Energy audit on Bere Island

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1 Introduction

In 2014, Bere Island joined the SMILEGOV[1] project through its membership in the *Comhdháil Oileáin na hÉireann* (Irish Islands Association) and subsequently in the *European Small Islands Federation* (ESIN). The objectives of SMILEGOV, funded by the IEE at the European Commission, is to establish a clear picture of the island's energy consumption, its emissions and how it is it supplied with energy, moving into an action plan for a more sustainable future, and to invite the island to join the Pact of Islands[2].

1.1 Process

The work has mainly been carried out by Senior Advisor Christian Pleijel, formerly at Sweco, now an independent consultant and the Vice President of ESIN (*European Small Islands Federation*), with the kind help of Mr John Walsh, Coordinator at the Bere Island Projects Group Ltd, and cathaoirleach at the *Ionadaí Oileáin Chorcaí*, with local support from the Bere Island Energy Group, from the Irish Islands Association and from the Cork County Council.

1.2 Methodology

The island has been observed from six different perspectives, a method described and used in Christian Pleijel's book on the small islands of Europe[3]: (1) Facts, (2) Identity and culture, (3) Optimism, (4) Pessimism, (5) Possibilities, and (6) Actions. The reason for not solely describing the energy is that issues such as energy and mobility are closely related to tourism, trade & industry, transports, healthcare, culture, schools and demography.

Islands are miniatures of the world, solitary, clearly separated from the mainland by the sea. Being small, distant and vulnerable, an island needs to plan and develop itself in a cohesive and continuous manner, handling the complexity of local, regional and European politics, combining small scale and big scale. In my opinion, the *West Cork Islands Integrated Development Strategy* does this an excellent example of such integrated planning. However, this is an attempt to further elaborate the energy side of developing the island.

I am solely responsible for all the opinions, arguments and facts and faults in this report.

September 2015,

Christian Pleijel

[1] http://www.sustainableislands.eu/
[2] http://www.islepact.eu/html/index.aspx
[3] http://europeansmallislands.com/how-to-read-an-island/

2 Summary

Baseline Year	2013
Population	209 / 320 residents
ENERGY CONSUMPTION	
Agri diesel	1,471 MWh
Boat diesel	1,470 MWh
Butane gas	59 MWh
Coal	530 MWh
Briquettes	58 MWh
Pellets	177 MWh
Heat oil	1,118 MWh
Electricity	1,001 MWh
Sum of energy consumption	**5,884 MWh**
Per capita 209 /235	28,153 kWh / 18,390 kWh
EMISSIONS	
Agri diesel	466,690 kg CO_2e
Boat diesel	438,828 kg CO_2e
Butane gas	10,856 kg CO_2e
Coal	196,160 kg CO_2e
Briquettes	62,858 kg CO_2e
Pellets	2,312 kg CO_2e
Heat oil	284,515 kg CO_2e
Electricity	462,444 kg CO_2e
Sum of emissions	**1,924,663 kg CO_2e**
Per capita 209 /235	9,209 kg CO_2e / 6,015 kg CO_2e
LOCAL ENERGY PRODUCTION	
None	

