The Habitability Handbook

An assessment tool for viable island communities

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Åbo Akademi

The Archipelago Sea Institute
of Åbo Akademi University

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Foreword

Islands are endangered societies. Over the past ten years, nearly twice as many small European islands have lost inhabitants as they have gained. What is wrong with us?

Are we not habitable? Maybe the cost of living is too high? Maybe there are too many people in a short period of the year and too few the rest of the year? Perhaps the perceived distance makes us seem unreasonably far away? Maybe climate change seems more threatening when you live out at sea? Perhaps we are ill-governed by people who do not understand our preconditions?

It is time to fight.

To this end, the habitability tool has been developed for islands by islanders – to be used by islanders. The habitability analysis checks what is attractive and what is not on an island as a place to live. To a large extent, you islanders will be your own researchers and your own consultants. With citizen science and using a common method to guide you through an open, systemic and honest process, the result will be eye-opening for your own island society.

This tool aims to show you what is marvelous about your island and what is not. You will examine it indicator by indicator: is it safety and inclusion? Is it kindness and cooperation? Is it the intricate business ecosystem and the hidden assets in the local economy? Is it April light over a clear blue sea?

You need to make your brand known, not as a place to visit but as a place to live. You are an attractive society, and you need more nice people to know about it.

The questions are the same as ever but don't settle with the same answers. Let us help each other to find some new ones.

Christian Pleijel
Kökar, June 2022

Originator of the Habitability concept

Introduction

The fascinating small islands of Europe

There are about 2,400 small, inhabited, unbridged islands in Europe. Some are far out at sea, while others are situated along the coasts. Some lie in lakes, and some build-up archipelagos. The European islands form a complex, widespread and heterogeneous unit. The total area of our islands is 454,753 km2, with 18,889,077 resident inhabitants. Imagine that all these islands were one nation. This imaginary nation would rank as the 5th European nation in size, between Spain and Sweden. In population, it would be placed after Poland but before Romania.

Each island is unique, but all islands are very different from the mainland. Islands have five characteristics:

(1) Small islands have very dynamic fluctuations in their populations. A small island with 250 all-year residents typically has 2,500 summer residents and 25,000 yearly visitors. The island's infrastructure – including energy, sewage, ferries, Wi-Fi, healthcare, etc. – serves a couple of hundred persons a day in January but several thousand persons a day in July. The residents of the island, those who "own" the island, are supposed to plan, finance, and implement sustainable solutions for all these challenges – a really wicked problem. Imagine the corresponding numbers for Manhattan (also an island but multi-connected to the mainland); 1.6 million inhabitants on a winter's day, 16 million or more on a hot day in summer, plus 160 million visitors yearly.

(2) Small islands are often economically vulnerable. Usually, they are dependent on a small number of economic activities, such as tourism and fishing. A decline in one of them can trigger a major socio-economic shock. This is further worsened by the inevitable competition between residents and tourists for the same limited natural resources, especially for coastal land on the islands.

(3) As the way to an island goes over water, the journey lasts longer than the equivalent distance on land. For islands, we have to calculate a "perceived distance" rather than the geographical distance. The average speed by car is approximately 70 km/h. If a ferry trip takes an hour to cover ten nautical miles (some 19 kilometres), the perceived distance exceeds the true distance. Waiting times at harbours, rough weather, and ice will make the journey longer, making the island feel more remote, which will affect the habitability.

(4) In small communities, the number of stakeholders is limited. On the advantageous side, self-governance is easier. The transaction costs are lower as the actors usually know each other and have information on the trustworthiness of other actors. On the contrary, small communities usually have a scarcity of management skills, as many highly educated persons move to urban areas on the mainland with richer work opportunities. Low population numbers also influence anonymity – for good and worse – as conflicts of interest arise easily.

(5) The governing structure of small islands is often affected by the lack of independence in matters that influence them. Most islands are part of and governed by a bigger municipality. Of all European islands, only two are sovereign states, 32 are regions, states or provinces, and 206 are municipalities. The remaining 2,000 islands are local communities with a local non-governmental and non-municipal organisation, representing the island before relevant authorities in political matters.

What is habitability?

Habitability is the concrete core for assessing the sustainability of an island. Every sustainable society must be habitable to survive, develop, and keep its resilience. As long as the logistics are efficient and sufficient, an island society has all presumptions to be habitable; there are children in the school, ample workplaces and affordable houses, and islanders feel secure and comfortable.

Naturally, the environment also plays an important role in the habitability process. It is nature that sets the outer limits of our islands, irrespective of where the island is situated; the storms on the Irish Sea, the heat in the Greek archipelago, or the low salinity of the Baltic Sea.

All islanders are experts on their own islands. They live their everyday lives here and know the fluctuations over the year and between the seasons. The question is: Do they know how to make their island more habitable?

Habitability, in our view, consists of seven aspects. These aspects, or areas, are divided into 45 indicators. The aim is to help you screen your island and focus on the most important parts of your habitability. Which of your strengths will you highlight in your strategies and marketing processes? Which issues need more effort to improve the habitability of your island?

The idea is not to compare islands with each other – an impossible task as islands are quite different – but to help the islands compete with the mainland and show that island living is a good alternative or possibly better.

With the help of the Habitability analysis, it is possible for you to describe and diagnose the habitability of your island, as you and your fellow islanders are its experts. We have intended to create an uncomplicated process but not an unintelligent one. Some indicators are based on facts, like the island's area, the number of inhabitants, and the number of children in daycare. Other indicators combine regional facts and credible assumptions made by a majority of the islanders, for example, conducted in a survey.

How to use the Habitability Handbook

The Habitability Handbook is primarily designed for the islanders on the more than 2000 small islands in Europe. Our purpose has been to describe the indicators generally enough so that they can be used on an island outside the coast of Scotland and an island in the Baltic or the Mediterranean Sea. Each indicator is rationally described and defined. We present how the result for the indicator is gained; either being an actual number, such as the area of the island, or a calculated value on a four-graded scale. For each indicator, there is a detailed example from a European island.

The seven areas and 45 indicators are based on the habitability analysis from the island of Kökar, Åland, in the Northern Baltic Sea. The original indicators have been revised and sharpened to cover the habitability of any European island better. Nevertheless, we can state that the analysis was developed by islanders, for islanders, to make our islands more habitable. In other words, it is not primarily a tool for scientists but islanders. Much of the information and knowledge will be gathered by citizen science, i.e., the islanders are the experts, and together they will evaluate the state of the habitability on their island.

Talking about islands, we are aware that islands can be very heterogeneous. In some cases, it is easy to define the island and, therefore, its habitability process. An island can be a municipality of its own, including one main island and a reasonable amount of smaller habited islands. This is the case with Kökar. Other cases are more intricate, like islands with very small populations, islands scattered in an archipelago, and islands under heavy stress from depopulation, immigration, war or natural disaster.

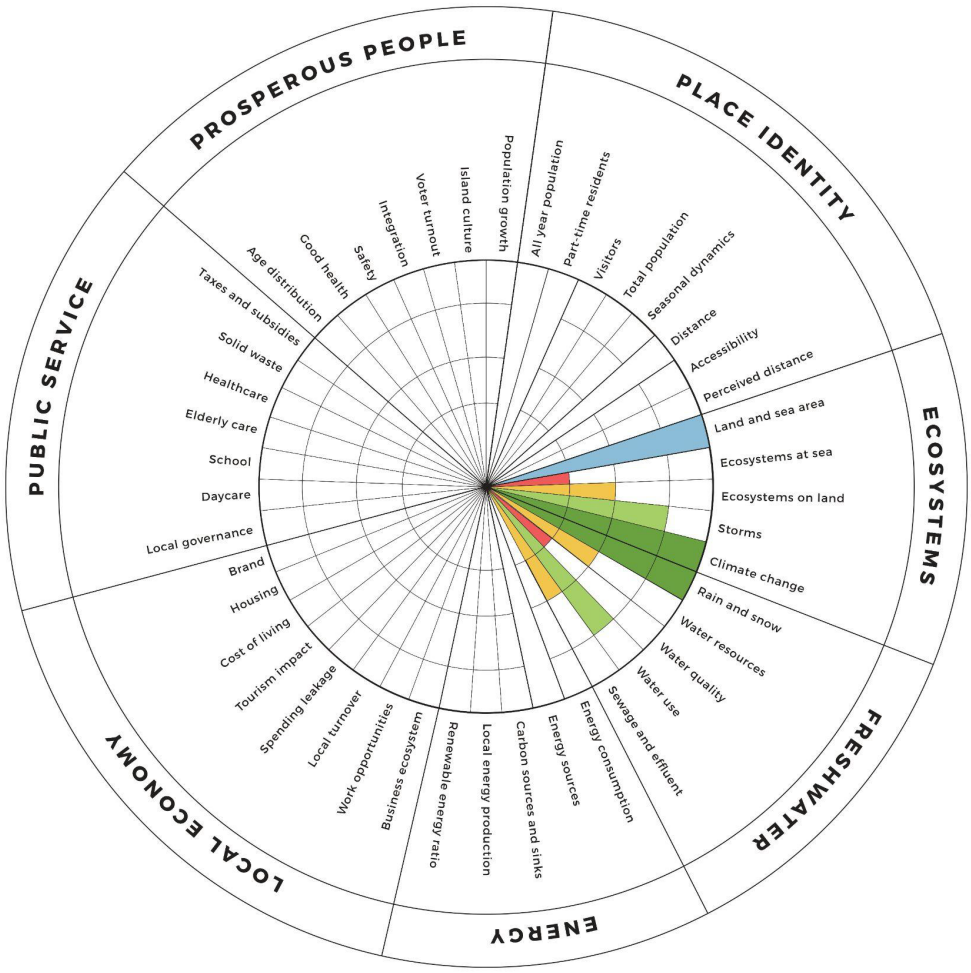
This method was developed to suit the needs of small, inhabited, unbridged islands in Europe. It may be of use in other landscapes, in another context – but that was never the intention. If, for example, you would like to perform a habitability analysis on an island with a very small population, you must consider which indicators will be relevant for your analysis. For example, if the island is too small to host a school, but the logistics for the pupils to travel to a neighbouring island or the mainland are functioning, you either must evaluate the indicator from the reality or explain why you will not assess a certain indicator.

If you live on an island connected to the mainland by one or several bridges, or if you do not live on an island at all, it is still possible to use the Habitability Handbook. However, you must be aware that some

indicators may not fit your reality perfectly. In such cases, make a judgement and motivate why some indicators are of no interest.

The seven areas and 45 indicators of habitability

We have integrated the characteristics of small islands described previously into a framework of habitability that consists of seven areas and is measured with 45 indicators:



The habitability wheel.

The Habitability Handbook describes each indicator in the same manner: (a) its rationale, (b) a definition, (c) how to make the computation, and (d) an example from a European island. Some of the indicators consist of basic facts, such as the area and the population size. Other indicators are numerical on a scale of 1–4, where 1 (red colour) stands for a critical state, 2 (yellow colour) is bad but not in need of immediate action, 3 (light green colour) is good, and 4 (dark green colour) is excellent.

Some indicators are easy to understand and compute, while others are more complex and may demand data from research or a survey. Some ask for a joint judgement from a knowledgeable group of islanders – based on the premise that it is wise to ask kids about kid matters and fishermen about fish.

The Habitability process step by step

To start a habitability process of your island, we recommend the following steps:

Get to know the tool: the design, purpose and process of habitability. Is it fit for your island?

Find company. A habitability process is not something you can implement on your own. The process must be led by a core group of practically-oriented enthusiasts between two, at the lowest, and, preferably, four to six persons. The core group will organise the work, set up and keep a realistic timetable, and follow up on the results.

Invite your fellow islanders. The habitability process must be open, transparent and inclusive. As it is built on citizen science, as many islanders as possible should be involved. Everybody possesses valuable knowledge needed when the information of the different indicators is collected and evaluated: kids, newcomers, businesses, commuters, local politicians and local organisations. In some cases, more in-depth interviews are needed, and in other cases, data is best collected through a survey.

Make a budget and get financing. You do not have to pay for the method since it was developed with EU financing, but you may need some funds for the project team, especially if you want a project manager to hold the process together. There will be workshops and venues when you must pay for meeting rooms, maybe serve something. You might need a small office, a computer and a telephone. Communication costs money, whether being live or digital. For some indicators, you might want some external or internal experts who are to be compensated. You can get help and advice regarding budgeting and financing from the habitability team at Åbo Akademi and other islands, who have solved this task well.

Set the goals. What is the purpose of a habitability analysis of your island? For what reason will you use it? Try to be realistic and try not to cover more than you can handle. Describe the red line and arrange an open meeting to agree on the process. It is an important step to get everybody on board and the core group to relate during the journey. Try also to draw a tentative timetable – how long will this first habitability analysis last? The advice is to give it enough time. We are often talking about a year-long process.

Sort the indicators. Start the habitability analysis by going through all the indicators and making a preliminary judgement if they are relevant to your island. In some cases, there can be some that are not of interest for you to analyse and evaluate. If there are a few, around five or less, they will not have a bigger impact on your result. Of importance is that you all – at least the core group, but in the best case, all islanders invited to a common meeting – agree upon leaving these indicators out. In the result of the analysis, you briefly motivate why this is done. If the majority of the indicators are not relevant or of interest on your island, then you should consider if a habitability process overall is doable for your island.

Teach your fellow islanders about habitability: what it is, which steps will be taken, how long it takes, how can each and everyone get engaged, what will be asked of them, and what is the final result? This is vital to make everyone confident and included in the process. There are movies and examples on the habitability website, and you can get support from Åbo Akademi University.

Start the analysis; delegate, inform and keep track. This is the major and most time-consuming step. It is up to you in which order you work with the areas and indicators. In the Habitability Handbook, we have tried to structure the process in a natural way, where we start with the basic facts of the island and the environmental conditions. In reality, they have no mutual order. As a little piece of advice, start with Area 1 – Place identity. The first indicators define your island and are easy to obtain. You will get a quick advance and feel that you are on your way. Another tip is to study the indicators well and make a roadmap

on how to advance. Who is doing what? It might be smart to divide the work into several smaller teams. If you are doing interviews and surveys, is it possible to merge information for several indicators into the same questionnaire? In matters concerning potentially new islanders, ask them directly. Try to be as heterogeneous as possible when choosing the respondents for the best overall results. Remember to keep the process transparent. The core group has the responsibility to listen to the islanders, keep everybody involved and informed – open meeting occasions or certain platforms on social media open for everybody interested (or in the best circumstances both) are good ways to perform – and, of course, follow up the process and keep the time table. The core group should also check that all data for all indicators are properly described and that all sources of information are documented. That gives the process dignity and helps to repeat it later.

Evaluate and document your results. After assessing all seven areas and 45 indicators, you have a complete picture of how habitable your island is. The results of the indicators evaluated in categories 1–4 give a clear and colourful picture of the situation in your habitability wheel. You should now be able to see the strong sides of your island community: which parts of habitability are green? On the other hand, you will certainly see the red ones, your weak points. Are they all – both strengths and weaknesses – expected and known from beforehand, or did you discover any surprises? Make a final report with a summary.

Celebrate your work. Congratulations, you have done a great job together! Do not forget to celebrate your effort before rushing to further projects.

Go back to step 4. Now is the time for action, based on the common, open, honest process of clarifying your strengths and weaknesses as a habitable island society.

We wish you Good Luck and enjoy your journey!

How it all started

The habitability process has, until today, only been performed on one single island community: Kökar, one of sixteen municipalities on the Åland Islands, Finland, in the northern Baltic Sea.

The municipality of Kökar was part of an Interreg Central Baltic project, Coast4Us, from 2018 to 2020. The aim was to evaluate the sustainability of the island community. The project engaged a majority of the islanders; 130 of the island's 232 resident inhabitants actively participated in the work. Besides that, the work involved experts from universities and consultants. However, the project got stuck halfway.

Sustainability measurement systems seemed to lack instruments and tools useful on the small-island scale. The characteristics of a small island could not be properly treated, for example, the skewed, seasonal population, the perceived distance, the gross local product or the importance of a diaspora. There was not enough data, or data could not be used as individuals were too easily recognisable.

Instead, the concept of habitability was born. According to the islanders of Kökar, an island society has to be habitable to become sustainable. To be habitable is to be a good choice for living, both for those born on the island and for new residents and families. It calls for a mixed population of all ages, genders, origins and opinions. A habitable and viable island is the most important component of long-term sustainability.

During many meetings, lectures, workshops, municipal committee, and board sessions, the community of Kökar developed forty indicators of habitability. Even though the islanders were involved in the work, the result was partly unexpected. The result led to further plans to make Kökar even more habitable, with the blessing of the municipal board and community council.

The habitability concept of Kökar was also of value to be spread and developed further. Christian Pleijel, who is the inventor of and one of the front persons in the habitability process of Kökar, contacted the Archipelago Institute at Åbo Akademi University in the autumn of 2020 to start cooperation based on the habitability process. The first initiative was an international distance course presenting the concept. The

course, which involved over 30 participants from twelve European islands and several island experts – researchers, politicians and mayors – as lecturers, was given in the spring of 2021. The engagement of both students and experts led us to revise and develop the concept further. During the autumn of 2021, the work for the Habitability Handbook started. Meanwhile, the Archipelago Institute got funding for a project where the concept of habitability is integrated into the development of a national network at the grassroots level for islands and coastal rural areas in Finland. A team consisting of Christian Pleijel, Pia Prost and Cecilia Lundberg – with the help of many islanders and island experts around Europe – have now further developed the concept to its present form.

1 Place identity

To define the identity unique to islands, the first basic area of a habitability analysis is focused on two characteristics: their dynamic populations, and their position in seas and lakes, making them hard to reach.

The uneven presence of humans on islands makes them a different kind of place, aside from being surrounded by water. Islands can be almost empty and sleepy in winter but awake around the clock in summer with lots of people present.

It is misleading to simply count persons. The people of Manhattan spend most of the year's 365 days in their hometown, a total of 595 million person-days, while their visitors typically stay 2,5 days, which adds up to 34 million person-days. Islands also have a third category of population: part-time residents. To more accurately understand human pressure, we must count the person-days for each of the three population types that stay on the island.

The island can have ten times as many people present in summer as in winter. Why is this important? Because island infrastructure must be adaptive. The amount of monthly waste collected in the low season on Kökar is two small containers per month: in the high season, 16 containers. The volume of sewage is 2 m^3 per day in January and 36 m^3 per day in July.

"Island life is subject to the tyranny of distance", says Professor Stephen A Royle in his "A Geography of Islands" (2001).

Islands with a fixed link lose their "islandness". A journey over a bridge is fast, banal, and has little sense of adventure. It is not the same as sea travel to islands. To travel to and from our islands, we use ferries, of which there are 670 in Europe, whereof 206 in the Baltic Sea, 121 in the North Sea, and 344 in the Mediterranean.

In Scotland, 7 million passengers and 2 million cars were transported along 50 sea routes in 2015. Scotland has a Road Equivalent Tariff (RET) where the car ferry to an island and the piers are, in fact, parts of a flexible road over which cars and commercial vehicles can pass to and from islands. But there is a different rationale concerning ferries: paying a road tax entitles road drivers to drive anywhere on the road system. Taxation is used to construct and maintain roads. Roads go everywhere except for islands. If it were possible to build roads to islands, it would have been done. Islanders pay a road tax while being uniquely denied access to the road system without paying a substantial ferry surcharge. To be fair, the cost to the islander of the ferry crossing is related to the cost of travelling along an equitable length of road – which mainlanders can freely drive on.

Indicator 1: All-year population

a Rationale

In biology and ecology, a population is a group of individuals within a species in a given area at a given time. The term is well suited to describe the human presence on an island. The Merriam-Webster dictionary defines population as "the whole number of people or inhabitants in a place", or "the total of individuals occupying an area or making a whole". Consequently, working with indicators 1-5, we will include all of the individuals who are, at times, occupying the island. In Indicator 1, we count the all-year residents.

b Definition

The current number of all-year residents of the island.

c Computation

The number of residents according to official statistics, corrected by the islanders themselves, given in both the number of individuals and the number of person-days. For small islands without a local administration, the data must be based on local knowledge.

Year	No of residents	No of residents, counted in person-days (x 365)

This indicator cannot be assessed on a four-grade scale. Some island populations are small, and others are large. Numbers are what they are and will be used in the following indicators and last, but not least, for indicator no. 45 – whether the population is shrinking or growing.

d Example

Porto Santo is Madeira's little sister, a small island 42 km^2 in size, 30 nautical miles northeast of Madeira. Porto Santo has its regional government under the auspices of the Madeiran regional government, which itself has semi-autonomic status within the Portuguese national system. Major policy decisions are made in Lisbon, but the Porto Santo council leads the local economic development.

The island has a permanent population of 5,158 people. However, the population can quadruple over weekends in summer. Until a recent influx of foreign retirees, the population was largely families living on the island for generations. Tourism, which is not overly dominant, gives jobs to all youngsters in the summertime but leaves half of them unemployed in winter.

Year	No of residents	No of residents, counted in person-days (x 365)
2021	5,158	1,882,670

Indicator 2: Part-time residents

a Rationale

Many islands have part-time residents. They may work on the island but are not registered residents. Many of these are summer residents who have inherited or bought a property. Describing the part-time population is important in order to understand their impact on the island society, its infrastructure and local economy.

Many part-time residents pay real estate tax, but no income tax to the island. They have no right to take part in local elections. They contribute to the local economy – part of the year. A dominant part-time population may put the society at risk of becoming two societies – one in winter and another one in summer. A sound balance is desirable.

b Definition

Part-time residents are people who live on the island part of the year. They often own property on the island. Part-time residents are also people who, on a long-term basis, are renting a house in which they spend part of the year.

c Computation

(i) Number of part-time residents

(ii) Number of part-time residents counted in person-days with the help of average days they spend on the island (might be several sub-categories).

Number of part-time residents	Average stay [days]	Total number of person-days

d Example

As can be seen on the map, land on the French island Houat is divided into a large number of small plots. The number of these parcelles is 1,118, almost all including a house. Approximately one hundred are homes belonging to all-year residents, the rest are owned by people who spend part of their time on the island. According to European statistics, a house is typically occupied by 2,3 persons. The houses on Houat are occupied for about 10 weeks a year, says Andrée Vielvoye, Madam Mayor of Houat. To get a grip on these numbers, we need to transform them into person-days.

Houses belonging to all-year residents: 105

Houses belonging to part-time residents: 1,118 - 105 = 1013

Part-time residents spend about 10 weeks on the island = 70 days a year.

Computation of part-time residents in person-days:

1013 houses x 2,3 persons x 70 days = 163,093 person-days

If we want to compare this to the all-year residents, we have to make the same calculation for them:

105 houses x 2,3 persons x 365 days = 88,148 person-days

Number of residents	Average stay [days]	Total number of person-days
Part-time residents 2,341	70	163,093
All-year residents 242	365	88,148

Through the number of person-days, we learn that the all-year residents account for approximately half the amount of "the whole number of people or inhabitants in a place", to cite Merriam-Webster.

Indicator 3: Number of visitors

a Rationale

Tourism is very important on islands. For many islands, money generated by the tourism industry makes up their primary contribution to the gross local economy. The United Nations World Tourism Organisation (UNWTO) has developed an indicator of the seasonal pressure on the host regions and populations' environmental and social resources. This is called the tourist-to-local ratio.

Andorra holds the world record with a tourist-to-local ratio of 36:1. Macau has 25:1 tourists to every local. Miami has 0.5 million inhabitants and receives 8.1 million tourists every year, which gives a tourist-to-local ratio of 16:1. Las Vegas has a ratio of 10:1 and Manhattan (also an island), with 1.63 million locals and 13.5 million international visitors annually, a ratio of 8:1.

Islands certainly follow this trend, and their tourist-to-local ratio can even outnumber those declared for Andorra or Manhattan. Houat (described in Indicator 2), with 84,500 yearly visitors and a resident population of 242, has a tourist-to-local ratio of 349:1. Hven, a Swedish island with 130,000 yearly visitors and a resident population of 528, has a ratio of 246:1. That is seven times more than Andorra, holder of the official world record, and sixteen times more than Manhattan.

b Definition

(i) Yearly number of visitors, preferably per category, counted both in persons and in person-days, during high and low seasons.

(ii) The tourist-to-local ratio.

c Computation

(i) Yearly number of visitors

Category	Length of stay [days]	High season (x days) [persons/day]	Low season (x days) [persons/day]	Number of persons	Number of person-days
Staying overnight					
Day trippers					
On cruise ships					
Sum					

ii) Tourist-to-local ratio

Number of tourists	Number of residents	Ratio

1	2	3	4
A ratio of more than 1:100 or less than 1:5	A ratio of 1:50-1:100	A ratio of 1:10-1:50	A ratio of 1:5-1:10

d Example

Capri is a mountainous island 25 nautical miles off Naples in Italy. The island has an area of 10.4 km^2. There are two municipalities on the island, Capri with 7,052 residents and Anacapri with 6,684 residents. Capri is visited by 2.3 million people a year, with up to 20,000 visitors per day during the summer. About 70% are day-trippers from either Naples or Sorrento.

On a relatively small area (Capri is 400 hectares and Anacapri is 636 hectares), there are 59 hotels, three residences, 30 furnished rooms, 104 rental vacation houses, 93 B&Bs, and a holiday farm. This means that

on 1,036 hectares, there are 209 accommodation facilities, almost five accommodations per hectare. There are also 124 restaurants, 15 bathing establishments, 14 nightclubs, and nine spas.

In Capri, the high season is four months of the year, with approximately 4000 daily visitors staying overnight. During the low season (200 days), 500 daily visitors stay overnight. Cruise ships bring about 500 persons a day to Capri during the high season.

