

This information is included in the energy system description as a way to characterise the vehicle fleet on the island and how developed the electric vehicle infrastructure is.

↑ La Palma workshops © Photo by Marina Montero Carrero in 2019.

Cres-Lošinj Archipelago, Croatia

For the archipelago of Cres-Lošinj, the number of vehicles that passed the technical inspection service on the island was available, further classified according to:

- ↳ Type of vehicle (scooters, motorcycles, passenger cars, vans, buses, trucks, etc.)
- ↳ Type of fuel used (diesel, petrol, LPG, electric car)
- ↳ In addition, for each category, an average mileage was available.

The procedure that was followed to estimate the energy consumption due to transport on the island was:

- ↳ The archipelago is well-connected by a short ferry to the mainland, and cars usually travel both on the mainland and the islands. Therefore, of the average mileage, only 50% was assumed to be on the islands.
- ↳ For each category, a representative vehicle model was assumed based on Croatian car sales. The fuel economy of this model was then multiplied by the assumed mileage on the islands and by the number of vehicles in the category.

The above steps indicated the total consumption by fuel (in volume) from the transport sector.

↑ Cres-Lošinj's citizen workshop in October 2021 © Photo by Walter Salković.

EXPLORE

↑ Kamares, Greece © Photo by Gaetano Cessati on Unsplash

Transport to and from the island

Transporting goods and people to and from the island is one of the major challenges for an island's clean energy transition. To show the full picture precisely, in terms of energy consumption, both trajectories (to and from the island) are taken into consideration for the energy system description of the Transition Agenda. In the case of multiple islands drafting a common Transition Agenda, transport between these islands needs to be considered as well.

The main transport modes to consider are:

→ Maritime transport (boats, ferries).

→ Air transport (depending on whether the island has an airport).

As was the case for transport on the island, the following sources may serve to calculate the final energy consumption to and from the island:

Fuel import data further broken down into, e.g., kerosene for aeroplanes and fuel for maritime transport (see example box on La Palma).

Data relative to flights and ferry trips to and from the island (see example box on Sifnos). Relevant indicators to collect are:

- ★ The total number of flights/ferries for each type of plane/boat per year. If tourism is important on the island, the frequency of the trips may vary depending on the month.
- ★ An average distance on all routes. This value should be doubled in order to consider return trips to and from the island.
- ★ Estimation of fuel consumption for each plane/boat involved. This could be found either on technical reports or provided by the involved air or maritime transport companies.

Possible sources for the required information are as follows:

→ Statistics agency in the country/region, either through databases, annual reports, etc.

→ Coast guard records.

→ Private/public companies offering ferry services.

→ Airport management companies.

EU ISLANDS EXAMPLES

Sifnos, Greece

In terms of maritime transport, no data on ferry energy consumption was readily available. The procedure followed to estimate the energy required for transport to and from the island was:

- The Hellenic Coast Guard provided **data on the arrivals and departures** of ferries to the island in the past year.
- The **average distance navigated** by the ferries was calculated.
- Two companies provided approximate data on the **average consumption** of their ships.
- The **participation of each ferr**y on the routes was estimated.

With all the above data, the energy consumption by maritime transport during 2018 was calculated.

La Palma, Spain

As with fuel supply to petrol stations, kerosene supply to air navigation is published by the regional government of the Canary Islands. This data corresponds to the kerosene fuelled to planes on the island; thus, it only reflects transport from the island to another destination.

In order to include the fuel consumed by air transport to the island, the kerosene data was multiplied by two.

↑ On 31 March and 4 April, the Energy Academy Spain Edition took place on La Palma focusing on the energy transition on the Canary Islands. © Photo IDAE.

↑ What if La Palma runs out of petrol in 5 years time? That was the question stakeholders discussed during the workshop with La Palma Renovable on the Canary Islands.. © Photo Jan Cornillie.

↑ The energy consumption due to transport on the archipelago of Cres-Lošinj was estimated based on the available data. © Photo EU Islands Secretariat.

Heating and cooling

Depending on the climate of the island, there may be a demand for heating and/or cooling. As part of this category, the consumption over the last (or most recent) year for boilers, heat pumps, A/C systems or any other heating or cooling device or technology used on the island should be considered. Possible sources for the required information are the following:

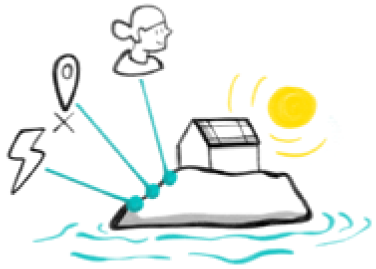
- → Statistics agency in the country/region, either through databases, annual reports, etc.
- → Gas/fuel providers.

As heat is usually produced on-site (for example in boilers placed in a house, apartment, or office building), it might be difficult to have accurate data on final energy consumption for this vector. Two different methodologies are suggested below:

- → If data on total fuel sales on the island is available: once fuel consumed for electricity production and by the transport sector is determined, it could be assumed that the rest of the fuels correspond to heating (unless there is industry or any other relevant sector on the island that may require a specific type of fuel).
- → The Odyssee-Mure project (see Resources) provides average data on heating consumption per dwelling and country. If this data could also be representative of the conditions on the island, it could serve to estimate heating consumption by island households.

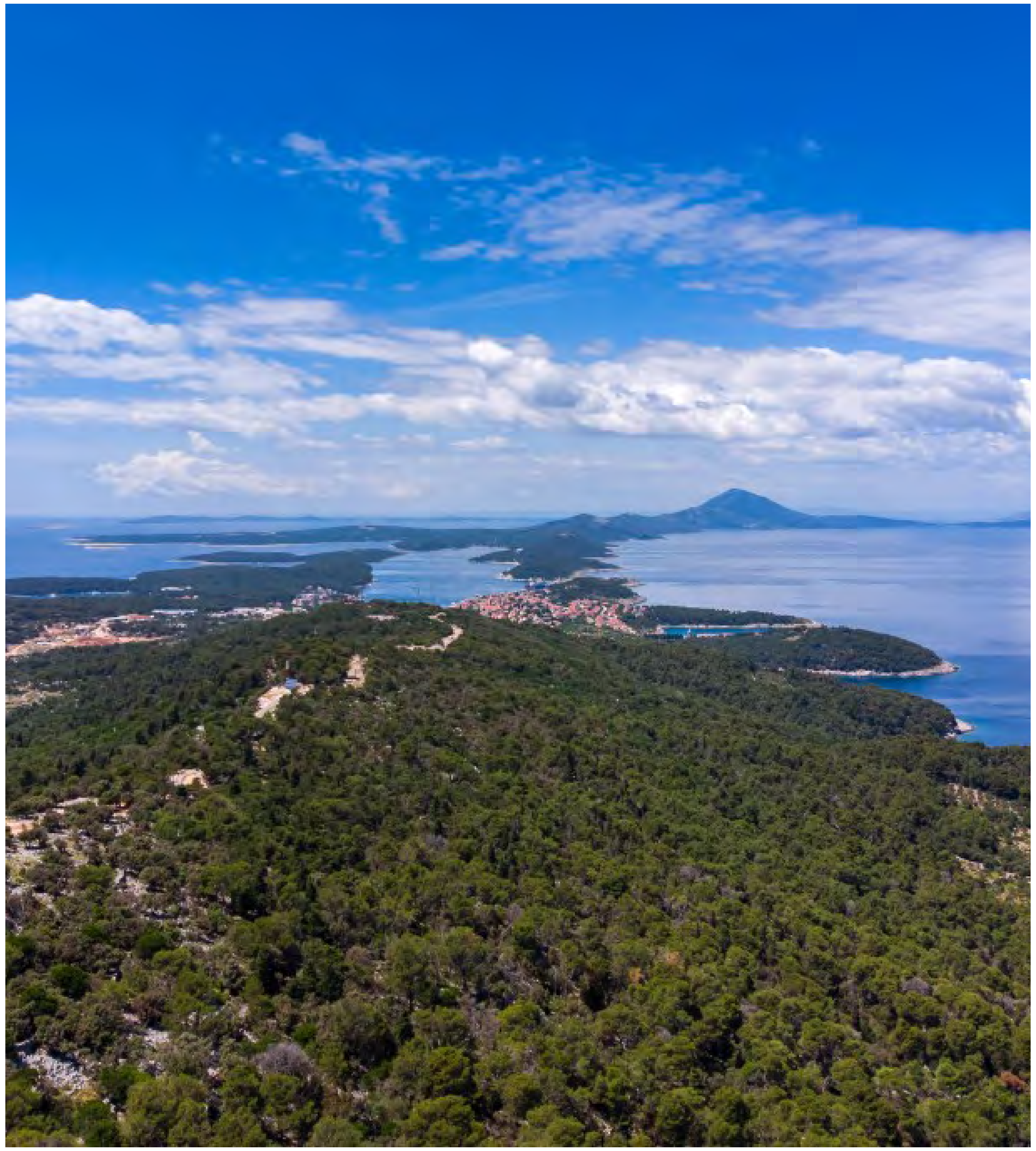
Certain devices such as A/C systems, electric boilers or heat pumps may consume electricity to produce heat or cold. In this case, their consumption could either be allocated under electricity or heating/cooling. Special attention should be given to avoid counting the same consumption under two categories.

Technology solutions booklet



Other

Other important sectors (such as industry, agriculture, water treatment, water desalination, etc.) may play an important role on the island and may consume large amounts of energy. In such cases, these can be covered in separate categories in the energy system description. As for the rest of the vectors, a description of the current situation should be included.



↑ Cres-Lošinj completed its Clean Energy Transition Agenda (CETA) successfully, involving all island stakeholders in this exercise and building a coalition on energy transition which has resulted in the archipelago hiring a sustainable energy coordinator. Photo © Ivan Brčić, picture of the Cres-Lošinj archipelago. In 2019 the Cres-Lošinj archipelago was selected as a pilot island from the Clean energy for EU islands secretariat.

Overall summary and CO_2 emissions

The data for the different vectors can be summarised in a table such as **Table 1** →.

At this point, if the breakdown per fuel type is specific enough, it would also be interesting to include the CO_2 emissions associated with each one of the vectors. The conversion factors (ton of CO_2 per MWh of energy consumed) are available through the Covenant of Mayors (see Resources). If there is an electrical connection from the mainland, the CO_2 emissions associated with electricity would depend on the energy mix of the region/country.

For islands that are not connected to the mainland or that produce part of the electricity that they consume, a second table summarising the total energy produced on the island, the primary energy consumed in the production of electricity and the CO_2 emissions (following the example of **Table 2** →) can be included. For renewable energies such as solar photovoltaic or wind energy, there is no primary energy consumed or CO_2 emissions associated with the production of electricity. Therefore, these should be left blank.

Table 1 Example of the summary final energy consumption data and CO_2 emissions

	Energy consumption [MWh]	CO_2 emissions [ton]
Electricity consumption		
Residential	XX	XX
Primary sector	YY	YY
Industries	ZZ	ZZ
Tertiary sector…	TT	TT
Transport on the island		
Source 1	XX	XX
Source 2	YY	YY
Source 3	ZZ	ZZ
Transport to and from the island		
Source 1	XX	XX
Source 2	YY	YY
Source 3	ZZ	ZZ
Heating and cooling		
Source 1	XX	XX
Source 2	YY	YY
Source 3	ZZ	ZZ

Table 2 Example of table summarising energy consumed by the electricity production units on the island

	Total energy production [MWh]	Primary energy consumption [MWh]	CO_2 emissions [ton]
Diesel generators	XX	XX	XX
Gas turbine	YY	YY	YY
Solar photovoltaics	ZZ	—	—
Wind	TT	—	—

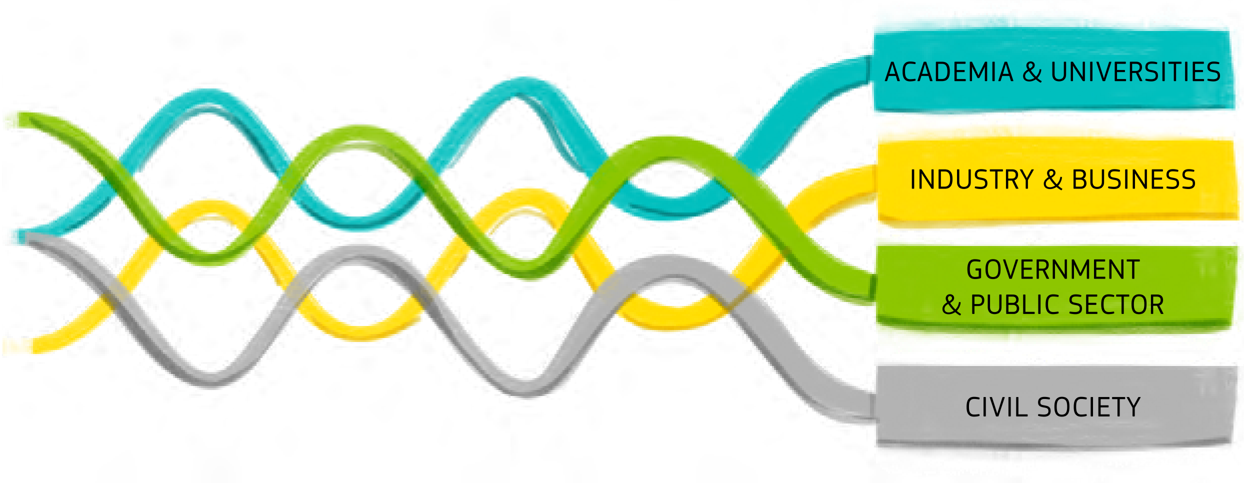
2. 3. Stakeholder mapping

Mapping the island stakeholders allows for identifying all the relevant actors on the island who are key to the energy transition. In addition, the stakeholder mapping exercise provides a structure for determining the governance of the transition (to be developed in Section "3. CETA Part II: Island transition path" on page 52).

Stakeholder groups

A quadruple helix approach is an approach to multi-stakeholder involvement in the clean energy transition. It consists of four strands, representing the four stakeholder groups (public authorities, academia, businesses, and civil society organisations), with individual agendas that overlap, see Figure ↓.

When well-implemented, the operation of the quadruple helix ensures the right balance between the **engagement of public authorities, civil society organisations, local businesses, and educational institutes**.



↑ The quadruple helix allows finding the right balance between different stakeholder groups

The key stakeholder groups include:

- → **Public authorities** as the entities that hold the legal responsibility for providing basic services on the island. Public authorities oversee general rules regarding land use and energy planning on the island. At a local level, their support can be a critical aspect of the success of the island's clean energy transition: their close involvement gives an important mandate to the Transition Team. Smaller islands do not always have their own public administration and will therefore need a good relationship and commitment from their nearest public administration office, either on the mainland or neighbouring island. On larger islands, there is often more than one public administration centre, for instance, numerous municipalities, each with their own different offices. It is advised to ensure that all administrations are committed or, alternatively, that the commitment is made on a regional/provincial level with a mandate to support all municipalities on the islands. Municipalities and the regions/provinces can also commit together to a strengthened collaboration of the public authorities.
- → **Civil Society Organisations** are well suited to achieve the broad support and outreach needed to safeguard the transition. They are key to ensuring a Transition Agenda tailored to the dynamics, history, and culture of the island. Citizens' organisations usually operate voluntarily, and they are often highly engaged in serving the community with a fast feedback loop of both positive and negative impressions. Formal or informal commitments among locals are made without the use of written laws or money: they, therefore, rely on mutual trust, a very strong force that is perfectly suited to pushing the clean energy transition.
- → **Academia** has the potential to push local engagement via teaching as well as using the integrity of the school as a local role model for change.
- → **Local business** associations and relevant private businesses on the island are a vital part of the local socio-economic ecosystem that will be affected by the transition. Including local business associations at an early stage will help identify the opportunities the Clean Energy Transition Agenda can bring to local entrepreneurs and business owners. Local tourism can play an important role in mobility, energy efficiency, as well as renewable energy production since sustainability in these domains can be a way to develop the tourism business on the island. Furthermore, the involvement of local craftsmen and service providers is recommended. They may need to upgrade their training and methods, but they also face new opportunities in the development of the clean energy transition.

One way to map stakeholders is to build a comprehensive stakeholder engagement register, where each stakeholder is listed together with the reason for their engagement and their perspective on the transition, see Table ↓

Organisation Name
Reason for their involvement: Gain/raise awareness, acquire support or resources (financial & people), show commitment or endorsement to the cause, take leadership, obtain data, gain expertise, participate in decision-making, coordinate the timing of projects, etc.
Perspective on the transition: Not supportive, neutral, supportive, etc.

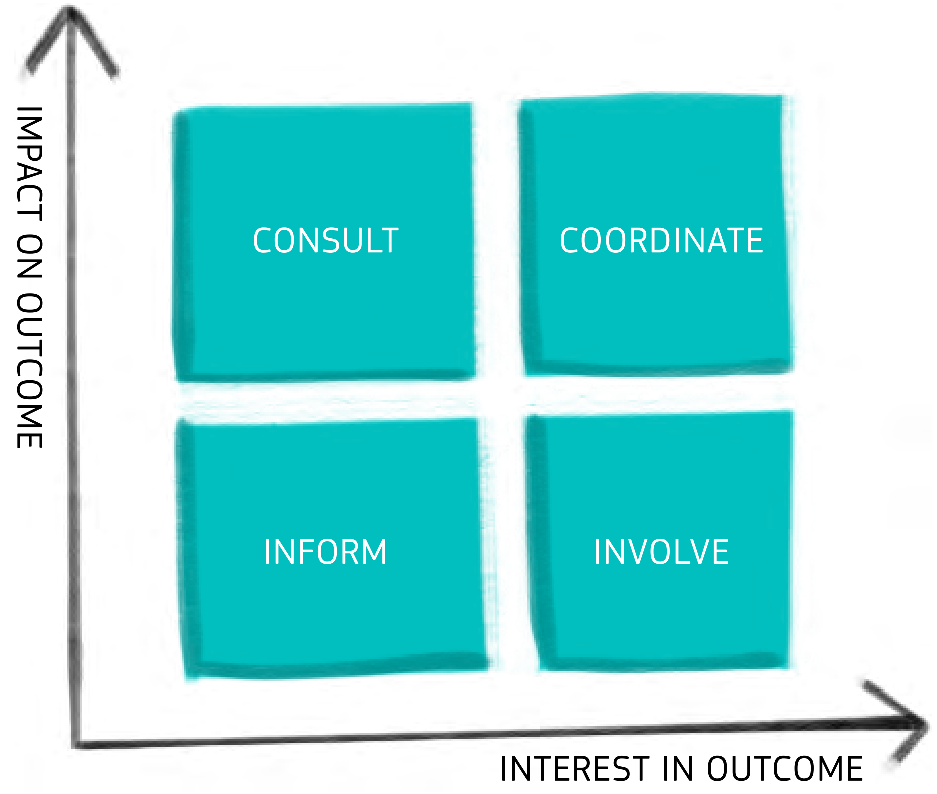
↑ Table example for the stakeholder register, including the reason for the stakeholder's involvement and their perspective in the transition

Mapping approaches

From the list above, the stakeholders can be mapped to determine their involvement in the process. Based on their level of interest and their impact on the outcome of the transition, the mapping determines which type of engagement should be assigned by the Transition Team per stakeholder, as shown in Figure →.

Stakeholders with **high interest and a high impact** on the outcome should be closely coordinated. They are invited to become part of the Transition Team, and in any case, a close relationship should be established regarding both the operational and strategic aspects of the transition.