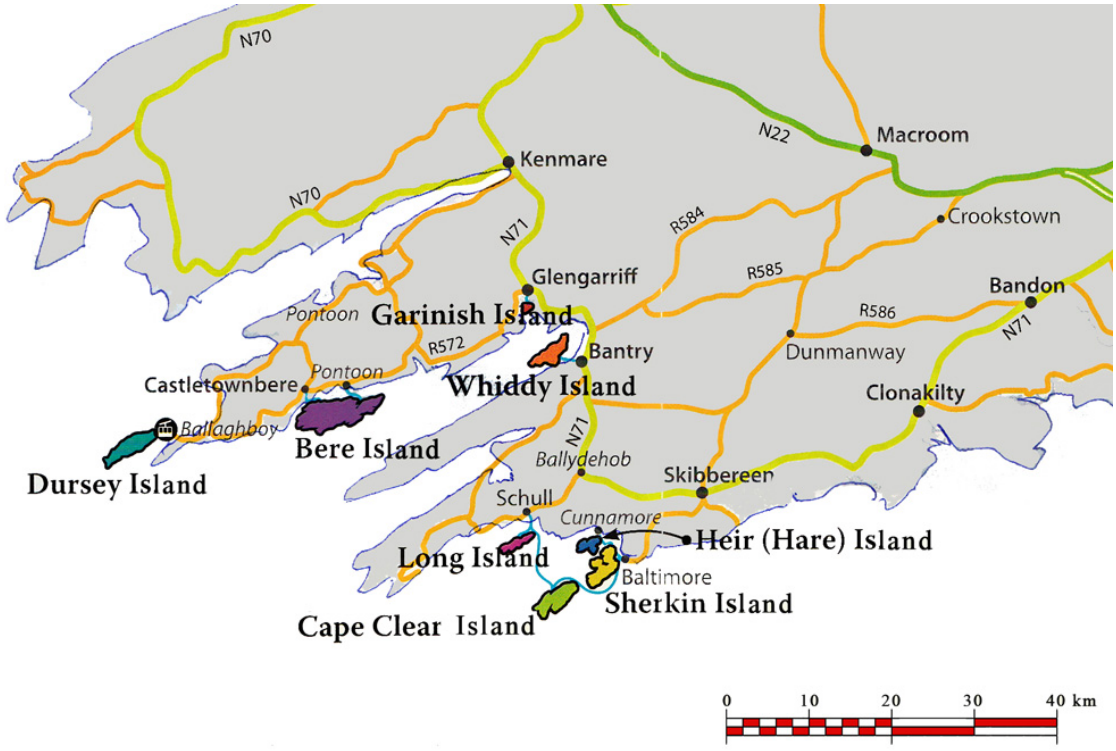
ACTION PLAN

Installation of 8 hot water solar panels (5% housing stock)

1 kWp polycrystalline photovoltaic system

3 Wind turbines ranging from 100 Watt up to 12 kW

1 self sufficient domestic off-grid installation



3 Facts

3.1 Bere island

Bere Island is the largest of the eight islands off the west coast of Cork. It is located in Bantry Bay. The ferry port at Casteltownbere is roughly 60 km from Cork and 48 km from Kenamre in County Kerry.

The island has an area of 17,7 km^2, being about 10 km long and 3 km large, situated 2 km offshore from the town of Casteltownbere, the largest white fishing port in Ireland.

The Slieve Miskish and Caha Mountain ranges of the Beara Peninsula tower over the island providing a dramatic backdrop.

The island's strategic position is at the mouth of Europe's deepest harbour. Berehaven and Lawrence Cove offer unrivalled shelter for boats of all sizes, something settlers have recognised since the Bronze Age – as the Druid's Altar wedge tomb, St. Michael's Holy Well, a scattering of standing stones and rings, Martello towers, and military fortifications dating from the late 17th Century.

3.2 Population

There are 209 inhabitants with 95 continuously occupied properties. The figure rises in the holiday season by 200-300 people.

The island also has some 18,000 visitors a year.

The human pressure on the island's fresh water system, on energy supply, on sewage and waste handling, postal services, healthcare, rescue, roads and ferries should be calculated as follows:

Residents (365 days)	209	76,285
Summer residents (90 days)	250	22,500
Visitors (1 day)	18,000	18,000
Sum		116,785

16,785 man-days divided by 365 gives 320. The number of people using Bere Island as a human society is equivalent to a population of 320. That is the base or calculating the island's ecological footprint. From an infrastructural and a sustainable perspective, Bere Island serves 320 people, not 209.

3.3 Governance

Bere Island is a part of County Cork.