High season: 120 days x 4,000 persons/day = 480,000 persons

Low season: 200 days x 500 persons/day = 100,000 persons

Total amount of persons staying overnight during one year:

480,000 + 100,000 = 580,000 persons

580,000 x 2 days = 1,160,000 person-days

Category	Length of stay [days]	High season (120 days) [persons/day]	Low season (200 days) [persons/day]	Number of persons	Number of person-days
Staying overnight	1	4,000	500	640,000 + 100,000	740,00
Day trippers	1	12,000	1,000	1,920,00 + 200,000	2,120,000
On cruise ships	1	500		80,000	80,000
Sum				2,940,000	2,940,000

The tourist-to-local ratio of Capri is calculated by dividing the total number of tourists by the total number of inhabitants of the island: 2,940,000 / 13,736 = 214,04

Number of tourists	Number of residents	Ratio
2,940,000	13,736	214:1

Capri has a UNWTO tourist-to-local ratio of 214:1 (pre-COVID) and scores 1.

Indicator 4: Total population

a Rationale

We have learnt that islands, besides their resident population, have important numbers of part-time residents and a huge influx of visitors.

The total population of the island includes the permanent residents, the part-time residents and the visitors. “Population" is a word borrowed from biology and ecology: a group of individuals of a species present in a certain area at a certain time. The term fits well when we now have to count the entire human presence on the island, not just the persons written on the island.

We want to count the entire population because the island's water and food supply, energy system, sewer lines, treatment plants, recycling and removal of waste, road network, ports, ferry capacity, public transport, legal system, health care, telephone and IT systems and more need to be dimensioned to cope with the real number of people present.

To understand the total human pressure on an island per year, we will now add all the person-days.

b Definition

Total human presence on the island compared to the official number of residents.

c Computation

Category	Persons	Person-days
All-year population *(Indicator 1)*	X	X x 365
Seasonal population *(Indicator 2)*	Y	Y x days/year
Visitors *(Indicator 3)*	Z	Z x days/year
Sum		

If you want to compare the official number of all-year residents to the total population (i.e., full-time residents + part-time residents + visitors), giving the overall human pressure, you have to divide the obtained sum by 365.

1	2	3	4
A ratio of 4:1 or more	A ratio of 3:1	A ratio of 2:1	A ratio of 1:1

d Examples

In this example, we use the information on the islands Porto Santo, Houat, and Capri, with some information obtained from indicators 1, 2, and 3.

Island	Category	Persons	Days	Person-days	Equivalent to persons a year *(/365)*
Porto Santo	All-year population	5,158	365	1,883,000	
	Part-time population	25,000	60	1,500,000	
	Visitors	59,900	5.9	353,000	
	Sum			3,756,000	10,290
Houat	All-year population	242	365	88,330	
	Part-time population	2,571	75	192,855	
	Visitors July & Aug	600	60	36,000	
	Visitors June & Sept	400	60	24,000	
	Visitors rest of the year	100	245	33,000	
	Sum			374,186	1025
Capri	All-year population	13,736	365	5,013,640	
	Part-time population	Unknown			

	Visitors	2,280,000	1-2	2,860,000	
	Sum			7,873,640	21,572

On Porto Santo, the total human pressure is twice as heavy as the official population number (10,290 instead of 5,158), an indicator value of 3. For Houat, human pressure is four times higher (1,025 compared to 242), an indicator value of 1, and for Capri, it is almost double, 21,571 instead of 13,376, an indicator value of 3.

However, these numbers do not give the whole story about human pressure, as tourists consume much more water and energy per person and day than residents do. Also, the pressure on the island's infrastructure and transport system is not evenly distributed over the year but concentrated on the summer season. We will examine this in the following indicator, number 5.

Indicator 5: Seasonal dynamics

a Rationale

Having counted the total population of an island, including every person who spends time there, we are now ready to describe the dynamics: the seasonal shifts in population numbers.

Many islands have a significant number of part-time residents, and many have a lot of visitors. These two categories are different from the all-year residents in one important aspect: while all-year residents live on their island during the winter and summer, the part-time residents and visitors spend time on the island mainly during the summer season.

Every individual uses the infrastructure on the island: we all drink water, shower, eat, produce garbage and sewage, use electricity and wi-fi, move around with cars and boats and bikes, need healthcare, and the like. To deepen our understanding of the habitability of an island, we need to show the dynamics of seasonality since it affects the local economy, the pressure on nature, culture, and the socioeconomics of the island. We will do this by describing summer highs and winter lows, which may appear as an oversimplification. Still, it will provide us with an indication of the peak load of the island infrastructure systems.

b Definition

The difference in human presence on the island in the low season compared to a day in the high season.

c Computation

The total human presence a day in the low season, divided by the total human presence a day in high season, six months apart. January 15 and July 15 are suitable in Northern Europe; February 15 and August 15 in Southern Europe, to adjust with regional holidays.

1	2	3	4
A ratio of more than 1:25	A ratio of 1:11 - 1:25	A ratio of 1:4 - 1:10	A ratio of 1:1 - 1:3

d Example

Holmön, an island with an area of 22.5 km^2, is situated in the north of Sweden, 10 kilometres from the mainland. Holmön is said to be the sunniest island in Sweden. The island is served daily by a ferry, a 40-minute trip. In winter, a bus drives to the island on an ice road.

Holmön was the smallest municipality in Sweden from 1925 to 1974. Twenty years ago, the number of residents was almost 100, and over 400 in 1945. Today, Holmön has 60 registered residents, but not all of them spend all the year on the island. About 580 persons, primarily descendants, grandchildren, and relatives to people on Holmön, are part-time island residents. They mainly spend their time on the island during the summer and at the weekends all year round.

The islanders have cleverly computed and organized their population in different categories, including all-year residents, part-time residents with two homes (one in town and one on the island), holiday all-time residents, holiday half-year residents, holiday part-time residents, and visitors.

39 persons inhabit Holmön during the low season and 576 persons during weekends in the high season. The ratio for Holmön calculates as:

576 / 39 = 14,8, thus 1:15.

The pressure on the island's systems on a weekend day during summer is 15 times higher than on a day during winter. This would give Holmön a value of 2.

Whether the water resources, sewage systems, energy provision, wi-fi, ferries, harbours and roads, fire brigade, and presence of doctors and nurses on Holmön can handle such shifting demands is a question we will discuss later on. It is as if Manhattan, with a nighttime population of 1.63 million, would have a daytime population of 24.5 million, or if Helsinki, with a resident population of 632.000 on a winter day, would have 9,5 million people in town on a summer day.

Indicator 6: Distance

a Rationale

The distance to an island may seem simple to measure. Still, in reality, it is trickier and calls for three interrelated indicators: distance (Indicator 6), accessibility (Indicator 7), and perceived distance (Indicator 8). One leads to another, and the purpose of this is to understand how distance affects the habitability of your island.

The geographic distance to an island can be defined by either the stretch of water dividing it from the mainland or the distance from the island's main port to the main port on the mainland. When judging the

habitability of an island, it seems reasonable to look at the travel distance instead, as it sets the scene for understanding accessibility (indicator 7) and the human geography of the island.

b Definition

From a distance point of view, Baldacchino and Pleijel (2015) propose five types of European islands:

Category	Type	Definition
A	Bridged	Islands with fixed links (bridges, causeways, tunnels) to their respective mainland. Typically located inside a town, a lake, a lake district, or a river.
B	Coastal	Near the shore of the mainland, close enough to be associated with the coastal area. Within sight, this side the horizon[1], well within VHF range[2]. Often part of a mainland community, municipality, or county
C	Off the coast	Out to sea, off-lying islands far away from land, hardly visible, located less than 12 nautical miles (or 22.2 nautical kilometres) from the mainland coast.
D	In the high seas	Offshore, faraway islands located more than 12 nautical miles (or 22.2 nautical kilometres) from the mainland coast, outside territorial waters (12 nm)
E	Overseas	Islands located outside or beyond the geography of the European continent.

[1] Standing at 1.70 m height, the horizon is roughly 5 km away

[2] A small boat antenna at sea level has a VHF range of about 5 nm ~9 km

c Computation

A	B	C	D	E
Bridged	Up to 5 km from the mainland, unbridged	5–50 km from the mainland	More than 50 km from the mainland	Outside the European continent

d Examples

Type A

Mont-Saint-Michel in France is a special place. It is a famed place, inhabited by 44 people, with 2.5 million visitors annually (a tourist-to-local ratio of 5680:1). Mont-Saint-Michel has a strong island identity, although it becomes an island only twenty times a year when very high tides roll.

Type B

Suomenlinna (Sveaborg in Swedish) is one of the largest sea fortresses in the world, located at the entrance to Helsinki. The building process started in 1748 when Finland was part of Sweden and is the most expensive defence project in Swedish history. Suomenlinna has been on the UNESCO World Heritage List since 1991. About 840 people live on the island, and it has a grocery shop and a primary school. The number of yearly visitors is about 670,000, mainly day trippers. The distance to Suomenlinna is about 1 kilometre from the city centre of Helsinki. It is served more than ten times a day by ferries and water buses. The journey takes about 15 minutes.

Type C

Capri is located 5 kilometres off Punta Campanella on the Sorrento peninsula in Italy. However, the bulk of marine traffic heading for Capri departs from the port of Naples and calls at Marina Grande, a 33 kilometres journey, which takes roughly an hour. The travel distance puts Capri in category C.

Type D

Lastovo, at 47 km^2, is a big island far out in the Adriatic Sea, the most remote of the Croatian islands. Lastovo has 792 persons living on the island all year round, but the human pressure on the island's infrastructure is the equivalent of a resident population of 1,509 people. The distance to Lastovo from the mainland port of Split is in a straight line of 90 km and by ferry, 207 km. There is both a ferry and a catamaran line from Split every day, with stops on Korcula and Hvar along the way. It takes five hours from Split to Lastovo with the ferry and three hours with the catamaran. Lastovo is thus a category D island.

Type E

In the EU context, "Ultra-peripheral regions" are a group of territories belonging to various member states located far from the European continent. They include the French Overseas Départements (Martinique, Guadeloupe, Réunion, French Guyana, and recently added Mayotte), the Canary Islands (Spain), and Madeira and the Azores (Portugal).

Indicator 7: Accessibility

a Rationale

While distance is a geographical feature, accessibility is a socio-technical factor based on mode(s) of transport, travel trip schedules, travel costs, waiting/travel/transfer time, travel considerations for disabled persons, and distance in length.

Islands with large populations offer many vital services, such as healthcare, education, administration. Coastal islanders may commute daily. For off-coast islanders, it is more difficult to access service, and it

can be almost impossible for islanders on islands in the high seas to access service every day. Smaller islands in archipelagos often face double insularity (with several ferry connections), which creates handicaps incomparable to any situation on the mainland.

b Definition

The degree of access to services on a 4-grade scale, from high to low access. See table below.

c Computation

1	2	3	4
Access to another destination demanding an overnight stay	Access to another destination is possible several days a week, without an overnight stay	Access to a destination possible in the daytime and in evenings, without an overnight stay	Local access

d Example

Shapinsay is one of the islands of Orkney, north of the Scottish mainland. The island has a population of just over 300. There is a primary school, a community centre, which doubles as the Headquarters of the local Development Trust, a shop, a post office, a medical centre with part-time GP coverage and a nurse practitioner in post, and a church.

To get to Shapinsay, you first need to get to Kirkwall. You can do this by air directly to Kirkwall airport or by sea from the Scottish mainland with Pentland Ferries from Gills Bay to St Margaret's Hope or Northlink Ferries from Scrabster the Scotto Stromness (both just a 20–30-minute drive from Kirkwall). If you are not keen on driving the whole way, there is a Northlink ferry that leaves direct from Aberdeen to Kirkwall. The m/v Shapinsay, commissioned in 1989, serves the island with six departures daily from Kirkwall, a 9-kilometre (25-minute) crossing.

In the Scottish Index of Multiple Deprivation (SIMD), Shapinsay falls into Decile 4, within the top 40% of most deprived areas in the nation. Under the Geographical Access domain, Shapinsay is within the top 2% of most deprived areas in Scotland, at 146 out of the 6,976 data zones. Regarding housing and income, Shapinsay scores low but compares positively against other areas nationwide in terms of health, education and skills, and, particularly, crime.

In 2022, the residents of Shapinsay formed the Shapinsay Development Trust. They erected an island turbine that is now their cash cow – bringing in up to £5,000 a day from the electricity they sell to energy companies. Some of these funds pay off the loan from the bank; the rest is invested in the community, such as an out-of-hours ferry link to Kirkwall, which runs twice during the evening and on Sunday mornings in the summer. The ferry allows residents to attend evening classes, evening work, Kirkwall Grammar School parent evenings, cinema, evening meals in restaurants, and many other things.

What accessibility to services do people on Shapinsay have? The below compilation is based on the Shapinsay Community Action Plan, the Scottish Index of Multiple Deprivation, a field study by Christian Pleijel back in 2012, and a visit by ESIN in 2017.

Service	Available on the island	Available elsewhere				Access 1-4
		Destination	Distance (km)	Distance (h)	Overnight return	
Agri/aquaculture bureau		Kirkwall 8 trips/d	9	0,5	Not needed	3
Bakery	Thomas Sinclair grocery & bakery					4
Bank		Kirkwall 8 trips/d	9	0,5	Not needed	3
Book store		Kirkwall 8 trips/d	9	0,5	Not needed	3
Butcher		Kirkwall 8 trips/d	9	0,5	Not needed	3
Café	Smithy's, open summertime					3
Car service		Kirkwall 8 trips/d	9	0,5	Not needed	3
Carpenter		Kirkwall 8 trips/d	9	0,5	Not needed	3
Church	Yes					4
Cinema	Monthly cinema club					4
Clothing		Kirkwall 8 trips/d	9	0,5	Not needed	3

Court 1st degree		Sheriff Court Kirkwall	9	0,5		3
Court 2nd degree		High Court Edinburgh	500	8 h	yes	1
Dentist		Kirkwall 8 trips/d	9	0,5	Not needed	3
Electrical appliances		Kirkwall 8 trips/d	9	0,5	Not needed	3
Doctor		Kirkwall 8 trips/d	9	0,5	Not needed	3
Electrician	Yes					4
Fire service	Local fire brigade					4
Furniture		Kirkwall 8 trips/d	9	0,5	Not needed	3
Food (mini market)	Thomas Sinclair & Balfour Bakery					4
Food (restaurant)	Smithy's (only summertime)					3
Gas/Petrol station		Kirkwall 8 trips/d	9	0,5	Not needed	3
Hairdresser		Kirkwall 8 trips/d	9	0,5	Not needed	3

Health centre	Medical centre					4
High school		Kirkwall 8 trips/d	9	0,5	Not needed	3
Hospital		Kirkwall 8 trips/d	9	0,5	Not needed	3
Kindergarten	Yes					4
Municipal administration		Kirkwall 8 trips/d	9	0,5	Not needed	3
Notary		Kirkwall 8 trips/d	9	0,5	Not needed	3
Nurse	Nurse practioner					4
Plummer		Kirkwall 8 trips/d	9	0,5	Not needed	3
Primary school	Yes					4
Post office	Yes					4
Physiotherapist	Well-being co-ordinator					3
Police		Kirkwall 8 trips/d	9	0,5	Not needed	3
Regional administration		Kirkwall 8 trips/d	9	0,5	Not needed	3
Shoes		Kirkwall 8 trips/d	9	0,5	Not needed	3

Sports	Children's football, various fit activities					3
Supermarket		Kirkwall 8 trips/d	9	0,5	Not needed	3
Tax service		Kirkwall 8 trips/d	9	0,5	Not needed	3
Theatre		Kirkwall 8 trips/d	9	0,5	Not needed	3
Tobacco	Yes					4
Town planning hall	The Boathouse					4
University		Edinburgh	500	8 h	yes	1
Veterinary		Kirkwall 8 trips/d	9	0,5	Not needed	3
Youth coach	Yes					4

The rating of Shapinsay is 149/46 = 3.2, which gives a value of 3. This is much owed to the out-of-hours ferry, which has transformed Shapinsay from rating level 2 to level 3.

Indicator 8: Perceived distance

a Rationale

The identity of an island and the image of an island are two sides of the same coin. Identity is who you are; image is how others see you. This fits nicely into the concept of distance. One side is the actual distance as the islanders know it; the other is how strangers perceive distance.

Ferries are a slow means of transportation, moving at an average speed of 18 knots (33 km/h). Catamarans can make 25 knots (46 km/h), a cable ferry is pulled at 4 knots (7 km/h). They all sail more slowly if they find themselves in choppy swells. A subway train makes 35 km/h, including stops. With a

car, you are accustomed to travelling at 70-90 km/h. Trains make one or several hundred km/h, and aeroplanes fly at around 800 km/h. If we compare the speed of aeroplanes with that of mediaeval ships (sailing at an average speed of 10 knots), the world is now 80 times smaller than the 14th century.

Visiting an island, the combined effects of isolation, a dedicated and maybe previously unexperienced journey over water, leaving the safety of the mainland, and the unusually long time even a short passage takes makes the island seem remote. Simply put, the distance from Valencia to Menorca is 320 kilometres and takes 9.5 hours, while the distance from Valencia to Madrid is 360 kilometres and takes 3.5 hours. From Valencia, Menorca is thus perceived as being much more distant than Madrid. The same goes for Turku, Finland, situated 167 kilometres from Helsinki, the capital of Finland, and 171 kilometres from the Åland Islands. The motorway takes you from Turku to Helsinki in 2 hours, while the journey to Mariehamn, the regional capital of the Åland Islands, takes 5 hours.

One way to describe this is to use isochronic (iso = equal, chrone = time) maps, which depict distances in time. Many geographers state that living space is changing in the world. With improved transportation technology, planners often speak of a shrinking world. However, this observation is not unique to the transportation system. One could find many other areas of communication, whether it be via e-mail, telephone, financial trading, or cultural exchanges, where the concept of spatial distance must be revised.

b Definition

The ratio of the real and the perceived distances, in travel time.

c Computation

In 2013, researchers Ioannis Spilanis, Thanasis Kizos, Michalis Vaitis and Nikoletta Koukourouvli at the University of the Aegean made an Atlas of the European Islands, where they computed the accessibility of selected islands using the formula:

VD= (RT + BT+ WT + (P x 168/N)) x TS

VD = Virtual Distance (km)
RT = Real Travel Time (h)
BT = Boarding Time (h)
WT = possible waiting time if the trip includes a change of ferries in a port (h)
P = probability of catching the ferry
168 = number of h/week
N = frequency of weekly connections
TS = travel speed of the ferry assumed at 20 knots (29,7 km/h)

The formula above calculates the perceived distance from a mainland port to an island's port. If your travel includes distances on both the sea and land, it is better to use a simpler way of computing:

Perceived distance = real time [h] x 90 [km/h]

Time = the time the journey takes in hours
90 km/h = the speed of a car on a trunk road

1	2	3	4
The perceived position of the island is four or more times the real one	The perceived position of the island is three times the real one	The perceived position of the island is two times the real one	The perceived position of the island is the same as the real one

d Example

In 2019, the Region of Stockholm used "time geography" to make an isochronic map of its archipelago. They used the simpler formula, multiplying the journey's time (in hours) by the speed of a car on a trunk road (90 km/h).

In the table below, you can see the real and the perceived distances to fourteen inhabited islands in the Stockholm archipelago. On the map, the islands have been moved from their true positions (bold outlines) to new positions (marked in yellow) at a perceived distance, which is how far you get when travelling on the mainland at 90 km/h.

	Real distance (km)	Real travel time (min)	Perceived distance (km)	Ratio	Value for Indicator
Arholma	56	70	105	1 : 1,9	3
Tjockö	30	31	47	1 : 1,6	3
Blidö	35	94	141	1 : 4,0	1
Yxlan	30	61	92	1 : 3,1	2
Ljusterö	25	46	69	1 : 2,8	2
Ingmarsö	33	79	119	1 : 3,6	1
Svartsö	33	69	104	1 : 3,1	2
Möja	45	125	188	1 : 4,2	1
Gällnö	30	64	96	1 : 3,2	2

Sandhamn	38	81	122	1 : 3,2	2
Runmarö	25	37	56	1 : 2,2	3
Nämdö	36	69	104	1 : 2,8	2
Ornö	32	55	83	1 : 2,6	2
Utö	28	68	102	1 : 3,6	1

Computation for Arholma

The time the journey takes in hours: 70 min / 60 min/h = 1.17 h

Perceived distance: 1.17 h x 90 km/h = 105 km

Ratio: 105 km / 56 km = 1.88, thus 1:1,9

The Euclidian world where space is flat and defined by straight and parallel lines, a world of stable entities and common-sense assumptions, has governed our understanding for the past two thousand years. It is an engineering model of planning, with a penchant for advanced decision making and blueprinting, claiming superiority to other forms of decision making due to its scientific character.

Entering into a non-Euclidian world of space-time geography can help us understand how people perceive our islands, their accessibility and habitability.

2 Ecosystems

A small island is an understandable, albeit complex, mixture of ecosystems. Organisms from terrestrial and aquatic environments form the biotic, living part of an island's ecosystem. Together with the abiotic, non-living parts – such as the geological landscape, the soil texture, and the weather conditions – the specific context for an island in question is formed.

There are no size limits for ecosystems. They can be as small as a pike's mouth or as big as the kelp forest in the Irish Sea. An island ecosystem is usually considered either small or medium scale. The whole surface of the Earth is a series of connected ecosystems, also called the biosphere.

A strategy called the ecosystem approach has been established to conserve and use ecosystem resources sustainably. The ecosystem approach is a strategy for the integrated management of land, water, and living resources. Humans are dependent on the goods and services produced by the environment. These are referred to as ecosystem services. Many of these services are taken for granted, like photosynthesis, natural air purification, and the circulation of nutrients in ecosystems. Mismanagement of these services will have negative consequences for humankind.

For islands, wherever they are located, ecosystem services significantly impact habitability; it is all about the fish in the sea, the crops in the fields, the timber in the woods, the bees for pollination. The beauty and allure of an island are also linked to ecosystem services. However, the shorelines of all the world's islands attract hundreds of millions of tourists every year, putting high pressure on the environment.

Indicator 9: Land and sea area

a) Rationale

An island is a piece of land surrounded by water. The so-called dry area is the area of an island primarily situated over the water's surface; the tidal zone lies in the transition area between the land and sea. However, the aquatic area hosts an integral part of an island's ecosystem and plays an essential role in analysing its habitability. Without water, the identity of an island is lost. If we limit habitability analysis to only the dry area, we will miss a crucial part of its richness and restrictions.

This is an intriguing indicator, as it can be challenging to define the amount of sea area that belongs to a particular island. The area depends on the island's legal status, vicinity to the mainland, military importance, marine assets, and the like. Generally, an island has at least some jurisdiction over its surrounding sea. Usually, it is a place for more or less active national and regional monitoring and actions.

b) Definition

The area of an island is the area that belongs to the island and creates its identity, both on land and at sea. If the island lacks jurisdiction over the sea, the sea area is the surrounding water that, for natural, economic, and historical reasons, are connected to the life of the island.

The definition should be given in km^2 along with a map. If the jurisdiction is unclear, the indicator calls for a joint judgment from a knowledgeable group of people.

c) Computation

Area in km^2 and a map where special areas of interest and influence are identified, such as fishing, marine traffic, recreation/tourism, ancient memories, and natural resources (gas, oil, wind parks, and the like).

d) Example

Vlieland, a Frisian island belonging to the Netherlands, is a municipality with 1,126 residents and an area of 316 km^2, 40 km^2 of which is land, and the remaining 276 km^2, water. The shallow water between Vlieland and the mainland is part of the Wadden Sea, a great asset and a Unesco World Heritage. Approximately 130,000 yearly visitors stay on the island for 4-4.5 days to appreciate the marine landscape. Consequently, mapping Vlieland should depict both the wet and dry areas and could also include Natura 2000 areas, existing and planned wind farms, routes for cables and pipelines, military sites, and shipping paths, as seen in the Netherlands Frisian Islands Marine Spatial Plan 2016–2021.

Indicator 10: Ecosystems at sea

a) Rationale

The UN Sustainable Development Goal-14 is named "*Life below water*". To quote the UN, we should "conserve and sustainably use the oceans, seas, and marine resources for sustainable development".

Our seas and oceans are under severe threats and risks, from eutrophication and acidification to overfishing, marine pollution, and ocean warming. About half of the marine key biodiversity areas are not under protection, and oxygen depletion in the bottom areas is causing dead zones, so-called marine deserts. Much of the richness and attractiveness of an island – for both residents and visitors – is related to the environments on and below the water surface.

b) Definition

The overall state of the ecosystems in the surrounding sea area.

c) Computation

The computation can be done in two different ways.

i) Do an assessment according to the state of the keystone species in the waters of your island, or ii) Follow the official status of the surface water surrounding your island, according to the EU Water Framework Directive. The EU Water Framework Directive aims to achieve a good qualitative and quantitative status for all water bodies. The directive includes inland water and marine waters up to one nautical mile from shore.

i) If your island makes or calculates its own computation, here is our advice. List the important keystone species in the surrounding water areas– about 10-15. Try to find a representative mixture of long-living algae, underwater plants, bottom-living invertebrates, important fish species, mammals, and seabirds. Give a value for the current state of each of these species from 1 to 4 according to the following computation:

> 4) High status - The species is healthy and in good condition. The species is present in the same amount and numbers as 20-40 years ago. The species does not seem to be harmed by the presence of humans.

3) Good status - The species is in good condition, and the numbers are more or less comparable with the situation 20-40 years ago. However, human presence has slightly influenced the living conditions of the species.

2) Satisfactory status - The living conditions for the species have deteriorated compared with the situation 20-40 years ago. The species number has decreased, and the spread is more scattered.

1) Bad status - The species has clearly diminished in numbers and presence compared with the situation 20-40 years ago. In extreme cases, the species has gone extinct.

The values can be collected by the islanders themselves or be based on scientific research reports, or both. Also, consider the present state compared to the situation, e.g. 20-40 years ago.

It is very appropriate to use citizen science - that is, what the islanders themselves can observe and document. This is a crucial part of the habitability work. There is a great deal of knowledge to be gained from fishermen, hunters and ornithologists. When the observations are done in collaboration with researchers, large data sets can be made reliable and structured.

When every species on the list has got an individual value, calculate the average of all the species, and use that number for indicator 10 of your island.

ii) If you choose to use the result of the EU Water Framework Directive (EU WFD), do the following: search for an official management plan where your water area is included; it should be found on the website of your local or regional environmental authority.