Stakeholders with **high interest and a low impact** should be involved in the process. They can provide valuable support by facilitating meetings, supporting outreach activities, doing research, etc. This simultaneously touches on their interest in the outcome.



↑ Stakeholder can be mapped according to their impact and influence to determine their role in the process

Stakeholders with **low interest and high impact** on the outcome should be consulted throughout the process. The Transition Team can use their support and feedback to determine the next steps.

Stakeholders with **low interest in the island's clean energy transition and a minor impact on the outcome** should be kept informed of the ongoing developments and progress. This can be through, for example, a public website, a newsletter, information posters in public areas, etc.

EXPLORE

Stakeholder mapping in Culatra, Portugal

The clean energy transition on Culatra, a small island in the Ria Formosa delta in the south of Portugal, is part of the Culatra 2030 project that aims to alleviate the living conditions on the island and spur local development by empowering the island community.

Culatra's transition covers energy but also goes beyond that.

Historically, access to basic services such as water and electricity on the island has been hindered and there is, therefore, a need for overall development.

The Transition Team consisted of Algarve University, the Resident Association of Culatra Islands, the Coordination Commission of the Algarve Region and Faro Municipality. They were supported by Make It Better, an organisation that specialises in working with communities on development projects and leading the participatory diagnosis with the island community.

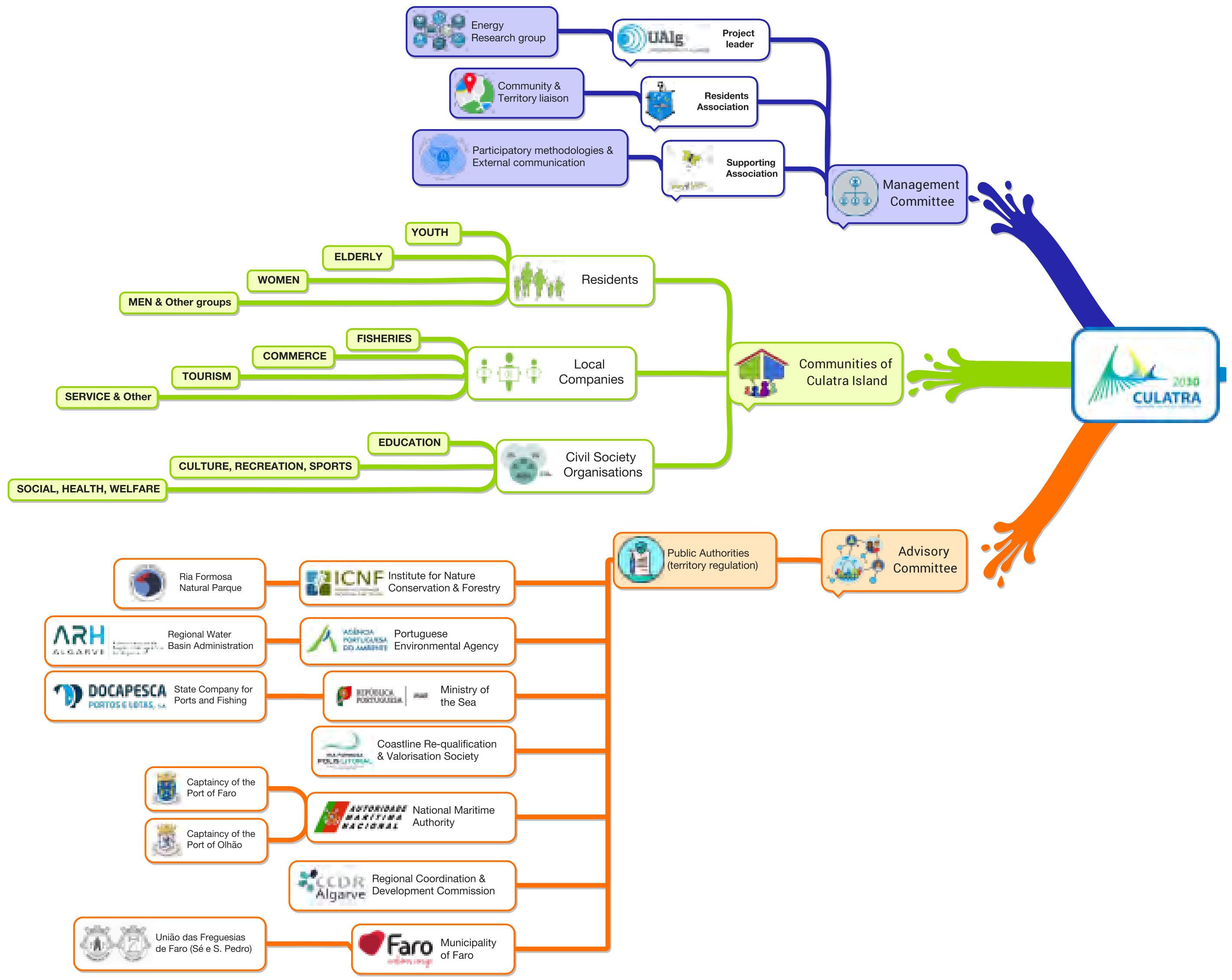
The Transition Team used stakeholder mapping to explore the island dynamics and identify the different stakeholders and consider their role and involvement in the process.

The team distinguished between three different groups:

- ↳ The management committee consists of the organisations on the island that play an active role in facilitating and driving the transition process.
- ↳ The communities present on Culatra that are engaged in the transition process.
- ↳ The advisory committee consists of organisations and public bodies of the island that are relevant to consider.

The mapping, shown below, gives an overview of the most important **stakeholder groups** on the island and identifies the actors off the island that play a role in the transition.

This helps the Transition Team to reach out appropriately to each of the groups, which is important for the participatory process.



↑ Stakeholder mapping on Culatra shows the different stakeholders involved. Image © Make It Better.

2. 4. Policy and regulation

The Transition Team should investigate how the island transition process is embedded in the broader policy and regulatory framework.

This provides the context in which the local energy transition takes place, such as international agreements on climate change, national and regional targets for the integration of renewable energy, local commitments to decarbonisation, etc.

This exercise contributes to a clear understanding of how the island's CETA relates to clean energy transition and planning processes at different governmental levels in your country.

A more detailed study of policy and regulation can also identify specific opportunities for the island's transition. Such a study investigates the available support schemes, sustainability programmes and other available resources.

Information on policy and regulation can be gathered through desktop research and interviews using information sources such as policy documents, government websites, national climate and energy plans, previous commitments and plans on energy that were made for the island, etc.

The Islands secretariat has developed an inventory of Policy and Legislation for all 15 EU member states with islands in which you can find information on support schemes for renewable energy (electricity, heating & cooling and transport), permits and authorisation processes. The inventory also contains information on grid-related policies, energy efficiency policies, community energy policies and other supporting policies available.

This is a good opportunity to reach out to government stakeholders to establish a point of contact. In the future, this can facilitate the information flow, both top-down and bottom-up. The inventory also contains an overview of the relevant public authorities in each Member State.

Regulatory inventory

↑ © Photo Maia Crimew on Unsplash.

Example: Salina, Italy

As part of their CETA, Salina studied the regulatory framework surrounding the island and identified several opportunities for their clean energy transition.

Salina is the second largest of the seven Aeolian islands, situated off the Sicilian North Coast. It is one of the 14 Sicilian Isole Minori – Sicilian Small Islands. Salina is electrically not interconnected and lies about two nautical miles from Lipari, the largest and most populated island of the archipelago.

There are three municipalities present on the island: Malfa, Santa Marina, and Leni. The Sicilian Region, through its regional energy department, is the highest government body responsible for energy planning in Sicily and on the Sicilian islands.

At a local level, all three municipalities on Salina have signed the Pact of Islands to commit to a reduction in primary energy consumption and greenhouse gas emissions. They each developed a Sustainable Energy Action Plan in 2013 to show which measures could be taken to make this happen. As part of the Clean Energy Transition Agenda, the Transition Team noted that limited progress had been made on these plans, which indicates that several barriers exist to the implementation of the actions.

The Transition Team also identified the policies and regulations at a regional and national level that have an impact on the clean energy transition for Salina.

The Transition Agenda gives an overview of the relevant decrees and resolutions. For example, the Decree of the Ministry of Economic Development known as the "Isole Minori" Decree promotes the construction of renewable energy plants by private individuals by providing remuneration for the production and self-consumption of electricity. It also sets the objective to reduce electricity production from non-renewable sources by at least 20% of the conventional annual electricity production – which equals 9 160 MWh/yr for the island – and the objective for the development of renewable energy sources to be reached by 2020 – 580 kWp solar power and 570 m^2 of solar thermal surface.

At a European level, the Transition Agenda identifies the major trends in energy, including the targets on greenhouse gas emissions, renewable energy integration and energy efficiency. It was found that the European rules on Renewable or Citizens Energy Communities can play an important role to empower citizens and small producers to participate directly in the clean energy transition by jointly investing in, producing, selling and distributing renewable energy.

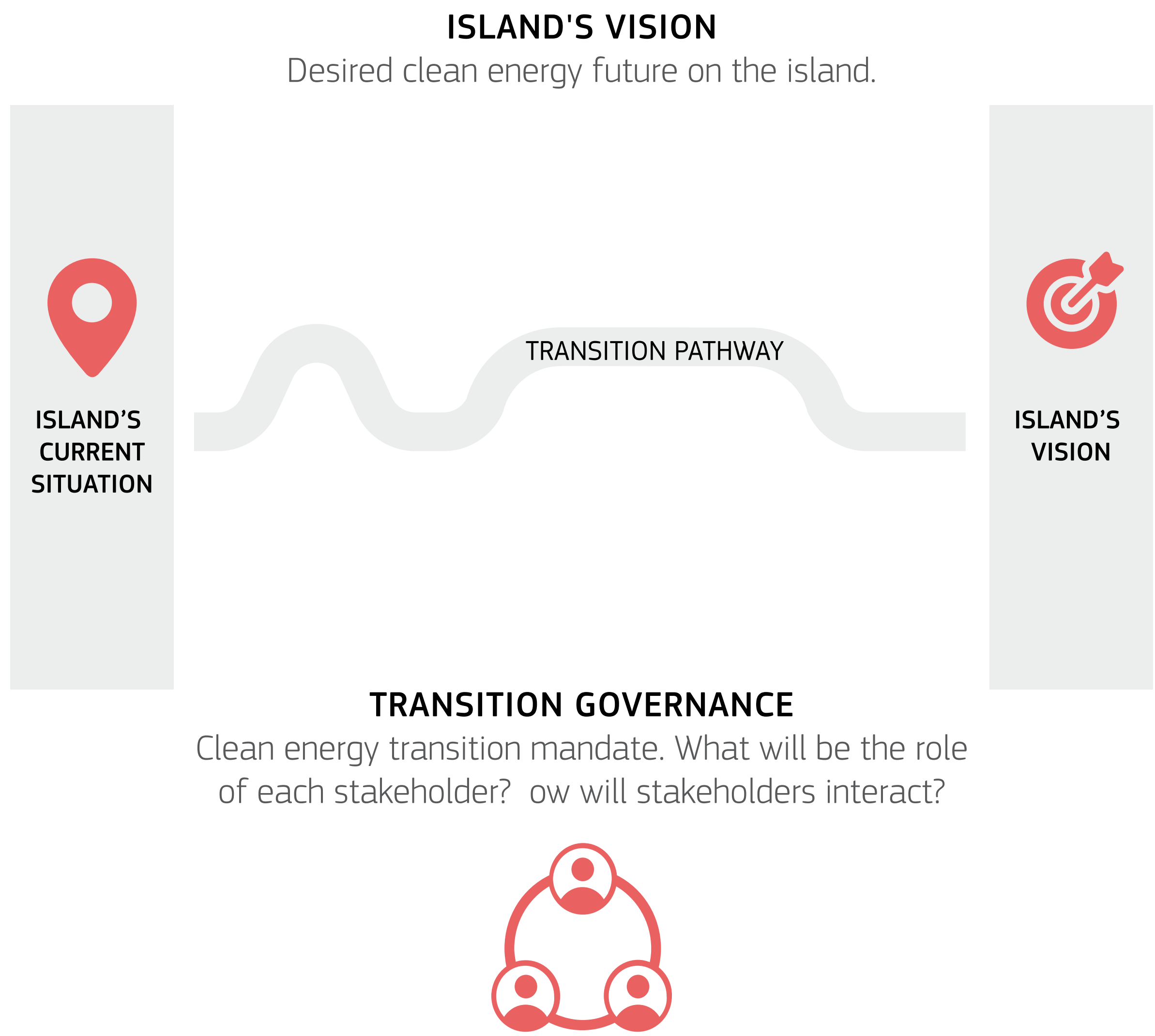
Through this analysis, the Transition Team was able to identify the top-down dynamics that are important to consider in the rest of the Transition Agenda.

↑ Poster © Green Salina

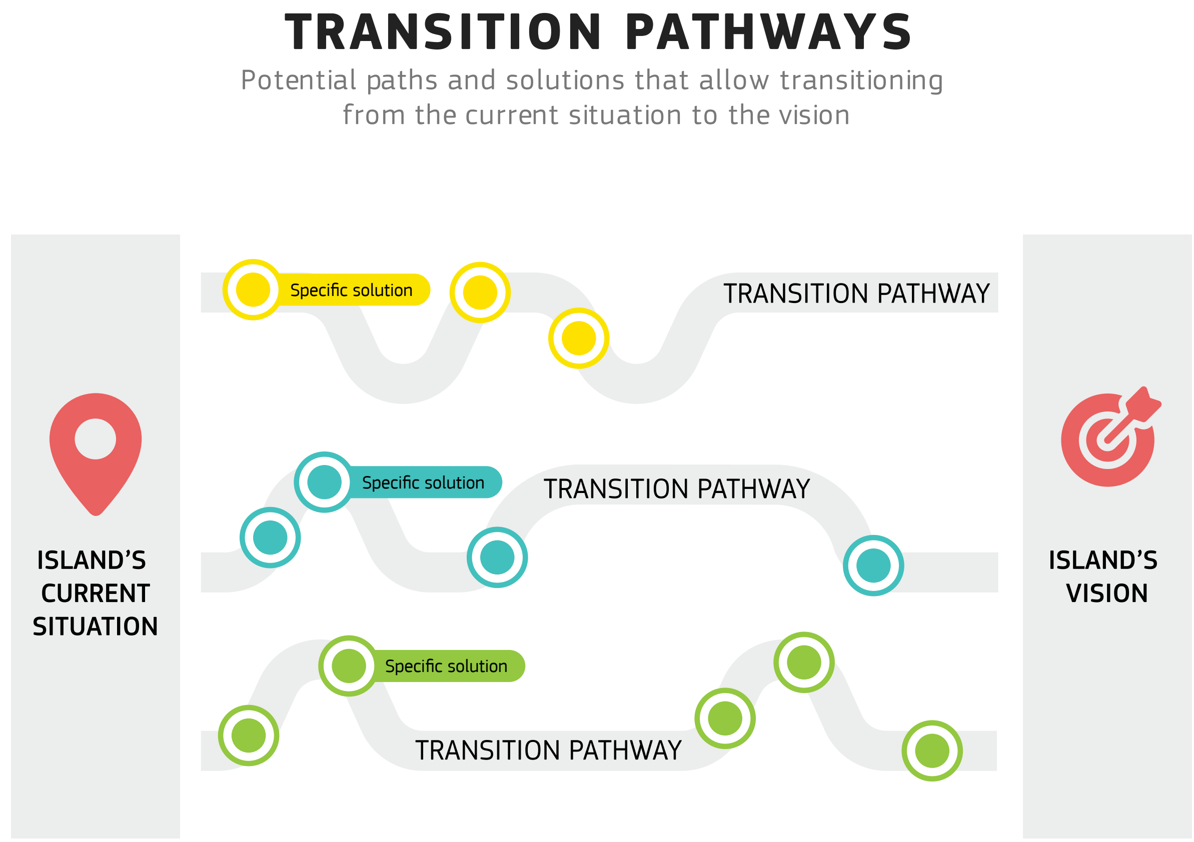
3. CETA Part II: Island transition path

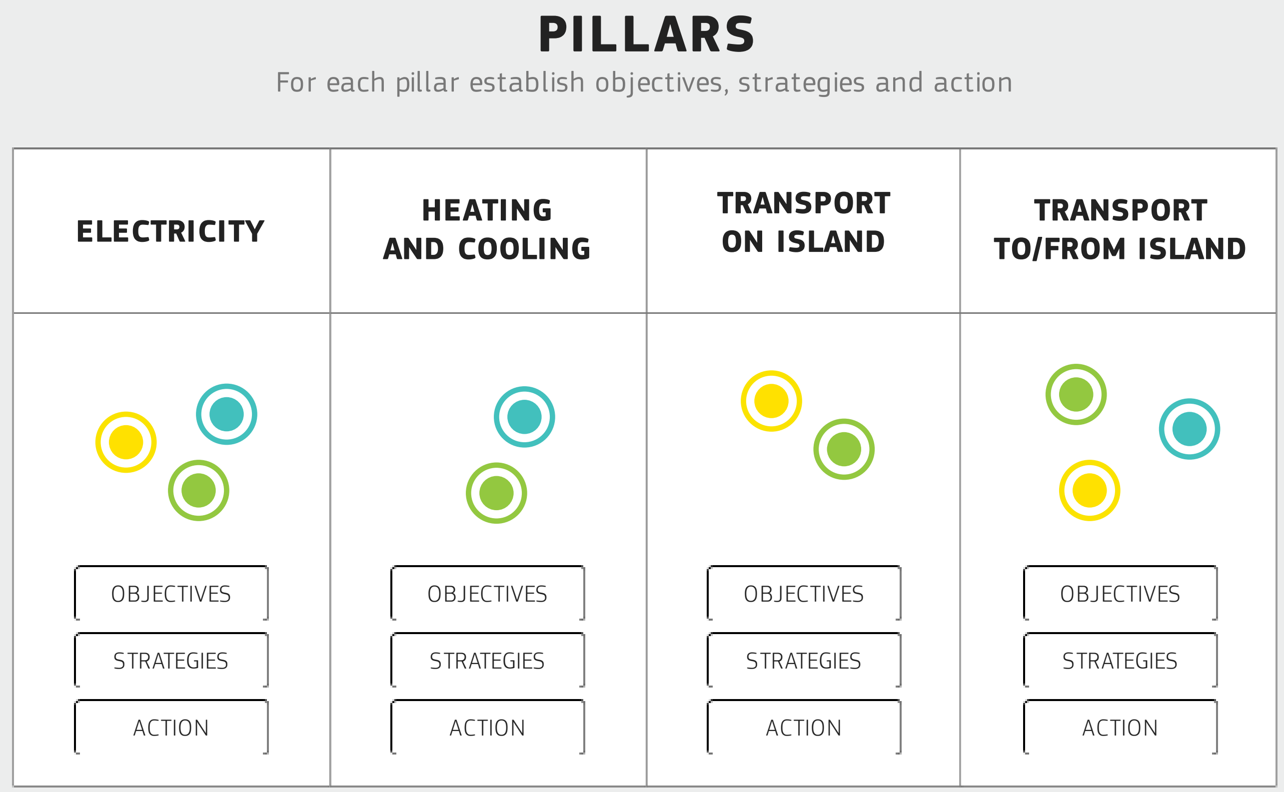
Once the present island dynamics are characterised, the Transition Team and the Transition Community develop the Island Vision–that will guide the energy transition–and the Transition Pathways and Pillars–that lay out the path to achieving the vision in the mid and long term.