On the island, there is a *Bere Island Project Group*, a community development group made up of volunteers from various sectors of the island community. The geographical nature of the island provides a distinct community with defined borders within which the projects group acts. The group focuses on development that will provide opportunities for the population to remain on the island into the future.

The group is involved in a diverse range of projects such as island health survey, heritage plan, and all island Rural Enterprise Protections Schemes (REPS). They work with local and national government bodies to create services such as employment schemes, road improvements, pier repairs, waste management and childcare initiatives with the aim to improve the quality of life for the islanders.

The business model for the project is the cooperative model with €1 share available to all islanders over the age of 16 including people with holiday homes and emigrants that now live off the islands. Profits would be used as seed capital to leverage other funding for the island. The wider community are kept informed of progress through public meetings, the Bere Island Newsletter and through www.bereisland.net.

The *West Cork Islands Integrated Development Strategy* was finalised in 2010[4] under Assistant County Manager Theresa White, chair of the West Cork Island Interagency Group. As a consequence, the West Cork Islands Community Council was launched early 2012.

[4] http://www.askaboutireland.ie/enfo/irelands-environment/county-focus/cork/islands/west-cork-islands-strategy.pdf

John Walsh told media they (Bere) were delighted with the setting up of the council, adding "this is the first time the seven inhabited of West Cork islands will be represented by one structure and this will be a positive step forward for the communities living there."[5]

The council's role and functions are:

- Collective representation of interests of all seven inhabited West Cork Islands
- Assistance with the implementation of the Integrated Strategy for the West Cork Islands in conjunction with relevant agencies;
- Promoting public awareness of the West Cork Islands as an entity and island group, while recognising the individual differences and specific issues pertaining to each individual islands.

A website for the all of the seven islands was launched in 2012: http://westcorkislands.com/

3.4 Public service

There is a primary school on the island with 19 children, a full time nurse and a doctor who comes once a month.

3.5 Trade & Industry

There are 19 businesses on the island: builders, boat builders, a marina, a mechanic, a journalist an administrator and a fish farm on the island.

There are two pubs on the island, no hotel but a hostel, guest houses and B&B.

There are opportunities for a hotel, for marine activities, painters, welders, engineers, aquaculture and bar staff. There is an eCentre offering broadband, meeting room facilities and networking opportunities.

Beara Tourism and Bere Island Projects part funded the rollout of ADSL broadband over the years. This covers up to 7 mbits. Plans are to upgrade to 26 mbits with a new radio link, which works up to 1 Gig, or fibre across Berehaven Harbour.

3.6 Access and transport

5 http://www.corkcoco.ie/co/pdf/786082054.pdf

The distance from the island to the mainland by ferry is about 2,000 meters. Nearest port is Castletownbere or Pontoon, roughly 136 km from Cork and 48 km from Kenamre in County Kerry.

Nearest airports are Cork (134 km from Casteltownbere) and Farranfore (99 km from Casteltownbere). Kent railway station is located 9 km from Cork Airport. Killarney railway station is nearer to Casteltownbere but does not have as frequent services.

Roll-on roll-off several times a day, the trip takes about 10 minutes.

One of the ferries has capacity for 4 cars and up to 75 passengers, boarded from the slipway for both passengers and vehicles, which is easier for wheelchair access. The other ferry can accommodate 60 passengers and 4 vehicles using both a slipway and a pier.

On arrival to the western end of Bere Island at Derrycreeveen there is a sheltered area with a public toilet for passengers waiting for the ferry, recycling facility, car park, bring bank, a lookout restaurant and a number of fishing boats/trawlers.

On arival to the eastern end of Bere Island from Lawrence Cove there is a quay and the small village of Rerrin, which has a shop/post office and a number of guest houses. The hostel is also located here.

Journey time to work, school or college for people on Bere island is[6]:

Under 15 min	35 persons
15-30 min	26 persons
30-45 min	11 persons
45-60 min	0 persons
1 – 1,5 hrs	5 persons
Over 1,5 hrs	1 person

It seems 35 people are working on the island and 43 are working or studying on the mainland whereof most in or around Casteltownbere.