The ecological and chemical status of the surface water is assessed according to the regulation of the EU WFD. The directive is assessed due to the biological quality (fish, benthic invertebrates and aquatic flora), the hydromorphological quality (structure of river banks, substrate of river beds etc.), the physical and chemical quality (temperature, oxygen, nutrients), as well as the chemical quality of specific pollutants.

The EU WFD consists of five classes: very good, good, moderate, poor, and bad. As our Habitability assessment only has four values, both WFD classes moderate and poor correspond to Habitability value 2.

1	2	3	4
The ecological status of the sea ecosystems is bad. The important keystone species have decreased in numbers or even disappeared. EU WFD: bad	The ecological status of the sea ecosystems is satisfactory. The negative impact of humans is clearly seen. EU WFD: moderate and poor	The ecological status of the sea ecosystems is good. However, a slight impact of human pressure is seen. EU WFD: good	The ecological status of the sea ecosystems is high. The system is healthy and seems to be unaffected by human pressure. EU WFD: very good

d) Example

Kökar is part of the Åland Islands, an autonomous part of Finland. It is situated far out in the Northern Baltic Sea, between the main island of Åland and the Finnish mainland. The area is 2,165 km^2 in total, where the dry parts are 64 km^2 and the rest, wet areas, is 2,101 km^2. Several large bays with hundreds of islets and skerries spread around Kökar add to the total area.

The overall state of the brackish Baltic Sea is classified as severe because of eutrophication and the biodiversity status, as well as contamination. There are signs of improvement during the latest years, but reaching a good ecological status is still far in the future.

Seabirds have traditionally been an important part of the ecosystem services at Kökar. Historically, seabirds were an essential food resource in the archipelago. However, the occurrence of eider and other seabirds has decreased over several decades. Today, the causes are primarily the predation of eagles, but other factors can also come into question (Fazer, 2021). Moreover, Kökar is a hotspot for birdwatchers.

Fish and fishing have traditionally been important for the habitants of Kökar, both as food and for income. Still, it is of great importance to the habitability of the island. Research reports show declining stocks, e.g. in 2005; the catches were a third of the situation in 1996. At present, there is no commercial fishing on Kökar.

The brown algae bladderwrack *(Fucus vesiculosus)* and the aquatic plant eelgrass *(Zostera marina)* are key species for the shallow ecosystems of the Northern Baltic Sea. Therefore, they are valuable indicators of good status in marine habitats. In the Baltic Sea, the bladderwrack occurs down to 12 meters depths if the water is clear enough and if the turbidity caused by eutrophication is not hindering light from penetrating the water column. Eelgrass has a depth range of 2–6 meters and is found on exposed sandy bottoms. Both species are important nursing grounds for fish and invertebrates. Many ecosystems absorb and store vast amounts of carbon dioxide. The eelgrass in the Northern Baltic Sea is one of these efficient natural carbon storage sources.

On Kökar, a workshop was arranged with islanders who work in the fishing sector (fishermen, fish farmers, fishing guides) or who have interests related to fishing (anglers, hunters, people interested in nature and the local culture, etc.) and who therefore have knowledge about stocks, the marine environment, social values, cultural heritage, economic conditions and ecologically important areas.

Thirteen species in the aquatic nature of Kökar were invented. The total sum of the assessed indicator values divided by 13 gives the common indicator value:

Keystone species	Ecological status in a long term perspective (approx. 20-40 years)	Assessed indicator value (1-4)
Seabirds		
Eider (*Somateria mollissima)*	Decreasing	1
Common Golden-eye (*Bucephala clangula*)	Decreasing	2
Goosander (*Mergus merganserser*)	Increasing	2
Mute swan (*Cygnus olor*)	Increasing	3
Cormorant (*Phalacrocorax carbo*)	Increasing	4
Velvet scoter (*Melanitta fusca*)	Increasing	3
Sea eagle (*Haliaeetus albicilla*)	Increasing	4
Fish		

Pike (*Esox lucius*)	Stable?	2
Perch (*Perca fluviatilis*)	Decreasing	1
Common whitefish (*Coregonus lavaretus*)	Decreasing	1
Baltic herring (*Clupea harengus membras*)	Decreasing	1
Underwater plant		
Eelgrass (*Zostera manrina*)	Decreasing	2
Macroalgae		
Bladderwrack (*Fucus vesiculosus*)	Decreasing in some localities, increasing in others	2
Sum		**28**

According to scientific reports and the judgment of islanders, the average value is 28/13= 2,15. This means that the Habitability indicator value 10 for Kökar is 2, on a satisfactory level. The EU WFD of the surface water places almost all waters of Åland Island to the state moderate, also corresponding to the Habitability class 2.

Indicator 11: Ecosystems on land

a) Rationale

The land-based ecosystems on an island are the same as a mainland, such as forests, lakes, and meadows. The ecosystems on the shorelines to the sea are also important for an island. These ecosystems can be exposed rocks, low-lying coastal meadows, as well as beaches of sand or larger stones. The island landscape and its biodiversity are strongly formed by the soil composition, the weather conditions and the close connection to the sea.

Within the EU, the ecological state of the ecosystems is regulated by the Habitat and the Bird Directives. These directives aim to protect a combined 233 distinct habitat types, 1400 rare, endangered or vulnerable species, and the 460 wild bird species of Europe.

b) Definition

The present state of the key habitats and species – wild species of vertebrates, invertebrates, plants and birds – compared to the situation 20–40 years ago. If an ecological field study has recently been conducted on your island, use that data. Otherwise, make your own list and use your own judgments.

c) Computation

Make a list with the following data:

- **Natural and semi-natural habitats** (habitats with no or slight human impact on biodiversity and biological processes) typical for the island.
- **Wild species**, typical for the island, sorted by the following categories:
    - **vascular plants**: 5-10 species
    - **mammals**: at least five species
    - **invertebrates**: choose species that are also easy for non-biologists to recognise, such as butterflies, bees, beetles etc.: 5-10 species
    - **birds**: try to pick both breeding and wintering species: about ten species

Give a value, between 1 and 4, to all these species and habitat types according to the following:

> 4) High status - The species is healthy, and in good condition; the habitat is favourable and stable. The species is present in the same amount or increasing as 20-40 years ago. The species seems not to be harmed by the presence of humans. The habitat is sufficiently large to ensure continuous maintenance of the species on a long term basis.
>
> 3) Good status - The species is in good condition, and the numbers are more or less comparable with the situation 20-40 years ago. However, human influence has slightly influenced the living conditions of the species. The habitat is sufficiently large to ensure continuous maintenance of naturally occurring species, but actual or potential negative influencing factors may have an impact.
>
> 2) Satisfactory status - The living conditions for the species have deteriorated compared with the situation 20-40 years ago. The species number has decreased, and the spread is more scattered. The habitat is not sufficiently large to ensure a continuous natural occurring species.
>
> 1) Bad status - The species has clearly diminished in numbers and presence compared with the situation 20-40 years ago. In extreme cases, the species has gone extinct. The habitat is heavily impacted by human influences, has declined in size, and is no longer in a natural condition.

The value should be motivated but can be based on either scientific research reports, a questionnaire distributed to the islanders, or a combination of both. Also, try to consider the present state compared to the situation, e.g. 20-40 years ago.

When you have evaluated all species and habitats listed in categories 1-4, calculate the average, which will be your value for indicator 12.

1	2	3	4
The land ecosystems are in a poor or bad state	The land ecosystems are in a satisfactory state	The land ecosystems are in a good state	The land ecosystems are in a high and stable state

d) Example

The island Jurmo is 2.79 km^2 in size (5 km x 1 km). The island is part of the city of Pargas in Southwest Finland. By car (about 35-40 minutes driving time), one ferry (10 minutes + eventual waiting time), and the connecting boat (3-3.5 hours), the perceived distance from the centre of Pargas to the harbour of Jurmo is considerable; especially since there are fewer departures for the connecting boat and not even daily ones during the winter season.

The nature of Jurmo is exceptional, and it differs greatly from the islands nearby. The island is an extension of the Salpausselkä ridge, which is a remnant of the last Ice Age. The terrain on Jurmo is barren and stony. Jurmo is a Natura 2000 area and part of the Archipelago Sea National Park. The island's nature is well investigated; for example, ornithological observations date back from the 1960s onwards.

Jurmo has about ten permanent inhabitants. However, the island attracts part-time residents and visitors throughout the year. Due to the fragile environment and nesting birds, visiting the western part of the island is prohibited from April to August.

The state of the land ecosystem on Jurmo is represented by three habitats and nine species. The total sum of the assessed values divided by 12 gives the common indicator value.

	Ecological status in a long term perspective	**Indicator value (1-4)**
Habitat (natural/semi-natural)		
Heath	Relatively stable. Due to restoration (clearing of land), the living conditions for the heather *(Calluna vulgaris*) have improved in a longtime perspective.	2
Grove	Stable	2
Coastal meadow	Stable. Dependent on the presence of cattle. Eutrophication may have had a negative impact.	2
Wild species		
Vascular plants		
Heath *(Calluna vulgaris)*	Stable. Fluctuating flowering.	2
Vertebrates		
Mountain hare *(Lepus timidus)*	Strong fluctuations due to the availability of food and predation pressure.	2
Field vole *(Microtus agrestis)*	Strong fluctuations due to the availability of food and predation pressure.	2
Common frog *(Rana temporaria)*	Relatively stable.	2
Invertebrates		

Rock grayling *(Hipparchia semele)*	Common and stable. Benefits of open areas.	2
Birds		
Redshank *(Tringa totanus)*	Stable	2
Arctic tern *(Sterna paradisaea)*	Slightly increasing. However, the nesting sites have moved from the main island to nearby skerries.	3
Common eider *(Somateria mollissima)*	Strong decrease due to predation. More or less absent on the main island; 80-90% decrease on nearby skerries.	1
Southern dunlin *(Calidris alpina schinzii)*	Always in small numbers. 4-6 pairs in the 1990s, during the latest years 1-2 pairs (1 pair in 2021). No changes were observed despite active restoration (restored biotopes, diminishing predators such as fox).	1
Sum		**23**

According to a judgement based on long term nature conservation and bird watching, the average value is: 23/12= 1.92. This means that the Habitability indicator value 11 for Jurmo is 2, on a satisfactory level.

Indicator 12: Storms

a) Rationale

Bad weather – especially storms – has always determined the life of the islanders. This was the case long before climate change, even if a consequence of global warming is stronger and more frequent storms (IPCC 2021). Islands are vulnerable to storms, which can cause damage to infrastructure, interrupt communication and power, and cause human injury and loss of lives. Strong winds impact coastal erosion, decrease freshwater resources, cause effluent and sewage systems to overflow, and affect recreational facilities. Frequent and long power failures, and cancellations in the ferry traffic, are everyday problems for many islanders.

The definition of storms is wind speeds of more than 24.5 m/s (89 km/h, 55 mph).

b) Definition

The level of damage to buildings, infrastructure and services because of storms.

c) Computation

1	2	3	4
Frequent disadvantages affecting daily life (more than 15 days a year), damage and high costs caused by storms.	Disadvantages affecting daily life (5-15 days a year) and high costs related to storms.	Some damage from storms, but the society is well-prepared.	None or almost no damage from storms

d) Example

Tory Island, officially known by its Irish name Toraigh, is an island 14 kilometres off the North-West coast of County Donegal. It is Ireland's most remote inhabited island.

The island is approximately 5 kilometres long and 1 kilometre wide. The 2016 census recorded a population of 119, a decrease from the 2011 population of 144. The population is distributed among four towns: An Baile Thoir (East Town), An Baile Thiar (West Town), An Lár (Middletown) and Úrbaile (Newtown).

The island of Tory has regular daily ferry connections to the mainland. The ferry, operating all year round, does not take cars but holds up to 70 passengers. Tory has no airport; however, a four-seater helicopter operates every other Thursday between Falcarragh and Tory between November and March. During the winter months, ferry crossings may not be possible due to rough seas or bad weather. The area is extremely tidal, and there are also days when the ferry can't operate because of very low tides.

According to statistics provided by the Islands Unit at the Department of Rural and Community Development in the Irish Government, during the years 2019–2021, the planned crossings for the Tory ferry were 6,828. From these, 5,218 ferry sailings could be carried out according to plan. During these three years, the ferry was cancelled due to storms 736 times (11% of the planned sailings). In February 2020, only 74 ferry crossings out of the 174 planned could be carried out. Of these, 88 crossings were cancelled due to bad weather.

Highly exposed to the elements in the Atlantic, everyday life on Tory Island is often affected by storms, especially in the winter when the main lifeline to the mainland, the ferry, is often cancelled. Tory receives a score of 1.

Indicator 13: Climate Change

a) Rationale

Climate risks are the combining result of climate-related hazards, vulnerability, and societal exposure. The main drivers of climate-related hazards include changes in temperature, precipitation intensity, windstorms, and sea-level rise. Also, factors such as salinity and water temperature are affected. These drivers are influenced by natural variability and anthropogenic climate change (Tuhkanen & Piirsalu, 2020). The consequences for society are either direct or indirect. Hazards related to climate change will cause loss of life, injury or other health impacts, property damage, social and economic disruption, or environmental degradation (UN 2016).

When looking at the climatic changes and impacts in the whole of Europe, there is a considerable variation between the different biogeographic regions and within regions. Islands have an exposed position and

face concrete risks due to a changing climate. Low-lying coastal regions and islands are vulnerable to sea-level rise; this includes a potential risk for flooding and coastal erosion. Another impact can be saltwater intrusion into low-lying aquifers, threatening water supplies. The loss of unique biodiversity on islands due to climate change would be huge.

Various impacts of climate change have consequences on the infrastructure, such as harbours, ferries, and airports, which will further cause potential impacts on tourism, recreation, and transportation functions. On many islands, agriculture is crucial for minimising dependence on food imports and is also an important source of foreign revenues. In the long term, most islands will be faced with decreased crop production and, at the same time, higher costs for water irrigation.

In the summer of 2021, the island of Sicily set a new European heat record of +48.8 °C.

b Definition

Assess the level of threats from climate change.

c Computation

Please see the map from the report, "Climate change, impacts and vulnerability in Europe 2016. An indicator-based report". Use the list of climatic changes and impacts for your region, and also include changes and impacts for "Coastal zones and regional seas". If the impacts for your region seem insufficient, please add more suitable impacts from other regions.

Give a value for the importance of these changes or impacts on your island. The value should be based on reliable observations by a considerable number of islanders, part-time islanders and regular visitors during a period of at least 20 years.

1	2	3	4	X
Affecting island life	Considerable changes already notable	Minor changes already notable	No changes notable	Can not be applied to our island.

Climatic changes and impacts	1	2	3	4	X
Continental region					
Increase in heat extremes					
Decrease in summer precipitation					
Increasing risk of floods or sea-level rise					

Increasing risk of forest fires					
Decrease in the economic value of forests					
Increase in energy demand for cooling					
Coastal zones and regional seas					
Sea level rise					
Increase in sea surface temperatures					
Increase in ocean acidity					
Northward migration of marine species					
Risks and some opportunities for fisheries					
Changes in phytoplankton communities					
Increasing number of marine dead zones					
Increasing risk of water-borne diseases					
Atlantic region					
Increase in heavy precipitation events					
Increase in river flow					
Increasing risk of river and coastal flooding					
Increasing damage risk from winter storms					
Decrease in energy demand for heating					
Increase in multiple climatic hazards					
Mediterranean region					

Large increase in heat extremes					
Decrease in precipitation and river flow					
Increasing risk of droughts					
Increasing risk of biodiversity loss					
Increasing risk of forest fires					
Increased competition between different water users					
Increasing water demand for agriculture					
Decrease in crop yields					
Increasing risks for livestock production					
Increase in mortality from heat waves					
Expansion of habitats for southern disease vectors					
Decreasing potential for energy production					
Increase in energy demand for cooling					
Decrease in summer tourism					
Increase in multiple climatic hazards					
Most economic sectors negatively affected					
High vulnerability to spillover effects of climate change from outside Europe					
Boreal region					
Increase in heavy precipitation events					
Decrease in snow, lake, and river ice cover					

Increase in precipitation and river flows					
Increasing risk of forest pests					
Increasing damage risk from winter storms					
Decrease in energy demand for heating					
Summarise and divide with the number of impacts taken into account					

d Example

The Danish island of Strynø is a flat island, 3x2 kilometres in size, situated south of Fyn. The island population peaked in early 1900 with 800 people, when most of the male inhabitants were hired on the sailing ships belonging to the larger neighbour islands of Ærø and Thurø. Today, the island population is just over 200 persons.

The sea around the island is very shallow and creates a special habitat for shallow water vegetation, fish and birdlife, as well as a considerable amount of seals. The highest point of the island is nine metres above sea level. Strynø is situated in a bird sanctuary, and the shallow sea provides a rich food source. Large flocks of swans, geese and other migratory birds inhabit the island successively during the year. Fish stocks have decreased in the past few years. Eel was abundant in the past century but has nearly disappeared in modern times.

The weather greatly influences everyday life: here, the wind largely determines the high or low tide and is responsible for occasional flooding of the surrounding small islands and the coast of Strynø. As on other small islands, Strynø has more hours of sunshine in the summer than the mainland, as the landmass of the island is too small to attract and create clouds.

On the map, Strynø is situated in the green area, “Continental Region”. Because of the close vicinity to the North Sea, also the changes and impacts of the “Atlantic region” were added, in addition to those from “Coastal zones and regional seas”.

Climatic changes and impacts	1	2	3	4	X
Continental region					
Increase in heat extremes		2			
Decrease in summer precipitation		2[1)]			
Increasing risk of (river) floods or sea-level rise			3		

Increasing risk of forest fires					No forests
Decrease in the economic value of forests					No forests
Increase in energy demand for cooling			3		
Coastal zones and regional seas					
Sea level rise			3		
Increase in sea surface temperatures				4	
Increase in ocean acidity				4	
Northward migration of marine species					Unknown
Risks and some opportunities for fisheries		2[2)]			
Changes in phytoplankton communities					X
Increasing number of marine dead zones					Unknown
Increasing risk of water-borne diseases				4	
Atlantic region					
Increase in heavy precipitation events			3		
Increase in river flow					X
Increasing risk of river and coastal flooding		2			
Increasing damage risk from winter storms	1				
Decrease in energy demand for heating					X[3)]
Increase in multiple climatic hazards					X
Sum 33/12 = 2,8					

[1] Not only in summer, for example March 2022 was very dry
[2] Decrease in fish numbers
[3] The opposite, larger demand for heating during windy/stormy periods

The indicator value of Strynø is 3.

3 Freshwater

Freshwater is essential for all life on Earth. We use it for drinking, washing, flushing our toilets, and irrigating our fields and gardens. We also heat, cool, and contaminate it before letting it back into the ecosystem.

The definition of freshwater is water containing less than 1,000 milligrams per litre of dissolved solids, most often salt. Freshwater is found in lakes, reservoirs, ponds, streams, canals, and freshwater wetlands. Freshwater is part of the water cycle and thus a renewable resource. The degree of precipitation, runoff, and evaporation steer the circulation. The changing climate intensifies hydrologic conditions and, with increasing air temperatures, more water evaporates into the air.

Freshwater amounts to 3% of all water on Earth, 69% of which is bound in glaciers and ice and 30% is groundwater. Only 0.29% of freshwater is found in lakes and swamps, 20% of which is in Lake Baikal in Asia alone. Rivers hold only about 0.006% of freshwater reserves. This means that life on Earth is dependent on a very small fraction of the total water supply on this planet.

Water supply and quality are critical in determining whether a place is more or less habitable. People have built different types of reservoirs to live in places with scarce water supplies. Most islands have freshwater scarcity, making it vital to keep a keen eye on water resources, water quality, how, when, how much, what we use it for, and what we make of it in the end.

Indicator 14: Rain and snow

a Rationale

Rain fills groundwater reserves from autumn to spring. Vegetation consumes most summer rains. The probability of snow cover varies with season, location, and geographical conditions. Latitudes above 35°N are usually given as a rough boundary for snowfall.

b Definition

Precipitation in mm/year, based on meteorological data on local rainfall obtained from the nearest meteorological station.

c Computation

1	2	3	4
Under 499 mm/y	500-749 mm/y	750-999 mm/y	Over 1,000 mm/y

d Example

Tilos is one of the Dodecanese islands in the South Aegean Sea, located 22 nautical miles NW of Rhodes and 222 miles from Piraeus. The island's area is 61.5 km^2.

Tilos has a Mediterranean climate with mild, wet winters and dry summers.

There is no meteorological station in Tilos. Data from the nearest existing meteorological stations, Kos, reports a total annual rainfall of 703 mm. The distribution of the total annual rainfall among the four seasons is shown in the following table:

Season	Rainfall (mm)	Per cent/y
Autumn	165	23.5
Winter	413	58.7
Spring	122	17.4
Summer	3	0.4
Total	703	100

On islands like Tilos, groundwater reservoirs are being emptied in or before summer when the human pressure and need for water peaks, as shown in the diagram.

According to our indicator, Tilos is on level 2.

Indicator 15: Water resources

a Rationale

The general problem with water resources on smaller islands is the absence of larger lakes, rivers or streams that can be used for water supply. Natural groundwater is the most common freshwater resource, combined with seawater desalination and occasional rainwater harvesting (storage tanks or artificial infiltration).

Groundwater is stored in natural aquifers, geological formations that have sufficient porosity. The aquifer under an island can be described as a groundwater lens recharged by precipitation. The amount of water a lens contains is determined by the size of the island, the amount of rainfall, the permeability of the ground, and water withdrawal rates. There can be salt mixing due to storm or tide induced pressure. Groundwater lenses can be as shallow as 1-2 decimetres or as deep as 20 metres.

The recharge of groundwater is the amount of water that enters the aquifers. Without recharge, extraction leads to the depletion of an aquifer. The extraction must be much smaller than the recharge since the ecological water demand from plants, groundwater-dependent ecosystems, and surface water discharge must also be considered.

The recharge water amount is much less than the precipitation: a large part of the precipitation is lost back into the atmosphere through the evaporation and transpiration of plants. Some precipitation falling on the ground cannot infiltrate the soil, for example, if the soil is already saturated with water or if the surface is impermeable (bedrock and sealed surfaces). This surface runoff will eventually flow into the sea.

The extraction of groundwater from aquifers is affected by the permeability of the soil. Larger amounts of water per unit of time can be extracted from gravel and sand; smaller amounts from clay and silt. In some

cases, high extraction rates are possible from bedrock, but more often not. Often very deep wells have to be drilled, which, on an island, includes the risk of finding saltwater.

It is wise to combine scientific research on water resources with local knowledge. On small islands, citizen science is always valuable.

b Definition

The water resources of the island.

c Computation

1	2	3	4
Long term scarcity and defects (more than ten days a year)	Short term scarcity and defects (less than ten days a year)	Enough water of good quality	More than enough water of good quality

d Example

The Koster Islands are two islands close to each other: North Koster and South Koster. They belong to the municipality of Strömstad and are part of the larger archipelago of Bohuslän, situated along the west coast of Sweden. The islands are separated from the mainland by a narrow, 250-metre deep fjord.

The year-round population is 246 persons, and 2,485 live here in the summer. Day-trip visitors are estimated at 107,000 every year, and 50,000 people stay for several days. On a winter's day, there are 246 water users; on a summer's day – 6,000.

There are 1,000 wells on Koster. Three hundred are drilled in the bedrock, and 700 are dug in the soil. In 2016, a research team led by Professor Roland Barthel from the University of Gothenburg investigated the groundwater reservoir for recharge, extraction and water availability to understand the current groundwater management and the future potential for sustainable drinking water supply. The researchers concluded that there is possibly 3.8 million m^3 of groundwater hidden in the two islands, 3,000 m^3 in soil and 700 m^3 in bedrock.

Knowing the amount of groundwater on the island is important, but it is not the same as availability. On Koster, it occurs mostly in areas far away from the existing wells. Groundwater can theoretically flow over large horizontal distances, but only if large, continuous aquifers exist, which is not the case on Koster. There, the groundwater system is separated into very small disconnected units.

Water resources on islands are subject to quite an uneven demand, as illustrated by Göran Lyth, a Koster resident, in an excellent diagram of the water use of his island. In winter, the aquifers are filled up when fewer people are on the island, and only 35 m^3 is used per day. Water usage in summer reaches 320 m^3 per day. In winter and spring, as the snow melts and it rains heavily. Water tables typically hit their lowest point in late summer and early fall. In many areas, the yearly groundwater recharge is equal to the volume of the aquifers. Two years of drought can lead to severe scarcity - but it rains a lot on Koster.

There is enough groundwater in the islands as a whole. The problem is its unevenness in time and place. Without systems to share the water resources - mains and pumps - there is a great risk of scarcity in parts of the island.

The Koster islands score a 3.

Indicator 16: Water quality

a Rationale

The quality of drinking water refers to the chemical, physical and biological characteristics. The chemical indicators refer to, for example, pH, hardness, nitrate and pesticides. There are physical indicators such as temperature, conductivity and turbidity (transparency). The presence and amount of bacteria and viruses are examples of biological indicators.

b Definition

Water that is clean and safe to drink, based on laboratory tests.

c Computation

1	2	3	4
There is no potable water on the island	There is potable water to a limited extent	There is enough water of good quality	More than enough water of good quality

Regarding municipal water, you should be able to obtain data from the local waterworks, supplemented with interviews and media information on occasional or enduring problems. You have to conduct interviews or send out a survey for private water wells. Water quality can greatly differ in different parts of the island – near or far from the sea, near agricultural land – and in different seasons. If rainwater is frequently used, you need to understand what it is used for before judging its quality.

d Example

Norra Stavsudda is an island in the archipelago of Stockholm. It is 0.54 km^2 in size, has 37 properties, and is an all-year home to 12 people, including a family with children. One hundred twenty part-time residents spend one to eight months of the year on the island. Visitors are mostly relatives of these residents. A study of water and sewage on the island showed that freshwater consumption for these people altogether was 1,197 m^3 per year.