The sections below explain how each of the steps may be undertaken to determine a common vision and produce a strategic plan for the island's decarbonisation. The connections between all these steps (vision, transition governance, transition pathways and pillars) are summarised in Figure →



↑ Part II of the CETA starts by elaborating the island vision, to then the transition governance, and elaborate the pathways and pillars.



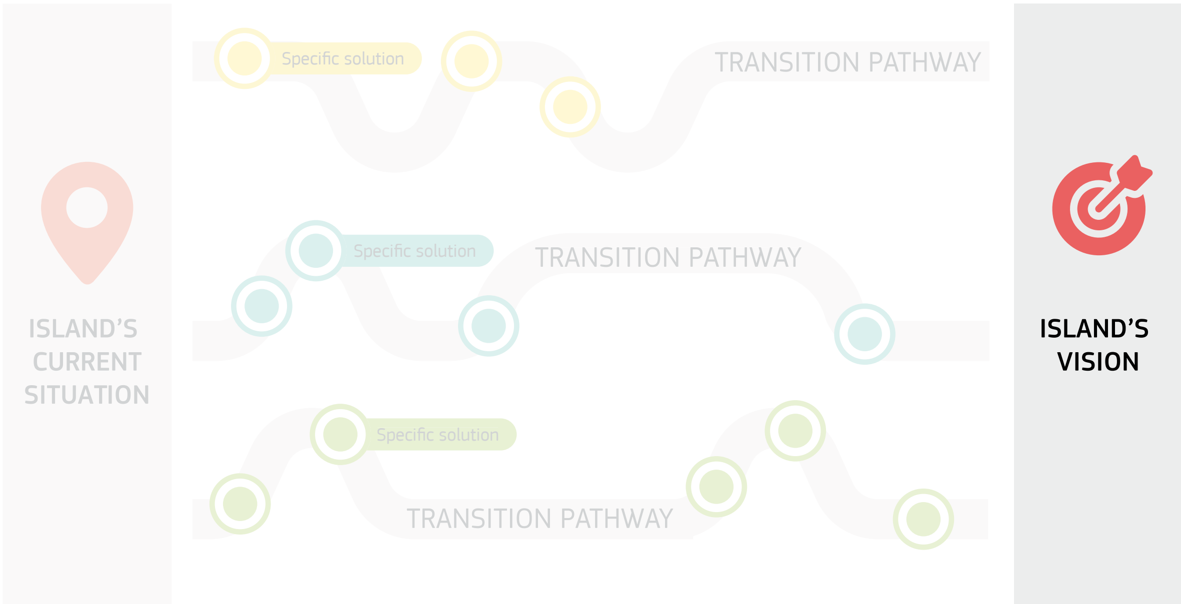


3. 1. Vision

A clean energy vision aims to establish a shared goal for the transition process. It can best be expressed as a sentence or paragraph that describes how the island stakeholders see the transitioning island in the future. This statement provides guidance for future transition activities.

An island vision needs to be bold and at the same time attainable. A trade-off should be found between an inspiring vision that can engage and mobilise people and a reasonable vision that can materialise in the long term.

The recommended timeframe for developing a vision is mid-term. A target of 10–15 years can play a psychological role: it creates an urgency that mobilises people to take immediate action for a future that both affects them and may also be influenced by them. Hence, an overall future direction is set while the possibility for future debates is left open.



The vision workshop

A vision can be developed in a workshop in which all the relevant island stakeholders participate. To begin with, the contributors to the transition dialogue may start discussing their core values, such as sustainability, justice, accessibility, autonomy, efficiency, citizen participation, etc.

Thereafter, the guiding principles for the island's future are formulated, e.g., a sustainable island, a socially just island, and an accessible island. These principles are effective tools for the vision workshop that will lead to the development of the overall vision.

If there are already existing agendas, visions, community initiatives, or pilot projects on the island, these should be taken into consideration when drafting the island's guiding principles and clean energy vision. Participants should be able to choose between building on existing visions or strategies or starting to work on these principles with a new perspective.

Following the discussion on guiding principles, the vision workshop may continue by envisioning the island in the future and answering, for example, the following questions: How will the island look in 2030, in 2050? How will people live? What do we want to see happening on our island?

The discussion should remain on a strategic level: achieving a consensus on details such as technological solutions or the final share of the energy mix is not necessary at this stage.

Maintaining a friendly atmosphere is important; however, conflict will have a place in this process. This is a healthy and normal part of all transition processes.

There are several ways to present the created vision and vision statements: they can involve artistic images and videos, online communication, headlines, front pages of future newspapers, newsmagazine issues, etc. Communicating the vision to a broader audience may mobilise networks and the associated resources for the realisation of this vision.

Technology solutions booklet

Good practices and benefits of envisioning

Some good practices around envisioning processes are the following:

- → **Consider existing, local storylines** around change and activate them within the vision.
- → **Allow for open confrontation** and the exploration of commonly shared values and future desires.
- → **Involve actors with different backgrounds** and types of knowledge to allow for learning and co-creation. When necessary, external actors may be also invited. Examples of interesting profiles include technological, financial, organisational, etc.
- → **Thinking outside the box** and being creative may help to make a breakthrough.
- → **Having a workshop facilitator** may help to address conflict, engage all the actors, and promote creative thinking.

For more information on how to organise and facilitate a workshop, please check the secretariat's Workshop Facilitation Guide.

Workshop Facilitation Guide

The benefits of envisioning are:[1]

- → Envisioning encourages fresh ways of thinking about the future and creates collaborative linkages between previously unconnected or disconnected actors.
- → Envisioning processes genuinely engage people and provide space for reflection and creativity, while paving the way for change.
- → A clear vision enables people to determine their own (personal/ organisational/ departmental) objectives and to collaborate with others, knowing that they are all working towards a shared goal.
- → When people that share the ambition to contribute to a common cause come together for the creation of a common vision, the collective energy inevitably increases, and a sense of real commitment is created.
- → When a vision is created with the participation and collaboration of all relevant stakeholders, then everyone shares its ownership. Therefore, it is more likely that the overall coordination will be easier.

1 Adapted from (Frantzeskaki and Tefrati, 2016)

Examples of visions of the six Pilot Islands from the pilot phase of the Clean energy for EU islands secretariat

Aran Islands vision: "The Aran Islands are self-sufficient in clean, locally-owned energy. The economy of the islands is built on the related benefits that accrue from this"

Cres-Lošinj vision: "The Cres-Lošinj archipelago is smart and energy-efficient. The local community is energy literate and actively involved in the energy transition. This will enable complete decarbonisation by 2040."

Culatra vision: "The vision of the Culatra 2030 Initiative is to create an energy community that manages and shares its own energy. Before 2030, renewable energy will allow for a fully decarbonised electricity system."

La Palma's vision: "La Palma is a 100% renewable island thanks to a combination of clean technologies, energy storage and auto-consumption. Energy efficiency, demand reduction and sustainable mobility are the core of the energy transition."

Salina's vision: "Salina is a sustainable island with an energy generation system based on renewables. Transport is decarbonised, and all buildings are energy efficient. The local community uses resources efficiently, and the island's natural features are respected."

Sifnos' vision: "Sifnos is energy independent with a 100% renewable energy generation system. Sifnos' inhabitants and private investors partly own the renewable installations. Transport is decarbonised. The island community and economy are protected and flourishing."

3. 2. Transition Governance

While working on the island's vision, pillars and pathways, the actors involved in the transition need to agree on their role in the transformation of the island's energy system. A clear governance structure is key to the success of the transition process.

The stakeholder analysis and mapping completed during "2. CETA Part I: Understanding the island dynamics" on page 22 which serves as a starting point to clarify questions about the potential roles and responsibilities of the different actors.

As guidance, to establish how the transition process will be governed, the following questions should be answered:

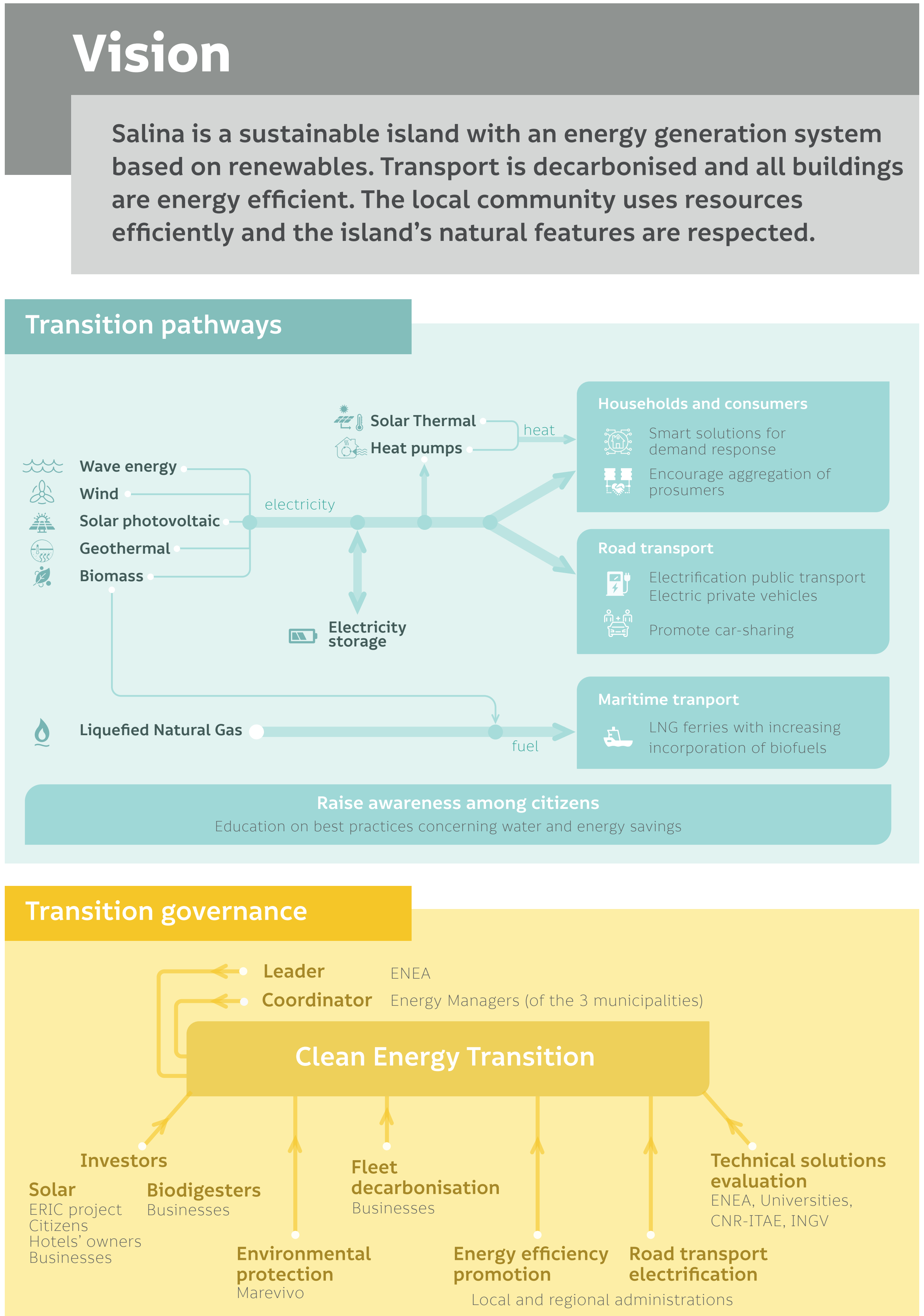
→ What is the role of each stakeholder in the process, and what are their motivations and resources?

→ How do the stakeholders interact and collaborate in the transition?

→ What is the role of local authorities? How are citizens and local businesses involved?

→ How can interests, motives, and policies of the various stakeholders be aligned toward the common vision?

↑ Ibiza © Photo by Jose Llamas on Unsplash



↑ Transition vision for the Salina island. Figure © Clean energy for EU islands

3. 3. Transition Pathways and Pillars

By spelling out the island vision, the stakeholders define where they would like to be in 10-15 years. But how to get there? Defining the possible pathways and solutions will follow the envisioning exercise.

The island's present situation was characterised in the first part of the CETA. Having the vision as the goal, the stakeholders may come up at this stage with a combination of solutions across different sectors to reach their objectives: these are the island Transition Pathways.

As an example of a Transition Pathway, the island stakeholders decide to install wind turbines to produce electricity. In moments of reduced electricity demand, the excess electricity from wind will be used to produce green hydrogen. Hydrogen may, in turn, serve as fuel for the ferry connecting the island to the mainland. This Transition Pathway example includes a combination of solutions (wind, hydrogen storage, hydrogen ferry) and spans across different sectors or Pillars (electricity, storage and transport).

Both concepts (Pathways and Pillars) are linked and will be elaborated in parallel by the Transition Community, guided by the Transition Team and with expert support if necessary. As the Pathways are drawn up, the different solutions are classified and further developed in the Pillars (see Figure →).

Pathways and Pillars may include technical, economic, social and organisational options that exist for the island's clean energy future.

Before starting, it is important to consider the level of expertise that is available on the island, as this will have an impact on the level of detail included in the CETA. The Pathways and Pillars strategically address the clean energy transition and, therefore, do not necessarily require detailed information on the technologies, costs, etc.

Nonetheless, a CETA can benefit from detailed and informed input to develop a realistic strategy. Inviting a professional to talk about his area of expertise can be an inspiration for the community and bring new ideas to the discussion table.

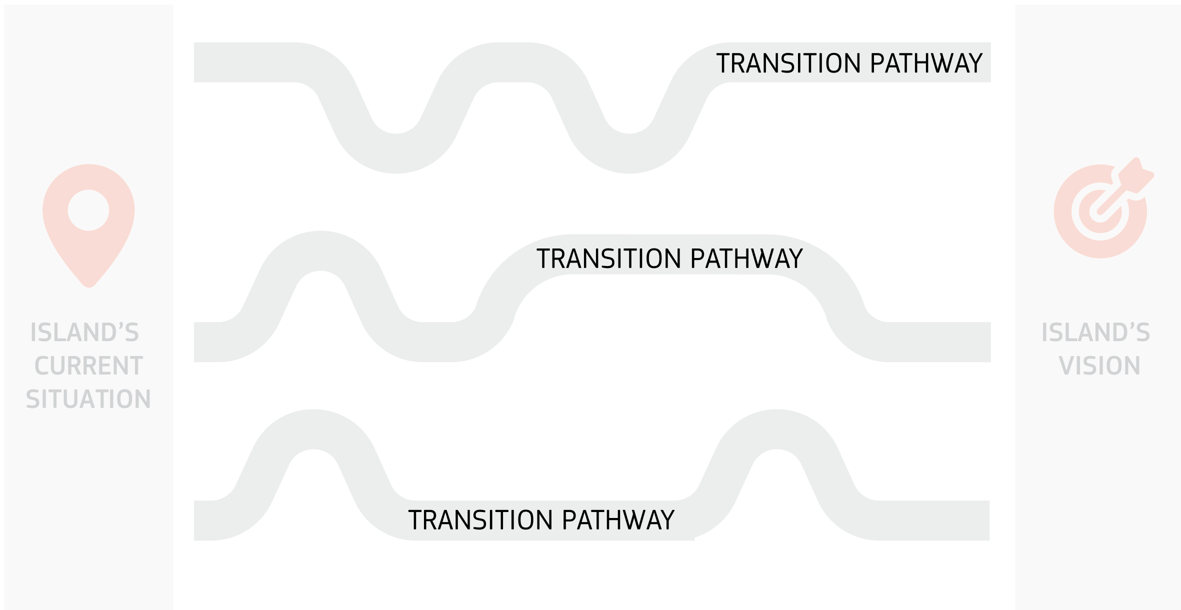
Pathways and Pillars can be developed in different ways, including a combination of research, presentations, and discussions.

Thematic workshops can be organised where participants contribute with their perspectives and ideas. Research can help to identify opportunities and eliminate unrealistic proposals. The results from these activities may be summarised in writing, pictures, and drawings and should be made publicly available.

The role of the Transition Team in this process is to facilitate the thematic workshops (send the invitations, coordinate the meetings, record the inputs, process the results, disseminate, etc.), do the back-office work (carry out the research, invite experts) and contribute to the dialogue. The number of thematic workshops will depend on the island context: some islands may have certain pillars for which concrete strategies have been developed, while other pillars will require more work.

The level of abstraction at which each of the pillars is specified depends on the priorities of the island's transition.

↓ Transition pathways and pillars allow the island stakeholders to define and organise the solutions that will lead to the vision.

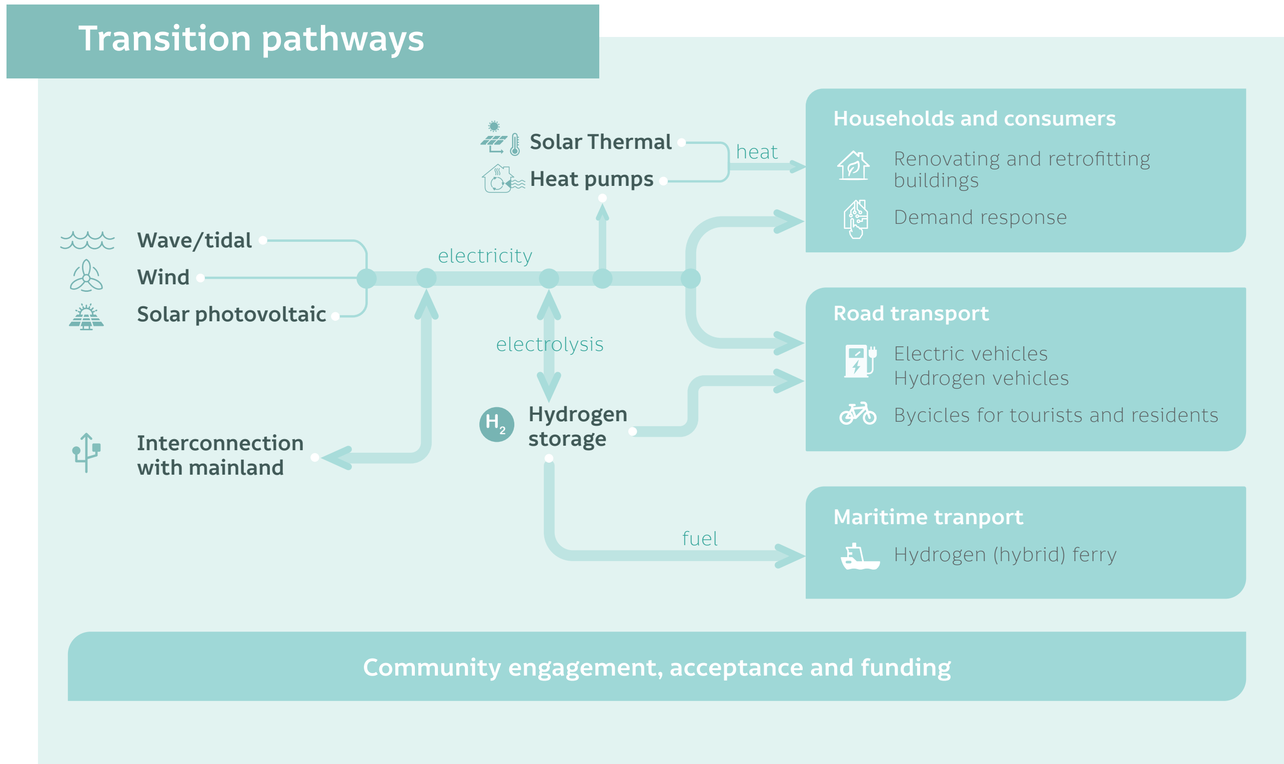


Island Transition Pathways

Transition Pathways link the present situation on the island with the envisioned future by integrating solutions that span across different Pillars. Pathways are not fixed plans but storylines across scales and sectors that present an overview of the existing possibilities for decarbonisation.