3.7 Water supply

Bere has two independent water systems, both taking water from a lakes in the island, treated via filtration and chlorination.

There are sporadic problems with the water and there are some plans to connect the island to Casteltownbere by an underwater pipe. It is identified in the Water Services Investment Program at a cost of about 8 million euro.

3.8 Energy

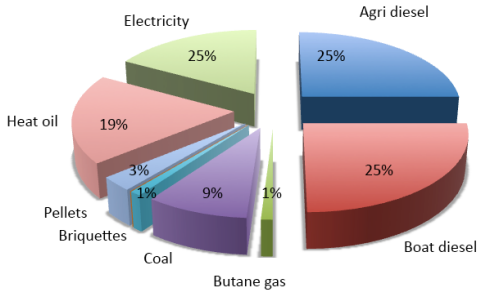
The island depends heavily on fossile fuel products for its energy use which is 100% imported and not renewable.

The island is served by three-phased electricity supplied via a cable from the mainland.

[6] West Cork Islands Integrated Development Stategy

People on Bere Island use energy for heating, transports and common services (freshwater, sewage, waste and street lighting). In 2011, Bere Island's 95 households and 19 businesses and public services used the following amounts of energy:

Agri diesel	144,800 litres
Boat diesel	1,136,850 litres
Butane gas	4,200 litres
Coal	64 tonnes
Briquettes	11 tonnes
Pellets	34 tonnes
Heat oil	112,361 litres
Electricity	1,000,549 kWh



This sums up to 5,884 MWh, which per capita counting 209 inhabitants is 28,702 kWh/y, counting 235 inhabitants it is 25,472 kWh/y[7].

Sea transports – getting to and from the island – account for 25% of the total energy used.

3.9 Emissions

The emissions from the island consist of sewage, waste and greenhouse gas (CO_2-equivalents), of which the latter should be balanced against Bere's ability to store carbon (not calculated here). Since Bere is an island, part of the sea area surrounding the island should also be included in the calculation its of carbon storage ability.

(a) Sewage

Wastewater treatment on the islands is generally comprised of individual on-site septic tanks or treatment systems.

The sum of sewage on the island can be estimated to 160 litres x 231 man-days x 365 days = 13.5 million litres. Most of it is grey water (from showers, bath, dish and washes) and a smaller part is blackwater from toilets comprising bacteria, nutrigents and medicine spill.

(b) Solid waste

There is no data on how much solid waste is produced on Bere a year.

The community undertakes to collect waste and bring them via ferry to the mainland piers, where a private company makes a weekly collection.

The island's recycling facility for glass, cans etc is excellent.

(c) Greenhouse gas[8]

[7] European average is 28.439 kWh/p/y

[8] Human emissions of CO_2 have augmented from 270 ppm to 380 ppm in 100 years. Parallel to this, the average temperature on Earth has increased with almost 1°C. We call this the 'greenhouse effect', gases contributing to this are carbon dioxide (CO_2), nitro-

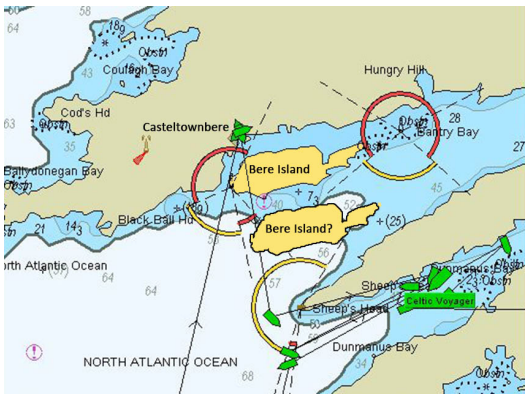
On Bere, the total yearly emissions of greenhouse gas are almost 2,000 tonnes of CO_2e. Sea and road transports are the main sources, followed by use of electricity.