The island is not connected to a municipal water network. Each property has a drilled or dug drinking water well, which is the common solution in the Baltic Sea archipelagoes – everyone takes care of their own water resource. Just a few properties share their well with others.

A common problem on Norra Stavsudda is that the water tastes like iron, smells of sulphur, has a yellow-brown colour, and is salty. The reason for this is mainly due to the dynamic population situation. With a tenfold population increase in summer, the outtake from wells is too large, resulting in sinking water tables and saltwater intrusion, sometimes even intrusion from nearby sewage installations.

In August 2020, as part of the aforementioned study, most households decided to make a joint effort to analyse the quality of their drinking water. Water samples were sent to a laboratory and analysed for 40 different chemical, physical, and biological parameters.

Only six of the samples had potable water without remarks. Three samples were unfit regarding microbiological parameters. Most samples had potable water but with remarks concerning colour, hardness, turbidity, manganese and iron. One sample contained chloride, meaning saltwater intrusion into the well. Wells with potable water had plenty of water.

These tests gave the property owners the possibility to have the results for their own wells and an overall, anonymised picture of the water quality of the whole island. As a result, the islanders started to discuss the water situation of the entire island. They now seek technical, financial, and juridical solutions on how to share, develop and take care of the common water resource of their island.

The indicator value for Norra Stavsudda is 2.

Indicator 17: Water use

a Rationale

In Europe, agriculture uses the most water: around 40%. Energy production is also very water-consuming, with 28% of the annual water use predominantly used for cooling in nuclear and fossil-fuel based power plants and producing hydroelectricity. Mining and manufacturing account for 18% of water use, followed by households with around 12%. On islands, water use by agriculture and manufacturing is smaller, while tourism, often being the biggest industry, is a major consumer of water.

A range of factors influences water consumption: water availability, water supply options, climate (a warmer climate leads to greater water consumption), community size, economic level of the community, level of industrialisation, metering of household consumption, water cost, water pressure and system losses in mains and pipes (typically 25%).

b Definition

The yearly amount of freshwater used on the island.

c Computation

An island's freshwater consumption can be measured from two sides: the consumer perspective and the producer perspective. It is wise to use both and then make a data confrontation, which will be explained below.

Let's start with the consumers' perspective. You will need data from indicator 4 (total population in person-days) to fill in the table below.

Category	Person-days	Litres person/day	Sum
Residents (365 days)			m^3
Seasonal residents (90 days)			m^3
Visitors			m^3
Total human water use			m^3

You can find figures on the national average of tap water use in your country on the webpage "Where Europeans Consume The Most Tap Water". According to the "Water Saving Challenge" report on water

consumption in small islands, it is reasonable to assume that resident islanders use 75% of the national average, summer residents 100% of the national average, while tourists use the European average, which is 150 litres/day. However, the hotel sector uses much more water than the general population, around 500 litres per guest and night.

Animals need water, of course. A goat consumes about 10 litres a day. Cows consume an average of 10 to 100 litres per day, depending on their age, sex, weight, and weather conditions. As mentioned above, 40% of the world's freshwater supply is used for agricultural purposes. Farmers seldom use municipal water, but the municipal office should be able to give figures on agricultural and industrial use.

Category	Sum
Human consumption	m^3
Agricultural use	m^3
Industrial use	m^3
Total freshwater use on the island per year	m^3

Now, change to the producers' perspective. How much water did the municipal waterworks produce in the same year as above? Please observe that 25% of the water produced is typically lost in leaks in the water mains. Schedule a meeting with your local water manager to get the figures for the table below.

	Sum
Households	m^3
Businesses (hotels etc.)	m^3
Agricultural use	m^3
Industrial use	m^3
Municipal buildings	m^3
Total amount of water charged for	m^3
Water losses, percent of the above	m^3
Total amount of water produced	m^3

If at this point you learn from the water producers that the island is importing water by mains or barges, or is producing water by desalination, you should note the amount of water that is not supported by natural water resources, and how this amount is related to population dynamics (indicator 5).

You should now be able to make a data reconciliation: the process of comparing data that has been derived from different surveys or other sources to assess and possibly improve their coherency, which is followed by an adjustment of the data to remove, or at least reduce, the impact of differences identified. It is not as complicated as it sounds; just a smart way of getting things right. You compare two data sources: the consumers' and the producers' perspectives. Adjusting them to each other should give you a more truthful image of your island's water consumption than the use of only one data source.

Given the score of indicator 15, Water resources, it is now the time to judge if the water consumption of your island is in balance with your natural water resources.

1	2	3	4
Freshwater is continuously over-consumed compared to natural resources	Freshwater is sometimes (seasonally) overconsumed compared to natural resources	Consumption is in balance with natural water resources	Water use is sustainable on a long term basis.

d Example

Under indicator 14, we looked at precipitation on the island of Tilos. Let's look at how they use their 703 mm of yearly rainfall. Tilos is made up of limestone – as a consequence, there is usually a rapid flow of water directly to the sea.

Consumer's perspective

In Greece, the average daily water consumption rate is 125 litres per person per day, of which nine litres are used for food and drinking, 50 litres for bath and shower, 21 litres for dishes, 13 litres for washing, nine litres for other purposes and 25 litres for flushing the toilet.

The human water consumption on Tilos can be estimated to be 54,000 m^3 per year. Of these 54 million litres of water, only four million litres are used for drinking (7%), over 21 million for baths and showers, and over ten million to flush toilets.

Category	Person-days	Litres person/day	Sum
Residents (365 days)	216.000	125	27.000 m^3
Seasonal residents (90 days)	72.000	125	9.000 m^3
Visitors	163.800	100	16.380 m^3
Campers	40.500	40	1.620 m^3
Total human water use			54.000 m^3

Agriculture on Tilos is mainly sheep and the cultivation of olives. Agricultural use of water on Tilos is from 5-6 private boreholes for irrigation purposes, with small (5 m^3/day) supplies that are not recorded. There are no industries on the island (except for tourism). Rainwater harvesting is not common.

Category	Sum
Human consumption	54.000 m^3
Agricultural use	7.500 m^3
Industrial use	None
Total freshwater use on the island per year	61.500 m^3

Producer's perspective

There are six municipal boreholes and two springs on Tilos. So far, there has been no need to desalinate or import water. But as the human pressure caused by tourism becomes more and more uneven – peaking in summer when the need for water is 250 m^3/day (compared to 75 m^3/day in winter) – the boreholes are at risk for saltwater intrusion.

Leakages are huge; only 40% of the water produced reaches the consumers. Therefore, water production must be 250% larger than the water used to deliver 54.000 m^3 of freshwater a year, thus 136.000 m^3 a year.

For indicator 17, Tilos is on level 2.

Indicator 18: Sewage and effluent

a Rationale

We drink the same water the dinosaurs drank. The water we use today will be reused by others in the future. Earth's water is not consumed; it is borrowed in an eternal cycle. We use it, contaminate it, clean it, and reuse it again.

Sewage is also referred to as wastewater from kitchens, toilets, or surface water, while effluent is water from industry and agriculture. Sewage has many forms: greywater from sinks, bathtubs, showers, dishwashers and washing machines, and 'blackwater', which is water that has come in contact with toilet waste and must be treated and disinfected before resuing. An individual produces 1–2 litres of urine per day, of which 95% is water, and the rest is urea, sodium, chloride, drug residues, etc. The amount of faeces varies more individually, but 400-500 grams per person per day seems to be an average, i.e. 127 kg/year /person.

Sewage can also come from irrigation and water runoff from streets, parking lots, and roofs. It can contain nutrients (nitrogen and phosphorus), solids, bacteria and viruses, oils and fats, heavy metals including mercury, cadmium, lead, chromium, copper and many toxic chemicals including PCBs, PAHs, dioxins, pesticides, phenols, chlorinated organic substances, microplastics, and drug residues. Before returning this contaminated water to the natural cycle, we clean it in individual sewers, with small communal

facilities, through industrial treatment processes and in larger municipal treatment plants, all of which are carefully regulated by law.

Islands have difficulties managing their sewers. The large proportion of holiday homes and tourists results in greater production of sewage per capita than in cities. Great variation in human presence results in uneven, seasonal sewage production. It is difficult to build well-functioning treatment plants for both small-scale winter use and ten times larger volumes in summer, which leads to technical, economic and environmental challenges.

b Definition

The level of treatment that the island's private and communal sewers, business facilities and municipal systems achieve.

c Computation

		1	2	3	4
		No control, no numbers, no one knows how it really is	Some control, known deficiencies and discharges of untreated sewage	Regular inspections, mostly works well, deficiencies under heavy load	Regular inspections, a well working system of good capacity
Private sewers					
Common sewers					
Sum for households					
Industry	Shipyards				
	Laundries				
	Hotel & restaurants				
	Construction				
	Other				
Sum for industrial sewage					
Municipal treatment plant					
Sum for municipality					

Sum of households + industry + municipality / 3

d Example

Möja is an island in the Stockholm archipelago, or actually, two islands: Big Möja and South Möja, surrounded by smaller islands called the Möja archipelago. The land area is 13 km^2, and the number of all-year residents is 250 in 140 households. In summer, there are 600 households, and the island has 25-27,000 visitors between June and August. Hostels, guesthouses, private rental cottages, and two restaurants are open all year round, plus 3-to 4 more restaurants open in the summer, and a shipyard.

In 2019, two students from Uppsala University wrote their master's degrees on the water supply and sewage treatment systems on Möja. The number of personal days spent in this archipelago is 267,300 (267,300 / 365 = 732 persons), resulting in urine being between a quarter and a half million litres per year. The amount of faeces is about 93 tonnes per year.

260 of the 740 households in the Möja archipelago are connected to municipal sewers, and the rest have individual solutions. Möja belongs to Värmdö municipality, where there are a total of 15,000 individual sewers. In 2015, 60–70% of these sewers did not meet the municipality's treatment requirements, which is why supervision of small sewage systems in the archipelago was started and has been ongoing.

An overall assessment of the sewage management on Möja gives the following results:

		1	2	3	4
		No control, no numbers, no one knows how it really is	Some control, known deficiencies and discharges of untreated sewage	Regular inspections, mostly works well, deficiencies under heavy load	Regular inspections, a well working system of good capacity
Private sewers			2 (before 2025)	3 (after 2025)	
Common sewers					
Sum for households					2,5
Industry	Shipyards				4
	Laundries				
	Hotel & restaurants			3	
	Construction				
Sum for industry					3,5
Municipal treatment plant					4

Sum for the municipality	4

Möja archipelago as a whole: (2,5 + 3,5 + 4) / 3 = 3.

Addition

Located on the main island of Möja, fisherman Rune Wikström and his family started a restaurant many years ago. Rune gets up early almost every day of the year, meets his tame trout in the harbour, goes fishing and returns in the morning with the day's catch, which is cooked and served in the restaurant. The restaurant periodically lacks freshwater as its three wells run dry in summer. The family decided that they could not afford to let the guests use freshwater to flush the toilets and referred them to a very well maintained outdoor toilet in the garden. Alas, many people did not find this charming or even acceptable.

To solve this, the municipality allowed Wikströms to pump purified water from the village's wastewater facility, located one hundred metres from the restaurant, provided separate pipes for wastewater were installed. This purified water was then used for flushing the toilets in the restaurant. This unusual and well functioning solution has been broadcasted on national television; however, there are still people who cannot accept the use of wastewater – not even for flushing toilets. A survey conducted among the permanent residents showed that many accept the reuse of greywater, but only a few accept that blackwater is reused.

4 Energy

Islands use energy for heating, electricity, and transportation on land and sea. Energy sources can be electricity – sometimes with the help of an electric cable to the mainland, oil-based fuels, and wood-based fuels. Local energy can be wind production, solar production, and heat pumps.

In 2015, a project called Smilegov, financed by Intelligent Energy Europe under the European Commission, investigated energy consumption, energy solutions, greenhouse gas emissions, and the efforts to produce sustainable energy locally on fifteen small islands of Europe. The islands were Ischia (Italy), Molène, Sein and Ouessant (France), Aran, Bere, Oilean Chléire and Arranmore (Ireland), Ven, Vinön and Visingsö (Sweden), Simskäla and Sottunga (Åland Islands) and Nagu and Iniö (Finland).

The project investigated whether:

1. small islands are energy-efficient,

2. the energy consumption patterns of islanders and mainlanders are the same, and

3. whether small islands have a positive or negative carbon balance.

Depending on whether the population of the island is counted as census data or total human pressure (person-days of summer residents and visitors included), the yearly energy consumption of the islanders ranges from 11,328 kWh per capita (Nagu in Finland) to 35,785 kWh per capita (Simskäla). If the total human pressure is not included, people on Nagu use 21,900 kWh, and residents of Simskäla use 66,457 kWh.

Islanders tend to exclude the impact of the sea and sea transport in their energy accounts. If an island is a piece of land surrounded by water, the “wet area” of the island should be included when making a carbon balance sheet and the impact of ferries, which are an integral part of the island society. The project could conclude that the main reason islanders are such extreme energy users is marine traffic: 36.8% of the total energy used on these fifteen small islands is for ferries, an unrequired means of transport in mainland communities.

In May 2017, the European Commission, together with 14 Member States, signed the "Political Declaration on Clean Energy For EU Islands". This declaration was born out of recognising that islands and island regions face a particular set of energy challenges and opportunities due to their specific geographic and climatic conditions. The opportunities have the potential to make Europe’s island communities innovation leaders in the clean energy transition for Europe and beyond. In 2018, in cooperation with the European Parliament, the EU Commission set up a secretariat to deliver the objectives of the Clean Energy for EU Islands Initiative. Today, the Clean Energy for EU Islands Secretariat is a platform for the clean energy transition of the more than 2,200 inhabited European islands.

Indicator 19: Energy consumption

a Rationale

Energy can be used more or less efficiently and for more or less important purposes. By monitoring the sectors using energy, you can find measures to improve the island’s energy use. The average consumption of energy in Europe is high in cold countries like Iceland (15,305 kWh) and Finland (11,897 kWh) but low

in developing nations such as Albania (2,221 kWh) and warmer countries such as Malta (3,303 kWh), as per figures from 2020, based only on the number of residents. When computing local energy use on an island, one must consider the whole population: all-year residents, part-time residents, summer residents and visitors.

Islanders use a lot of energy since they must travel by ferry from and to their islands. The European project Smilegov, focusing on implementing sustainable energy planning on islands, could conclude that 36.8% of the total energy used on the fifteen small islands sampled in the project was for ferries, an unnecessary means of transport for mainland communities.

For this indicator, you need the data from indicators 1–4 on population, for which you will calculate the energy use of the households. Land transportation calls for a lot of citizen science: you need to count cars, buses, and tractors and how many kilometres they cover on the island. For sea transportation, you better talk to the personnel on the ferry to get it right. The municipality may know the municipal, industrial and agricultural energy spending; otherwise, this calls for more inquiries, surveys and other detective work.

b Definition

Energy use per capita and year: kWh/p, y, population counted on the total human pressure.

c Computation

1	2	3	4
Over 30,000 kWh/p, y	20,000-30,000 kWh/p, y	10,000-20,000 kWh/p, y	Under 5,000 kWh/p, y

d Example

Visingsö is Sweden's 33rd largest island with an area of 25 km^2, 14 km long, located in Lake Vättern. Lake Vättern is of great practical, historical and economic importance to the island's history, economy, and energy use.

Visingsö has 736 registered residents. The chairman of the Visingö Council calls them "two-footers" (standing with both feet on the island). There are also about one hundred people who spend half the year on the island. The chairman calls them "one-footers" (standing with one foot on the island and one ashore). Quite a smart way of describing the two categories of people on the island, besides summer residents and visitors.

Category	No of individuals	No of days spent on the island	Person-days
Two-footers	736	365	268,640
One-footers	100	150	15,000
Summer residents	200	60	12,000
Visitors	100,000	1	100,000
Total			380,640

The average human presence on Visingsö is 380,640 / 365 = 1,043. From ecological, energy, and infrastructure perspectives, Visingsö's population is not 736 but just over a thousand.

Visingsö belongs to the County of Jönköping and is served by a ferry from Gränna. The length of the ferry route is 6,200 metres, and the crossing time is approximately 25 minutes. The new (2014) ferry, m/s Braheborg, has a capacity of 34 cars and 397 passengers. She is 58 metres long and has a maximum speed of 13 knots. With a gross tonnage of 1,500 tonnes, she is the largest ship that has ever operated on Lake Vättern. The seasonal variations in traffic needs are large. The older m/s Ebba Brahe and m/s Christian Brahe are used during peak summer hours.

The residents, companies, and visitors on Visingsö consume energy for (1) households (heating, hot water), (2) land transportation, (3) sea transportation, (4) municipal technology and other public services (water, sewage, street lighting, roads and other infrastructure), (5) agriculture, forestry and fishing, and (6) industry and construction.

(1) Households

A Swedish household uses an average of 60% of the energy to heat the house, about 20% for hot water (shower, sink, etc.) and the remaining 20% for household electricity: refrigerators, washing machines, lighting, TVs, computers and other electrical appliances. This should also apply to Visingsö's 360 households, i.e. 8.2 MWh per person and year.

8.2 MWh x 1,043 = 8,553 MWh

(2) Land transportation

Road-bound traffic on Visingsö can be calculated by the number of vehicles transported by ferry (78,050 round trips in 2015, as well as 2,396 dump trucks and 137 buses). If each vehicle drives from the ferry terminal to Kumlaby and back, it gives 644,644 kilometres, not counting the islanders' local runs.

644,644 km x 0,07 l/km = 45,125 litres

Since this value is for vehicles running on both gasoline and diesel, we will use a calorific value of 9.5 kWh:

45,125 l x 9.5 kWh / 1000 = 429 MWh

(3) Sea transportation

Many islands prefer not to include maritime traffic as part of the island's energy use. It might also be difficult to obtain energy data (fuel and emissions) from ferry operators. The arguments for including the energy that the ferries consume between the island and the mainland are two: the ferry traffic exists because there is an island, and the energy is consumed in the island's waters, which means that the discharges are local.

The fuel consumption for a ro/pax ferry of Braheborg's size is between 200 and 500 litres per hour. Consumption is not static but is affected by ship-specific parameters (hull shape, weight, machines) and external factors (currents and ice conditions). The low calculated consumption for m/s Braheborgs, based on the fact that she has a GRT of 1,500 tons, four Volvo Penta diesels with a total power of 1,920 kW and makes 13 knots, is about 200 litres of marine diesel per hour. For m/s Christina Brahe and m/s Ebba Brahe, 100 litres/hour is assumed.

In winter, m/s Braheborg makes 32 trips per day of 25 minutes; in summer, 34 trips. The two smaller ships make 14 trips per day during summer, totalling 6,113 running hours per year.

The estimated annual consumption is 1 million litres. One litre of marine diesel is equivalent to 10,96 kWh. The ferries thus consume 10,960 MWh per year.

1,000,000 l x 10.96 kWh / 1000 = 10,960 MWh

(4) Municipal technology

Reported as 3,754 MWh.

(5) Agriculture, forestry and fishing

According to the municipality, 3% of the total energy consumption is for agriculture, forestry, and fishing = 751 MWh.

(6) Industry and construction

Most industry on Visingsö is construction work. It has been estimated by the municipality to be a total of 1,472 MWh.

Population	1,043 persons
Households	8,553 MWh
Land transportation	429 MWh
Sea transportation	10,960 MWh
Municipal services	3,754 MWh
Agriculture, forestry and fishing	751 MWh
Industry and construction	1,472 MWh
Sum	**25,919 MWh**
Per person (1,084)	23,911 kWh

The average total energy consumption per year and per capita in Europe is 28,439 kWh. In Jönköping County, the average value is 34,000 kWh. Visingsö residents are thus well below their neighbours on the mainland, despite their energy-consuming ferries.

The value of Visingsö is 2.

Indicator 20: Energy sources

a Rationale

Energy sources consumed on the islands are: gasoline, gasoil, diesel, residual heat oil, anthracite, lignite, natural gas, peat, municipal waste, wood, plant oil, biodiesel, bioethanol, electricity from the grid, solar, and geothermal energy.

For indicator 19, we compiled the island's energy consumption from the user's perspective: households, transport etc. Now, we look at it from the other side: which are the energy sources? Gasoil and diesel are consumed by ferries and for land transportation in trucks and tractors. Gasoline is consumed by boats and vehicles on land, such as quad bikes, passenger cars, motorcycles, and mopeds. Lignite (coal), peat, pellets, firewood, and residual heating oil are used for heating buildings. Electricity is used for many purposes: to heat, serve and light buildings, for electric cars, in industry, for street lighting, for telecom and IT services, and others.

The table you create for this indicator will also be of use when working on indicator 23.

b Definition

Comparative use of different energy sources on the island.

c Computation

This is a complicated task asking for consideration and precision. There is much help to get, for example, from the EU initiative Clean Energy for EU Islands Self-Assessment Tool and the webpage of SEAI, Ireland's national sustainable energy authority.

When calculating the total energy consumption for an island, all different forms of energy are converted into the unit MWh. This is done by utilising the calorific values of the various fuels as is in the table below and dividing the end result by a thousand because the calorific values in the table are stated in kWh. The calorific value indicates how much energy (heat) is generated at full combustion of a certain amount (mass or other physical entity) of different fuels.

The actual calorific value of biofuels, peat and coal depends on their moisture content. If the moisture content of the fuel is known, the calorific value can be increased or decreased vis-a-vis its moisture content.

There are free Energy Consumption Calculators on the internet; one can be found on the webpage of The Archipelago Institute of Åbo Akademi University.

Source	Type	Calorific value	Amount	Sum
Gasoline, cars	1 litre	8.7 kWh		
Gasoline, small boats	1 litre	11.9 kWh		
Diesel for cars	1 litre	9.9 kWh		

Gasoil, diesel for farming	1 litre	11.8 kWh		
Marine diesel for ferries	1 litre	11.63 kWh		
Residual Fuel Oil	1 litre	10.02 kWh		
Kerosene	1 litre	9.5 kWh		
Anthracite	1 kg	8 kWh		
Lignite briquette	1 kg	7.25 kWh		
Coke	1 tonne	6,800 kWh		
Peat (50% damp)	1 m^3	2.57 kWh		
Natural gas	1 m^3	10,800 kWh		
Municipal waste	1 tonne	2,700 kWh		
Wood	1 m^3 birch	1,300 kWh 1,700 kWh		
Plant oil	1 m^3	9,340 kWh		
Biodiesel	1 m^3	9,340 kWh		
Electricity grid	1 kWh			

Solar energy	1 kWh				
Geothermal energy	1 kWh				
Sum	1 kWh				

d Example

Simskäla is an archipelago in Vårdö municipality on Åland, consisting of two main islands, a large number of smaller islets, cobs and skerries and a village; all in all, comprising about 2,000 hectares of land, of which the main islands make up just over half, and about 12,000 hectares of water area. There are 35 residents on the island. Three of these are farmers who grow vegetables in greenhouses. There are also 50 summer residents who spend 100 days on Simskäla and 200 summer residents who spend 30 days. This sums up to 23,775 person-days, divided by 365 = an average population of 65 persons.

The residents and visitors of Simskäla consume energy mainly for (a) heating, (b) transport, and (c) municipal services (water and sewage). The 13 households are heated with oil & air heat pump (1 household), ground / geothermal heat (3 households), wood chips (2 households) and wood combined with an air heat pump (7 households). The summer cottages are heated with wood and electricity, and there are 5-6 small, private wind turbines.

The main industry on Simskäla is greenhouse cultivation, for example, radish, of which 20 tonnes are exported to Finland every year. The greenhouses are heated with 25 loops of hose in the bay next to the greenhouses, each 800 metres long, and these 20 kilometres of hose are filled with a water-alcohol mixture. They function according to the same principle as geothermal heating: cold water in the hose is heated by the sea and returned back to the heat exchange system. Between 80 and 90 per cent of the heat required for the greenhouse crops is thus provided by the sea, even in winter when the sea is frozen. More than 100 tonnes of diesel have been replaced by renewable energy. To produce 1,000 MWh, the pumps running the system consume 250 MWh.

The ferry weighs 60 tonnes, runs 3,200 h/y and uses 23 litres an hour, summing to 70 tonnes = 114 MWh.

The energy sources of Simskäla are:

Source	Type	kWh	Amount	Sum
Gasoline, cars	1 litre	8.7 kWh	6,000	52.2 MWh
Diesel, cars	1 litre	9.9 kWh	9,000	89.1 MWh

Gasoline, small boats Diesel, small boats	1 litre 1 litre	11.9 kWh 9.9 kWh	5,000 6,000	59.5 MWh 59.4 MWh
Gasoil, diesel for farming	1 litre	11.8 kWh	4 m^3	47.2 MWh
Marine diesel for ferries	1 litre	11.63 kWh	70 tonnes	692 MWh
Wood	1 m^3 birch	1,300 kWh 1,700 kWh	180 m^3	234 MWh
Electricity grid Greenhouses Inn	1 kWh	1 kWh		 250 MWh 20 MWh
Sea thermal energy	1 kWh	1 kWh		750 MWh
Geothermal energy	1 kWh	1 kWh		40 MWh
Solar energy	1 kWh	1 kWh		6 MWh
Sum				2.233 MWh

<u>Computations:</u>

Diesel for the ferry, using the calorific value of 11,63 kWh/l

1 ton of diesel has a volume of approximately 850 litres.

The ferry: 70 tonnes x 850 = 59,500 l

59,500 l x 11,63 kWh/l / 1000 = 692 MWh

Gasoline for cars, using the calorific value of 8,7 kWh/l

6,000 l x 8,7 kWh/l / 1000 = 52.2 MWh

Gasoil, using the calorific value of 11,8 kWh/l

4 m^3 = 4000 l

4000 l x 11,8 kWh/l / 1000 = 47.2 MWh

Wood, using the calorific value of 1,300 kWh/m^3

180 m^3 x 1,300 kWh/m3 / 1000 = 234 MWh

The high energy consumption per capita on Simskäla is due to the ferry and electricity for the pumps of the greenhouse heating system. For its very innovative solution for heating the greenhouses, Simskäla was nominated for the EU Sustainable Energy Award in 2017.