An example of the Transition Pathways of the Aran Islands is summarised in Figure ↓

↓ Transition pathways for the Aran islands. Figure © Clean energy for EU islands



Island Transition Pillars

Firstly, the themes of the Transition Pillars need to be identified.

The Clean energy for EU islands secretariat suggests starting with the same structure as the Energy System Description; therefore, the pillars can be divided into:

- ✓ Electricity generation and consumption
- ✓ Transport on the island
- ✓ Transport to and from the island
- ✓ Heating and cooling

The Pillars depend on the context and specificities of the island and can also be cross-cutting sectors (e.g., lifestyle, community engagement, education).

Once pillars are determined, **strategic objectives** need to be defined for each one of them. These objectives allow establishing short-term actions and identifying feasible strategies, projects, and activities per pillar.

While the transition pillars are based on a participatory process, it is important to emphasise the need for accurate information.

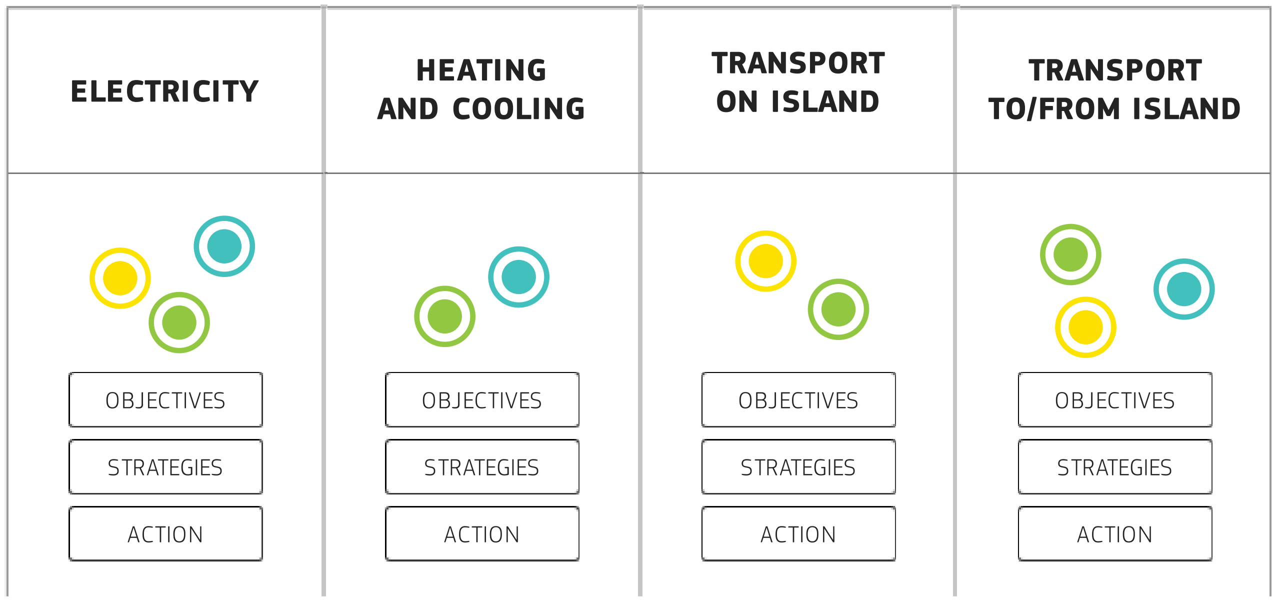
Correct numbers on the impact of the transition need to be available during the transition dialogue, for example, on electricity prices, number of local jobs, renewable energy potential, financing, etc. Accurate data ensures trust between the different stakeholders, which in turn ensures a good ground for agreement.

Three tools are suggested in Annex I that may help in the Pillars Workshops: SWOT analysis, Transition Canvas and Technology assessment.

"SWOT ANALYSIS" on page 134

"TRANSITION CANVAS" on page 138

"TECHNOLOGY ASSESSMENT" on page 140



EXPLORE

The pilot islands

The Clean Energy for EU Islands Secretariat developed Clean Energy Transition Agendas with six islands:

- the Aran Islands in Ireland,
- the Cres-Lošinj archipelago in Croatia,
- Sifnos in Greece,
- Culatra in Portugal,
- Salina in Italy,
- La Palma in Spain.

Their Transition Agendas provide good examples of how island transition pathways and pillars can be developed.

These Transition Agendas are published on the Clean Energy for EU Islands website.

Further reading: Clean energy for EU islands the overview

↑ Portuguese islands Energy Academy in 2022 focused on the possibilities for the clean energy transition, technolgies, chances, and barriers. © Photo by Clean energy for EU islands.

Ibiza: an example of how dedicated human resources can drive the energy transition despite a global pandemic.

The island of Ibiza decided to seriously invest in its energy transition and hired two people to work full time and lead their transition team: one person who specialised in participatory processes and an expert in energy systems.

Despite the COVID-19 crisis, this dedicated transition team managed to substantially progress on the development of Ibiza's first CETA.

Through a **survey**, islanders could provide their views and proposals to achieve a renewable island.

The results from the survey were used as input for the workshop named '**Dialogues towards a sustainable island'**, which eventually took place online in June 2020.

More than 40 people (from NGOs, businesses, public administration, renewable energy experts, etc.) participated in the workshop, split over two days of intense, joint effort and showing the island's commitment to the clean energy transition.

During the workshop, the island's clean energy vision, as well as transition pathways and pillars, were discussed, thanks to the facilitation of the transition team and by **making use of online tools**.

The output of the workshops was written down to become the first version of Ibiza's CETA.

Further reading: Ibiza's CETA

↑ Ibiza © Photo by Michael Tomlinson on Unsplash.

3. 4. Monitoring

Monitoring allows for keeping track of the developments of the transition.

Both the transition process itself and the way that it is managed can be monitored and reflected upon. Periodic assessment is recommended to confirm that the transition is going in the right direction.

The Clean energy for EU islands secretariat has developed a self-assessment tool–available for download here – with nine indicators that cover six areas.

→ **Clean Energy Transition Agenda**

→ **Vision:** is there a medium or long-term island-wide vision on clean energy? Are specific objectives included? Is the vision approved by the relevant authority and the island's community?

→ **Community**:

- ✓ **Stakeholders:** Are the stakeholders on the island aware of the island's clean energy transition? Are individual actors committed? Is there a commitment on the island's wide level?
- ✓ **Organisation**: Are there stakeholders on the island working on the clean energy transition? Are stakeholders working on an individual level or are there partnerships in place? Is there a forma island-wide transition team, represented by actors from all four stakeholder groups?

→ **Investment/project concept:** is there awareness on funding opportunities for clean energy projects on the island? have potential projects been identified, and their funding solutions conceptualised? Is there a project pipeline, with an investment concept in place?

→ **Decarbonisation plan:**

- ✓ **Island diagnosis:** Has the energy system on the island been analysed? Has a baseline energy consumption and emissions been carried out, covering sectors like electricity, transport on the island, transport to and from the island, and heating and cooling?
- ✓ **Data:** is data on energy consumption and CO2 emission collected regularly and periodically from all sectors?
- ✓ **Action Plan:** Have the priorities and key actions and measures on clean energy been identified? Is there an island CETA in place, approved by the relevant authority, than includes actions, timeline and the budget available to achieve the targets and objectives?

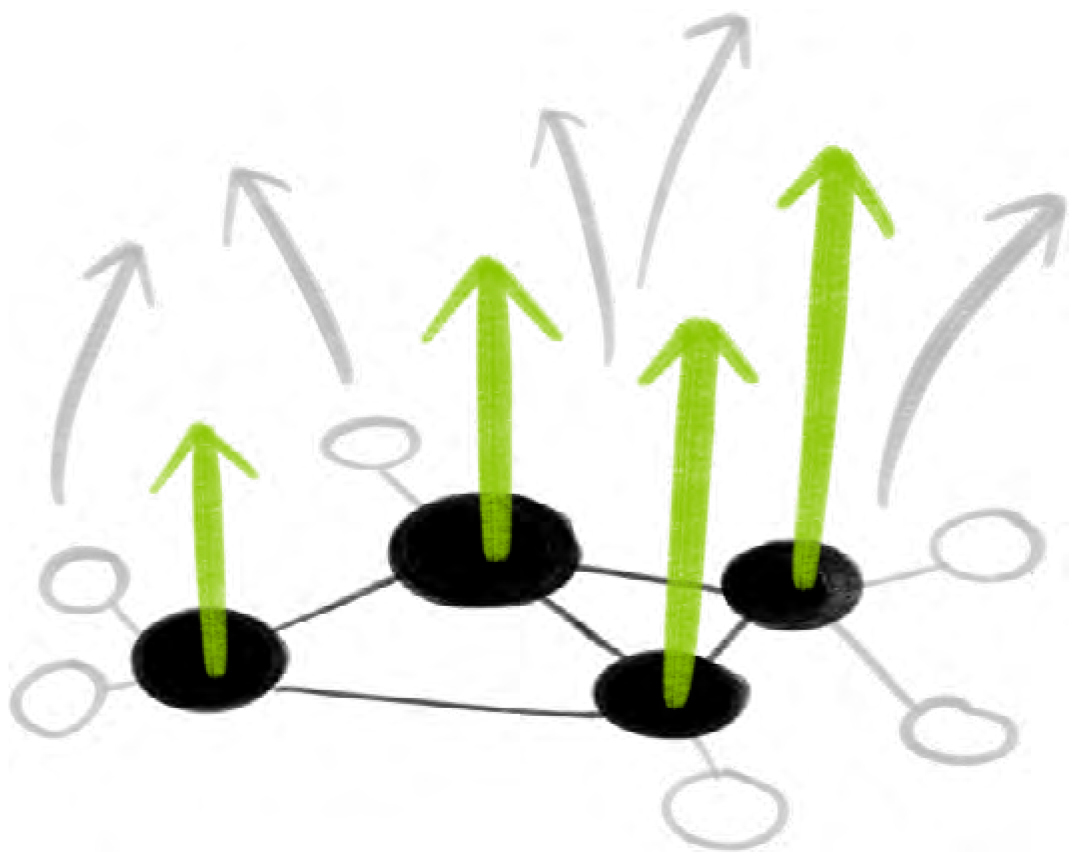
→ **Multi-level governance:** Is there interaction with relevant local, regional, or national authorities on the clean energy transition?

Each of the indicators is scored from 1 (low development in the area) to 5 (high development).

The self-assessment allows for diagnosing the transition process on the island: by identifying the strengths and weaknesses it is possible to prioritise the different aspects to focus on in the transition process.

The **self-assessment** is done by the Transition Team, as the experts regarding the situation on the island.

Each indicator is discussed among the team members and a score is agreed upon. The exercise takes less than one hour and should be repeated periodically–for example, every six months–to analyse the development in the transition process.



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PART II – SHAPE

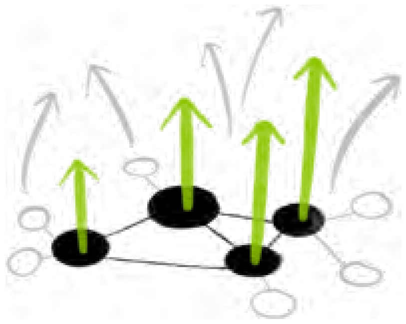
The CETA, developed by engaging the wider island community, is the steppingstone to the next stage focused on shaping energy transition projects.

To unfold the energy transition on the island, the visioning and strategising need to lead to concrete actions. In the **SHAPE** phase, the transition Pathways and Pillars from the CETA are, therefore, operationalised into a viable project pipeline, ready for execution in the **ACT** phase later on.

The development of a project can be broken down into three steps:

- → **Further advancing the project idea:** pinning down the technology and site (if applicable), making sure that all the necessary stakeholders are onboard, and screening the funding opportunities that could be available at this stage.
- → **Assessing the feasibility of the project:** first, by carrying out a pre-feasibility study to determine whether the project is worth pursuing. If the result is positive, then a detailed feasibility study is performed so that stakeholders have the details to commit to proceeding with its implementation. The difference between these two assessments is explained in detail in the sections below.
- → **Building the business model and the financing concept.**

CETA
Technology solutions booklet



STAGE					OUTPUT
SHAPE	Building a pipeline of feasible clean energy projects	Developing the project's idea	Assessing the feasibility of the project	Business development	Bankable, developed clean energy projects
		on page 75	on page 84	on page 106	

SHAPE

↑ Photos on this page © Rousay, Egilsay and Wyre Development Trust 2018 - 2021

4. Project idea

While building the Transition Pathways and Pillars, specific solutions were proposed to bring forward the island's clean energy transition.

During the **SHAPE** phase, these solutions shape into projects, starting by developing the project idea. At this stage, the stakeholders involved need to be revisited to ensure that all the relevant actors have been contacted and are on board. In addition, the technology needs to be decided and the availability of funding, researched.

4. 1. Stakeholder engagement

Stakeholders need to be identified and engaged from an early stage in the island's energy transition, as indicated in the **EXPLORE** section. Once the project pipeline starts to take shape, the stakeholders should be revised to ensure that everyone affected by the development and potential outcome of the project is on board as early as possible.

Relevant stakeholders include those from the quadruple helix (explained here) at the local level. However, regional or national agencies, research institutes, or administrations would also need to be informed and engaged. Involving key actors might also help to unlock issues that could arise as projects develop. For more detailed information about local, regional and national stakeholder engagement, check the Islands secretariat Engagement Guide.

SHAPE

4. 2. Technology and site selection

The first step when **SHAPING** the clean energy transition is to narrow down the technologies to be deployed.

This is something that has ideally already been discussed within **EXPLORE** as part of the Pathways and Pillars of the CETA; however, depending on how detailed and how much expert support was received in the development of the Pillars, the adequacy of the chosen technologies may need to be re-evaluated more closely.

The Clean energy for EU islands secretariat has developed a Technology solutions booklet that provides an overview of energy technologies that are currently commercially available for islands to advance in their clean energy transition.

The booklet offers, for each technology:

- ✓ Short description, an overview of advantages and disadvantages,
- ✓ The latest relevant targets and regulations set by the European Commission,
- ✓ Examples of European islands already implementing it.

Different technologies in the sectors of electricity, heating and cooling, transport, and storage are presented, as well as technologies for energy efficiency, community energy action, and smart grids. Islands that wish to dive into more details for selected technologies may furthermore take advantage of the bibliography and links to relevant websites that are available in the booklet.

The specific local circumstances are important when considering a technology:

- → Available natural resources,
- → Financial supplies,
- → Local know-how,
- → Landscape constraints,
- → Regulatory constraints,
- → Suitable sites that best serve the stakeholders, etc.

These will be thoroughly examined in subsequent feasibility assessments; however, a general appreciation of the situation is necessary at this point.

Technology solutions booklet

SHAPE

4. 3. Funding

Funding sources may be available to support the development of a project in the **SHAPE** phase (some funding programmes may even be ready to support the development of a CETA in the **EXPLORE** phase, such as the Islands Facility NESOI, or the Technical Assistance from the Islands secretariat).

Below we provide some recommendations to take into consideration when applying for EU funding:

Identify a relevant funding programme

As a first exercise, it is crucial to **identify a pertinent funding programme and select a call for proposals that best fits the characteristics of the project.** Careful attention should be given to the priority of each funding programme, eligibility criteria, type of actions that are financed, funding rates and other specific requirements.

Clean energy projects will likely need a source of co-financing; hence, internal resources should be examined at this point. Also, preparing a proposal requires substantial work and time: making enough resources available at this point should be a priority.

Choose amongst the call for proposals

Making a summary of the most important information for potential calls can help identify the most suitable one. All relevant documents need to be carefully studied: the call for proposals document, the programme guide, the applicants guide, and the application form provide useful information. The most important elements to consider in a call for proposals are the objectives, eligible actions, eligibility criteria (e.g., eligible countries, minimum and maximum budget, eligible expenditure, eligible activities), co-financing rules, administrative and documentation requirements, application form needed, selection process, evaluation methodology, and the deadline for submission.

Developing a project proposal

Constructing a summary of the project idea is helpful at this stage to start developing the idea and reach out to potential partners.

This summary would include the objectives, target group, milestones/main deliverables, and the ideal project partnership. The situation that the project wishes to improve thanks to EU funding should be described, which will allow for properly evaluating the impact of the project. The sequence of actions during the project should be logical and linked to the project description. The expected results and quantitative estimates of impacts should also be clearly defined. Finally, make clear which actions the project should fund.

For more information on how to develop a project proposal, see the INTERREG Europe guide.

Identifying partners

The active participation of the main stakeholders and experts is key to ensuring a successful project partnership: who is affected by the problem? Who will use the solutions/tools developed in the project? How can they be involved? Who has the adequate expertise and experience to help with the project topics?

Communication, dissemination, exploitation

Communication, dissemination, and exploitation are crucial horizontal activities that must be taken up in EU-funded projects.

These activities not only inform about the project and promote its results, but they also ensure that other entities can make concrete use of those project results and learn from success and/or mistakes.

Most EU funding programmes give a higher evaluation to projects that contain strong strategies to share and invite other entities to exploit results. Bold exploitation strategies add value to a project proposal.

See here for more guidelines on dissemination and exploitation activities.

↑ Iapetos Village Hotel in Symi covers 95% of its hot water needs through solar collectors, resulting in savings of 7,440 kg CO_2 annually. Payback time of the investment was 4.5 years, proving that solar thermal technology is a cost-efficient and environmentally friendly way for hot water production. © Photo Nikolaos Mavrikakis.

SHAPE

Combining EU funds and grants with loans

It may be possible to combine EU funding programmes to develop clean energy projects. For example, synergies can be exploited between H2020 or the new Horizon Europe and CEF actions.

In turn, both H2020 and CEF develop synergies with other programmes. CINEA's thematic publications on Intelligent Transport Systems and Safe and Green Aviation. Browse other examples of H2020 and CEF Transport projects in the TRIMIS database.

Further reading: here and here for more details on synergies between funds.

Also relevant to state that given the funding rates or the eligibility of the investments Combining grants with loans may be required depending on the funding rates or the eligibility of the investments.

Special attention should be paid when:

→ There are available programmes that finance the interest rate to make soft commercial loans. **Subsidised loans** have proven relevant to almost all types of energy efficiency projects and in many regions across Europe.

→ The **grant does not cover the totality** of the project scope.

→ The reimbursement of the grant is associated with r**eceipts of payments**, i.e., there is a need for upfront capital.

In these cases, the business plan must consider all the costs and requirements associated with the loan.

↑ Pumped hydro picture from El Hierro which has received support of the capital investment by the Spanish Government and EU grant through 5th Framework Programme. The island has received a second prize for Responsible island from EU. © Gorona del Viento.

↑ Geothermal power stations in the Azores. Due to the small size of the networks, the power market is less attractive to private investment and the geothermal projects have been driven with an emphasis on public service. © Photo: Terceira Pico Alto.

EU ISLANDS EXAMPLES

MEHRLIN project

The MEHRLIN project in northern Italy, for instance, has integrated different funding sources in the promotion of Hydrogen as an alternative fuel, namely CEF, H2020 and LIFE. It will finance through CEF the construction of H2 stations for buses, whilst the LIFE programme is financing the deployment of a fleet of 28 hydrogen fuel-cell cars (Zero Emission LIFE IP).