A Bere resident emits 9,2 tonnes of CO_2e a year, 8,3 if the inhabitant number is considered to be 236.

gen oxide (NO_x), methane (CH_4), freones, water steam and ozone. Carbon dioxide is the most frequent by volume with 379,64 ppm (2015). Although the degree of methane is low, methane is 25 times more efficient than carbon dioxide in producing heat. This is why all gases should be included in discussions on temperature changes and possible actions on lowering their effects. In order to measure this, CO_2-equivalents (CO_2e) are used, which define the amount of any greenhouse gas needed to produce as much heat as CO_2. One kilo of methane gas has the same effect as 21 kg carbon dioxide.

4 The culture and identity of Bere Island

The identity of Bere Island and its inhabitants is much related to the sea and to its military history. They have a very strong local community.



The real and the perceived distance to Bere

Bere is not so remote counted in kilometres but it is quite distant counted in time.

Bere is 2 kilometres, from the port of Casteltownbere. The trip takes about 10 minutes. People are used to voyage at 70 km/h and perceive the distance to be 7, not 2 kilometres.

Because of the distance in time, many people (especially visitors) see the island much more remote than it really is. This is true for most (small) islands and affects the willingness to live and work small islands, generally.

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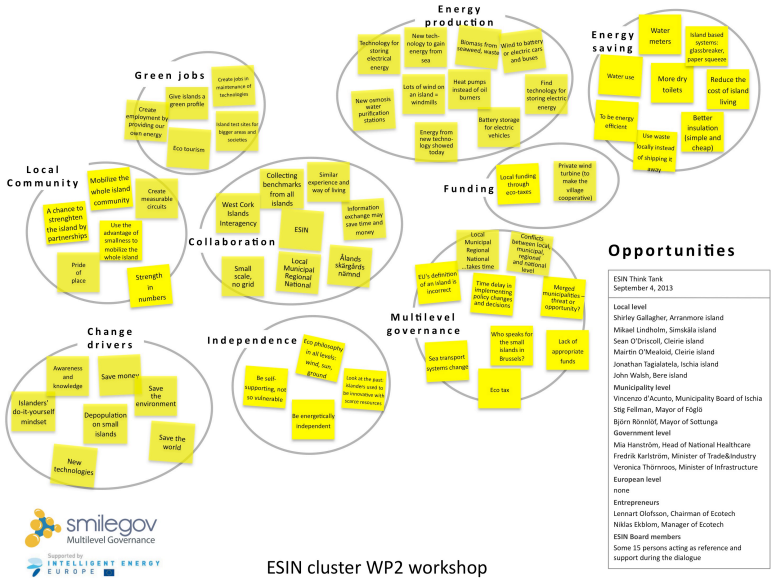
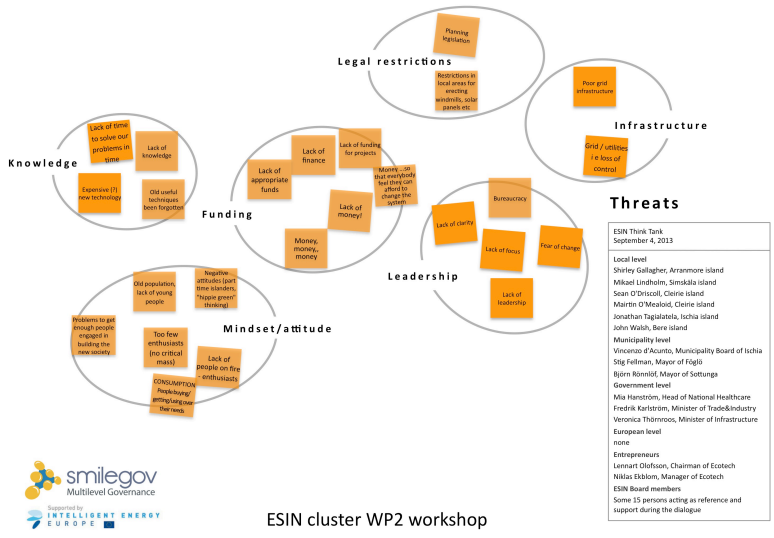
5 Optimism



ESIN cluster WP2 workshop

At an initial Smilegov workshop in Mariehamn, September 2013, the ESIN cluster islands including John Walsh from Bere island, made a Metaplan summary of common opportunities (see above).