Indicator 21: Carbon sources and sinks

Since the middle of the 19th century, human carbon dioxide emissions have increased carbon dioxide levels in the atmosphere from 270 ppm (parts per million) to over 400 ppm. In parallel, the earth's average temperature has increased by almost one degree. The most important gases that contribute to the greenhouse effect are carbon dioxide (CO2), nitrogen oxide (NO), methane (CH4), freons, water vapour, and ozone. Carbon dioxide is the most abundant greenhouse gas in terms of volume. Atmospheric carbon dioxide measured at NOAA's Mauna Loa Atmospheric Baseline Observatory peaked in May 2021 at a monthly average of 419 ppm, the highest level since accurate measurements began 63 years ago.

Carbon sources

The emissions of gases like nitrogen, methane, freons, water vapour, and ozone are usually collected as greenhouse gases. The carbon-containing compounds are often referred to as carbon dioxide emissions. The source of these compounds is human use of fossil coal, oil and natural gas, and they are the basis for the ongoing change of the earth's climate, especially near the ground where the greenhouse gases heat the air. Changes in land use, deforestation and the production of cement (an ingredient in concrete) and fertilisers (phosphorus and nitrogen) also strongly affect the atmospheric content of carbon dioxide and cause the earth's temperature to rise.

For practical reasons, all greenhouse gases are usually converted to carbon dioxide equivalents of CO_2e, a measure of greenhouse gas emissions that takes into account that different greenhouse gases have different abilities to contribute to the greenhouse effect.

Island communities often use more energy than mainland communities. Islanders make a large ecological footprint because they have to take a ferry from and to their island, which increases their energy use by an average of 37% (indicator 19). On the other hand, they live in a large carbon sink: the sea.

The vast majority of people are worried about climate change. An island that wants to be resilient must keep track of its emissions and help to reduce them. Most household emissions come from heating houses, heating domestic water, land, sea and air traffic, agriculture/land use, and electricity consumption. The emissions are directly related to the island's energy consumption. Thus, one can switch to more climate-friendly heat sources (solar, wind, geothermal and firewood) and avoid unnecessary travel and transport.

Carbon sinks

A carbon sink captures carbon dioxide from the atmosphere by binding it. An easy way to describe it is that a sink absorbs more carbon dioxide than it emits.

Carbon sinks capture carbon dioxide for a long time, which means periods of a few decades up to several thousand years. The longer, the better. The largest carbon sinks are the oceans, the forests and the soil. The plants, the ocean planktons, fungi and bacteria absorb carbon when they grow. The forest's carbon sink varies depending on tree species, ditches, felling, soil type, etc. An approximate value for European forests' carbon sink is 1.7 tons CO_2e per hectare of forest. In a recent Swedish study, measuring the forest in forest cubic metres (m^3) – here 140 m^3 per hectare, Swedish forests accumulate more than 50 tons of CO_2e annually.

For an island, carbon sources and carbon sinks are difficult to calculate, both globally and locally.

Computation

Carbon sources

Use the table and numbers from indicator 20:

Source	MWh	LCA emissions, kg per MWh	Sum
Gasoline, cars		299	
Gasoline, small boats		299	
Gas oil, diesel for farming		305	
Diesel fuel for ferries		321	
Residual Fuel Oil		310	
Anthracite		393	
Lignite		375	
Natural gas		237	
Municipal waste		339	
Wood		2–405 [a)]	
Plant oil		182	
Biodiesel		156	
Bioethanol		206	
Electricity grid		295	

Solar energy		[b]	
Geothermal		[b]	
Sum			
Sum per capita counted on the number of persons in the population			

Please note that the table is based on Life Cycle Analysis (LCA) emission factors, including the identification of energy and inputs of material, meaning, for example, that wind power figures include raw material and the building of a wind turbine. The numbers are taken from the Technical annexe of The Covenant of Mayors.

[a] Lower if the wood is harvested in a sustainable manner, higher if harvesting is unsustainable
[b] Data not available, but emissions are assumed to be low

Carbon sinks

One can calculate the carbon sink of oceans and for large volumes of sea, such as the Irish Sea, the Tyrrhenian Sea or the Baltic Sea. However, the local carbon sink in the island's water area, as we calculated under indicator 9, is impossible to calculate.

	Hectare	Coal sink per ha	Sum
Forest		50 tonnes CO_2e	

Carbon dioxide emissions minus carbon sink per capita, annually.

1	2	3	4
More than 12	11.9–9	8.9–6	Under 5.9

Example

Iniö is an archipelago outside Åbo in Finland with 200 inhabitants. It was a municipality of its own until 2009, when it was integrated into the city of Pargas. Iniö is an archipelago, a group of islands with about a thousand islands, islets, skerries and cobs. The land area is 64 km^2, and the water area is 273 km^2, totalling to 337 km^2. 83% of Iniö's surface is water, and 1,000 hectares of Iniö are covered by forest.

There are 200 all-year residents on Iniö and 400–500 summer cottages with a summer-time population of about 1,000 persons, all in all (73,000 + 60,000 =) 133,000 person-days, equivalent to 364 people.

Iniö is served by three ferries that interconnect the larger islands. Ferry traffic's share of the energy consumption – and thus carbon dioxide emissions – is large on Iniö, over 50%, according to the computation. Connecting boats, leisure boats, and passenger traffic also have significant shares. The total emissions from maritime traffic are 1,000 tonnes of CO_2e.

Energy consumption and emissions:

Source	MWh	LCA emissions, kg per MWh	Sum
Gasoline, cars	230	299	68 tonnes
Gasoline, small boats	955	299	285 tonnes
Gas oil, diesel for farming	478	305	146 tonnes
Diesel fuel for ferries	2,230	321	715 tonnes
Residual Fuel Oil	437	310	135 tonnes
Wood	1,755	2–405 [a)]	8 tonnes
Electricity grid	273	295	81 tonnes
Sum	6,358		1,438 tonnes
Sum per capita counted on the number of persons in the population (364 persons)	17.5		3,951 kg

Carbon sink:

	Hectare	Coal sink per ha	Sum
Forest	1,000	50 tonnes CO_2e	50,000 tonnes

When the islanders of Iniö's made a local energy plan in 2015, the 1,000 hectares of forest was estimated to be a carbon sink of 1,700 tonnes. New research from 2020 tells us it should be 50 tonnes per hectare, thus 50,000 tonnes. The volume of the sea surrounding Iniö is 15 km^3 but cannot be counted.

Each person on Iniö, counted as 364 persons, uses 17.5 MWh individually per year, which is close to the average value for Finland. Their individual emissions of CO_2e are 3.95 tons.

When it comes to energy use and emissions, Iniö is a very habitable island. Adding the carbon sink from the island's forest, Iniö leaves no ecological footprint at all. The value for Iniö is thus 4.

N.B. The CO_2 emissions from farming and farmland would also be a very important factor to estimate. There is some data available; ca 5 CO_2e/hectare. Very varying depending on soil type and use.

Indicator 22: Local energy production

a Rationale

Islands face an important challenge regarding energy supply due to their small size and isolated energy systems. If they are not connected to the mainland by cables, they are typically dependent on fossil fuel imports for electricity generation, transport, and heating.

Local energy benefits the local economies of islands. Locally produced energy will probably lower CO_2-emissions, deliver financial and psychological benefits to the community and its stakeholders, and create local jobs.

b Definition

Percentage of total energy consumption produced locally on the island.

c Computation

With the help of the past indicators, make a simplified energy balance sheet of your island:

ENERGY DEMAND			ENERGY SUPPLY		
	MWh	Percentage		MWh	Percentage
Land transport			**Imports**		
Private houses			Fuel		

Holiday houses			Electricity		
Industry			Gas		
Municipal services			**Locally produced energy**		
Sea transport			Wood		
			Wind		
			Solar		
			Geothermal		

1	2	3	4
24% or less	25-49%	50-74%	75% or more

d Example

Texel was first formed in a storm on Allerheilegenflut (All Saint's Day) in 1170. Still, it didn't become an island until a hundred years later, when another storm separated it from the mainland. Today, it is the largest Dutch Frisian island with seven villages, part of the Unesco World Heritage Wadden Sea. Texel's dry area is 162 km^2, and the wet area is twice as large: 301 km^2. The island is home to 13,584 inhabitants who live in 6.050 private houses. There are 3.230 holiday houses, 1.240 companies, 5.677 personal cars, 1.743 vans and lorries, and 666 motorcycles on Texel.

Many of the islanders rely financially on tourism-related activities, making the local economy highly dependent on summertime visitors. Tourism is regarded as both blight and blessing – it brings in more than the agriculture and fishing industry. The ferries bring approximately 2 million visitors and a million car passengers to and from Texel per year.

Texel can't quite cope with its tourism. The unique sheep and lamb found here aren't those visitors find on their plates since most meat is imported from New Zealand. Pollution threatens Texel – the island's skies are not so starry anymore. 80 percent of the visitors have visited the island before. Many of these are ornithologists, worrying that the birds are being affected by night light from villages, cars and ships.

In 2007, people from Texel and the neighbouring islands of Terschelling, Schiermonnikoog, Ameland, and Vlieland gathered for a conference about the islands' futures. The conference produced four different scenarios, which were then discussed among all the Texel islanders, resulting in a fifth scenario called Texel Unique Island. This included a ceiling for tourism of 47,000 guest beds. There are three strategic areas:

(1) Texel provides energy, meaning that the island will produce more renewable energy than it uses.

(2) Texel is a human recharging station, meaning that the island will give renewed energy and strength to its visitors.

(3) "Tested and Tried" on Texel, meaning that the island will be an experimental area where various types of trials and tests can be carried out. The phrase 'light pollution' was coined here.

Sustainable energy sources are readily available: sun, wind, waves, and tides. In 2014, then alderman of Texel Eric Hercules called for the island to be one of the first municipalities in the Netherlands to be energy neutral by 2020.

Six years later, current alderman Hennie Huisman-Peelen had to admit that the ambition to be self-sufficient by 2020 was far from being achieved. Much had been researched, tried, and developed, yet only 5% of all energy had been generated sustainably on the island. “The landscape is the capital of our island, and we have to be careful with it. Wind turbines and solar parks affect its appearance. That is why part of the population is strongly against it. Others want to realise their sustainable ambitions and take steps. Because of this division, it is difficult or impossible to get energy projects off the ground.”

In 2020, the simplified energy balance of Texel looked like this:

ENERGY DEMAND			ENERGY SUPPLY		
	MWh	Percentage		MWh	Percentage
Transport	268,000	50%	**Imports**		
Private houses	123,000	23%	Fuel	268,000	50%
Holiday houses	38,000	7%	Electricity	75,000	14%
Industry	107,000	20%	Gas	193,000	36%
Sum	536,000	100%		536,000	100%

Sad to say, the value for Texel is 1.

Indicator 23: Renewable energy ratio

a Rationale

Renewable energy is energy generated from natural sources that are continually replenished, such as sunlight, wind or waves. Renewable energy usage in energy production usually causes significantly less inconvenience than other energy sources and should always be promoted.

The use of renewable energy is one of the most powerful ways of reducing our ecological footprint. It measures how fast we consume resources and generate waste compared to how fast nature can absorb our waste and generate resources.

Researchers use the term “ecological footprint” to describe how many resources come from using fossil fuels. It is done by estimating how large an area of newly planted forest (as mentioned in indicator 20) is needed to “catch” carbon dioxide in the atmosphere from our use of oil, carbon and gas. Our example island below is situated in Germany, which in 2020 had an ecological footprint of 5.3, meaning we would need five planets instead of the one we have.

b Definition

Proportion of the island energy produced from renewable sources.

c Computation

Use the table you made for indicator 20, adding new columns:

Source	Sum in MWh	Non-renewable	Renewable	Percentage of total energy use
Gasoline, cars				
Gasoline, small boats				
Diesel for cars				
Gasoil, diesel for farming				
Marine diesel for ferries				
Residual Fuel Oil				
Kerosene				
Anthracite				
Lignite briquette				
Coke				
Peat (50% damp)				
Natural gas				
Municipal waste				
Wood				
Plant oil				
Biodiesel				

Bioethanol				
Electricity grid				
Solar thermal				
Geothermal				
Solar thermal				
Sum				

1	2	3	4
24% or less	25-49%	50-74%	75% or more

d Example

The islands of Helgoland are the only two German islands that are not in the immediate vicinity of the mainland. They are situated in the North Sea, 69 kilometres north of the mainland at the mouth of the River Elbe. They are very small, only covering 1.0 + 0.7 km^2 of land, with a permanent population of 1,469 inhabitants. Helgoland is a holiday resort, with over 50 million tourists visiting since 1826. It enjoys tax-exempt status, as it is part of the EU but excluded from the EU VAT area and customs union. It has, though, ceased to be the tourist magnet it once was: with 800,000 tourists a year in the seventies, the number of visitors has since long been halved. In 2021, the number was 319,000. Besides tourism, marine research and harbour services are the main sources of income.

In 1990, a 1.2 MW wind turbine was installed. Besides technical problems, the turbine was not lightning-proof, and insurance companies would not provide coverage. The islanders viewed the wind energy project as a failure and stopped it.

In 1997, a group of students under the direction of professor Beate Ratter at Hamburg University estimated Helgoland's ecological footprint. They multiplied the then 1,370 residents by 365 days, added the 288,102 day-visitors at 0.5 days each, and the 206,477 overnight visitors at one day each. The total was 848,578 days. They computed all the food, electricity and water consumed by people during 848,578 days and added the ships' fuel for 494,579 trips, which made up for 85% of the entire imposition. They assumed that Helgoland's area is 1 km^2 and arrived at 10,502.5 gha (global hectares), meaning Helgoland then managed to consume 62 times its own surface.

In 2009, Helgoland was connected to the mainland with a 53 km submarine power cable. Until then, electricity on Helgoland was generated by a local diesel plant, still in use for heat supply and still 100% heavy fuel oil-based. Drinking water on Helgoland (150,000 m^3) is made from seawater, consuming 11% of the island's power supply. Sewage is treated in a municipal wastewater treatment plant, and waste is shipped to the mainland weekly. Mobility is 95% electrified. Lighting on the island is already 99% LED-based.

In 2011, the municipality set the goal to become a Zero Emission Island by 2020. A major step forward was a 100% LNG powered island ferry, m/s Helgoland, in 2015. It generates 30% less carbon dioxide than fuel oil and 45% less than coal, with a twofold reduction in nitrogen oxide (N0x) emissions and almost no sulphur dioxide (SO_2) emissions. Since 2016, a project has been aimed to replace the diesel plant. The goal will be a 50% reduction of the island's CO_2 emissions.

With its main business, tourism, in dangerous decline, the island needs a new business model. Helgoland has become a service island for the offshore wind industry. Companies that maintain and control wind farms in the North Sea have established themselves on Helgoland and, since 2015, brought the island ten million euros in business tax annually. Mayor Jörg Singer has used the offshore money to renovate ports and build apartments. In three years, the island should be free of debt.

Helgoland is currently changing from a holiday island to an energy island and becoming the centre of one of the largest hydrogen projects currently planned in the world. Hundreds of new wind turbines are to generate electricity in the sea off the island, and the electricity will generate hydrogen on-site, which in turn is brought to Helgoland by pipeline. From there, it goes on to the mainland by ship.

Some people on Helgoland are afraid that the hydrogen project is a few sizes too big for the island. The chemicals needed to make hydrogen transportable are dangerous, and they are afraid the tourists will be scared off. "They want to come to a natural island and not an industrial island", says a local politician.

Most people on Helgoland seem to favour offshore wind power and believe hydrogen is a good idea in principle. Global warming is probably the greatest danger to people and animals, as well as to Helgoland. The same rifts run through Helgoland as through the rest of the world of islands: How should one decide between animal welfare and climate protection, nostalgia and progress, and wind energy and homeland security?

Source	MWh	Non-renewable MWh	Renewable MWh	Percentage of total energy use
3 million litres of heavy fuel oil annually for heating buildings	24,000	24,000		36%
Natural gas (LNG) for the ferry	~ 30,000	30,000		45%
Municipal waste (for burning)	Not computed			
Electricity grid	12,000	12,000		18%
Solar for heating buildings	105		105	Less than 1%
Sum	66,105	66,000	105	100%

5 Local economy

The finite borders of an island create unique ecosystems – as described in biology, ecology, earth science, meteorology, and geography. It also creates a singular business ecosystem: a local economic context with arrangements brought forward by the smallness of the territory, the limited resident population, the scarcity of resources (raw materials, infrastructure, human potential), as well as the isolation caused by the sea.

There are economic advantages of insularity, such as low competition and tourist success, but also many disadvantages that oblige the island economies to set up a particular management system.

We will define the local economy of an island as a business ecosystem by examining the local turnover, how much money is leaking out of the island, the impact of tourism, work opportunities, if there is affordable housing, how expensive it is to live on the island, and how strong the brand of the island is – as a place to inhabit.

Indicator 24: Business ecosystem

Business economics is usually focused on value chains, meaning how the price of a product or service is gradually built until it is finished and sold to a customer. Someone grows fodder for someone who has chicken and hatches eggs that are sold to a store that sells them to their customers. The purpose of describing value chains is to set the right prices to maximise profits and minimise costs.

On islands, we'd like to focus on business ecosystems instead: the entire network of customers, employees, suppliers, subcontractors, competitors, distributors, investors, infrastructure, and authorities involved in creating an island product or island service through less competition and more collaboration. All parts of a business ecosystem affect and are affected by the others, which creates a dynamic relationship – as in a biological ecosystem, where everyone is dependent on everyone.

The theory emerged from the rapid technological changes of recent decades, globalisation, and periods of financial turbulence. It was presented by Professor James Moore in 1993. Moore claimed that companies must be developed together, across company boundaries. He said that success increasingly requires cooperation between many stakeholders, many actors, both private and public.

Although the theory was first tested in Silicon Valley to describe how Apple grew, it also fits well on an island; this is the way many small Irish and Scottish islands are organised. To reduce costs, their food producers placed joint orders for feed. It provided economies of scale, and the unit cost for the individual farmer was lower than if they had each made their own small, individual purchases. Together, they improved their marketing and collectively bought expensive equipment that the individual farmers could not otherwise afford.

Sometimes island cooperatives for special products were developed, but most often cooperatives with a broad focus and a general, multifunctional business such as Comharchumman Inis Meain Teo – on Inishmaan, one of the Aran Islands – with an annual turnover of thousands of pounds. This cooperative has renewed the electricity system, renovated the town hall, and built and now manages the system for water distribution with tanks, pumps, filters, pipes and metres. Additionally, they run a summer school in Gaelic, have built a football field, the island's telephone network and telephone exchange, paved the runway for flights, and own and manage a textile factory.

Typically, business ecosystems comprise six main areas. Some of these areas can be partially defined using other resilience indicators.

Area	Ecosystem activities on islands	Related indicators
a Marketing	A smart and well-groomed common brand that has support and funding from all parties	Perceived distance (8) Brand (31)
	A well-maintained common customer database, accessible to all	
b Work opportunities	Joint efforts to recruit and retain skilled labour on the island	Living costs (29) Affordable housing (30) Daily care (33) School (34) Subsidies & tax (38) Integration (42)
c Suppliers	Support for local suppliers regardless of higher prices	Accessibility (7)
	Joint acquisitions from the mainland	
d Infrastructure	The island's companies have a strong collective representation in the bodies on the mainland that are responsible for hard and soft infrastructure	All indicators related to water, energy and municipal services
e Support from authorities	Local authorities are knowledgeable about, aware of and provide active support to the island's business community	Local Governance (32)
f Investors	Joint efforts to obtain appropriate regional, state and EU support	
	Successful contacts with the island's diaspora*	

*Diaspora is a term for former islanders and their descendants who no longer live on the island but have a strong love for it. The word is taken from the Bible, where it is used to reference Jewish people in Babylonian captivity. Ireland, for example, has a very large diaspora with many millions of emigrated Irish. Small islands with large emigration, such as Kastellorizo in Greece and Susak in Croatia, have a diaspora with a huge impact on island life and industry through investment, trade, tourism, and philanthropy.

b Definition

The extent to which joint efforts to reach customers and labour, keep costs down, reach suppliers, ensure proper infrastructure, obtain public support, and obtain capital constitutes a strong, cooperative business ecosystem on the island.

c Computation

Level of collaborations between companies, organisations, authorities and investors		1 Non-existent	2 Low	3 OK	4 High
a	Island brand				
	Customer database				
b	Joint efforts to recruit labour				
c	Local suppliers				
	Joint acquisitions				
d	Ensuring the right infrastructure				
e	Support from authorities				
f	Financing				
	Well managed diaspora				
Sum = (a+a+b+c+c+d+e+f+f)/9					

d Example

Ærø is a large 88 km^2 island located in the southern inlet to the Little Belt, said to be the most beautiful island in Denmark. One of the smallest municipalities in the country, with 5,951 islanders in 2021. The main town Ærøskøbing is well preserved with mediaeval origins, colourful houses, original exterior doors, and cobbled streets.

The island has more than 20 daily ferry trips. There is virtually no traffic, the buses are free, and crime is as close to zero as possible on our planet. It is a wonderful place to stay and to visit.

A large part of Ærøs economy is based on tourism. The island is a popular place for getting married. Weddings of foreigners on Ærø rose from a few hundred in 2008 to 5,338 in 2018. It was partly down to Danish bureaucracy – or lack of it – and the country's open and tolerant nature to same-sex weddings. The average European couple who got married within the last five years spent a median of 5,000 euros on their wedding or civil partnership. The wedding industry brings millions of euros to Ærø.

This wedding industry has evolved into a strong business ecosystem made up of the local food industry, restaurants and hotels, the church, shops, service companies, and transportation, including horse carriages and Ærø's own airline Starling Air. Also adding to its brand, Ærø has a remarkably high share of renewables in electricity, with wind energy as an important source. Ærø EnergyLab manages energy-related projects for the municipality of Ærø and welcomes visitors from around the world to explore the island's energy solutions. In 2021, Ærø was awarded the RESponsible Island Prize 2020 by the EU Commission.

Island brand	4
Customer database	3
Joint efforts to recruit labour	3
Local suppliers	4
Joint acquisitions	Unknown
Ensuring the right infrastructure	4
Support from authorities	4
Financing	4
Well managed diaspora	3
Summa 4 + 3 + 3 + 4 + 4 + 4+ 4 + 3) / 8	3,6

Ærø scores a 4.

Addition

Natural ecosystems are affected and threatened by macro-level changes such as global warming and invasive species. The same applies to business ecosystems: in 2019, the Danish law prohibited pro forma marriage and made it much more difficult for foreigners to marry in Denmark. Due to this and also covid-19, the number of marriages on Ærø fell to 2,502 in 2020 and 2,400 in 2021. In the coming years, we will see if Ærø's creative and cooperative cooperation model will be able to adapt its ecosystem to new conditions.

Indicator 25: Work Opportunities

a Rationale

If an island is to be habitable, there needs to be available work. It might be working at a commuting distance or work that can be done distantly, at least partly. A prerequisite for remote work is good technical solutions on the island, for example, a well-functioning network connection. Many prefer to work on the island to avoid commuting or working as a sailor away from home for long periods (quite common on islands). If a couple or a family wants to be able to stay or move in, there must be work opportunities for two people. If there are different types of workplaces in several sectors, the chance of finding suitable work increases.

b Definition

The number of jobs on the island in relation to how large the labour force is (workplace supply), unemployment rate, the proportion of islanders working on the island, and how widespread the industry is on the island.

c Computation

	1	2	3	4
	Low	Acceptable	Good	Very good
Workplace supply	Less than 50%	50-69%	70-89%	Over 90%
Network connection	Absent or limited	Unstable	Well-working	Broadband or high-speed connection
Unemployment rate	More than 10%	7-9%	4-6%	Less than 4%
Proportion of islanders working on the island	Less than 40%	41-60%	61-80%	More than 80%
Industry spread	Workplaces are mainly in one sector	Workplaces are mainly in a couple of sectors	Workplaces are relatively well spread across several different sectors	Workplaces are well spread across several different sectors

It can be difficult to find official data on a small island, which means field studies are needed. Be careful not to single out individuals or groups when the number of inhabitants is low.

d Example

Menorca is an island located northeast of Mallorca, 53rd in size among Europe's islands, with a land area of 660 km^2 and a resident population of 99,037 (in 2021). The island is Mallorca's little sister, with a fifth of its area, a tenth of its population and a fourteenth of its tourists. The number of tourists was about 1 million in 2021.

The dairy industry is significant; 30,000 motley cows graze on the island. At the end of the 19th century, almost 40% of the population subsisted on shoe manufacturing. "Abarcas", leather sandals with soles made of car tires, are typical for Menorca. The most famous shoe factories are in Alaior and Ferreries. Also, various fashion accessories are made of leather: bags, vests, belts and jackets.

There are about 47,000 permanent jobs in Menorca. The population is almost doubling during the high season due to the amount of labour-active in various hospitality industries, so labour supply is very good.

Sector	Number of jobs	Percent of BLP
Agriculture and forestry, fishing	550	0.5
Manufacturing	3,100	7.5
Construction	4,000	6
Services:		86
Accommodation, food, trade, local transport	19,200	36
Real estate	500	17
Public administration	9.100	16
Industry (except construction)		7.5
Qualified services	4.600	7
Arts, entertainment and recreation	4.700	5
Finance and insurance	960	3
Information & communication		2.5

Employees in accommodation, food, trade, and local transport make up 40% of the permanent workforce and provide 36% of BLP. The proportion of the workforce working on the island is nearly 100%. When

the demand for labour increases in the high season, the number of employees also increases, especially in unskilled occupations–all without BLP increasing. Jobs with low-skill requirements, such as waiters, cleaning staff, kitchen assistants, or bricklayers, are prone to low salaries and generally poor conditions. There is a 14% risk of poverty in Menorca.

Most common occupations	No of employees
Waiters and bartenders	4.900
Cleaners	2.700
Sales	2.000
Kitchen aids	1.100
Masons	1.000
Chefs	970
Bricklayers	700
Administrators	580
Housework	560
Composers, musicians and singers	540

Unemployment was 10.6% after the island recovered from the Covid-19 restrictions, but still 21.4% among young people under 25 years.