Through the H2020 JIVE project, 27 fuel-cell buses for the same location will also be supported.

There are additional examples of synergies between CEF and H2020 projects in pre-feasibility and feasibility studies.

MEHRLIN
ZERO EMISSION

↑ Photography above shows a fuel cell electric buses which include both a hydrogen fuel cell and batteries/capacitors. In such hybrid architecture, the fuel cell provides all of the energy for the vehicle operation, whilst the batteries/capacitors are able to provide peak power to the motors to meet rapid acceleration and gradients. By using a fuel cell in conjunction with a battery, the size of each can be optimized for a given route.
© Photo SMTU via www.fuelcellbuses.eu

PART II – SHAPE → Pre-feasibility and feasibility studies

5. Pre-feasibility and feasibility studies

Once the project idea is sufficiently advanced, it is time to evaluate the viability of the project through first a pre-feasibility and (if applicable) then a feasibility study.

Both pre-feasibility and feasibility assessments have a similar structure and touch upon the same aspects of the project: the main difference is the thoroughness of the analysis and, therefore, the uncertainty of the results.

	Pre-feasibility study			*Feasibility study*		
Objective	Is it worth further pursuing the project?			Thorough analysis of all aspects of the project.		
Uncertainties	-35% to +65% for capital Cost. P50 for expected output. P50 means that there is a 50% probability that the value will be equal or greater than the stated value.			-22% to – 35% for Capital Cost. P90 for expected output. P90 means that there is a 90% probability that the value will be equal or greater than the stated value.		
Financing	Preliminary assessment generally included, but not mandatory.			Financial bankability must be ensured.		
Structure	Common for both pre-feasibility and feasibility studies, the difference lies on the level of detail provided, the difference lies on the level of detail provided.					
	Technical assessment	Policy and regulatory assessment	Financial assessment	Environmental & social assessment	Organisational assessment	Risk assessment

Pre-feasibility:

The pre-feasibility study is the first high-level review of the potential of the project. It aims to determine whether the project is worth bringing forward by investing more money and time; in other words, whether an elaborate feasibility study should be done. The pre-feasibility study allows also pointing out the elements that are critical to the viability of the project.

Information at this stage is obtained mainly from secondary sources and informal surveys.

Questions to be answered in a pre-feasibility study include:

- → Is the expected revenue high enough to continue evaluating the project more thoroughly?
- → Are there any legal or regulatory issues that could compromise or limit the project?
- → Is it worth going ahead with the idea from a financial and an environmental viewpoint?
- → How will the project impact society and the environment?
- → Are there any risks or uncertainties that could compromise the desired outcome?

Feasibility:

For the projects with the most favourable pre-feasibility assessment, a feasibility study will follow.

If it has been decided to proceed with a feasibility study, it means that the project has been deemed feasible and the financial resources have been already identified. When the feasibility study determines that a project is feasible, this usually means that the project is also bankable.

A feasibility study contains the main aspects of the pre-feasibility study, but is more thorough, carrying out detailed analyses and calculations. At this point, the project can be described more precisely, for example, with a specified location and estimated size. A complete implementation schedule with milestones needs to be included. The assumptions and solutions obtained need to be well justified. The feasibility study produces estimates with much higher accuracy, e.g., P50 for the expected output in the pre-feasibility and P90 for the feasibility study. As a result, it also requires more time and effort, as well as more expertise.

A feasibility study is a valuable instrument to evaluate practical risks at all levels of a clean energy project. As such, it may be solicited by **developers, asset managers, architects, engineers, building owners, contractors, or financial institutions**. To help islands assess their renewable energy project—especially for larger projects—recourse to a professional consultancy or engineering firm is advisable.

SHAPE

Technical Assessment

Technical analysis is one of the cornerstones of both the pre-feasibility and feasibility studies.

Unless the transition team or one of the involved stakeholders has the expertise and resources to carry out this technical work, it might be necessary to outsource it. This is something that should be taken into account in the financial assessment.

First, the key **characteristics of the technology** need to be determined, in order to allow for the necessary calculations, such as typical efficiencies, technical lifetime, space requirements, and other technology-specific features.

This information can be obtained from **literature, manufacturers' catalogues, or interviews with manufacturers**. The key technology parameters will be used both to estimate the size and exact siting of the project and to provide input for the evaluation of the business case, which requires input parameters such as the project lifetime, annual generation of electricity/heat or annual energy requirements, maintenance needs, and land requirements. In the pre-feasibility study, many parameters have a high uncertainty; hence, it is useful to provide a range of the different inputs instead of isolated values in order to allow for a sensitivity analysis of the business case parameters.

For the feasibility study, a higher effort goes into obtaining parameters as precise as possible, although it is always advisable to quantify the uncertainties.

The second step requires **estimates of the demand**, depending on the nature of the clean energy project (energy, heat, mobility needs, etc), and its temporal as well as spatial distribution. This will help determine the required size of the project, the space needed, and whether later expansions will be necessary. For example, electric vehicle charging infrastructure could be planned to expand depending on the uptake of electric vehicles on the island.

Technology solutions booklet

The demand may have already been estimated when developing the CETA. A similar approach, potentially more local and specific, can be taken for this study. It can be based on information provided by the public authorities (e.g., regulator or energy agency) or stems from the number of people living in the area/island, including its potential seasonal variation (i.e., increase of population in the summer months due to tourism).

For projects that are based on the use of renewable energy sources, the third step would require a **resource assessment study.**

Depending on the resource (wind, sun, geothermal energy, water, organic waste), different tools and methods may be used, but in most cases, renewable energy resource maps are developed.

Such maps show the theoretical resource potential for the technology that is considered within the assessed area. The maps are made of data layers—**modelled or measured geospatial data**—as shown in the image in the Halki example (next page).

The Power Density (W/m^2) or potential electricity generation per unit (for example a wind turbine) over a given period (kWh/ m^2/day) can be calculated using these layers.

When developing the maps, it is important to **identify and exclude** the areas where the development of renewable energy projects would not be possible for technical reasons (e.g., topography, grid connection possibilities), or where it is prohibited (e.g., protected lands for nature preservation or military activity).

On the other hand, economic development areas or areas that benefit from a priority status also need to be **identified**. The legal and regulatory assessment of the pre-feasibility study can provide insights into these aspects.

SHAPE

This can further help with obtaining permits and support at a later stage.

The following free web applications are available for the development of the resource maps:

- The Global Solar Atlas is a free, online, map-based application that provides information on solar resources and photovoltaic power potential globally.
- The Global Wind Atlas is a free, web-based application developed to help policymakers, planners, and investors identify high-wind areas for wind power generation virtually anywhere in the world, and then perform preliminary calculations.
- The PRISMI (Promoting RES Integration for Smart Mediterranean Islands) project has developed a load-flow analysis tool. The aim of this tool is to facilitate the analysis of energy plans and solutions by providing the user with specific implementation examples and recommendations regarding operating challenges for the electricity grids of islands. By means of this analysis, the user can identify cases in which the installation of RES plants at specific points of the island grid could cause a violation of the operating limits.

↑ La Palma © Photo Lukas Nowy on Unsplash.

SHAPE

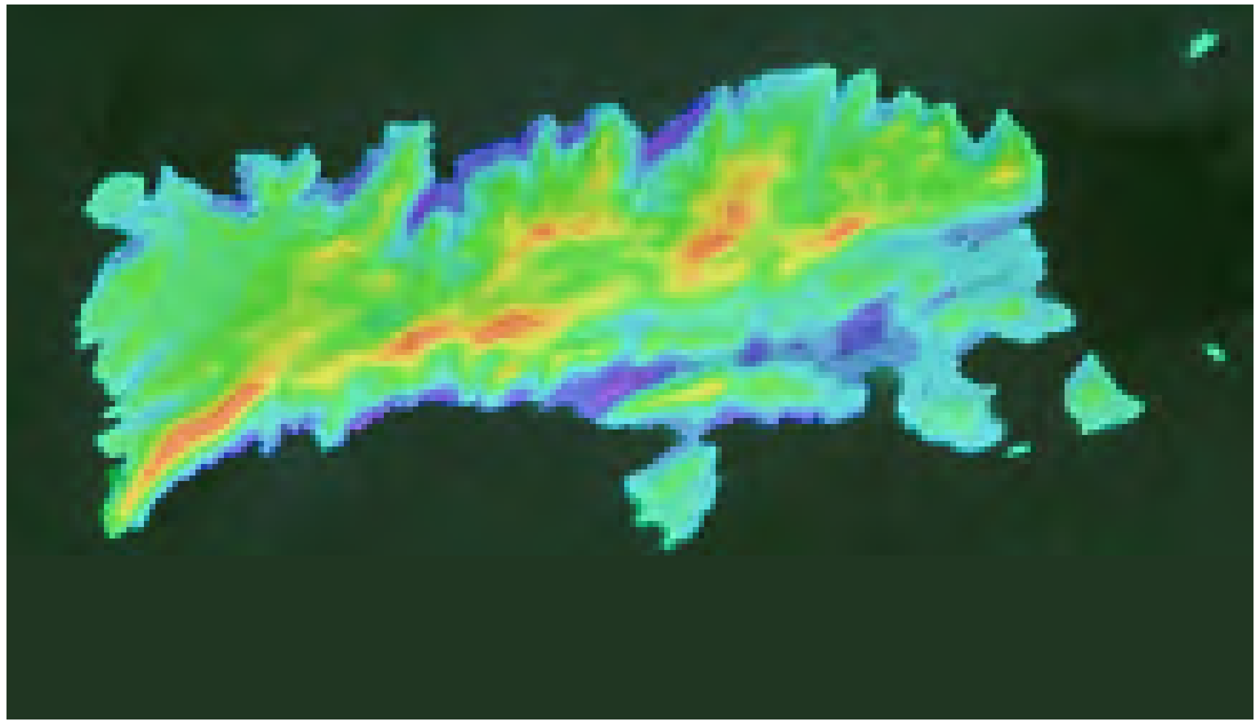
EU ISLANDS EXAMPLES

Halki Renewable energy mapping and wind measurement campaign

The Clean energy for EU Islands secretariat supported the Greek island of Halki determining its wind energy potential and carrying out an energy yield assessment.

For this purpose, the terrain the at site was modelled in detail. A wind atlas has been created using the software WindPro at different heights above ground level. Subsequently, the most significant locations for the exploitation of wind energy and for the installation of measurement masts have been traced.

Different additional criteria were considered before suggesting feasible areas for wind energy exploitation. These included the analysis of the orography on-site, the feasibility regarding access (roads/elevations) and distance from the main grid. Finally, two configurations of vertical axis wind turbines have been envisaged, with a consequent estimation of the annual energy yield.



↑ Resource map representing the mean wind speed resource map at 32m AGL for Halki.

Solar Carport in Mali Lošinj

The Cres-Lošinj archipelago published 2019 its Clean Energy Transition Agenda, where electricity production by solar PV was identified as a steppingstone in the decarbonisation of the archipelago's electricity sector.

As part of the 2021 Call for Technical Assistance, the Clean energy for EU islands secretariat carried out a pre-feasibility study for the INSOLCARPARK project, located in the town of Mali Lošinj. INSOLCARPARK is a carport PV project, which consists of a roof-mounted PV power plant on canopies that serve as a shading area for vehicles in a car park. The Islands secretariat studied how to place the canopies to optimise solar production, providing an estimation of the expected production and the cost of the facility.

The results of this pre-feasibility study indicated that a 518.10 kWp solar PV car park at the Mali Lošinj parking area will produce 12 976 MWh of electricity over a project lifespan of 20 years, based on a P50 probability.

The system will cost approximately €580 525 to complete and €4 660 per year to operate and maintain using a third-party O&M contractor.

↑ Cres-Lošinj © Photo Arno Senoner on Unsplash

SHAPE

↑ Clean energy for EU islands #CE4EUislands Forum session moderated by Marina Montero Carrero, during which island stakeholders spoke about the clean energy transition on their islands, what they have already achieved, the challenges and opportunities, as well as their goals. The audience also had the chance to ask some questions. © Siora Keller for DG ENER, 2022.

↑ Ibiza © Photo by Adrien on Unsplash.

PART II – SHAPE → Pre-feasibility and feasibility studies

Policy and regulatory assessment

Policy and legislation are key when developing a clean energy project: they may affect its viability through certain restrictions or limitations or foster it through subsidies.

The pre-feasibility and feasibility studies should therefore analyse the regulatory framework: including the available support schemes, the possible restrictions to the development of the project, and the required authorisations and permitting procedures.

As policy and regulation at the European and national levels are rapidly evolving in the domain of clean energy, it is imperative to have an up-to-date understanding of the options available and the obligations. The project team should be ready to comply with the necessary legal requirements for the project.

A variety of support systems, such as feed-in tariffs, feed-in premiums, tax exemptions, etc., are available at the national, regional, and/or local levels. Certain elements need to be carefully considered from the start: the **eligibility conditions, the functioning of the support system as well as the application procedure**.

Having identified support schemes early enough in the project will allow saving time during its implementation and ensure that the business case is complete by taking properly into account the revenue streams or cost-saving.

To help islands navigate through policies and regulations in their respective countries, the Clean energy for EU islands secretariat has developed an inventory of Policy and Legislation. In this inventory, islands can find policies and legislation for clean energy development on European islands.

For all 15 European Member States with islands, information can be found on **support schemes for renewable energy** (electricity, heating & cooling and transport), permits and authorisation processes. The inventory also contains information on grid-related policies, energy efficiency policies, community energy policies and other supporting policies available. Finally, the Inventory contains an overview of the relevant public authorities in each Member State.

Regulatory inventory

SHAPE

The restrictions that the project could face during its development are also a key outcome of the legal and regulatory analysis. Specifically, the size and location of a clean energy project may be subject to restrictions aiming to protect the natural environment (e.g., Natura 2000 sites), cultural heritage, or the good working of the local electricity grid infrastructure (e.g., renewable energy capacity limits on non-interconnected islands). Furthermore, rules may exist relating to the **proximity to other infrastructure, inhabited areas, or other sites of public value.** These restrictions need to be considered in the feasibility assessment.

For the construction or operation of clean energy infrastructure, developers and owners/operators often also need to obtain construction and operation permits. These are subject to a certain number of authorisations from administrative agencies. Additional permission may be needed for some projects, such as a water-use permit, permission to use public land, etc. Permitting requirements can considerably impact the cost and development time of a project. Having a clear view of which entities are involved and what the concrete requirements are critical.

The Clean energy for EU islands secretariat's inventory of Policy and Legislation also includes a detailed section on the permitting procedures in each Member State.

Some Member States, furthermore, have developed specific information documents on planning/permitting processes, like, for example, the Community Energy Resource Toolkit: The Planning Process from the Sustainable Energy Authority Ireland.

Other information may be found for specific industries active in Europe. For example, Wind Europe, an association promoting the wind industry, has developed several information documents, among which is the 'Overview of national permitting rules and good practices'.

Although the primary purpose of their report is to map and compare the main restrictive permitting rules that limit the development of the wind energy sector, it also includes a clear overview of the administrative processes at the national level. It furthermore contains rules for both onshore and offshore wind, regarding noise restrictions, acceptable distances from protected areas, etc.

Regulatory inventory

↑ Porto Santo Island was turned into a "living lab", and EEM, together with the local Regional Government and AREAM - Regional Agency for Energy and Environment, made some investments and developments related to smart grids (advanced metering infrastructure), renewable energies, battery energy storage system (4 MW/3.3 MWh), energy efficiency (smart telemanagement public lighting), etc. © Photos EEM.

Example: Ile de Sein renewable energy community

The Clean energy for EU islands secretariat provided in 2020 Technical Advisory services to the island Île de Sein, a French island in the Atlantic Ocean.

A pre-feasibility study investigated the available renewable resources of the island (sun, wind, tidal, and wave). In addition, the legal and regulatory framework for the local governance of the envisaged system was mapped.

The analysis of the legal framework on energy communities led to the conclusion that IDSE (Ile de Sein Energies) could qualify as a renewable energy community under French Law and would thus be authorised to produce, consume, share, store, and sell renewable energy. IDSE would not be allowed to operate its own grid, but the competent public electricity distribution system operator is obliged to cooperate with the IDSE to facilitate energy transfers between the members of IDSE.

↑ Île de Sein © Lory on Unsplash.

Example: Regulatory assistance for RES-based desalination on Tilos, Greece

In 2021, Clean energy for EU islands secretariat provided Technical Assistance to the non-interconnected Greek island Tilos for their project DESALINAID concerning a reverse osmosis desalination plant powered with RES (solar or wind).

The goal of the technical assistance was to provide an overview of the regulatory framework and financial opportunities for the development of this project, consulting information from existing related projects to identify possible barriers and opportunities.

The regulatory assessment showed that no specific measures were yet in place for RES-based desalination, however, simplifications were recently made to the RES permitting procedures and new laws were being drafted regarding energy storage. The lack of a specific regulatory framework for desalination and the long permitting procedures were identified as a barrier also in existing projects. It was found that the RES-powered desalination could benefit from a feed-in tariff support scheme with virtual net metering available for small RES plants and plants on non-interconnected islands. The maximum limit for RES plants on the Tilos electrical system, imposed due to grid limitations, was 50 kW. However, it could be increased to 100 kW for PV and 60 kW for wind, in the case of legal entities pursuing public benefit. On the same island, an Energy Community could install a PV station with a capacity of up to 300 kW. Furthermore, provisions were found that grant RES installations for desalination priority, under certain circumstances, in the examination of the production licence requirement or exemption thereof. These findings could be used as inputs to the pre-feasibility study of the DESALINAID project.

↑ Tilos © Photo Tilos European H2020 project.

Financial and economic analyses

A financial analysis evaluates the profitability of a project from an investor's viewpoint. The costs and expected revenues are assessed over the lifespan of the project. This includes costs of financing, taxes, and subsidies.

An economic analysis evaluates the impact of a project on society by determining its costs and benefits to the overall economy. Two scenarios are contrasted: a baseline or business-as-usual without the project, and a scenario where the project has been developed. The effects of the project are considered, and externalities are quantified in monetary terms, including the social and environmental outcomes. If the net benefit of the economic analysis is positive, the project will have an overall positive effect on society regardless of the results of the financial analysis.

Key financial parameters

The key financial figures required for the financial analysis are:

- → Capital costs constitute the largest expenditure for renewable energy projects that are capital-intensive such as wind and solar. Within capital costs, the following can be distinguished:
  - ✓ Capital expenditure (CAPEX) covers the main construction costs, including procurement and infrastructure (EUR/MW)
  - ✓ Development expenditure (DEVEX) covers the costs until signing the main construction contracts, e.g., development and planning, permitting and logistics, land acquisition, etc. DEVEX is sometimes included as part of the CAPEX (EUR/MW)
- → Operation and maintenance cost (OPEX) refers to ongoing expenses during the project's lifetime, such as management, operation and maintenance, insurance, etc. (EUR/MWh)
- → Revenue streams for the project can have different sources: markets, agreements, existing subsidy schemes and even sales of residues or by-products. Revenue streams not only need to be quantified, but also their stability over the lifetime of the project needs to be assessed. Depending on the nature of the project, factors to take into consideration include future power prices, risk of stagnation of electricity demand, risk of congestion of the grid, etc.
- → Inflation rate (%)
- → Lifetime of the project (years)
- → Weighted average Cost of Capital (WACC) is the minimum rate of return required by a company for a project to invest in it. The WACC represents the rate at which the company is supposed to pay to all its security holders to finance its assets (%)

In the pre-feasibility stage, a high uncertainty may be associated with the above parameters whereas in a feasibility or bankable study additional effort and resources are invested to reduce this uncertainty. In any case, it is crucial to understand how the change in one key parameter may affect the financial feasibility of the project. Therefore, quantifying the uncertainties is important to assess the robustness of the business case as well as to allow for precise sensitivity analyses.

