

BATEEIRO



Photographer: Luis Miguel Bugallo Sánchez (Lmbuga)
Source:
https://commons.wikimedia.org/wiki/File:A_Illa_de_Arousa_09.jpg
License: CC-BY-SA-3.0
Modifications: none

 **A ILLA DE AROUSA**

“The ship-to-grid solution is applied not only to reduce pollution, but also to support the local grid.”



This project is supported by the EU Islands Facility NESOI. NESOI has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N°864266

The European Islands Facility NESOI aims to unlock the potential of EU islands to become the locomotives of European Energy Transition. To do so, NESOI aims to mobilize more than €100 million of investment in sustainable energy projects to give EU islands the opportunity to implement energy technologies and innovative approaches, in a cost-competitive way. NESOI has selected 56 such projects across the European Union and provide them with financial resources and technical support.



BoAT ELectrification for the decarbonisation of the fishing sector at the Island of aROusa

ABOUT THE PROJECT

Project Promoters

ASOCIACIÓN DE MEXILLOEIROS ILLA DE AROUSA
 ORGANIZACIÓN DE PRODUCTORES DE LA PROVINCIA DE PONTEVEDRA
 CONSELLO REGULADOR DO MEXILLÓN DE GALICIA



Stakeholders

Local authorities

Mussel harvesting organizations

Boat industry

General public



Country Spain



Sector Mobility



PROJECT VALUE 950,000 €

DESCRIPTION

1) Feasibility study for the electrification of bateeiro boats, with the aim to decarbonise the fishing sector which is the main economic activity of the island.
 2) Study of a Battery Energy Storage System able to cover one working day in full electric mode, and to provide Ship-to-Grid (S2G) services allowing to transform the future moored fleets into energy storage systems supporting the local grid.

AIM OF THE PROJECT

The boat electrification solution developed by BATEIRO, combined with the development of a renewable energy microgrid on the island of Arousa will enable the reduction of GHG emissions as well as oil and fuel spilling in the sea. The project aims to follow the Sustainable Development Goals of 2030, by attracting new generations to the mussel fishing industry while improving the quality of the product.

FUTURE STEPS

The S2G solution developed by BATEIRO will provide a means for Arousa's future fleets to integrate renewable energy sources (RES) and act as battery energy storage systems that can cover peaks in the local demand, giving stability to the grid, providing a higher penetration of RES in the island, and therefore achieving a real impact towards the island's decarbonisation effort.

HOW THE EU ISLANDS FACILITY NESOI SUPPORTS THE PROJECT

- 1 Analysis of existing planning documentation, identification of the project boundaries and existing planning constraints.
- 2 Assessment of the key project sizing drivers.
- 3 Identification of suitable technological options given existing project sizing requirements.
- 4 Definition of the required environmental permitting procedures.
- 5 Cost Benefit analysis and socio economic and environmental impact evaluation.
- 6 Definition of the technical, economic and financial, fiscal project inputs.
- 7 Risk analysis and identification of available mitigation strategies.
- 8 Assessment of existing procurement options (e.g., tender, PPP, etc.).
- 9 Financial modelling and identification of target scenario.
- 10 Identification of financing/funding options.
- 11 Action plan and identification of project monitoring procedures.





BATEIRO

BoAT ELectrification for the decarbonisation of the fishing sector at the Island of aROusa - Interview

INTERVIEW WITH

Virginia Gómez Luengo
and Laura López Ferrer

SFICE Innovative Minds, S.L.



Q: How was the project initially designed? Why choose this specific technology?

A: This project was initiated by the Asociación de Mexilloeiros Illa de Arousa to help avoid bateeiro boats from consuming fossil fuels to move and in the cranes that lift the mussels from the rafts. Additionally, when there is a problem on board, ships spill diesel into the sea, which involves environmental problems. The cropping and collection of mussels from the rafts is the main economic activity of the island. Therefore, a certain technological evolution was needed to try to attract young people to this type of work, using new technologies in the bateeiros, and improving working conditions. The Asociación had different ideas: some involved the electrical conversion of the fleet. This reconversion could be carried out based on battery or hydrogen propulsion. Based on these ideas, the Asociación de Mexilloeiros Illa de Arousa contacted SFICE Innovative Minds, S.L. and Soluciones Generales de Ingeniería, S.L. (SGI) to initiate the NESOI funding application. The use of electricity storage batteries was chosen because they are the most feasible technology to decarbonize the fleet of bateeiro boats.

Q: What were the challenges? How does NESOI help overcome them?

A: BATEIRO faced several challenges, including technological, economic, and legal issues. Bateeiro boats require specific design for propulsion engines and cranes for mussel collection. Developing electric motors for these boats was challenging, and gaining the trust of fishermen was a challenge. The project retrofitted existing ships to ensure safety, but also faced high costs and financing issues. Subsidies were crucial for the project's success, and legalizing and certifying the new systems at the European level was a minor challenge.

Q: What are your next steps towards clean energy transition, beyond this project?