Most companies are small: 3,500 companies have no workers other than the owner, 2,000 companies have 1-2 employees, 660 companies have 3-5 employees, 250 companies have 6-9 employees, 70 companies have 10-19 employees, and 40 companies have more than 20 employees. It does not entice families to move to Menorca. There is a Balearic Islands Employment Plan to address the labour market shortcomings.

Type	No of employees	Turnover	No of companies
Micro	Fewer than 10	2 MEUR	96%

Small	Fewer than 50	10 MEUR	3%
Medium	Fewer than 250	50 MEUR	0,4%
Large	More than 250	Exceeds 50 MEUR	0,1%

The industry spread is relatively small, with a focus on tourism and real estate. Real estate investments account for more than 80% of all foreign investments. In 2015, EUR 261 million was invested in Menorca, mainly through the purchase and sale of hotels. The majority (143 million) were German capital, closely followed by Great Britain.

Menorca gets a mixed rating:

	1	2	3	4
Workplace supply				4
Unemployment rate	1			
Proportion of the workforce working on the island				4
Industry spread		2		

Sum (4 + 1 + 4 + 2) / 4 = 2,75.

The indicator value for Menorca is 3.

Indicator 26: Local turnover

a Rationale

A part of the local economic analysis is monetary, with money used as a measure. In a country, a nation, the value of all goods and services produced in one year is its Gross Domestic Product (GDP). This measure provides an economic snapshot of the size of the country's economy and growth. GDP can be calculated in three ways: using expenditure, production and/or income.

Ever since local economic thinking and analysis were introduced twenty years ago, it has been challenging to measure a gross local product – what villages, towns, rural areas, or islands are worth in monetary terms. Three good attempts have been made by the Swedish islands Ven in the Sound (in 2013), Holmön off Umeå (in 2020) and Nämdö in the Stockholm archipelago (in 2021). They have based their calculations on the turnover of local companies and the taxable income of the inhabitants.

Holmön outside Umeå went a step further because they had difficulties obtaining data from Statistics Sweden, which does not release data on places with less than 200 inhabitants – Holmön has about 70 registered inhabitants. The people of Holmön were creative; based on local knowledge, they produced figures about their island. They also decided that everyone who stays on Holmön should be included in the statistics because everyone contributes to creating a basis for the available services.

On Nämdö in the Stockholm archipelago, with the support of researchers Cecilia Solér and Robin Bankel from the Department of Business Administration at the University of Gothenburg, it was calculated:
how much money the companies in the archipelago turnover:

- how large the total taxable income of the inhabitants is;
- how much money is spent by the island residents in the archipelago and how much is spent on the mainland.
- how much of the work carried out by companies in the archipelago takes place in the archipelago or other places.

This knowledge has since been used to understand what may need to be done to strengthen the local economy in various ways.

b Definition

The gross local product consists of (i) the companies' total turnover and (ii) the inhabitants' total taxable income.

c Computation

(i) The companies' total turnover is obtained from the National Tax Agency.

Number of Companies	Total turnover

(ii) The total purchasing power of the inhabitants can be calculated with the *expenditure method* – how much the individuals spend, or with the *income method* – all persons over 20 years of age with a taxable income.

The expenditure method

Average household costs can be obtained from national statistical databases, sometimes broken down into urban and rural areas.

	Average per household	Total for all the island's households
Food		
Non-alcoholic beverages		
Restaurant meals		
Alcoholic beverages		
Tobacco		
Consumables		

	Average per household	Total for all the island's households
Household services		
Clothes and shoes		
Residence		
Furniture		
Healthcare		
Transportation		
Leisure and culture		
Sum		

The income method

The number of inhabitants multiplied by their average income before tax.

Total income	
Taxes	
Left in purchasing power	

d Example

Ven is situated in the middle of the Öresund strait, two nautical miles from Sweden and four nautical miles from Denmark. Maritime traffic past Ven is intense, with about 75,000 ship movements per year (200 a day). The island has an area of 7.5 km^2.

There are 370 residents on Ven; 160 people registered elsewhere live permanently on the island, and there are 30 part-time residents and 60 summer residents. Ven has 130,000 yearly visitors, mainly day-trippers who spend a day biking around the small island during the summer months. Some visitors stay overnight.

Ven was a Danish island until 1660, when Denmark and Sweden swapped Bornholm and Ven. Eventually, the island became a municipality of its own. In 1959, it was integrated into the mainland city of Landskrona. The islanders of Ven have always felt they are something the cat dragged into Landskrona, which has no other island. The 370 residents of Ven constitute less than 1% of Landskrona's population and 3% of its area. For people on Ven, it is important to clarify whether they bring a surplus or a deficit to

their land-based municipality. It is important to clarify not only for the reasons of self-esteem and pride, but also to understand how to develop the local economy, make the island more habitable, and bring new residents to Ven.

The companies' total turnover

In 2013, there were over 70 companies at Ven and 160 professionals, which equals one company for every other professional, mainly small companies. One company had 20 full-time employees. One-third of the companies were service companies in the tourism industry. The rest were mixed with a small number of food processors (distillery, dairy, mill, oil press, bakery, pasta production, jams and marmalades).

Number of Companies	Total turnover
70	48,5 million SEK

In addition, the project was able to map where the companies' revenues came from:

All-year residents	5 milj SEK
Part-time residents	7 milj SEK
Visitors	36,5 milj SEK

Residents' expenditure

With the help of The Swedish Bureau of Statistics, the estimated average costs for households in sparsely populated areas and surveys that show how much money Ven residents spend on the island and the mainland, the following figures could be calculated:

	Average according to statistics	Total 120 households	On Ven	Outside Ven
Food	38.240	4,588.000	2.154.000	2.434.800
Non-alcoholic beverages	3.050	366.000	172.000	194.000
Restaurant meals	8.210	985.200	500.000	485.200
Alcoholic beverages	3.970	476.400		476.400

Tobacco	2.320	278.400	130.000	148.400
Consumables	6.570	788.400	370.000	418.400
Household services	15.140	1.816.800	100.000	1.716.800
Clothes and shoes	12.460	1.495.000		1.495.200
Residence	74.560	8.947.200	1.200.000	7.747.200
Furniture	20.630	2.476.000		2.475.600
Healthcare	7.600	912.000	90.000	822.000
Transportation	60.090	7.210.800	200.000	
Leisure and culture	56.790	6.814.000	120.000	
Sum SEK	309.630	37.155.600	5.036.000	32.119.600

Residents' income

In 2011, 298 residents had an average income before taxes of 232.771 kr.

Sum of income	69.365.886
20,24% municipal tax	- 14.039.655
10,39 county tax	- 7.207.116
Left in purchasing power	48.562.080

Per household (120 st)

Purchasing power	404.684
Spent on Ven	42.000
Spent on the mainland	268.000

Savings (for example amortisation)	95.000

Addition

Ven has calculated its resident population with a taxable income: 298 people. If they had done as Holmön and Nämdö – which we advocate – they should have included their 160 permanent dwellers (residents of Landskrona but living all year on Ven), 30 part-time residents and 60 summer residents.

Category	Number of persons	Number of days	Number of days on the island
All-year residents	298	365	108,770
Permanent dwelling	160	365	58,400
Part-time residents	30	120	3,600
Summer residents	60	45	2,700
Sum			173,470

173,470 days of stay correspond to an average population of 475 people. The total income will then be SEK 110 million, taxes to Landskrona, 22 million, and to the region, 11 million. One purpose was to show Ven's monetary value for the mainland.

Sum of income	110.566.225
20,24% municipal tax	- 22.378.603
10,39 county tax	- 11.487.116
Left in purchasing power	76.700.506

Indicator 27: Spending leakage

a Rationale

Spending leakage is the act of money leaving the island and ending up elsewhere. With the world becoming increasingly globalised and monopolised by the most successful multinational corporations, economic leakage is becoming more and more prevalent. Highly specialised economies, such as isolated mining towns or small islands that are less able to meet the needs of the local households, will find that consumers are making periodic non-local shopping trips or doing a lot of online shopping.

Keeping more money on the island is one of the best ways of strengthening the whole island economy.

b Definition

How much of the islanders' available income is spent on the island.

c Computation

1	2	3	4
Less than 10%	10-25%	26-49%	Over 50%

d Example

Returning to Ven (indicator 26), figures in euro according to Statistics Sweden (SCB):

	Per household	120 households	Expenses made on Ven	Expenses made on the mainland
Provisions	3,511	401,097	197,784	223,567
Non-alcoholic beverages	280	31,987	15,793	17,813
Dining out	753	86,023	45,911	44,552
Alcoholic beverages	365	41,698	-	43,744
Tobacco	213	24,333	11,937	13,626
Consumables	603	68,887	33,974	34,418
Household services	1,390	158,794	9,182	157,639
Clothes and shoes	1,144	130,691	-	137,291
Residence	8,646	987,719	110,186	711,360
Furniture and fittings	1,894	216,371	-	227,313
Healthcare	698	79,740	8.264	75,477
Leisure and culture	5,518	630,376	18.364	643,743

Transportation	5,215	595,762	11.019	614,727
Sum	28,431 €	3,247,957 €	462,413 €	2,949,272 €

The people of Ven pay almost half a million euro for goods and services on the island, but 3 million on the mainland. Out of a ten euro bill, 90 cents is spent in the local grocery shop and local restaurants, 45 cents on local services, and the remaining 8,65 are used for buying groceries, paying the rent, gasoline, bus and ferry tickets, sport and cultural activities which all is paid on the mainland.

Looking at an individual level, the spending leakage is quite huge:

Per resident	16,000 €
Per household	39,000 €
Of which is consumed on the island	3,500 €
Of which is consumed on the mainland	27,000 €
Savings	8,500 €

Out of a total of 3,247,957€, only 14% (462,413€), was spent on Ven. Therefore, the value for Ven is 2.

Indicator 28: Tourism Impact

a Rationale

Tourism is a predominant sector on many (most) small islands. It differs from other industries, such as agriculture, fishing, shipping and trade, in that 60-90 percent of the money a customer (tourist) spends during a stay leaks back to airlines, hotels and travel companies, mainly in the tourist's home country. Calculating the importance of tourism is important to understand how dependent the island community is on this industry, which does not bring as much revenue as it might seem.

b Definition

Percentage of local turnover emanating from tourism.

c Computation

1	2	3	4
Over 80%	60-80%	40-60%	Under 40%

d Example

The Isles of Scilly is an archipelago off the southwestern tip of Cornwall. The islands have a separate local authority: the Council of the Isles of Scilly.

The islands have successfully attracted visitors due to their special environment, favourable summer climate, relaxed culture, efficient coordination of tourism providers, and good transport links by sea and air to the mainland, uncommon in scale to similar-sized island communities. Tourism on Scilly is a highly seasonal industry owing to its reliance on outdoor recreation and fewer tourists in winter, resulting in a significant constriction of the islands' commercial activities.

The number of tourists who make the 45-kilometre journey by boat, plane, or helicopter each year is about 125,000. There are also some 40 cruise ships with 17,500 passengers coming ashore to see what the islands offer. Tourism employs 70% of the island's 2,224 (2019) permanent inhabitants.

Tourism shapes the pattern of life on the islands by sustaining employment and the population level. It also generates income and business rates and sustains the transport links that would otherwise be fewer and of doubtful viability. It supports the school's viability and hence opportunities for families and young people to stay on Scilly. Tourism generally supports the essentials of an existence with modern comforts – shops, restaurants, health services, building trades. It provides a job (sometimes 2 or 3) for more or less anyone who wants one, which means unemployment is low.

Under a more critical view, tourism has locked Scilly into a seasonal economy with under-employment during the off-season and income levels below the national average. Transport and services of all kinds are scaled to cope with the peak demand and are oversized and difficult to maintain at other times. The visitor influx puts a significant demand on already ageing infrastructure for power, water, and waste disposal. Self-catering accommodation, second homes, and staff accommodation take up many of the available beds, causing high prices and a housing shortage. The specialisation in tourism creates risks in a downturn and has perhaps blocked diversification into other sectors.

While wildness and remoteness attract many visitors, they also demand almost everything to be shipped in, driving up the costs of living and doing business and chipping away at the competitiveness of the islands. Construction and improvement of buildings are particularly expensive and add further caution to investment decisions.

There was a decline in arrivals by the main transport modes from 2005 to 2010 – from 111,420 to 102,381. With Scilly's economy so dependent on tourism, the decline in visitors threatened its whole structure.

The Islands' Partnership, which is responsible for marketing Scilly as a destination, had projected that 70,000 visitors would spend £34m on the islands during 2020. However, Scilly was closed for tourists from March 21 as all flights and passenger ferry services were suspended. The COVID crisis and the lockdown could not have happened at a worse time for the tourism and hospitality sector: at the end of the winter, when cash flow is traditionally at its lowest and borrowing at its highest. Since then, tourism has not generated income whilst covering fixed costs and paying back booking and deposits.

Pre-Covid, tourism was estimated to account for 85% of the islands' income, bringing some £50million to the Scilly Islands' economy each year. In February 2022, the Council of Scilly adopted a Corporate Plan with four areas: (1) Housing, (2) Climate change and waste management, (3) Transport and highways, (4) Community wellbeing and fairness. Now the question is not how the islands will recreate their former tourism, but "how do we bring tourism back better?"

The value of Scilly is 1.

Indicator 29: Cost of living

a Rationale

Islands have a limited local market and transport time/costs, leading to a higher cost of living compared to the mainland.

b Definition

Comparison of costs on 25 everyday articles and other goods.

Necessity	Price on the island	Price on the mainland	Comparison (percentage)
Shopping cart			
Potatoes			
Coffee			
Milk			
Oats			
Sausage			
Fish (salmon)			
Apples			
Bread			
Cheese			

Sum			
Other goods			
Petrol			
Pizza (nice restaurant)			
Rent/m^2			
Gravel 1 m^3			
Room for 2 in a hotel			

Average	

c Computation

1	2	3	4
More than 25% more expensive than on the mainland	10 to 20% more expensive	Less than 10% more expensive	Cheaper than on the mainland

d Example

Kökar (population 232) is situated 31 nautical miles plus 30 kilometres from Mariehamn (population 15,000), the capital of the Åland Islands. The grocery shop on Kökar gets deliveries by lorry and ferry. The customer base on Kökar is small, and, in the end, the customers pay the extra costs for the long deliveries (in nm, km and time).

This is the price comparison between a large grocery shop in Mariehamn and the small grocery shop on Kökar, euro per kilo:

Necessity	Price on Kökar	Price in Mariehamn	Kökar / Mariehamn percentage
Shopping cart			
Potatoes	1.29	0.94	137
Coffee	9.98	3.89	256
Milk	1.30	1.27	102
Oats	2.71	1.09	249
Sausage	5.73	5.48	105
Fish (salmon)	22.90	17.90	128
Apples	2.69	2.99	90
Bread	4.53	3.70	122

Cheese	13.90	4.69	296
Sum			148
Other goods			
Petrol	1.60	1.37	117
Pizza (nice restaurant)	13.50	13.50	100
Rent/m^2	7.50	9.50	78
Gravel 1 m^3	35	10	350

Room for 2 in a hotel	152	135	113
Average			151

Kökar gets the value 1 since the island is more than 25% more expensive than the mainland.

Indicator 30: Housing

a Rationale

"Small island communities are experiencing a peculiar paradox: the number of permanent residents is decreasing, but there is still a shortage of housing for new and returning islanders", ESIN wrote in its report "Meeting the Challenges of Small Islands" in 2007. The demand for vacation homes and second homes creates inflation on the island property market.

b Definition

Price level on property.

c Computation

1	2	3	4
Very high	High	Moderate	Low

d Example

Denmark has 27 small islands that are not municipalities and therefore lack a vote in the Danish parliament. In 2015, Professor Jørgen Møller from Aalborg University proposed shutting them all down. The reason for this was that one in seven inhabitants had left these islands since 2003, and that the 4,605 inhabitants cost the state 14 million euros per year - mainly in ferries. "It can be boring too, can't it?" said Jørgen Møller in a radio interview, meaning island life in general, which he apparently did not really understand.

The statement received a lot of attention in the Danish media. Dorthe Winther, a resident of Omø, commented: "There is an old saying: Bad publicity is better than no publicity. In this case, one is tempted to say that bad publicity is even better than good publicity. What started as a negative story about the small islands has caused the islanders to fight, the media to clear the square - and most importantly: It has made people listen. Listen to the story of what kind of life the small islands offer. Thank you, Jørgen Møller, you have put the spotlight on the small islands, and we are glad for that."

Omø is a small island in the Great Belt with 166 permanent residents who make a living from fishing and agriculture. It belongs to Slagelse municipality, where the houses cost DKK 16,120/m^2. On a list showing which of Denmark's 98 municipalities are the most expensive to buy a house in, Slagelse came in at number 52. Samsø, Laesø, Aerø (indicator 24) and Langeland all end up far down the list. There are no statistics for Omø (it is not a municipality), but there are two houses for sale in late summer 2022: the old bank and bakery for DKK 2,750/m^2 and a house with a view of Kirkehavn for DKK 11,824/m^2. However, nothing is available for rent.

In 2020, the Danish government decided to allocate DKK 30 million to subsidize the construction of public housing on small Danish islands and the island municipalities of Fanø, Laesø, Samsø and Aerø during the period 2021-2026. DKK 404,000 can be granted per house construction. The municipal council must apply, but the developer gets the money. DKK 20,020 can be granted in annual rent reduction for existing homes.

Apparently, the government does not have the same solution to the housing issue as the professor who wants to buy out the islanders so that their houses can be used as holiday homes, writers' cottages and summer camps.

Dorthe Winther can be proud. She came to Omø with her husband, both teachers, in 1988. In 2001 she was elected chairman of the Association of Danish Small Islands, which represents 27 islands that are not municipalities. She is most satisfied with the "Landevejsprincippet", which states that it should cost the same to travel a distance by ferry as the corresponding distance by road. After 22 years, she quits as chairman 2022, and can also be satisfied with how the government's housing agreement also covers the small islands in Denmark. Will the rental subsidy stimulate the local rental market in Omø?

Indicator 31: Brand

a Rationale

There are two sides to a brand: identity and image. Identity signifies what we have and who we are, while image signifies who we want to be. Our image is created by how others see us – think about how our personal image among friends and family may differ from our image at work.

Islands with a strong image are prison islands like Gorgona in Italy and Bastøy in Norway. Poveglia in Venice's lagoon, said to be the most haunted location in Italy, combines a terrible image with a strange identity that is attractive to some. The island of Mont Saint-Michel in France is an iconic image, which attracts 2.5 million visitors every year (pre-Covid), but it has only 44 residents.

Regarding habitability, we aim to attract immigrants, not mere visibility or visitability. In this context, we don't want people to tour our island; we want them to stay – regardless of whether they were born here or elsewhere. We want them to root themselves here. Not tourism, but "rootism".

b Definition

How well-known your island is among people you want to attract.

c Computation

The strongest tool for measuring the island brand is probably a survey directed at people outside the island, belonging to the segments you want to attract, supported by a survey directed at people who have recently moved to the island or left it.

Establishing your image as an island is primarily a sales and marketing challenge. To calculate the indicator value of your island, there are a number of possible indicators which should be used together:

	1	2	3	4
	Weak brand	Medium brand	Strong brand, unique image, but not with a focus living	Strong brand, well-known as a good place for people to live
Printed media last year	No articles	A few articles, mostly touristic	Many articles, some describing the island as a good place to live	Active contacts with media to get the island well known to possible new islanders
Hits on the internet	Under a million	1-3 million	3-9 million	Over 10 million
Population growth	Negative	Stable	Positive (over 5% the last ten years	Very positive (over 10% last ten years)
Published research	Not known	A few works published but not known to or used by the island community	A few works published which are communicated to the island community	Close contact with a university, students and researchers are welcome and actively studying different aspects of island life
Active diaspora	Not activated	Irregular activities, mainly activated by the diaspora	Frequent activity, some regular support	Strong support, many activities, "Ambassador" program
Survey	Not done	Planned	Done but outdated	Recent, well-made survey

d Example

When the emperor Napoleon was exiled on the island of Elba after his defeat in 1814, the island had 12,000 inhabitants. On his second day, the new king went for an inspection ride on this island, which was 224 km² in size. He learned that his kingdom was much poorer than he had expected and that the capital Portoferraio was a fly-buzzing stinking village with narrow alleys where garbage was thrown out into the streets.

With his usual energy and organisational ability, he turned the island upside down. He planted potatoes, lettuce and cauliflower to make Elba self-sufficient in vegetables, chestnut trees to prevent erosion, olive trees and vineyards. He enacted laws, organised garbage collection, arranged street lighting, improved schools and hospitals, and built facilities for trade and shipping. He "conquered" the neighbouring island of Pianosa and dealt with stray dogs, public hygiene, and the construction of new roads. The large number of goods and supplies for the court and military personnel significantly increased trade, and Portoferraio particularly benefitted from this.

For the first time in centuries, the Island of Elba was united under one flag (the only time, in fact, that it was united: today, it is still divided into seven municipalities). Napoleon put Elba on the map and made it a more habitable island, addressing indicators 3, 8, 11, 23, 24, 27, 28, 34, 36, 38, 44, 46 and 47. He improved both the identity and the image of the island. Not bad for a ten-months stay.

Today, Elba is still known for Napoleon's stay on the island and his actions to turn the island more habitable, a story often told.

The island is divided into seven municipalities: Portoferraio (which is also the island's principal town), Campo nell'Elba, Capoliveri, Marciana, Marciana Marina, Porto Azzurro, and Rio. We refer to the island as a whole.

Printed media last year	Number of printed articles		2,5
Hits on the internet	24 million hits		4
Population growth 2001-2020	Portoferraio	+3%	4
	Rio	+6%	
	Porto Azzurro	+15%	
	Capoliveri	+26%	
	Campo nell'Elba	+12%	
	Marciana	-2%	
	Marciana Marina	+0,5%	
Published research	Number of scientific papers		3
Active diaspora			Unknown

Survey		Not made

Elba scores a 3, thanks to Napoleon and the island's growing population.

6 Public services

Islands are, in many aspects, different and peculiar societies. Among the more than two thousand inhabited islands in Europe, including its overseas regions, 3 are countries, 39 are regions, states or provinces, 205 are municipalities, and 1,915 are local communities.

Some 1,453 islands are coastal, located less than 12 nautical miles from the mainland coast; 301 are in the high seas, located beyond a country's territorial sea, more than 12 nautical miles from the coast; 397 are tied to the European mainland by bridges or tunnels.

With all respect for islands that are regions, states or countries, located in other continents, or have bridges or tunnels to the mainland – the 45 indicators of this tool won't fit. They lack the geophysical and economic challenges that unbridged islands face, and they have jurisdictional autonomy to manage their own affairs.

		Political dimension			
		Local community - no jurisdiction	Municipality	Region, state or province	Country
Geographical dimension	Overseas	54	3	10	1
	High seas	148	87	18	2
	Coastal	1 339	83	5	0
	Bridged	354	29	4	0

The Oxford English Dictionary defines subsidiarity as "the principle that a central authority should have a subsidiary function, performing only those tasks which cannot be performed at a more local level". The principle of subsidiarity is to guarantee a degree of independence for a lower authority vis-a-vis a higher body or a local authority vis-a-vis the central government.

The primary subjects of the habitability analysis are the 1,487 local communities and 170 municipalities located inside the European continent but not attached to it with a fixed link. These 1,657 islands cannot govern themselves and typically have a weak representation before their municipalities, shires or counties. Their constraints and challenges are seldom understood, and they are frequently regarded as a cost, not an asset.

This level of local governance is important to keep in mind when analysing indicators for public service: daycare, school, elderly care, healthcare, solid waste, taxes and subsidies.

As stated in the introduction to this Handbook, you sometimes have to consider how you use, or if you can use, the different indicators for your island. If the island is very small or situated in an archipelago, the service in question might be lacking on that very island – but a well functioning service might be available on the neighbouring island instead. Then, it is up to the islanders to decide if, for example, "your school" is the school on the neighbouring island. If the logistics are functioning well and the islanders are happy with this solution, this is absolutely not a problem, and you should do the analysis accordingly. If this, however, is seen as a problem, you might want to tackle the indicator differently. The main thing is to describe the choices you make and why.

Indicator 32: Local governance

a Rationale

The small island communities for which the habitability concept is intended can either be part of a land-based municipality, be an independent municipality, or make up several municipalities. The first case is common in northern Europe, the second is common among Atlantic islands, and the third in the Mediterranean region.

The local administration can be municipal, an island council or committee, another collaborative body or nothing at all. It is governed by a complex collection of European, national, regional and municipal laws, regulations, ordinances, instructions, initiatives, programs and projects that can apply to everything from agricultural subsidies, schools, renewable energy, rents, municipal mergers, child benefits, ferry itineraries and other things that affect habitability. The administration can be placed out on the island or on the mainland.

Responsibility for islands' development and sustainability is shared, fragmented and difficult to understand. Who rules, who has power and money, whose values govern planning and budgets?

Using indicator 32, we measure the degree of autonomy with which the island is managed. We try to understand the extent to which the islanders can influence the public administration of their habitability.

Cooperation is a way of finding financial resources to develop the island community, outside the ordinary resources of the local administration. Islands can cooperate in different ways, with different strategies. You can use several strategies - if you have the energy and skills. Islands can (1) enter into a bilateral alliance with a strong partner that can provide resources, (2) enter into a broader, multilateral partnership with several other similar islands, or (3) work to have laws and regulations that give the island advantages and protection in regional, national and EU contexts.

1 Bilateral relations

Collaborating with a large partner can be smart but requires the smaller party to succeed in making the larger party aware of its value. Helgoland (indicator 23) takes help from E.ON, RWE and WindMW to develop energy and business, Lidö in the Stockholm archipelago cooperates with the oil company Neste, Ven (indicator 26) made its parent municipality Landskrona aware of how much the islanders of Ven consume on the mainland.