↑ © Photo Henner Busch, Lund University.

Methodologies for financial assessment

The following metrics allow evaluating the business case of a project. A short description is provided for each one of them. For more details, the following sources can be consulted (Economic and financial analysis from Nordic Council of Ministers, Prefeasibility Studies Guidelines from Danish Energy Agency, World Bank report).

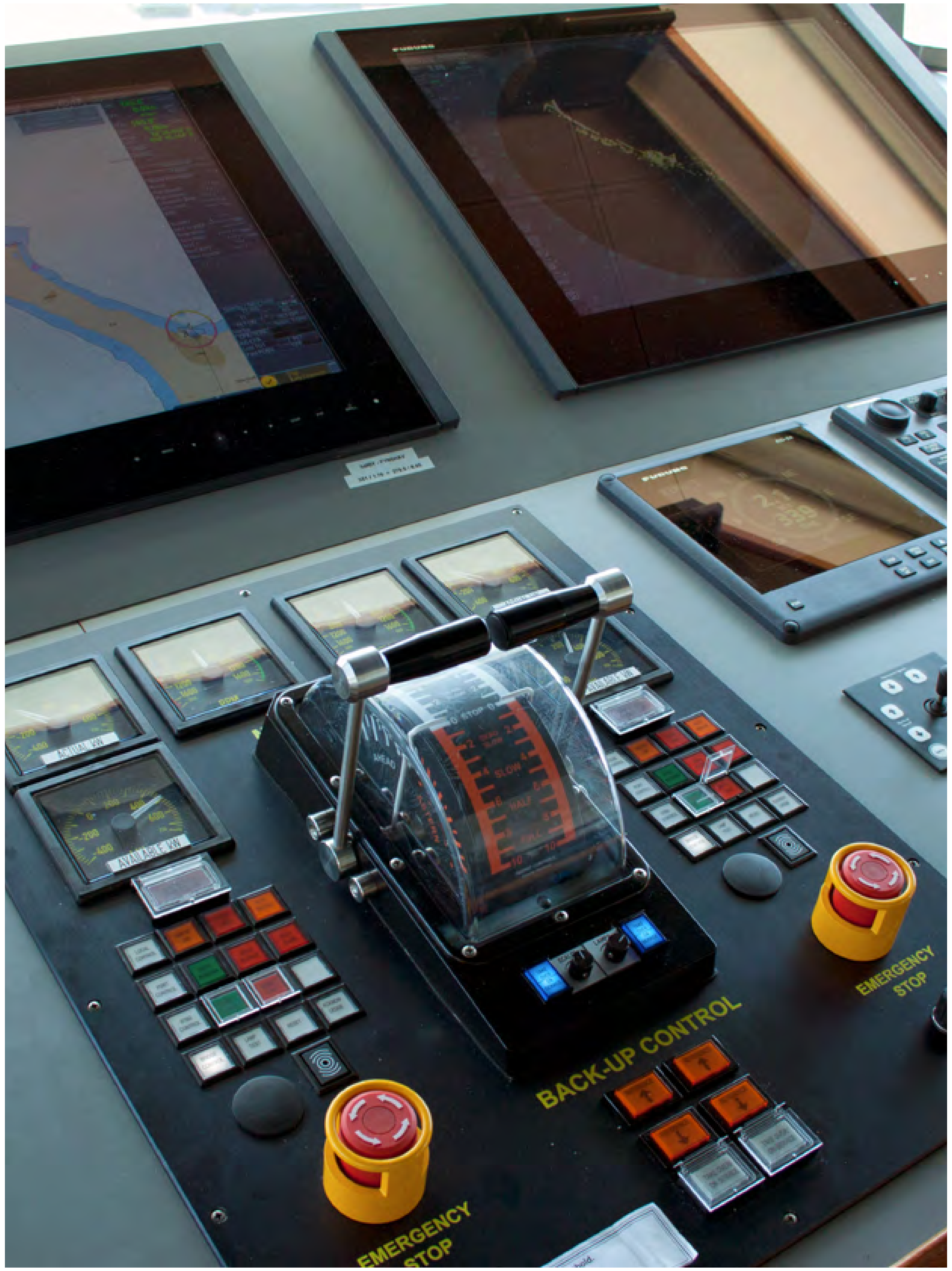
The Net Present Value (NPV) shows the net value of a project by capturing the difference between the present value of inflows and the present value of outflows. It requires estimating a discount rate from an investor's point of view this rate would be the WACC.

The NPV allows comparing different projects of a similar size: the one with the highest NPV would be the most profitable. However, NPV presents some disadvantages, for example, it does not allow for a fair comparison of projects of a different size – projects requiring a higher capital cost would likely end with larger gains than those of a more reduced initial investment, even if in percentage terms the smaller project might be more profitable. In addition, the NPV does not provide insight as to when the initial investment will be recovered.

The Internal Rate of Return (IRR) is the discount rate that provides an NPV equal to zero. Investors will be interested in projects with an IRR higher than their WACC. IRR allows comparing investments regardless of their size. As a downside, the IRR will lead to negative or senseless values for those projects that do not end with positive outflows.

Payback Time (PBT) illustrates the number of years needed to recover an initial investment

Levelised Cost of Energy (LCOE) measures the average cost of generating energy for a project over its lifetime. It allows comparing technologies and is often used for tracking the economic development of technologies.



↑ © Photo by Ærø municipality.

Environmental and social aspects

The assessment of environmental and social aspects is more important for the feasibility than for the pre-feasibility study.

Nevertheless, studying the environmental and social impacts (in more or less detail, depending on the stage) allows for identifying early enough potentially serious issues that may appear during the project implementation or operation phase. Possible environmental and social risks should also be considered in the project's risk assessment. If specific regulations exist on certain environmental constraints, these will be evaluated as part of the regulatory analysis; however, there may also be concerns not captured by regulation that need to be addressed. Key aspects to take into account are:

- → Pollution of the air, water, and soil
- → Carbon emissions
- → Endangerment of wildlife
- → Visual impact, noise, odour
- → Land use
- → Interference with other activities such as agriculture or fishing
- → Loss of jobs in other sectors because of competition, etc.

Environmental and social impacts are the most common reasons to lose public support for a project, which is crucial for the island's clean energy transition. Experience in the area or with similar technology can be used as a guide, as well as recommendations about acceptance levels.

On the positive side, the role of clean energy projects is, in fact, to reduce environmental impacts, including—but not limited to—emissions of CO_2 and other pollutants (PM, NO_x, SO_x). If the project is well-conceived, not only environmental benefits but also social benefits could be realised.

These should be highlighted so that the different stakeholders have a clear understanding of the balance of benefits and potential impacts and make more informed decisions.

PART II – SHAPE → Pre-feasibility and feasibility studies

Organisational and scheduling aspects

Preparing an implementation plan with a tentative timeline to identify potential risks is useful even for the pre-feasibility study.

Delays may come from permitting procedures, the development or testing of new technology, delivery issues, or resource shortages. The project team should have the necessary organisational capacity to carry out the work in the foreseen timeframe. This involves both the development of the project, such as the construction of an installation and also the maintenance and management during the entire project's lifetime. This is a good opportunity to also address end-of-life considerations for the project.

These may be legal or involve the dismantling and recycling of the used equipment, rehabilitation of the land, etc.

↑ © Photo by Ærø municipality.

SHAPE

Risk assessment

Risk assessment is a vital element following the entire project's lifecycle and is part of both pre-feasibility studies – as an initial, high-level assessment – and feasibility studies – in more depth, aiming at quantifying and/or qualifying the risks and reducing uncertainties.

The potential risks should be described in terms of their expected impact on the project. Impact refers to the harm that could be caused by an event, while likelihood refers to the probability of that event occurring. Both impact and likelihood can be classified as more or less critical for the project, using, for example, a risk matrix such as in Figure ↓. Actions to mitigate the risks should also be identified.

	Negligible	Minor	Moderate	Significant	Severe
very likely	low med	medium	med hi	high	high
likely	low	low med	medium	med hi	high
possuble	low	low med	medium	med hi	med hi
unlikely	low	low med	low medium	medium	med hi
very unlikely	low	low	low med	medium	medium

Using coloured post-its to map out project implementation and risk assessment © Photo by Jason Goodman on Unsplash.

There are several types of risks to consider in a clean energy project, which can be technology-specific or general risks. The following are some examples of such risks:

Technical risks:

No available location, RES resources lower than expected, damage due to extreme weather events, cybersecurity concerns, curtailment, fast degradation of the components, new technologies, shortage of skilled personnel, etc.

Regulatory and legal risks:

Changes in law, amendment of terms, revisions of support schemes or taxes, too complex or slow licensing procedures, land acquisition issues, tariff structure change, etc.

Financial risks:

credit risk, unfavourable currency exchange rates, higher inflation, higher interest rates, loss of demand for the product/service, etc.

Other risks:

such as environmental risks, safety risks, opposition the from local community or specific stakeholders, natural hazards, terrorism, etc.

An example matrix of risks typically found in a photovoltaic solar public-private partnership transaction can be found on this page, together with guidance on how those risks are typically allocated between the Contracting Authority and the Private Partner, and the rationale for such risk allocation.

SHAPE

6. Business development

After the pre-feasibility study, the stakeholders decide whether to continue pursuing the project and go ahead with the feasibility study. Once the latter is finished, the relevant actors have all the necessary information to resolve whether the project should be implemented. The development of the project's business model and the financing concept help the transition towards the **ACT** phase by focusing on preparing the projects for implementation.

6. 1. Business model

Investments in clean energy generate benefits to society by reducing the emission of greenhouse gases.

These investments are often capital-intensive and usually **designed to generate financial returns**. The adoption of **the right business models** is a key factor for the bankability of the projects.

The most appropriate business model for a given project will depend on local conditions, the financial and regulatory environment, the institutional framework, and the support mechanisms in place. Also, the **scale of the project, identified risk and expected revenues** play a major role in the business model definition.

Business models can be categorised in different ways, the most common being as **ownership models** or as **service models**.

In **OWNERSHIP MODELS**, the assets are **owned by the user**.

For example, a person acquires, instals on their rooftop, and maintains a photovoltaic system for self-consumption.

In **SERVICE MODELS**, customers **pay for an energy service** without having to make a high upfront capital investment.

An example is when the customer only acquires the energy produced by a photovoltaic system installed on their rooftop but owned by a company that provides the service.

The selection of the most suitable business models for a specific project can vary, depending (among other factors) on the ownership of the assets from Public-Private Partnerships to User Cooperatives, and the availability of upfront capital or feed-in-tariffs.

The experience says that most of the day-to-day business models are hybrids, i.e., **combining elements of various categories and approaches**.

The C40 knowledge hub developed a Clean Energy Business Model Manual that provides guidance on business models and financial mechanisms to support clean energy generation and uptake, as well as the decarbonisation of the grid. It explores various business models and presents their administrative and financial structure as well as assesses their advantages, disadvantages, and suitability to various regulatory and market conditions.

Also, IRENA's Innovation Landscape report highlights innovations that create the business case for new services, with ground-breaking business models enhancing power system flexibility and incentivising rapid integration of solar and wind technologies.

These business models—which can either expand consumer choices or boost the availability of renewable power—are explored in specific briefs.

Further reading about renewable energy and transport costs as well as statistical data:

Renewable Power Generation Costs in 2020, IRENA

Projected Costs of Generating Electricity 2020, IEA

Levelized Cost of Electricity — Renewable Energy Technologies, Fraunhofer ISE

Statistical Review of World Energy 2020, 69th edition, BP

Key World Energy Statistics 2020, IEA

Road Transport: The Cost of Renewable Solutions, IRENA

Renewable electricity requirements to decarbonise transport in Europe with electric vehicles, hydrogen and electrofuels

SHAPE

E-mobility in Syros

The municipality of Syros has initiated a long-term project in collaboration with the Network of Sustainable Greek Islands (DAFNI) to become an exemplary island regarding sustainable e-mobility. As part of the 2021 Call for Technical Assistance, the Islands secretariat supported Syros in identifying optimal business models to involve the municipality in the operation of electric vehicle charging stations.

As a first step, the Islands secretariat **analysed the current state of the energy and mobility systems on Syros** to explain in clear terms what an ecosystem of electric mobility could look like. This allowed the understanding of the involvement of different stakeholders and identifying the possible roles that the municipality could play.

In a second step, an overview of the possible business models related to the charging infrastructure was provided, outlining how the Municipality could engage with private parties to deploy the chargers. Examples from European practices or islands were provided, where available with a focus on cases that clearly identified the role of the local government.

Thirdly, the **regulatory framework for electric mobility and EV infrastructure** in Greece was analysed. This allowed identifying barriers and enablers, especially regarding the way that electric mobility can be integrated into the whole energy system and can provide additional benefits, such as system backup, flexibility, and integration of renewable energy sources.

Based on the overall assessment, the **technical assistance** determined that a joint-venture business model would be recommended for the implementation of EV public charging infrastructure on Syros.

The involvement of the local private sector and the local community in the investment and use of e-mobility would be beneficial to assure a long-term transition that fosters local economic development. This could be organised through a **cooperative or an energy community**, allowing for a variation in pricing for the local community, businesses, and visitors of the island.

Furthermore, given the seasonality of energy and mobility needs on the island, business models for car-sharing and semi-public options for charging infrastructure could be considered to **optimise the use of electric vehicles and infrastructure.**

Finally, while e-mobility is a step toward decarbonisation, to reap all the benefits it should be coupled with electricity from renewable sources.

For this reason, the technical assistance further included a **Long-Term Yield Assessment for a 1 MW solar photovoltaic plant** for the location proposed by the local team.

More details on this project can be found on Syros Island page.

↑ Electric mobility and EV infrastructure in Syros © Photo EEM.

SHAPE

E-MOBILITY ECOSYSTEM

CONTRACTS:

MOBILITY SERVICE

1. Vehicle use
2. Mobility service use
3. Mobility as a service

ELECTRICITY

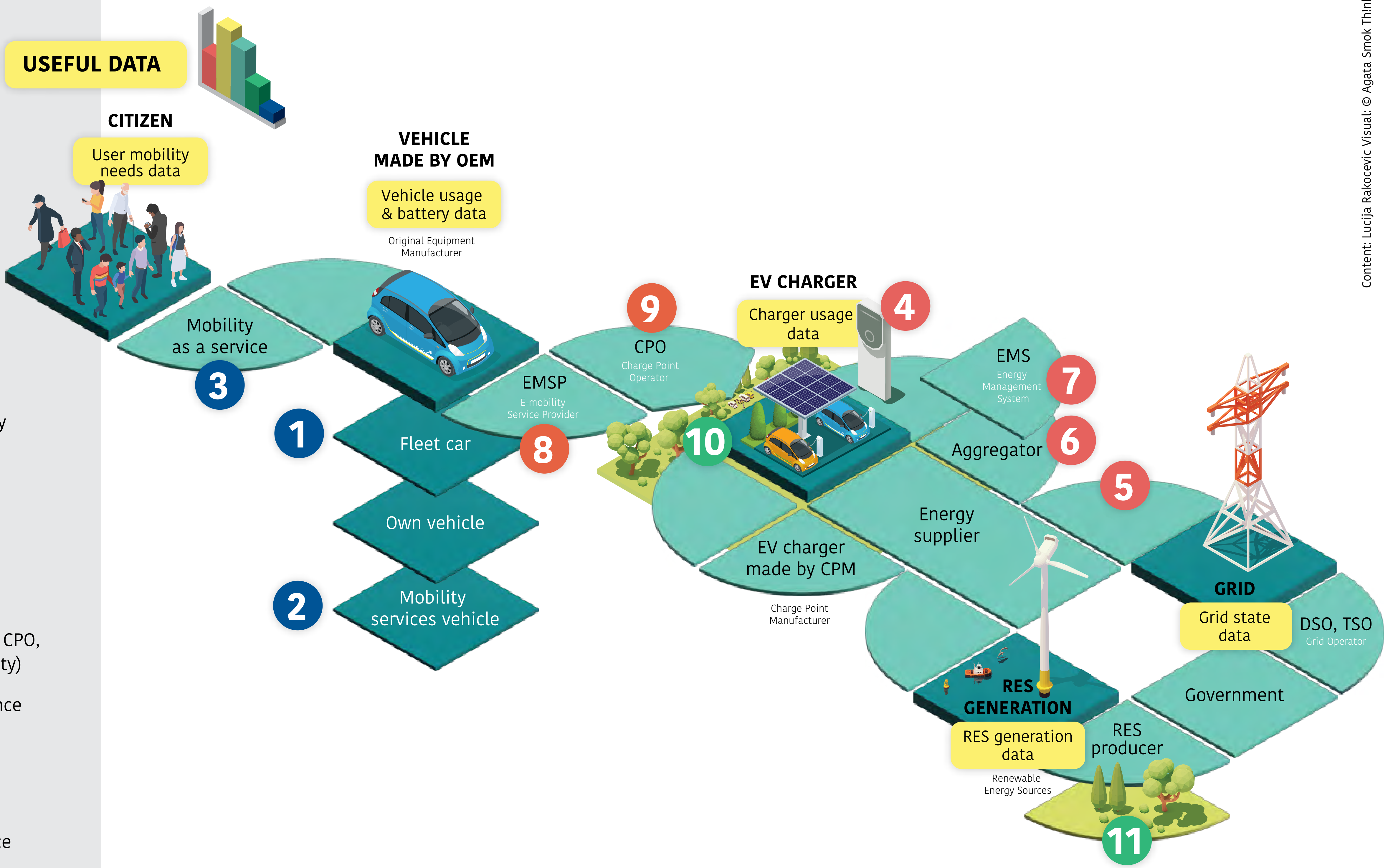
4. Charger ownership
5. Electricity/capacity supply
6. Aggregator
7. Energy management

CHARGING SERVICE

8. Charging services (EMSP, CPO, CPM, Supplier, Municipality)
9. Operation and maintenance of charger

LAND USE

10. Charger and parking space
11. RES generation



Menorca – Business model PV plant with citizen participation

A consortium of local municipalities on the Spanish island of Menorca is developing a Photovoltaic Power plant.

The consortium applied for the secretariat's support (as part of the 2021 Call for Technical Assistance) for developing the business model.

The Islands secretariat helped them to find regulatory ways to **involve local citizens as investors and owners of the PV plant implemented, owned and operated by the consortium of local municipalities.**

The Balearic Climate change and Energy Transition Law requires the public administrations of the Balearic Islands to support the participation of citizens, civil society organisations and local renewable energy communities in the deployment and management of renewable energy systems.

Several possibilities such as crowdfunding, cooperatives/energy communities and a specific Spanish legal instrument **'Expediente Patrimonial'** were assessed.

More details on this project can be found on Menorca Island page.

↑ Menorca © Photo by Gerard Marques on Unsplash.

↑ Menorca © Photo by Katarzyna Urbanek on Unsplash.

6. 2. Financing concept

Different financing opportunities exist for clean energy transition projects, depending on the technology, the stakeholders involved, and other project-specific factors.

A financing concept is an analysis of the steps and approach required to develop a pipeline of projects on the island. It outlines how various sources of public and private funds are combined to develop a viable and effective financing structure.