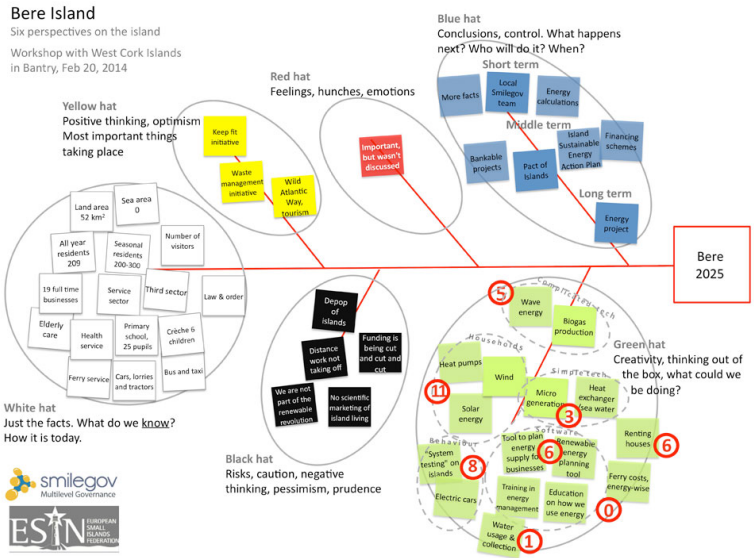
6 Pessimism



ESIN cluster WP2 workshop

From the same workshop: a metaplan summary of common threats.

7 Possibilities



On a Smilegov workshop in Bantry, February 2014, Bere made a ”fishbone” analysis of its general situation 2025 summarising six different different aspects of the future for the island.

The Bere Island Projects Group reported the following possibilities on short, medium and long term:

Short term 1-5 years

- Energy reduction scheme and awareness education
- Increase uptake of domestic solar hot water
- Small scale wind and PV installations
- Increase biomass (wood and pellet) burners
- Plant biomass (willow, trees and miscanthus

Medium term 10-15 years

- Install <500 kW wind turbine
- Install 150 kW PV
- Increase biomass planting
- Investigate electric vehicle usage

Long term 10-20 years

- Increase wind power production
- Install tidal / wave production
- Use excess power for new business (protected cropping, manufacturing and electric vehicles)
- Export to national grid

Large scale power production

PROS:

- Grid power supply to BI usually constant and seamless
- Predictable surplus reducing power costs to BI
- Single source of renewable power to maintain and repair
- Grid supply to homes and businesses maintained by grid supply

CONS:

- Variable supply cost increases
- Grid supply not constant
- In 'outage' still no supply to BI even with renewable generator
- High cost of renewable installation
- Still part of an ageing long distance wasteful grid network
- Dependant on mainly non-renewables.

Small scale power production

PROS:

- Mix to give constant supply (bio fuel generator and pumped hydro to be on standby)
- Not all generating capacity in one form i.e. large wind turbine
- Can be added to, modified or adapted
- Independence from grid
- Unit price controllable

CONS:

- Legality
- Local agreement
- Landscape effects
- Loss of national grid sense of security
- Local Bere Island grid to be self maintained

8 Action Plan

What Bere Island wants to achieve now:

Installation of 8 hot water solar panels (5% housing stock).

1 kWp polycrystalline photovoltaic system.

3 Wind turbines ranging from 100 Watt up to 12 kW.

1 self sufficient domestic off-grid installation.