2 Multilateral relations

Intranational networks

Many islands form cooperatives, networks and associations within their own country, to be stronger together. "Four brave men who do not know each other will not dare to attack a lion. Four less brave, but

knowing each other well, sure of their reliability and consequently of mutual aid, will attack resolutely. That is the science of the organisation of armies in a nutshell." (Ardant du Picq, *Études sur le combat,* 1880).

In France, *Les îles du Ponant* is the representative body of fifteen inhabited offshore islands of the Atlantic and Channel Sea coast. 576 Swedish islands formed *Skärgårdarnas Riksförbund* in 1982. In Denmark, *Sammenslutningen af Danske Småøer*, founded in 1974, represents 27 small islands that are not municipalities. *FÖSS* is the association for Finland's 431 small, inhabited islands. The Scottish islands fall into six different local authority areas – Shetland, Orkney, Western Isles, Argyll & Bute and North Ayrshire, but are united in the *Scottish Islands Federation*. 33 Irish islands are represented by *Comhdháil na nOileán*, registered as a co-operative society in 1994. The *Association of Estonian Islands* promotes development and sustainable populations on 16 islands. 29 Greek islands have formed the *Hellenic Small Islands Federation*. 29 inhabited Italian small islands are represented in the *Associazione Nazionale Comuni Isole Minori*. In Croatia, *Pokret Otoka* is an association helping and promoting the 48 inhabited Croatian islands and life on them, advocating action towards sustainable development.

International networks

There are also many international networks facilitating the circulation of information among its members, allowing comparison of how different countries cope with issues, share knowledge, and influence EU institutions.

The *European Small Islands Federation* (ESIN) is the voice of 359,357 islanders on 1,640 small islands. CPMR has an *Islands Commission* covering nineteen European regional island authorities located in the Mediterranean and Baltic Seas and the Atlantic, Indian, and Pacific Oceans. The *Network of the Insular Chambers of Commerce and Industry of the European Union* (INSULEUR) aims to promote the economic and social development of EU islands.

EU initiatives

Through a number of initiatives and programs, mainly to address high energy consumption, the EU invites its islands to develop a long-term framework for energy transition. Initiative and program examples include; the *Clean Energy for EU Islands Initiative*; NESOI, *New Energy Solutions Optimized for Islands*, which provides small grants and technical assistance; *Smart Islands Initiative*, a bottom-up effort; the *Observatory on Tourism for Islands Economy* (OTIE), which offers data and research.

There are also global networks such as Italian-based *Greening the Islands* (GTI), which focuses on energy innovations, and the French-based *Small Islands Organisation* (SMILO), which promotes and finances community-led solutions that enhance small island sustainability.

For an island, there is thus no lack of possible support. It's a question of choosing the right strategy and a fitting partnership. You don't have to go all the way like Cinderella when she slipped out of her family prison to enter a totally new relationship; you can have both.

3 Laws

Some countries have an island or archipelago law describing the rights and obligations of islanders, notably to force municipalities to create reasonable socio-economic conditions for people on the islands. Such is the case in Croatia, which has an Islands Act from 1999, revised in 2018. Finland has a law promoting archipelago development from 1981, which will be revised shortly.

Other islands have secured a position of their own, often as “tax-havens” – a jurisdiction with very low "effective" taxation rates for foreign investors. On a general level, the Netherlands and Ireland are considered as tax-havens. On an island scale, the Channel Islands and the Åland Islands have tax exemptions regarding alcohol and tobacco, which is also the case on the tiny island Helgoland (indicator 23). Bø (indicator 38) altered its wealth tax level in opposition to its shire and the whole nation.

b Definition

Level of self-governance attained through bilateral and multilateral partnerships and jurisdiction.

c Computation

1	2	3	4
Local community without decision-making power	Local community with limited decision power	Municipality	Region, county or state
No bilateral partnerships at all	One bilateral but not very active partnership	One bilateral active partnership, to some use	One or several active and very useful bilateral partnership(s)
No multilateral partnerships at all	One multilateral but not very active partnership	One multilateral active partnership, to some use	One or several active and very useful multilateral partnership(s)
No island law	Islands are mentioned in regular laws	Island law but not very useful in practice	Powerful island law
No exemptions	One but not very useful exemption from national law	One useful exemption from national law	Ample exemptions from national law

Count the average value for your island.

d Example

Susak is a small island located in northern Croatia, southeast of the Istria peninsula. It covers a surface of 375 hectares. Compared to the neighbouring islands of Lošinj, Unije, Vele Srakane, Male Srakane and Ilovik, Susak looks unusual. The many flat terraces used for cultivating vine give the island a “stepped”

appearance. A lighthouse rests on the highest part of the island, with its lightroom 100 metres above sea level. This light is one of the main landfall lights on this part of the Adriatic coast.

In the past, Susak's inhabitants mostly made their living from farming, fishing, and winemaking. The economy flourished until the middle of the 20th century; a fish cannery was operating on the island until the 1940s, and a cooperative wine cellar was running from 1936 to 1969, processing 1,400 tonnes of grapes each year. The island even had an indigenous red grape variety called Sansigot. Almost a third of the entire island's surface was planted with Sansigot, which flourished on the sandy soil.

After the end of World War II, Susak became part of Yugoslavia. The Communist regime launched a nationalisation process and agricultural reform, and the majority of the population decided to leave the island for either political or economic reasons or both. In 1948, the island had 1629 inhabitants. During the following 23 years, the number of inhabitants dropped by more than 1300 persons. From 1971, the population has continued to decrease to the current number of around 150 residents.

Most fled via Italy to Hoboken, New Jersey; others have moved to France, Canada, Argentina, and Australia. Nowadays, the largest number of families originating from Susak reside in New Jersey and the wider New York City area, and it's estimated that the Susak diaspora based in the US currently counts between 2,500 and 4,000 people. They are crucial supporters of Susak today and an example of how population growth and development can be totally governed by external forces, as thoroughly described in the study “Lost in transition – the island of Susak”.

The local community of Susak is weak (1) but has a very strong external partnership (4), a not very active national island partnership (2), and a functioning island law (4) but no exemptions (1). This gives Susak an average value of 2,4 = 2.

Indicator 33: Daycare

a Rationale

Kindergarten and daycare are important requisites for a functioning working life for both children and parents.

b Definition

A balanced assessment of the staff’s training and adequacy, vacant daycare places, resources, activities, and suitable opening hours.

c Computation

	1	2	3	4
Personnel and their competence	Continuous lack	Sometimes lack of personnel or lack of personnel who have the right training	There is personnel, but not all have the right competence	All personnel at hand with the right competence

Age distribution	Children are missing in five age groups	Children are missing in three or four age groups	Children are missing in one or two age groups	There are children in all age groups
Available daycare	Lack of vacancies	Some lack of vacancies	Just the places needed	No lack of available daycare
Resources for activities	Lack of resources	Some lack of resources	Just the resources needed	Lots of resources
Activities concerning sustainability and island identity	Not included	A few times per semester	Once a week	Daily
Daycare time	Does not match at all	Some needs cannot be met	Regular needs can be met	All needs can be met
Sum A + B + C + D + E + F / 6 =				

d Example

The island of Houtskär, with about 500 all-year residents, is situated to the far west in the Southwest of Finland. To reach the mainland, you use three different ferries. The connection between Korpo and Houtskär is the longest crossing for the yellow road ferries carrying cars in Finland: 9.5 kilometres. Houtskär ceased to be a municipality of its own in 2009 and instead became part of the city of Pargas. Houtskär offers a good basic service that is complemented by private companies. The activities of different island associations contribute greatly to the well-being of the inhabitants.

The kindergarten in Houtskär has places for 21 children: from 1-year-old babies to 6-year-old children, in preschool, which in Finland is the last year before school starts at the age of seven. In 2022, 19 children are recorded as being in daycare on the island.

The kindergarten has become a pioneer in sustainability in recent years. The personnel strive to include the local environment and everything that the archipelago nature offers in their activities for children. They freely move around with two electric bicycles that seat five children each.

Local food is used in the kitchen, and the kindergarten has its own garden where vegetables are grown. It tries to minimise food waste and uses the bokashi method for composting. The kindergarten is located in the Archipelago Sea Biosphere Reserve. It utilises the biosphere reserve's program, “Superheroes of the archipelago”, where children gather knowledge about nature, sustainable development, island identity and their own roots in the archipelago.

The computation for the kindergarten in Houtskär would be:

Personnel	*3*
Age distribution	*4*
Available daycare	*4*

Resources	*4*
Activities	*4*
Daycare time	*4*

3 + 4 + 4 + 4 + 4 + 4 / 6 = 3,8. The value for Houtskär is 4.

Indicator 34: School

a Rationale

A school on a small island is the central point on which the society balances. The school is vital for families with school-age children – both its existence and its qualities. A well-run school is important for children and the well-being of the parents and the staff.

b Definition

The staff's adequacy and competence, access to resources for desired activities and extra support, the children's age distribution, and whether children go on to higher education after upper secondary school.

c Computation

	1	2	3	4
Enough staff with adequate competence	Continuous lack	Sometimes lack of personnel or lack of personnel with the right training	There is personnel, but all do not have the right competence	All personnel at hand with the right competence
Resources for activities	Lack of resources	Some lack of resources	Just the resources needed	Lots of resources
Age distribution	Children are missing in five or more classes	Children are missing in three or four classes	Children are missing in one or two classes	There are children in all age classes
Activities concerning sustainability and island identity	Not included	A few times per semester	Once a week	On a daily basis

Continued education after elementary school	Less than 50%	51-70%	71-85%	Almost all pupils continue their education after elementary school
Sum				

d Example

The French mainland's furthest outpost in the west is Ouessant (called Ushant in English). The island is a rocky landmass with a total area of 15 km^2 in the Iroise Sea on the French side of the English Channel. These dangerous waters are amongst the most troublesome in the world, with 10-knot tidal streams and numerous sharp reefs both over and under the water surface. To protect ships and sailors, no less than five lighthouses beacons are surrounding the island, including one of the world's strongest, Phare du Créac'h. It can be seen from 60 kilometres away.

In 2019, the population was 833, reduced by half since 1968. In summer, the population is at least 2,000. The number of second homes was 360 in 1990 and is now reaching 500. The island has about 150,000 one-day visitors per year, giving a locals-to-tourist ratio of 1:170.

Administratively, Ouessant is a municipality of the Finistère in the Brittany Region.

In the previous school system, children from the age of 11 were sent to schools on the mainland where they were often the only ones living in boarding schools. When a series of storms in the winter of 1975 forced children from the neighboring island of Île de Sein to remain on the mainland over Christmas, parents and islanders had enough. Instead of moving the children, it was decided to move the teachers. In 1976, Ouessant together with the islands of Batz, Molène, Sein, Groix, Houat and Hoëdic created the Collège des Îles du Ponant network school with a capacity for about 100 students. The school is a combination of 26 traveling teachers with good working conditions and strong technical support, and distance learning.

In 2021, close to 100 students attend this school. Ouessant has 40 students at primary school level and 14 students at secondary school level. The study results are good.

On a higher level of education, there is a triple helix cooperation between l'Université de Brest, l'Association des îles du Ponant and the Region of Brittany. It was initiated by the university and the association in 2016, followed by a feasibility pre-study the next year, whereafter the Region of Brittany joined the cooperation. Three islands stood out as primary objects in the following years: Sein, Molène and Ouessant. A communication program started when 20 teachers/researchers joined the initiative, and a Master's program was organised, which in 2019 had 46 students writing their theses on subjects from these islands. Since then, several programs and theses have been applied mainly on Ushant, two of these are still active in 2022.

The cooperation has successfully pinpointed what is needed to keep these 15 islands habitable. At present, there are 15 ongoing research programmes, among them indicators of well-functioning social services such as daycare, healthcare, elderly care and the unusual school system, which moves teachers instead of pupils.

For Ouessant, the computation would be

Staff: 3

Resources: 3

Age distribution: 4

Activities: 4

Continued education: 4

3 + 3 + 4 + 4 + 4 = 3,6, giving an indicator value of 4, which this school system well deserves.

Indicator 35: Elderly care

a Rationale

A habitable island can take care of its elderly population and avoid sending them to institutions on the mainland. Older populations being away from their relatives and homeland and among unknown caregivers can be at great risk for loneliness and depression.

An elderly person's home is also an important workplace on a small island.

b Definition

Distance to and availability of vacant care places, the staff situation and the quality of care.

c Computation

	1	2	3	4
Distance	No municipal elderly care on the island, distant solutions	No municipal elderly care on the island, but there is care quite close on the mainland	Elderly family care with strong support from the municipality	Most elderly people, unless with complicated health, dementia, or palliative care, are taken care of on the island
Availability	Very long waiting time	Long waiting time	Enough support, short waiting time	Enough places, short waiting time

Competence	No local competence	Personnel who have the right competence on the mainland	Most of the necessary personnel with the right competence	All the necessary personnel with the right competence
Quality	There are always complaints from caretakers and families	Many complaints from caretakers and families	Some complaints	No complaints
Sum				

d Example

Finland has more than 500 islands with full-time settlements and almost 20,000 islands with part-time settlements without a fixed road connection. Including Åland, the country has about 100,000 resident islanders. Many of the islands along the coast of Finland and inland have a declining population, weak attractiveness for immigration, and strong seasonal variation due to intense tourism pressure. Consequently, many municipalities face challenges in establishing a basis for service provision, including healthcare, schools, and social care. Finland also has an elderly population profile, increasing the demand for healthcare and care services.

The island of Bergö on the shores of the Bothnian Bay is approximately 3.15 km^2 in size, with a population of 470. Once an independent municipality until 1973, Bergö is now a part of Malax. The ferry from the mainland port, Bredskär, takes 10 minutes with almost 50 round trips a day. Islanders can use a bus to commute to Vaasa town - once a day. Sixty people are working on the island, 22 of which are whitefish fishermen, landing some 250 tonnes a year. There is a grocery store, a library, hairdresser, flower and gift shops, and a café on Bergö. Municipal water and wastewater treatment services are available for around two-thirds of households, and energy is brought to the island with a cable from the mainland.

The island council, *Bergö öråd,* was founded in 2002 with the idea of building a new common service house on the island. At that time, when elderly people could no longer stay by themselves, and there were no possibilities to take care of them in the family, the only alternative was to move to the mainland. For relatives, a visit meant a three-hour journey by car or taking a bus at eight o'clock in the morning, returning at four o'clock in the afternoon. In addition to this, the cost of the service was high, and possible workplaces on the island were lost.

The islanders accomplished a combined solution incorporating a primary school, a public library, a service housing for older people, a health station and mobile care facilities. This was a locally-led initiative by the island council and a related working group, which persistently advocated for local development, organising joint activities and seeking state and municipal funding to make an "under-one-roof" solution possible: a new service building for the whole island.

Evaluation of the elderly care on Bergö:

Distance 4

Availability 3

Competence 4

Quality 4

4 + 3 + 4 + 4 = 15/4 = 3,8. The value for Bergö is 4.

Time has shown that the waiting time, i.e. availability, is the most problematic factor on Bergö. The need for caretaking places was underestimated while planning for the centre; 10 places are simply too few. As of spring 2022, 3-4 elderly people from Bergö are taken care of on the mainland.

The service house, which came to expand into a multi-functional service centre (or 'service bundle'), combines elderly care with healthcare, welfare/social care, education, and cultural services. Of real importance is the link between younger and older islanders. A combined initiative now enables older people to stay on the island when they require special care and young children to receive an education close to home, creating workplaces on the island. Bergö illustrates a process in which locally-led service provision has been successfully designed through a combination of hard work, community spirit and collaboration, and long-term dialogue with the local municipality and state support.

Indicator 36: Healthcare

a Rationale

Public healthcare should prevent diseases, promote health and prolong life. It is a complex indicator as the "public" could be a handful of people, a city or an entire nation. It is part of a country's overall health system and is implemented through the surveillance of health indicators.

Safe and good healthcare is an important ingredient in making an island habitable and, of course, an important tool for maintaining good health among the islanders.

b Definition

An overall assessment of the health care services offered for the islanders and the availability of health-promoting activities.

C Computation

		1	2	3	4
Healthcare					
a	Access	Unaccessible, hard to book a time	Not so accessible and sometimes hard to book a time	Quite accessible, easy to book a time	Very accessible, very easy to book a time
b	Care	Lots of deficiency	Some deficiency	Good	Very good
Doctor					
c	Access	Unaccessible, hard to book a time	Not so accessible and sometimes hard to book a time	Quite accessible, easy to book a time	Very accessible, very easy to book a time
d	Care	Lots of deficiency	Some deficiency	Good	Very good

Dentist					
e	Access	Unaccessible, hard to book a time	Not so accessible and sometimes hard to book a time	Quite accessible, easy to book a time	Very accessible, very easy to book a time
f	Care	Lots of deficiency	Some deficiency	Good	Very good
Health promotion					
g	Activities	Lots of deficiency	Some deficiency	Good	Very good

Sum of obtained values, divided by 7: (a+b+c+d+e+f-g)/7	

d Example

Situated in Bantry Bay is the Irish island Bere. It is the second-largest Irish island, discounting islands connected by causeways or bridges. It has a population of 160 people (a sharp decline from 216 people in 2011 and its peak back in 1926 with 1,182 all-year inhabitants). About a third are elderly, and a number have underlying health issues.

Bere matches its dwindling population with a phenomenal community spirit, which binds the island community together. Many visitors are attracted to the island because of all the different events arranged by the islanders – the list of activities would put many large towns to shame. The events include sending a lorry to Ukraine on St Patrick's Day (March 17, 2022), preparing a religious retreat at Easter, an islands' festival in June, a children's summer camp in July, a heritage week in August, and an all-island football tournament in September. With hotels, B&Bs, Airbnbs, bars, cafes, restaurants, and its Bakehouse Cafe with its sizzling garlic prawns, the overriding impression of Bere Island is of a thriving island community.

The Bere Island Projects Group (BIPG) is a non-profit organisation with two employees, John Walsh and Laura Power. John, who is also the chairman of the European Small Islands Federation, says BIPG deals with every issue from the cradle to the grave, working to sustain the island population through the creation of employment, promoting community initiatives and supporting local businesses.

In 2018, the general nurse working on Bere was taken from the island to the mainland on various days to cover planned and unplanned leaves by colleagues. This left many on the island without a service – a very worrying time for the residents who feared that this was the beginning of a withdrawal of the service. Then came COVID. In March 2020, Bere Island asked people not to visit as part of an effort to protect the elderly living there. BIPG made the appeal after discussions with the local ferry company and health professionals, and they were trying to limit the number of trips islanders have to make to the mainland. The island also had an active age scheme with a list of people willing to do messages and jobs for the elderly and a strong, active retirement group, which would also be mustered to help.

Today, Bere has a nurse on the island, and the local project group does some health promotion work for the islanders. The doctor and the dentist are on the mainland, in the town of Castletownbere, where the ferry lands. The town has two doctors and a dentist. Sometimes, you have to travel to the city of Cork, two hours away, for a dentist and hospital appointments. Coming out of COVID in the spring of 2022, the coordinator of BIPG assesses the healthcare situation as follows:

Healthcare	a Access	3
	b Care	4
Doctor	c Access	3

	d Care	4
Dentist	e Access	2
	f Care	4
Health promotion	g Activities	3
Total		23
Sum of obtained values, divided by 7 (a+b+c+d+e+f-g)/7		**3.3**

The indicator value for Bere is 3.

Addition

In 1984, sixteen islands founded Comhdháil na nOileán – the Irish Islands Federation. At that time, there were serious shortcomings regarding access to the islands, healthcare, and other essential services. Currently, there are 33 member islands with populations from just one person to 824 and a total combined population of just under 2,900.

The Irish Government started working on an Islands Policy Consultation Paper in November 2019. Regarding healthcare, the consultation states that "the challenge is to support individuals living on the islands to be as healthy and resilient as possible while providing appropriate and accessible services that reduce the risk of hospital admissions and facilitate people to remain living on the islands. This is not a straightforward task given that the islands, by their very nature, are remote and isolated places, while the availability of services can vary and is often at the mercy of poor weather conditions and limited transport availability. It can also be difficult to attract and retain healthcare professionals to serve island communities."

Regarding healthcare, Comhdháil na nOileán has demanded that the additional time and costs involved in visiting patients on the islands should be taken into account when allocating workloads and budgets for Public Health nurses; also, the cost of accommodating relief nurses on the islands should be reimbursed, and island women should be offered greater choice in maternity care, including visits on the island from a midwife.

Indicator 37: Solid waste

a Rationale

Waste management in small island communities is complicated by their geographical setting and an often tourism-dominated economy. They frequently rely on imported products and choose not to control the "waste-to-be" being brought to the island.

People in the EU generate roughly 505 kg of municipal waste per person per year, of which 48% is recycled (2020). Some countries generate less and some more, ranging from as low as Romania's 280 kg to Denmark hitting 844 kg per person. Waste from tourists is produced at almost twice the rate of locals. Including waste from the construction sector, mining, quarrying and manufacturing, we generate 5.2 tonnes of waste, of which 39% were landfilled and 38% were recycled.

Due to financial resources and limited land availability for disposal, the quantity of waste is often beyond what the island can handle. This situation is further complicated as islands often have difficulties finding markets for re-sale recyclables on the mainland. As a result, solid waste on small islands has often been managed through open dumping on land, in water, and open-pit burning, with limited recycling. The generation of waste makes the island less habitable through widespread environmental, social, and economic impacts. Preventing waste is always the first option, and sending waste to landfills (on the island or the mainland) is the last one.

b Definition

The percentage of waste being recycled, excluding construction waste.

c Computation

	Total tonnes per year	Amount recycled
Combustible waste		
Carton		
Newspapers		
Plastics		
Metal scrap		
Glass		
Inert waste		

	Total tonnes per year	Amount recycled
Dangerous waste		
Sum		

1	2	3	4
0 to 25% is being recycled	25 to 50% is being recycled	50 to 75% is being recycled	Over 75% is being recycled

d Example

Porquerolles, an island on the French Mediterranean coast, has a permanent population of 350 inhabitants throughout the year. For many centuries, Porquerolles had a mere military function, and a village was built in the 19th century to accommodate the military families. For almost 60 years, beginning from 1912, the island was private property. In 1971, 80% of the island was sold to the French Government, and it became a National Park in 1985 – one of ten car-free islands in France.

There is a challenge to reconcile tourism and protecting the island's fragile environment. One of the beaches on Porquerolles – la plage de Notre Dame – was selected as the most beautiful beach in Europe in 2015. Every summer, one million tourists visit the island. The daily average is 6,000 visitors, sometimes as many as 9,000. Most of these are day-trippers, but there can also be some 1,500 boats, of which 500 stay overnight. In 2020, the Covid-19 pandemic forced the French to take their holidays in France, causing an over-frequentation of tourist places. Porquerolles peaked on July 13, 2020, with more than 15,000 visitors, which, among other problems, caused a freshwater shortage.

The considerable number of visitors to the island generated much waste, as we humans always do. Before 2020, the waste collected amounted to 2,214 tons of cardboard/paper, 1,200 tons of glass, and 276 tons of plastic waste. The average French person generates 546 kg of waste per year, but the residents of Porquerolles only produce 191 kg each. But the one million visitors, as well as the hotels, restaurants, and private boats, add approximately 4,000 tonnes of solid waste.

The terrain on Porquerolles is not easy. While the roads are sealed in the village and the harbour, there are only dirt roads on the rest of the island. Furthermore, the space – especially in the village – is very constrained. This poses challenges for the collection of waste and storage of containers.

Garbage is collected every day from 5 to 10 am, beginning in the village, then on the beaches on the west side of the island, and then back to the village. The team also collects paper from the "savage toilets" – no wonder on an island with public toilets only on one of the beaches. In the evening, the team notes the volume and type of waste collected, including driftwood, and where it has been collected.

The transfer and transport of waste come after collection. While non-recyclables are shipped every day to the incinerator on the mainland, recyclables are first stored in containers in a transfer zone on the island until they are full. They are then transported by ferry to the mainland, which adds considerable costs.

There are four authorities on the island: the national park, the municipality of Hyères, the authority of the ports of Toulon, and IGESA, a French army institute that runs a vacation site for military personnel and their families. Each of these has its own waste policy and storage facilities; for example, in one part of the island, they demand you to separate your waste, and they do not in another part of the island. This makes it almost impossible to know how much waste is produced per fraction on Porquerolles, but we know that of the total amount of waste transported from the island, 30% was recycled, 8% composted, 42% incinerated and 20% landfilled.

This gives the island of Porquerolles a value of 2.

The islanders themselves are unsatisfied. There is too much garbage left on their beautiful beaches. On three days in January 2020, 55 volunteers assembled 1.6 m^3 of waste along 3,000 meters of shore in 30 hours. The waste included: 650 litres of polystyrene, 642 bottle caps, 226 plastic bottles, 200 cotton swabs, 120 empty cartridges, 100 plastic cups, 62 lighters, 42 shoes/sandals, 41 metal cans, 35 ballons/balls, 22 diapers, 20 coffee filters, 12 syringes, six bait boxes, five pieces of clothing, two tires, two fishnets, one battery, and three litres of cigarette butts.

In early July 2021, a year after the invasion of July 13, 2020, the Municipality of Hyères, the Métropole Toulon-Provence-Méditerranée, the National Park of Port-Cros, the company in charge of the public transport service between the mainland and Porquerolles, and representatives of the 12 shipping companies, which also provide maritime shuttles, agreed to set a threshold for the flow of visitors at 6,000 per day.

"An island jewel for which the situation was no longer tenable", said Jean-Pierre Giran, Mayor of Hyères, and continues: “We could have tripled the fare, but ultimately only the rich could have come. It is anti-democratic. With this gauge, we are taking an important step. It is an ethical and courageous act."

Indicator 38: Tax and subsidies

a Rationale

Taxes affecting island life are personal income tax, property tax, corporate tax, mandatory social insurance contribution, VAT, road tax and an energy tax. Subsidies can lower the effects of some of these taxes or insularity in general.