A financing concept is more than just a financial plan for a single project.

It is a solid basis from which to **implement parts of the decarbonisation plan** and it is a starting point for **discussion with potential promoters and financiers**.

This concept can target national and European public funds, institutional investors, impact investors, banks, and specialised private investment funds. It should include a blend of **subsidies, fiscal incentives, and public funding while attracting market and private capital**. It is advised to look beyond business-as-usual and consider alternative financing schemes such as energy performance contracting and financing concepts that involve citizens such as crowdfunding and peer-to-peer lending.

More information on financing energy projects can be found in the Clean energy for EU islands secretariat's Quick Reference Guide on Financing and on the financing corner of the Islands secretariat website.

Also, the tools and resources on financing made available through the EU Covenant of Mayors provide more information.

CE4EUislands Financing corner

EU Covenant of Mayors

PART II – SHAPE → Business development
→ Financing concept

↑ Spetses © Photo by Theo Maroulis on Unsplash.

SHAPE

Kythira & Spetses Energy Transition Programme

Kythira and Spetses are two small Greek insular municipalities in the region of Attica, with each counting a population of about 4 000 inhabitants.

As part of its 2020 project-specific support, the Clean energy for EU islands secretariat and the team on Kythira & Spetses discussed possible financing mechanisms pertinent to their transition project.

The most relevant possibilities identified were H2020 PDA and ELENA.

The islands received advice on different ways they could achieve the necessary pre-financing for ELENA (with 8 000 inhabitants across the islands, significant capital could be created through individual contributions of up to €500 per inhabitant on average).

The secretariat provided the transition team with capacity-building documentation to develop their knowledge about EU funding, thanks to which the transition team succeeded in applying for H2020 PDA funding.

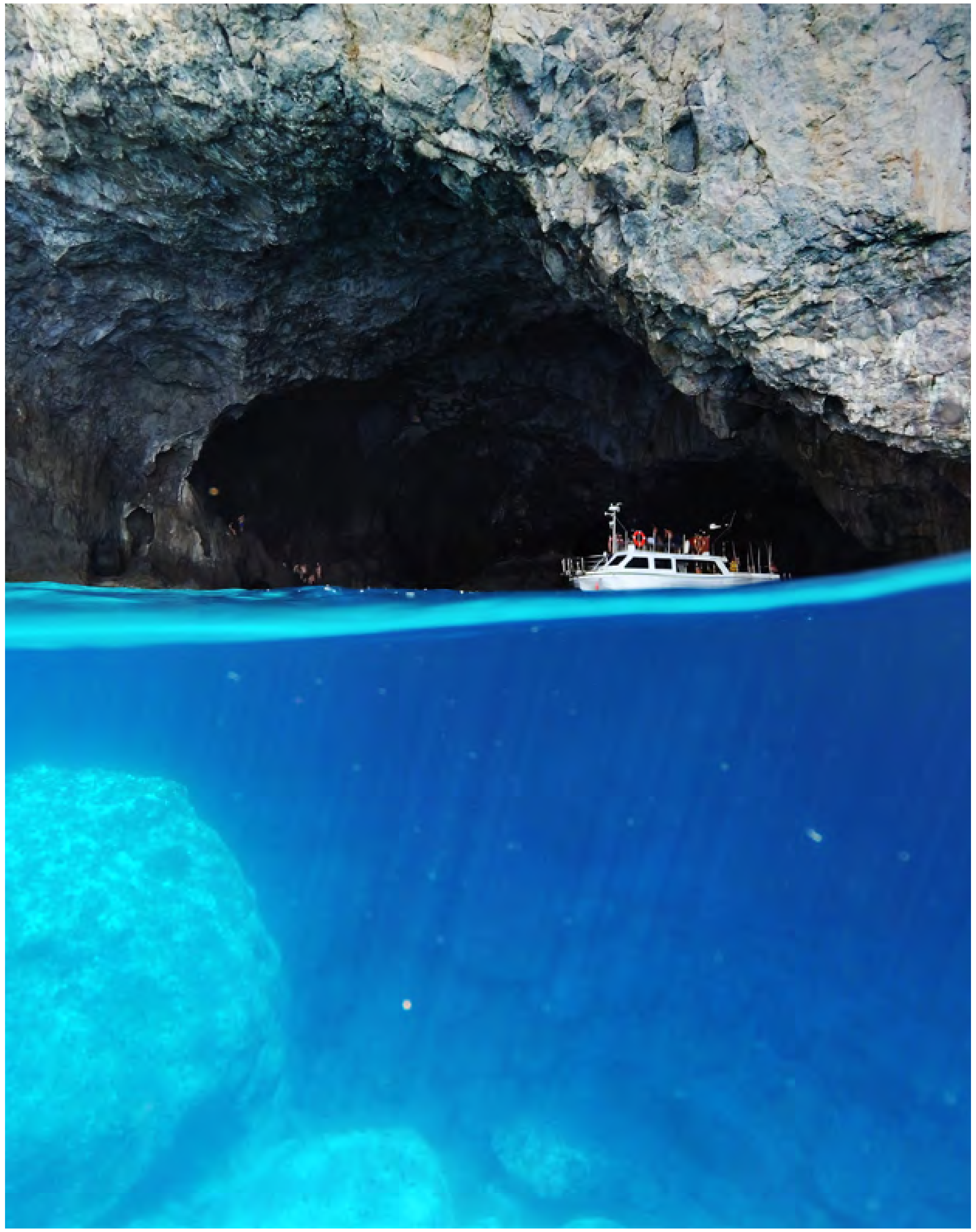
More details on this project can be found on Kythira Island page.

More details on this project can be found on Spetses Island page.

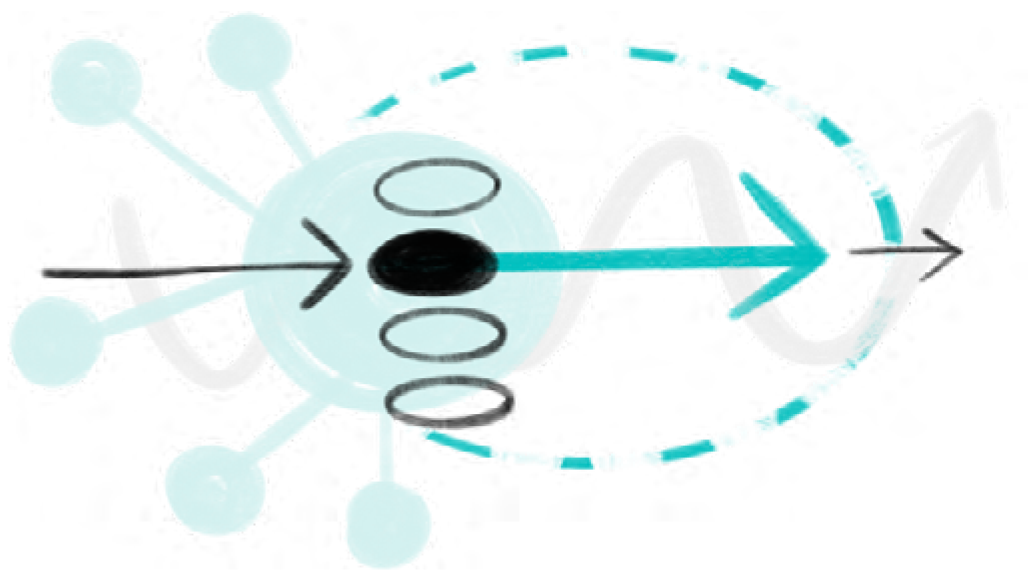
CE4EUislands Financing corner

Project Development Assistance (PDA)

ELENA – European Local ENergy Assistance



↑ Chytra, Kythira, Greece © Photo by August Politis on Unsplash.



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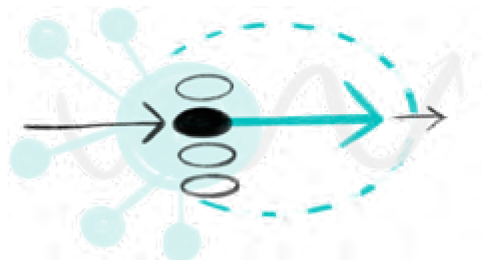
PART III – ACT

Once the viability of the project has been confirmed and the stakeholders have decided to continue with its implementation, it is time to start taking concrete actions to develop the clean energy project. In this phase, the project pipeline contains feasible projects to be executed by developing adequate business models, obtaining the right funding and financing, and starting the collaboration with the right partners.

PART III – ACT →



STAGE				OUTPUT
ACT	Developing projects for implementation on the ground	Setting up the collaboration with partners	Obtaining the right funding and financing	Projects with available financing ready to be implemented — ACT

on page 122

on page 124

7. Setting up the collaboration with partners

The project developers should make the necessary arrangements to prepare the project to be successfully implemented.

At this point, the potential suppliers and subcontractors are brought in, a schedule is set up, materials and tools are ordered, and ..instructions are given to the personnel. Which party is responsible for each of the specific tasks depends on the chosen business model, as illustrated in the EXPLORE phase chapter. Ultimately, there should be no pending issues for the implementing parties, and all contracts should be drafted and ready to be signed.

Ideally, an energy project should be implemented by a professional partner, who will use information from the feasibility and any other detailed studies. The specific partners that are required depend on the nature of the project, two of the most frequent are an Energy Service Company (ESCO) and an Engineering, Procurement and Construction (EPC) partner.

Energy Service Company (ESCO) and an Engineering, Procurement and Construction (EPC) are explained in the following paragraphs:

For an energy efficiency project, it may be advisable to work with an Energy Service Company (ESCO), which is an enterprise that is charged with the development, installation, and financing for projects designed to improve energy efficiency and reduce maintenance costs for a building over a certain period.

More information on ESCOs can be found on the website of the EU science HUB. A suitable partner can be found in the JRC database of Energy Service Companies.

For larger wind or solar projects, a contractor for the engineering services and procurement of equipment, design and construction will need to be found. It is customary to look for the right Engineering, Procurement and Construction (EPC) partner via a tender procedure.

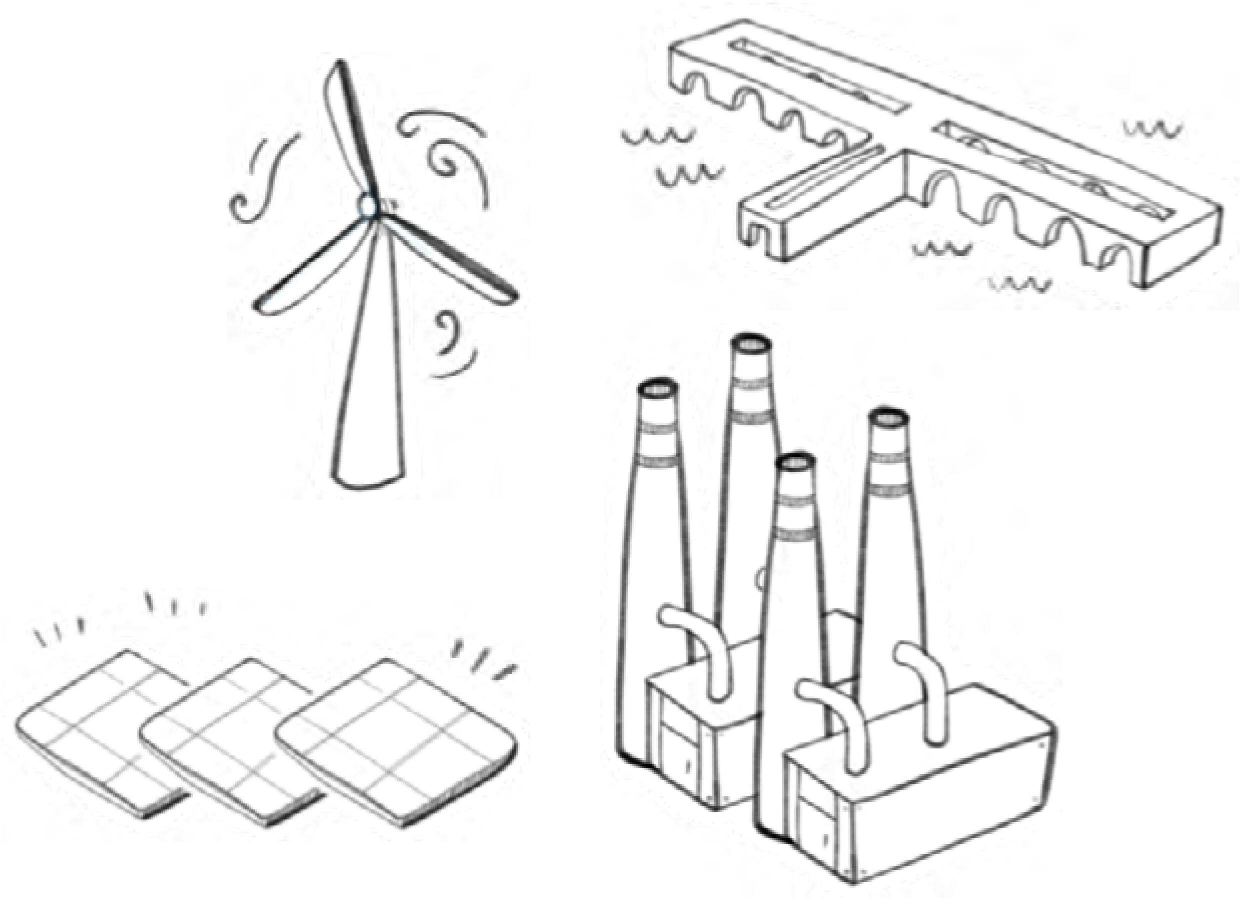
The search for a suitable EPC starts with the drawing up of a Request for Proposal or Tender Specifications.

PART III – ACT → Setting up the collaboration with partners

These are sent out to various candidates and then (possibly with the help of a specialised party) a comparison and ranking are made of the tenders submitted. After that, the various contractual terms of the most suitable parties are examined, and negotiations are started.

The outcome of the selection process is an EPC contract, which sets out the relationship between the project owner and the contractor for the provision of professional or technical services. Under such a contract, the EPC contractor will enter various subcontracts with subcontractors for the performance of specified portions of work. However, the contractor will be responsible not only for the engineering aspects of the project but also for the **procurement of equipment and design and construction of the clean energy project.** Often an **Operation and Maintenance (O&M)** contract is linked to the EPC.

Specifically for solar energy, SolarPower Europe has developed comprehensive EPC Best Practice Guidelines, which systematically detail the EPC phases of a solar power plant.



ACT

8. Obtaining the right funding and financing

In both the private and the public sectors, financial instruments are used to finance clean energy projects. Clean energy projects are usually capital-intensive: they require a large upfront cost, which poses an important barrier to clean energy deployment. Adequate financial instruments are thus crucial, also to overcome obstacles such as lack of long-term financing, limited participation from the private sector, underdeveloped financial markets where obtaining financing at reasonable costs is difficult.

Selecting the correct type and level of the financial instrument allows for effectively tackling these barriers.

As opposed to funding, which refers to public money in the form of grants and other governmental schemes, financing involves capital or money for business purposes usually provided by financial institutions, such as banks or other lending agencies.

As highlighted in the **SHAPE** part of this handbook, feasibility analyses need to be carried out to assess the viability of a project. For certain projects, professional assessments and studies will be necessary to raise debt financing; banks and credit unions will require professional data collection before proceeding with a loan contract.

The Clean energy for EU islands secretariat has developed the Financing Corner containing useful information on how to find the right financing and funding for clean energy projects.

CE4EUislands Financing corner

PART III – ACT → Obtaining the right funding and financing

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↑ © Photo Green Chameleon on Unsplash.

ACT

8. 1. Financial instruments

European Fund for Strategic Investments (EFSI)

EFSI is an initiative launched jointly by the European Investment Bank (EIB) Group and the European Commission to help overcome the investment gap in the EU. EFSI is one of the three pillars of the Investment Plan for Europe. It is not a fund in the traditional sense, but a guaranteed instrument allowing the EIB to increase its risk-bearing capacity to lend to higher risk projects, for example, those related to smart cities where research and innovation are major components. Urban and regional development projects are two important components of EIB financing activities, particularly under EFSI. By reducing the risk, EFSI provides the opportunities to explore new markets, previously considered too risky, or to develop new types of financial products. Local authorities, public sector companies or other government-related entities can benefit from project loans and technical assistance for project development. Providing financing to small islands to mitigate and adapt to climate change is an important aspect of the EIBs Climate action.

Investment Loans

Islands have a variety of financing needs. When a single large investment project needs long-term funding, the EIB can provide dedicated project-specific loans, which are known as Investment loans. EIB lends to individual projects for which the total investment cost exceeds €25 million. EIB support is often the key to attracting other investors. These loans can cover up to 50% of the total cost for both public and private sector promoters, but on average this share is about one-third.

Framework Loans

Framework loans are used to finance tens or even hundreds of projects in different sectors. The projects, most frequently regarding infrastructure, energy efficiency/renewables, transport, and urban renovation, are re-grouped into multi-component, multi-annual investment programmes. Framework loans are the most flexible financial instrument for cities and regions. The European Investment Bank has a useful factsheet on this topic.

Natural Capital Financing Facility (NCCF)

The NCCF combines EIB financing and funding under the LIFE Programme, acting as a financial instrument that supports projects delivering on biodiversity and climate adaptation through tailored loans and investments, backed by an EU guarantee. The facility can provide between €2 million and €15 million. In combination, a technical assistance facility can provide each project with a grant of up to €1 million for the preparation, implementation, and monitoring of the outcomes. More information is available on the website of the European Investment Bank.

National Promotional Banks (NPBs)

Across Europe, NPBs support commercial banks' lending to low-carbon projects by using financial instruments that mix public and private funding. They act as financial intermediaries for EIB Group investments directed to small-scale projects. They channel EIB loans to businesses and local authorities in their home countries. This method of financing is relevant for all sectors of interest to islands and their investment plans, from urban development and housing to transport, energy and adaptation to climate change. The European Investment Advisory Hub is designed to act as a single point of entry to a comprehensive offer of advisory services and technical assistance.

Alternative Financing Schemes

The C40 – Clean Energy Business Model Manual mentioned above explores various financial instruments and presents their implementation, advantages and disadvantages. It explains instruments such as crowdfunding, feed-in schemes, renewable energy certificates, net metering, on-tax bill financing, on-energy bill financing, tax incentives, investment grants, green bonds, and pay as you go, ...

ACT

Pantelleria Technical Assistance

The RETRIEVE project, on Pantelleria (Italy), foresees the implementation of two medium-sized renewable energy plants: a PV plant and five small scale wind turbines.