A: The main obstacle to the project is economics, as subsidies are needed for the first demonstrator or pilot. The Asociación de Mexilloeiros Illa de Arousa has been working on it since 2019. NESOI has provided crucial information and prepared deliverables for the European Commission. The Local Councillor of Environment is also actively involved in other initiatives.

THE IMPACT

ON LOCAL COMMUNITY



1 Local Economy

The population of the island is 4,926 people, and the main economic activity of the island is mussel cropping comprising around 48% of the island workers. Moreover, more than the 90% of the island workers are dependent to the sea sector. The main concern is the aging of the 400 to 500 workers which aim to attract the new generations to the mussel harvesting sector by improving the boats increasing the investment in innovation and progress towards sustainability.

2 Social Acceptance

The population in Arousa is fully dedicated to its island's decarbonisation agenda and as such they participate in communal events to co-design and develop the decarbonisation objectives and pathways. The general population has a positive point of view regarding the change of boat technologies and therefore it is foreseen that all inhabitants will be in favour of BATEIRO.



BATEIRO

BoAT ELectrification for the decarbonisation of the fishing sector at the Island of aROusa – Technical Data

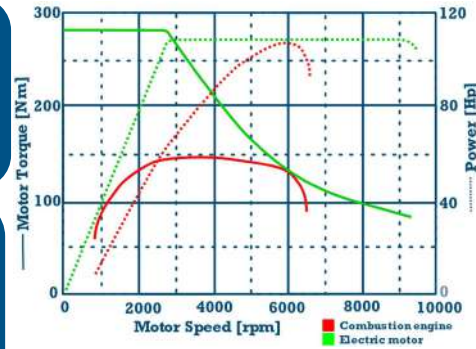
FOCUS ON

BATEIRO FISHING BOATS AND THE HYBRIDIZATION OF BATTERIES AND FUEL CELLS

A “bateiro” is a flat-bottomed boat between 15 and 20 long. It is designed for the breeding and harvesting of mussels with a set of mussel processing machines and a crane. They are located, among others, on the island of Arousa, Galicia, Spain where there are about 110 vessels dedicated to mussel harvesting. Bateiros usually have two diesel combustion engines and therefore emit nitrogen oxides (NO_x), nitrous oxide (N₂O), sulphur dioxide (SO₂) and PM10 and PM25 particles.

Due to the quality of the fuel, the incomplete combustion and the age of the engine, it is estimated that these pollutants have a high polluting influence. There are several solutions to reduce pollutants. These include the use of batteries and fuel cells. Combining the use of these with the diesel combustion engine would provide a much cleaner hybrid solution. Depending on the feasibility, these technologies could replace the main diesel engine, the auxiliary engine or even both.

In the hybridization case of the BATEIRO Project, the main objective is to reduce the emissions of the diesel combustion engine as much as possible, therefore Plug-in hybrid (PHEV) will be used so that the set of batteries and an electric motor are responsible for propulsion and power supply of the electrical systems.



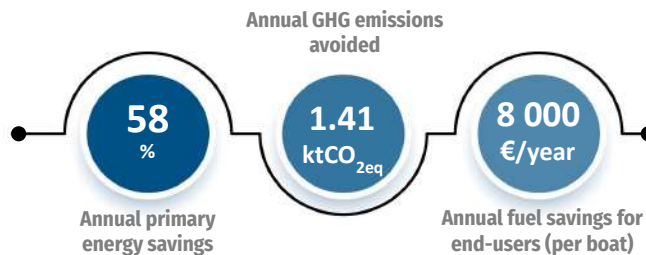
Electric motor and combustion engine torque and power curves

A comparison between torque and power curves of a hybrid system that combines a combustion engine and an electric motor, where the solid and dashed lines indicate the torque and power respectively for a combustion engine (red) and an electric motor (green).

EXPECTED ENVIRONMENTAL BENEFIT

One of the more important greenhouse gases carbon dioxide (CO₂) that according to previous studies it is estimated that for each bateiro 29 tons of CO₂ are emitted every year into the atmosphere which contributes significantly to the greenhouse effect. Considering that there are 110 bateiros on Arousa Island, it is estimated that 3,190 tons of CO₂ are emitted every year into the atmosphere exclusively by these mussel boats. However, all energy use of the bateiros (both for moving and treating the mussels), can use renewable energy if the boat is coupled with batteries and electric engines substituting the diesel ones and this can enable a reduction of CO₂ and oil spilling if the solution is adopted and deployed in a range of similar fishing boats.

KEY NUMBERS OF THE PROJECT



REPLICABILITY IN OTHER ISLANDS

As the zone (not only Arousa Island but also Galicia, Spain) accounts for around 1200 bateiros with similar routines, dimensions and machinery, there is a high level of replicability not only in Galicia but also for any other European island using bateiro fishing boats. After the technology is developed for this use, it can be exported to other marine communities with similar uses, loads and/or working times. Vigo’s port 78% of non-leisure boats are dedicated to fishing where the most part is focus on national fishing. Only in Arousa island there are 1639 boats dedicated to inshore fishing and about 890 dedicated to aquaculture which gives an approximation of the scalability in the region.