The relative importance of taxes and subsidies varies greatly across island nations. Focusing on a single instrument could be misleading. Personal income taxes often have a progressive structure and include different levels on all sources of earned income, wages, pensions and social benefits, for example, unemployment benefits. Taxes paid on income from capital are usually characterised by a more proportional scale.

Personal and income taxes represent less than 10% of GDP in France and Spain and almost 15% in Finland, to name three outstanding island nations in Europe. In all countries, mandatory social insurance contributions are levied on labour income from employees, although with a lower rate than on work, representing 10% of GDP in France, 5% of GDP in Finland and 4% in Spain. Wealth taxes exist in many forms in almost all countries, ranging from 1% in Finland to 3.5% in France.

VAT is levied at each stage of the supply chain, where value is added from initial production to the point of sale. VAT raises government revenues without punishing the wealthy. It is said to be an alternative to income tax – which is not necessarily true because many countries have both an income tax and a VAT.

In the previous habitability process, we have seen many examples of island overcosts and financial challenges such as in indicators 5 (skewed population dynamics), 6 (long distances), 7 (accessibility), 24 (viability of the business ecosystem), 27 (spending leakage), 29 (high cost of living) and 30 (affordable housing). The question is: are taxes and subsidies compensating islands for these challenges?

b Definition

The overall impact of taxes and subsidies on island life, compared to the nearest mainland town, municipality or region.

c Computation

	Issued by				Compared to mainland			
	Municipality	Region	State	EU	High	Low	Fair	Unfair
TAXES								
Personal income tax								
Property tax								
Corporate tax								
Mandatory social insurance tax								
VAT								
Tax paid on income from capital								
Road tax								
Energy tax								
Other								

SUBSIDIES								
On ferry charge, persons and cars								
On ferry transport of goods								
On farming								
On fishing								
For business start-ups								
Tax exemption for example on alcohol & tobacco								
Other								

1	2	3	4
Taxes are unfair	Some taxes are unfair	Taxes are quite fair	Taxes are fair
No subsidies	Few subsidies	There are subsidies to a certain extent	Compensating subsidies

d Examples

The most northern Norwegian shires are Nordland, Troms, Finnmark, and Svalbard, far up in the Arctic region. Here, schools, bathhouses, fire brigades, police stations and other municipal functions are maintained where only a few thousand people live. This is due to a whole set of subsidies: Mandatory social insurance tax is lower the further away you are from the big cities; Student loans can be depreciated for those who move to the countryside; Personal income tax, which is taxed at a flat rate of 23% in Norway, is lower in the northern shires: only 19.5%.

Langøya in Nordland, north of Lofoten, is Norways' third island in size, 850 km^2. It is divided into four municipalities: Bø, Øksnes, Sortdal and Hadsel. European Route 10 leads from the mainland to Hinnøya over the 1,000-metre Hadsel bridge to Langøya. Furthest to the east is Bø municipality, with 2,565 all-year residents, a steady reduction since the 1950s when over 6,000 people were living here.

In addition to income tax and social security payments, Norway levies a 0.85% wealth tax on residents' global assets above 1.5 million Norwegian crowns (154,000 euros). Of the wealth tax taken, 0.15% goes to the state, with the remaining 0.7% going to the municipality in which the individual lives.

Bø decided that from January 2021, it will charge just 0.2% wealth tax, meaning a drop from 0.85% to 0.35% for its residents. Bø's conservative mayor Sture Pedersen hoped the tax cut would make some of the country's richest move to Bø and lead to an overall income boost and new economic opportunities for the municipality. "Public authorities abandoned us years ago," said Pedersen. "We do this to attract capital to our municipality. We need that to survive and to create jobs."

Indeed, retired cross-country skier and cultural icon Bjørn Daehlie moved to Bø among a group of wealthy Norwegians. But there is an equalisation rule in Norway, which was not taken into account when the decision was made. Bø does not receive the full amount of wealth tax from the newcomers immediately, and, of course, the existing residents also get a reduced wealth tax. The sums simply don't add up for Bø.

It seems the tax reduction was ill-managed and planned, scoring a 1, while subsidies in this northern shire of Norway score a 4.

7 Prosperous people

Sustainable development is built on three pillars that interact closely with each other: ecological, economic and social sustainabilities. To evaluate the degree of prosperity of an island community, social sustainability is the focus. It is about systems, structures, and relationships, both formal and informal, and creating healthy and viable communities. The well-being of the island and the islanders has to be supported in well-functioning infrastructures for social and cultural life, allowing open and inclusive citizen engagement.

A socially sustainable society has the human need in focus, both on an individual level and as a part of society. For a resilient community, population growth and the demographic distribution have to give hope for future development. Democratic processes, a good integration of newcomers and a welcoming and rich cultural life are all premises and results of a well-functioning society. These actions, handled with care, will usually enhance the aspects of health and security.

Indicator 39: Age distribution

a Rationale

The share of the working-age population in Europe is expected to decline during the period 2020-2100. Accordingly, older people will account for an increasing share of the total population. People aged 65 years or over will account for over 30% of the population in the EU by 2100, compared with 21% in 2020.

Whether the number of residents is growing or shrinking is an indicator of the habitability of an island. It is also important to understand if the population grows thanks to immigration or the “local production” of new islanders.

In this indicator, there are three demographic groups to be considered: (1) children and young people in need of daycare and school, (2) grownups of working age, and (3) older persons outside working life who will eventually need some extra care. Unless there is a noticeable unbalance, gender is not an indicator of habitability.

Islands tend to over-represent older people who settle on islands when retired.

b Definition

The age distribution of the resident population on the island, measured by the total age dependency ratio.

c Computation

The age dependency ratio expresses the relationship between three age groups within a population: ages 0-15, 16-64 and 65-plus. Higher values indicate a greater level of age-related dependency in the population. The "dependent population" is defined as people ages 0-15 and 65-plus, while the "working-age population" is between 16 and 64.

Children and young people, age 0–15	%

Grownups, age 16–64	%
Older people, age 65–	%

The total age dependency ratio is calculated as:

([Population ages 0-15 + Population ages 65-plus] / [Population ages 16-64]) × 100

1	2	3	4
A dependency ratio of >70	A dependency ratio of 60–70	A dependency ratio of 50–60	A dependency ratio of <50

d Example

The Outer Hebrides are situated 55 km (34 miles) off the northwest coast of Scotland, and they cover an area of 3000 square kilometres. They consist of over 100 islands, 15 of which are populated. The major islands are Lewis, Harris, North Uist, Benbecula, South Uist and Barra. The area is sparsely populated, with a density of nine people per square kilometre, compared to a Scottish average of 65.

The only large town is Stornoway (*Steòrnabhagh*) on Lewis. It is the Outer Hebrides' largest town and administrative centre. There are approximately 6,953 people in the Stornoway settlement Laxdale, Sandwick and Newmarket. The remaining population is scattered throughout over 280 townships across the islands.

The most recent mid-year population estimates for the Outer Hebrides give a population of 26,500. This number has been relatively steady in recent years, but there has been a long term population decline. Since 1991, the population in the region has declined by 10%. The recent decline has largely resulted from a "natural" population decrease, more deaths than births. From mid-2019 to mid-2020, there was a decrease of 0.8% (220 persons).

Demographically, the population of the Outer Hebrides is ageing. The continuing trend is for young adults to leave the islands for further education or employment. The median age in the islands was estimated to be 49.9 years (Scottish average 42.1 yrs) in June 2020. A higher percentage of the population is of 'pensionable age' (Outer Hebrides 25%, Scotland 19%), and a lower percentage is of 'working age' (Outer Hebrides 59%, Scotland 64%).

The age profile for the area is:

0–15 years	16%
16–64 years	59%
65– years	25%

The total age dependency ratio is calculated as:

([Population ages 0-15 + Population ages 65-plus] / [Population ages 16-64]) × 100
16 + 25 / 59 = 0,69
0,69 × 100 = 69

The indicator value for the Outer Hebrides is 2.

Indicator 40: Good health

a Rationale

Island communities top the list of places in the world where people enjoy longer and more meaningful lives, such as Ikaria in Greece, Okinawa in Japan, and Sardinia in Italy. These islands belong to "The Blue Zones" of the world, a phrase coined by the Belgian demographer Michel Poulain and the Italian statistician Gianni Pes. The concept has since then been explored by many, among them the American adventurer David Buettner who wrote a series of articles on blue zones for National Geographic magazine. Buettner states: "Our life spans are about 20% dictated by our genes, the rest is lifestyle".

Most national institutes of Health and Welfare provide disease indexes that evaluate the health of municipal residents, typically based on the most common and serious diseases (cancer, coronary heart disease, diseases of the blood vessels of the brain, diseases of the musculoskeletal system, mental illness, accidents, and dementia). The lower the value of such an indicator, the healthier the population.

b Definition

The health of the islanders according to national health indexes, compared to the rest of the nation. Or surveyed self-rated health for islands that are not municipalities.

c Computation

Most European countries use a health index describing the population's health in different municipalities and regions in proportion to the whole country. The comparative number of the country as a whole is 100. The lower the number for a city, municipality or province, the healthier the population.

If your island is a municipality, you should be able to find national data on the health status of your island. There are, however, varying approaches in different countries, which means that this indicator might have to be applied to the statistical data that can be found in your country. If the rating below is not applicable in your country, try to find a corresponding system!

1	2	3	4
The health index is over 115	The health index is 100–115	The health index is 85–100	The health index is below 85

For islands representing smaller entities than municipalities – which most of our islands are – this data can be hard to obtain. If experts on health matters (nurses, medical doctors, statisticians) can confirm that the island's health status corresponds to that of the municipality, use that index.

If not, we recommend that a question on self-rated health be included in any surveys done among the islanders. This seemingly simple question: 'In general, how would you say your health is?' (Ware & Sherbourne, 1992) is widely used by researchers and has been found to correspond well with health

surveys done on a much broader scale. Responses are on a five-point scale (excellent, very good, good, fair or poor). Since the Habitability Index is a four-point scale, "excellent" and "very good" both result in a 4:

1	2	3	4
Poor	Fair	Good	Excellent or Very good

d Example

Ikaria is a Greek island in the Aegean Sea with an area of 255 km² and some 8,300 all-year inhabitants. Ikaria lacks a good harbour, ferry transports are irregular, and the short landing strip is very windy. The average income is very low, and the unemployment rate is very high. The island has a dark history; the *Ikariótes* (Icarians) have suffered hard times. Ikaria is both famous and infamous, nicknamed the "Red Island" – till 1973 and the fall of the Greek Military Regime, Ikaria was used as an exiled land for political prisoners and mostly communists.

In spite of this – or because of this? – it has become one of the world's five "Blue Zones", i.e. a demographically confirmed geographical area where people live measurably longer. One in three make it to their 90s on Ikaria. Why is this?

The Ikarian diet and lifestyle have become famous for their health benefits. According to Christina Chryshoou, a researcher at the University of Athens, almost the entire Ikarian population is free of chronic disease and dementia, with sexual activity until their late 80s. A daily routine that includes taking naps, drinking herbal teas, gathering with friends and family, exercising by walking and tending to gardens have all influenced this.

People in Ikaria live in mountain villages that necessitate activity every day. They also have a diet that is very high in olive oil, fruits and vegetables. About 150 kinds of vegetables grow wild on the island. These greens have somewhere around ten times the level of antioxidants in red wine.

The value for Ikaria is 4.

Indicator 41: Safety

a Rationale

If you have food on your table and a roof over your head, you are less likely to commit a crime. "A hungry man is an angry man", is an ancient proverb. All human beings have basic needs, including food and shelter. Community, education, and economic opportunity follow soon after.

Safety is the state of being secure and protected from harm and danger. A safe place needs to provide freedom from crime, a peaceful environment, and quality health outcomes. It also requires an economy that allows governments to support their people and individuals to earn enough wealth to fulfil their basic needs.

Can islands provide low crime rates, no ongoing conflict or militarisation, good healthcare and health outcomes, economic prosperity and negligible environmental threats?

Ranking low on one aspect of safety affects the totality. Small island Zmiinyi (Snake Island) in the Black Sea is only 17 ha with a population ranging from 30 to 10 (depending on whom you ask). On February 24,

2022, supported by the Russian cruiser Moscow, it was attacked and invaded. Crime, healthcare and money suddenly lost importance as war hit the island.

Security is not so easy, to sum up.

b Definition

The assessed sum of crime rates, conflict, healthcare, health outcomes, economic prosperity and environmental threats; and the ability to call for help if needed, which is not always a given fact on some remote islands.

c Computation

Aspect	Sources	1	2	3	4
Crime rates	National statistics, and the Current Crime Index				
Ongoing conflict and militarisation	Global peace index				
Healthcare	See indicator 36				
Health outcomes	See indicator 40				
Economic prosperity	See indicator 26, 28 and 29				
Freedom from environmental threats	See indicator 13 and 14				
Mobile coverage	National mobile operators				

d Example

Gozo, or Ghawdex in Maltese, is the island where Ulysses spent time with Calypso three thousand years ago. Gozo has an area of 67 km^3 and 31,000 all-year residents. Regular ferry services to Gozo began in the year 1241. For over 650 years, ferries went to and from Valetta, but nowadays, they run between the two new ferry terminals Cirkewwa in the northwest of Malta and Mgarr on Gozo. It takes 23 minutes by boat from the urban, hectic Malta five kilometres away.

Tourism is the main source of income in Gozo. Diving is a major attraction thanks to world-acclaimed diving sites, amplified by scuttled vessels creating interesting diving attractions and infrastructure serving the diving industry. In 2017, Gozo had 388,000 visitors, and whereof many were domestic day-trippers, but also 29,700 scuba-divers who spent 282,600 nights on the island. The whole contribution of the tourism industry in terms of expenditure amounted to around €180 million in 2017, which is equivalent to just under 50% of the Gozo GDP. International visitors stay for longer periods of time, spending more than day-trippers or domestic tourists.

Gozo is a fairly safe place to visit: street crimes, burglaries, and petty thefts are not major concerns. In 2020, there were 276 reports of theft. No underage people were caught in entertainment establishments; ten people were caught smoking in public places. Gozo Police has 30 fewer officers than required to have a full complement, but that does not seem to be a problem. A real estate agent states that the crime rate on Gozo has always been nearly non-existent "since we are an island where everyone knows everybody. Landlords leave the key in their front door when they go out." His view is well supported by statistics from Cambeo (an offspring of Google that produces safety reports from towns and places all around the globe).

More than half of the residents believe that a tunnel or a bridge between Gozo and Malta would improve life on the island, where the biggest problem is the lack of work. Malta, including Gozo, is not dependent on Russian gas but sources most of its wheat, barley and corn from Ukraine. In 2019, Malta rescued over 3,000 refugees at sea; in 2020, 2,300; and in 2021, 800. Being sheltered by Malta to the south, Gozo only receives a minor part of the refugees but seems to take fairly well care of them.

The computation for Gozo would be

Crime rates: 4

Ongoing conflict and militarisation: 3

Healthcare: 4

Health outcomes: 4

Economic prosperity: 3

Freedom from environmental threats: 3

4 + 3 + 4 + 4 + 3 + 3 = 21/6 sums up to 3.5. The indicator value for Gozo is 4. There is nothing to overturn the computation, resulting in a fair grade for this peaceful, sleepy, not as heavily populated place as "mainland" Malta and therefore greener and much more secure.

Indicator 42: Integration

a Rationale

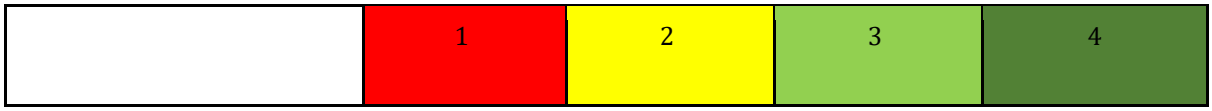
In an ideal island society, no one suffers from loneliness, and there are plenty of social connections. Small islands offer good conditions for togetherness and participation.

Activities of different associations and corresponding groupings provide a context for social interaction. As a newcomer, it is not always easy to enter a society, but active support and help can facilitate integration.

b Definition

Number of active compounds. Number of organised events and social events open to the public. Measures to include newcomers and alleviate loneliness and exclusion.

c Computation



a	Associations taking an active part in integration (not necessarily formal)	None	1-2	3-4	5 or more
b	Open events and/or information channels	None	1-2	3-4	5 or more
c	Active inclusion of newcomers	None	Measures and plans in this direction are taken	There is a person appointed for this task	There are several groups, persons or an organisation appointed for this task
d	Active prevention of loneliness and exclusion	None	Measures and plans in this direction are taken	There is a person appointed for this task	There are several groups, persons or an organisation appointed for this task
Sum of obtained values, divided by 4: (a+b+c+d)/4					

d Example

In 1961, the population of the Greek island Tilos was 789 people. In 1981 it was 301; by 1991 it had decreased to 258 due to emigration to the USA and Australia. Today, Tilos has 780 residents again.

Its former mayor, Anastasios Aliferis, was the island's doctor and an unusual bird lover. He mobilised over 6,000 ornithologists and the majority of the islanders in an appeal to make Tilos a natural reserve for birds that were formerly hunted. Of course, bird watchers came in thousands to Tilos.

The Greek island of Tilos has a strong tradition of integration. As the mayor of Tilos, Anastasios Aliferis wed two homosexual couples in 2008. As this is not allowed in Greece, he was threatened with imprisonment. The case was eventually dropped, but people who wanted to get married came to Tilos.

After Tasos passed away in 2012, his daughter-in-law Maria Kamma was elected Mayor. In 2015, refugees from the Middle East started entering Europe, the vast majority by crossing the Aegean Sea from Turkey to Greek islands less than 6 km from the Turkish coast, such as Chios, Kos, Lesbos, Leros, Kastellorizo, Agathonisi, Famrakosini, Rhodes, Tilos, and Symi. At times, incoming refugees on some of these islands outnumbered the locals.

On Tilos, refugees were not only given only accommodation and residency; they were also given work and were integrated into the society. Most migrants in Greece live in camps, while Tilos has integrated 50 migrants. Maria Kamma may have turned her community into Europe's friendliest island, saying: "If this small island managed to do this, then it is a bright example that with a little bit of effort there will be no refugee crisis, no humanitarian crisis, there will be no refugee problem, not only in Greece but in all of Europe, too."

In 2019, Maria Kamma was re-elected as Mayor of Tilos.

It seems Tilos lands on 5 + 5 + 5 + 5 = 20 / 4 = 5. And, it is most certainly worth it.

Indicator 43: Voter turnout

a Rationale

Voter turnout is an indicator of trust in society and the political system in which it exists. Differences in voter turnout between nations tend to be greater than those between classes, ethnic groups, or regions within nations. Contradictorily, some of the factors that cause internal differences do not seem to apply globally. For instance, nations with better-educated populations do not have higher turnouts.

In the 2019 elections to the European Parliament, 51% of eligible voters participated. Of young people under 25 years of age, only 42% voted. Of those aged 25-39, only 47%.

An island is always in the lead in national elections: an example is Malta, with 90% voter turnout. Surveying recent elections in regions and countries with many islands in the 2020-2021 period, Malta is followed by Ireland (62.9%), Madeira (55.1%), Azores (45.4%) and Croatia (46.4%).

Interest in expressing one's opinion in democratic elections measures citizens' belief in the island society around them.

b Definition

The percentage of eligible voters who cast a ballot in an election.

c Computation

1	2	3	4
Less than 50	50-59.9	60-69.9	Over 70

d Example

Voter turnout of the June 2021 municipal elections in five former municipalities (polling districts) in the southwestern archipelago of Finland, which now form the municipality of Pargas.

Polling district	Entitled to vote	Turnout	Value
Iniö	166	77.1	4
Houtskär	444	72.1	4
Korpo	693	69.4	3
Nagu	1179	64.7	3
Pargas	9832	57.4	2

It seems the smaller the place, the more commitment. Both Iniö and Houtskär would get an indicator value of 4.

Indicator 44: Island culture

a Rationale

When analysing the habitability aspect of your island culture, don't compare it with Leonard Cohen's Hydra or the island of Eigg in Scotland. Your main competitor is the societies on the coast, not other islands. The idea is to assess how well you take care of what's yours for the benefit of those who live there, those you want to attract, and visitors. Local culture is often used to entertain tourists. Be careful not to wear it down.

We look at seven aspects of local culture: the treasures of your island, either natural or cultural; the local museums displaying your cultural assets; if there is available information in printed form or on the web; if there are local guides and local paths; and if you are arranging cultural festivals.

b Definition

How well the islanders are taking care of the island's own local culture.

c Computation

Aspect	1	2	3	4
Natural, cultural and historical treasures	Many treasures have been destroyed or are at risk	Mischiefs and environmental destruction occurs	Relatively well kept	Very well kept
Local museum(s) displaying your history, art, handicraft, nature	No local museum	One fairly good museum	A local museum that displays the island's culture very well	Several well organised museums
Available information about the island's nature, culture, songs, language and history in books and films	Information is missing	Many areas are missing important information	Good information in most areas	Lots of information in all areas
Available information about the island's nature, culture and	Information is missing	Many areas are missing important information	Good information in most areas	Lots of information in all areas

history on the internet				
Local guides	No local guide	There is a local guide but only for some areas	There are local guides, some very good (certified?), for most areas	There are very good (certified?) guides in all areas
Walking paths	No walking paths	There is a walking path but not very well managed	There are several walking paths some with signs and maps	There are several walking paths with signs printed and digital maps
Festivals	No festival	There is a yearly festival	There are several yearly festivals	There are several festivals attracting people from far away

d Example

Kihnu is an Estonian island in the Gulf of Riga with an area of 16.8 km2. It has been one of the remaining small municipalities of Estonia since the 2017 administrative reform when municipalities with populations under 5,000 merged. The other small communities are small islands, too: Vormsi, Muhu and Ruhnu. It was wiser and smarter to keep them self-governed.

On Kihnu, men have historically been absent to fish and hunt seals, being away for months. The role of women expanded beyond traditional gender roles and into every aspect of life on land. They took care of the farm, tending chickens and sheep, making clothes and fixing tractors. Often referred to as Europe's last matriarchy, the island community is primarily powered by the strength and resilience of women. Keepers of a culture so rich it became a UNESCO World Heritage in 2003.

Nowadays, the men still work away from Kihnu for weeks, mainly with construction. The women balance the responsibilities of farming, child-rearing and daily life with the inherited duty of maintaining ancestral traditions. They drive old Russian army motorcycles with side-vans, dressed in headscarves and striped, red skirts, take care of the lighthouse, lead church services and even dress up as Santa at Christmas.

The population of Kihnu is officially 700 people, whereof 400 actually live here all year round. They welcome 30-35,000 tourists per year. A trip to the island takes 3 hours from Pärnu and 1 hour from Manilaid. When the sea is frozen in winter, it is possible to drive to the island over the ice. There are only a few paved roads, two small food shops, a museum, a church, and a primary school with 36 children, down from over 100 children some years ago.

The local museum is superb, thematically well displayed, airy and well managed. The young Mayor (a man) is not dressed in a business suit but in a traditional sweater. The guides are excellent, teaming up and working well together.
It is easy to fall in love with the island and to understand its preconditions and why it became what it is. They are proud of what is theirs and score high in taking care of their culture:

Natural, cultural and historical treasures: 4

Local museum(s): 4

Available information in books and films: 4

Available information on the internet: 4

Local guides: 4

Walking paths: 4

Festivals: 4

4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 = 28 / 4. The amazing result of Kihnu leads to an undisputable 4.

Indicator 45: Population growth

a Rationale

In Northern and Western Europe, small islands have small populations and declining populations, while in Southern Europe, small islands have large populations, and numbers are quite stable. Growth is thus mainly an issue for islands in the Baltic Sea and the Atlantic Ocean. A population can grow by children born on the island or by immigration.

This is the 45th and last indicator of the habitability analysis. It is built upon the other 44 indicators, an entire syndrome of associated actions and events that lead to population growth, which we evaluate with the help of a brutal four-grade scale. The clearest indication of successful development of the attractivity of a society is a constantly rising island population.

b Definition

Population change in percentage of the resident population.

c Computation

1	2	3	4
Population change over the last ten years is negative	Population is stable	Population change over the last ten years has been up to 5%	Population change over the last ten years has been more than 5%

d Example

One of the 15 inhabited islands of the region of Bretagne is Ouessant, a rocky landmass some eight by 3 kilometres. The dangerous waters around Ouessant are amongst the most troublesome in the world, with a 10-knot tidal stream and numerous sharp reefs both over and under the water surface.

The official population number of Ouessant is 834 (2016), but it is really 805 (2021), having been reduced by half since 1968. In summer, the population is at least 2,000, and the number of second homes is now reaching 500. There are about 150,000 one-day visitors per year to the island. In the summertime, they can be over 1,000 a day.

The Mayor of Ouessant, Denis Palluel, a teacher by profession, founded the inter-island organisation “Les îles du Ponant” (AIP) in 1971. They initiated measures to maintain the population of these islands and started to cooperate with the University of Brest (UBO) and professor Louis Brigand. An island project brand was developed within a network of companies, supported by a research program. A yearly island

festival has been organised to make discussion and engagement possible and as an affirmation of the French island identity. Eventually, the university initiated interdisciplinary and interinstitutional research on island issues, focusing on three of the islands (Ouessant, Molène and Sein), including offices, labs and lodging on the islands.

In 2016, a formal contract was set up between AIP and UBO, leading to a feasibility study in 2017, a partnership with the regional authority of Brétagne and the development of support and structures for residents, local authorities and researchers. A master's program and a summer university, both based on the islands, were developed.

This turned out to be the most comprehensive support program for maintaining habitable islands in Europe. As a gift from above, the first baby was born in 2017 on the island of Ouessant for a good thirty years. The baby, Léanie, decided to enter the world while her mother was waiting for the ferry. Firefighters and the island doctor were called for, and the future mother was placed in the fire truck and taken to the airfield where the baby was born while waiting for the arrival of the mainland medical services.

"Les Ouessantines are like that; they never want to leave!" commented a resident in national media. "She hadn't time to go as she had to take care of her job at the local supermarket."

Sad to say, the score for Ouessant is 1. But, Léanie gives us hope.