On the financial side, the Clean energy for EU islands provided assistance on the following:

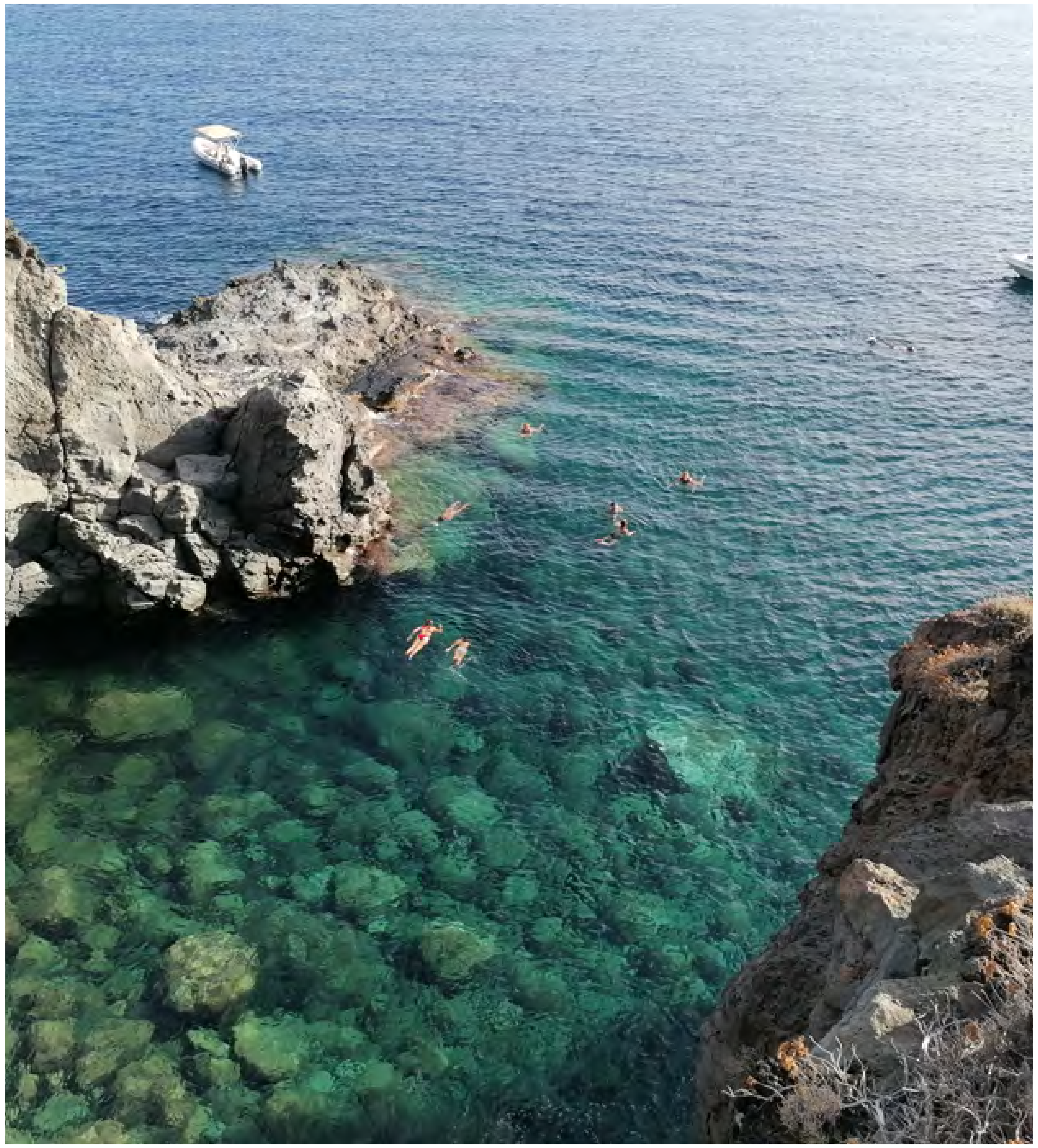
- The **CAPEX** for project implementation was estimated.
- A **tool was provided** to assist the RETRIEVE team in looking for financing. With this tool, it was estimated the profits, the cash flows, the payback time, etc.
- A **company spreadsheet was supplied** to showcase the company's key financial metrics.
- A **risk assessment tool** was developed that enables the island beneficiaries to assess the risks associated with the RETRIEVE project implementation, in a quantitative and qualitative manner.
- A **training session on financial topics**, where topics of relevance to the project development were discussed.

On the legal and regulatory part of the study, the following options for co-ownership were examined:

- Public-private partnership,
- Special Purpose Vehicle with crowdfunding,
- Collective self-consumption
- Renewable or citizen energy communities.

In turn, for each of the options, the following aspects were assessed:

- The legislative framework.
- The ownership and management of the plants.
- The procedures for applying.
- Limitations, advantages vs disadvantages.
- Examples.



↑ Cala Nikà, Pantelleria (Italy) © Photo Claudio Moscoloni, the winner of the first photography competition organised in 2021 by the Clean energy for the EU islands secretariat.

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9. Communicate on the progress and achievements

It's important to keep all relevant stakeholders –island inhabitants, supporting organisations, other islands, the Islands secretariat, etc. – updated on the progress and achievements of the project. Of course, not every type of stakeholder needs to be updated as frequently or as comprehensively. First and foremost, the island inhabitants, supporting organisations and any other stakeholder close should be part of the project from the very start. They should be active participants and contribute to the various steps of any project – **EXPLORE**, **SHAPE**, and **ACT**.

Secondly, it's important to share the big moments in the project – realisation of an energy community, signing of the EPC contract, finalisation of the construction, etc. As a pioneering island, this is paramount as it can inspire other islands to take the next step in their decarbonisation process. It also helps make projects more replicable, adding to the overarching goal of clean and affordable energy for all. Therefore, it is encouraged to keep the Islands secretariat updated, so we can share islands' success and best practices, and possibly set up and participate in exchange moments or events (like the Clean energy for EU islands forum, webinars, workshops, etc.). In addition, issuing a press release allows publicising the project more broadly.

While writing a press release is a skill on itself, several guidelines are mentioned below:

- → Describe the project in understandable terms.
- → For example, don't just mention the installed power capacity of a project, but translate this to how many households can now be provided with energy.
- → Focus on the benefits, not just on the features.
- → For example, did the project lead to new jobs, less air or noise pollution, increased touristic attraction?
- → Spread the praise.
- → While the project is a tremendous feat, specific partners or people probably had a big hand in delivering the project. Don't shy away to put them in the spotlight
- → Look back at the trajectory
- → Do not only focus on the current result but mention the barriers and obstacles that were overcome and how.
- → Gaze towards the future.
- → Don't only mention the current result, but share information on future sustainable plans in order to probe interest from potential future partners

ACT

RESOURCES

Explore

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Shape

- The IRENA project Navigator can be found on their website.
- The Clean energy for EU islands secretariat Technology solutions booklet is available on the website.
- The Global Solar Atlas can be found here. The global Wind Atlas can be found here.
- The PISMI load-flow analysis can be obtained via their website.
- The Clean energy for EU islands secretariat's Quick Reference Guide on Financing can be found on the website.
- Funding and financing resources on the Covenant of Mayors website.
- The Clean energy for EU islands secretariat's inventory of policy and legislation can be found on the website.
- IRENA Wind Resource Measurement: Guidelines for Islands can be found here.

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- The Clean energy for EU islands secretariat's Financing Corner is available on the website.
- The C40 Clean Energy Business Model Manual is available on the website.
- IRENA's Innovation Landscape report can be downloaded on the website.
- The Clean energy for EU islands secretariat's inventory of policy and legislation can be found on the website.
- The European Investment Bank Factsheet on Framework Loans can be found here.
- Information on European Investment Bank's Natural Capital Financing Facility is available on the website.
- The European Investment Advisory Hub is available here.
- Wind Europe's overview of national permitting rules and good practices is available here, however only for Members.
- The G20 Global Infrastructure Hub PPP (public-private partnerships) Risk Allocation Tool on energy can be found here.
- The website of the EU science HUB with information on ESCOs can be found here and the JRC database of Energy Service Companies can be found here.
- SolarPower Europe's Engineering, Procurement and Construction (EPC) Best Practice Guidelines can be found here.

EXPLORE

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ANNEX I – TOOLS FOR DEVELOPING TRANSITION PILLARS

SWOT ANALYSIS

The Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis is a tool to investigate the factors that will help to achieve a pillar's objective. Using a 2-by-2 matrix, the strengths and weaknesses of the people involved, and the available resources are listed, and the external opportunities and threats are identified.

Threats are the obstacles that would prevent the transition to develop in the envisioned direction. These can be:

- → Regulatory
- → Institutional
- → Economic
- → Technology-specific
- → Historic traditions
- → Infrastructure
- → Cultural and social perceptions, etc.

ANNEX I – TOOLS FOR DEVELOPING TRANSITION PILLARS →

OPPORTUNITIES, on the other hand, are the circumstances that are helpful to achieve the envisioned objective. They can include:

- → Political commitment
- → Transparent planning and resource allocation decisions
- → Community support
- → Local experience
- → Well-trained construction and/or utility workforce
- → Capital investments that are ready for replacement
- → Specialised university training courses and expertise
- → Advanced utility metering and billing infrastructure

Finally, **BARRIERS** can be:

- → Unclear permitting requirements
- → Utility rate structures
- → Lack of consumer awareness
- → Inadequate credit or project repayment history
- → Misaligned electricity production incentives
- → Overlapping governmental responsibilities over energy
- → Access to land
- → Lack of necessary skills in the workforce.

ANNEX I – TOOLS FOR DEVELOPING TRANSITION PILLARS → SWOT ANALYSIS

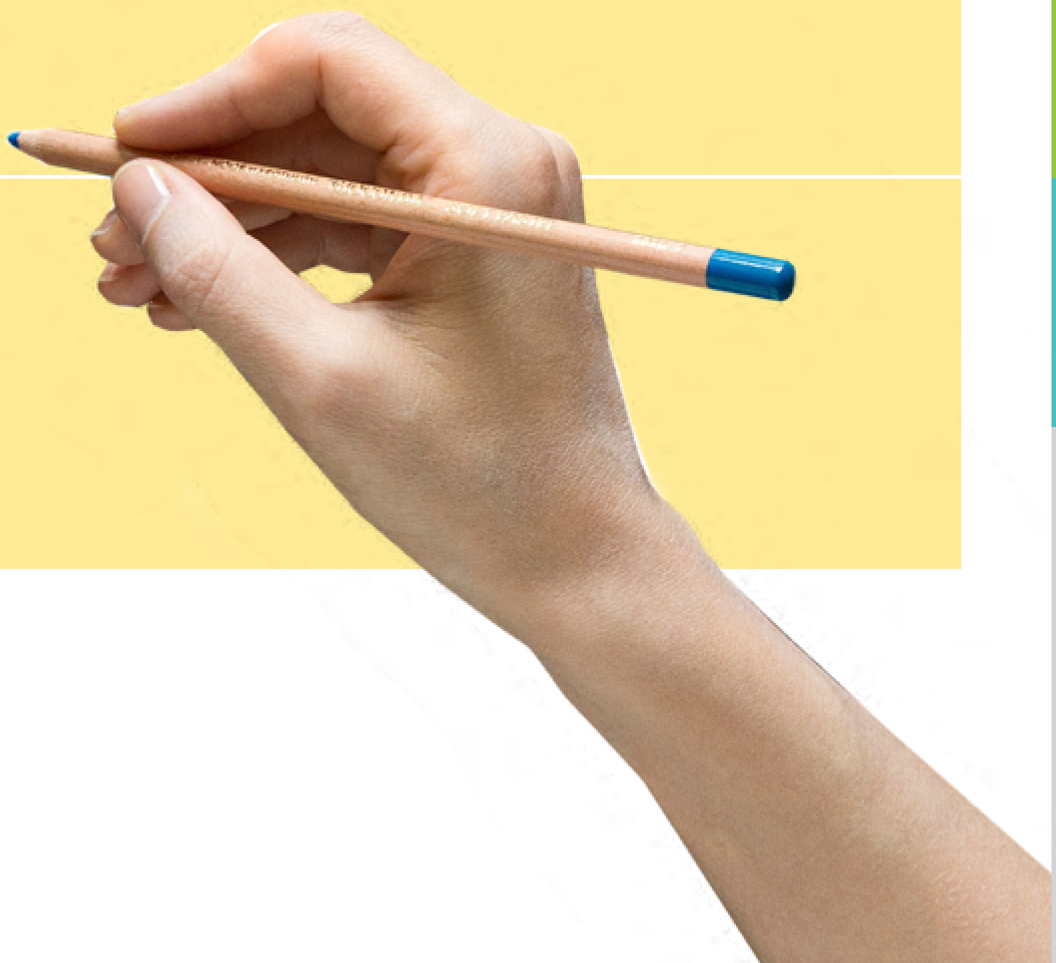
WEAKNESSES

- → Lack of expertise in energy
- → Lack of capital
- → Lack of suitable partners
- → Lack of interaction with major stakeholders and policy makers

STRENGTHS

- → Good relations with investors
- → xxx

	Positive	Negative
Internal	**Strengths**	**Weakness**
External	**Opportunities**	**Threats**



↑ Figure of Strengths Weaknesses Opportunities and Threats matrix

TRANSITION CANVAS

To develop more concrete ideas, the transition canvas can be used. This tool allows structuring project ideas and identifying the relevant partners, activities, resources, etc. **It breaks down an initiative into the individual components:**

- → **Key partners:** Who are the key partners that need to be involved?
- → **Key activities:** What activities does the key objective require?
- → **Key objective:** Which problems does the initiative solve? What value is delivered?
- → **Engagement:** What type of relationship can be established with the stakeholder groups or users?
- → **Key stakeholder groups and users:** For whom is value created? Who benefits from this transition model?
- → **Key resources:** What resources does the key objective require?
- → **Channels:** Through which channels can they be reached?
- → **Cost structure:** What are the main costs associated with the initiative?
- → **Revenue:** What are the sources of revenue?
- → Social impact: What social impact does the initiative have?
- → **Environmental impact:** What environmental impact does the initiative have?

The transition canvas can function both as a workshop tool to guide brainstorming or as a guide for research to find out which problem will be solved and how.

↑ La Réunion has shown how synergies between renewable energy and agriculture can happen thanks to a project of PV integrated into greenhouses. Five of such greenhouses have already been developed on the island. © Photo Akuo Agri.

↑ In 1997, Samsø decided to stop importing fossil fuels, like oil, and get rid of the uncertainty that fluctuating market prices, accidents of all sorts or just the will of oil sheikhs and oligarchs in oil-producing countries used to create. This was an opportunity for local farmers to provide straw and organic matter from their fields that remains after harvesting to the central boiler. © Photo Søren Hermansen, Samsø

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TECHNOLOGY ASSESSMENT

To determine the suitability of a certain technology in your island's context, a technology assessment can be made.

This can be carried out by members of the Transition Team, or by an external expert.

The results of the assessment technology act as a fact-check for the transition dialogue.

They answer the questions: **is the technological strategy that we are considering realistic? To what extent can a technology meet the identified objective?**

The following aspects need to be included in the technology assessment:

Technology description

What does the technology do, and which aspect of the clean energy transition does it address?

Potential on the island

A resource assessment identifies how much this technology can contribute to the island's decarbonisation. As an example, for renewable solar and wind power, resource mapping is based on historical meteorological data for the island, and can consider further constraints such as protected areas, permitting, land ownership, etc.

Organisation

Which business/ownership models does the technology allow?

Cost

How much does the technology cost and how does this compare with other technologies?

Maturity

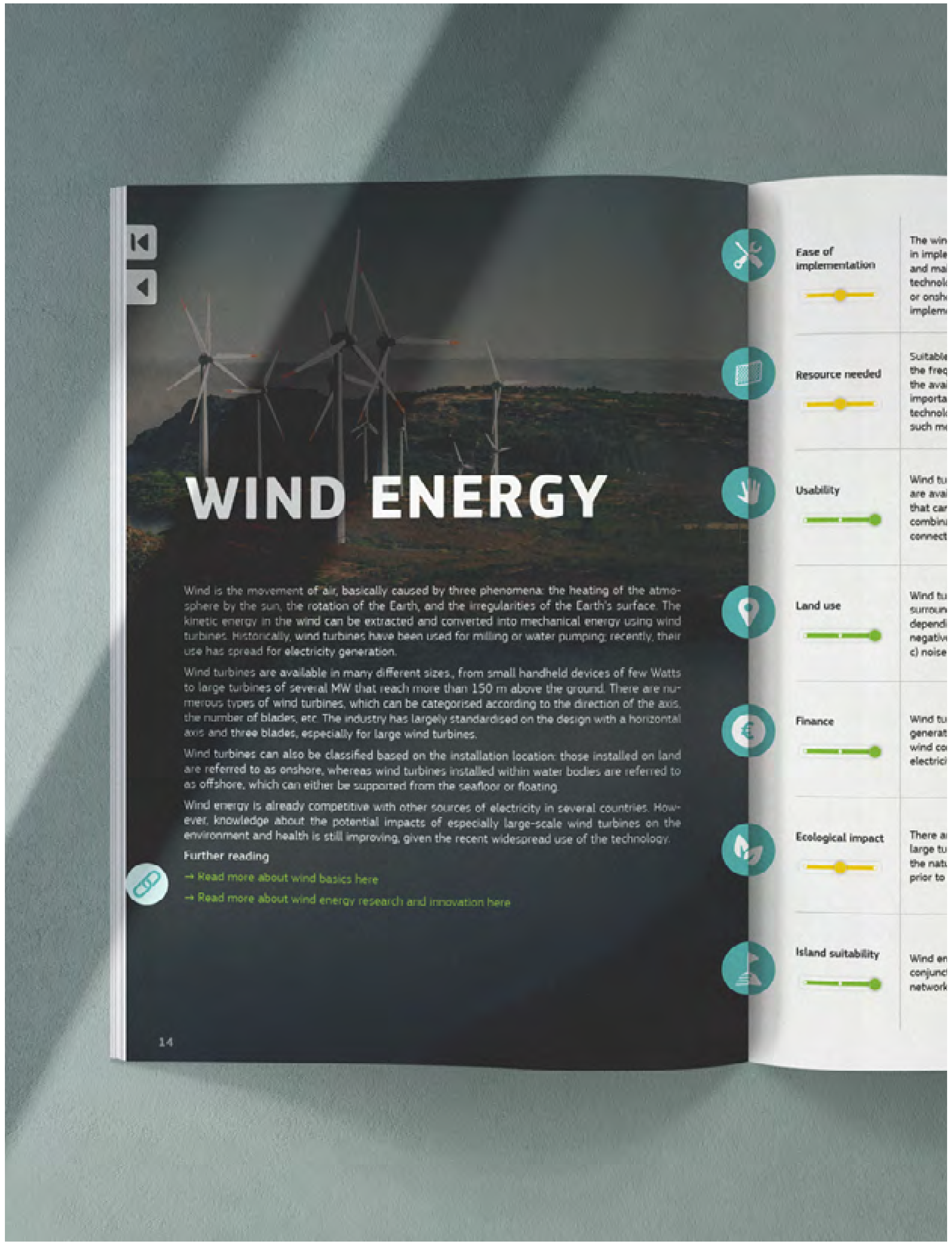
What is the technology's track record and how has it previously performed in the island context? Many innovative technologies are promising to address issues related to clean energy transition. However, they often come with high risks which means that the success of such a project is not guaranteed.

Previous cases

Investigating previous implementation cases can show whether the technology works well in a certain context and allows to identify the best practices.

ANNEX I – TOOLS FOR DEVELOPING TRANSITION PILLARS → TECHNOLOGY ASSESSMENT

Technology solutions booklet



↑ Technology solution booklet © Photo Clean energy for EU islands.

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ANNEX II – BIBLIOGRAPHY

The following references provide more information on renewable energy and transport costs and statistical data:

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- Road Transport: The Cost of Renewable Solutions, IRENA
- Renewable electricity requirements to decarbonise transport in Europe with electric vehicles, hydrogen and electrofuels

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↑↓→ Clean energy for EU islands #CE4EUislands Forum in 2022
© Photos Clean energy for EU islands

↑ Project director Jan Cornillie
© Photo Instituto para la Diversificación y Ahorro de la Energía (IDAE).

↑ **Rhodes island** during Clean energy for EU islands #CE4EUislands Forum in 2022 © Photos Clean energy for EU islands

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