

Renewable and energy efficient solutions for local dwellings dammusi

RENEWDAMMUSI



"The project proposes a new approach to energy transition for protected heritage buildings and islands under landscape constraints."



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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.

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ABOUT THE PROJECT

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RENEWDAMMUSI studies Dammusi, the main building stock type most largely diffused in the Italian island of Pantelleria. Dammusi are unique vaulted buildings, dating back to the Byzantine era and made with local volcanic stones.

Project promoter

Ente Parco Nazionale Isola di Pantelleria

Scountry Italy

Sector Energy efficiency

DESCRIPTION

The project investigates, enables and encourages the application of technological solutions for energy efficiency and self-sufficiency of such precious architectural heritage elements: heat pumps, shell thermal insulation replacement of windows & doors, building-integrated PV systems and solar thermal panels, geothermal probes.

AIM OF THE PROJECT

The main expected impacts on the island environment are: 1. a consistent decrease of the

- primary energy demand for the residential sector
- a reduction of carbon emissions related to the residential electricity supply
- a reduction of energy poverty
- an overall increase in distributed power generation and RES share in the island electricity mix

FUTURE STEPS

PROJECT VALUE 14 M€

IFWNAMN

RENEWDAMMUSI, starting from the interaction with the regional regulatory players, has the ambition to open the way to similar actions on several other islands, proposing a new model of rural buildings development at a national and Mediterranean Sea scale.

HOW THE EU ISLANDS FACILITY NESOI SUPPORTS THE PROJECT

- Assessment of the key project sizing drivers
- Creation of technical guidelines for the renewal of the local building stock
- Definition of the required environmental permitting procedures
- Cost Benefit analysis and socio economic and environmental impact evaluation
- Definition of the technical, economic and financial, fiscal project inputs
- Risk analysis and identification of available mitigation strategies
- Assessment of existing procurement options (e.g. tender, PPP, etc.)
- Financial modelling and identification of target scenario
- Identification of financing/funding options
- Action plan and identification of project monitoring procedures
- 1 Technical support in communication and dissemination of the results



Centro abitato di Pantelleria, Italy (2008)

Photographer: Luca Conti; Source: https://commons.wikimedia.org/wiki/File:Pantelleria_North.jpg; License: CC-BY-SA-2.0; Modifications: none



RENEWDAMMUSI

Renewable and energy efficient solutions for local dwellings dammusi - Interview

INTERVIEW WITH

Sonia Anelli and Gaspare Inglese Ente Parco Pantelleria



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

A: Dammusi are typical buildings of Pantelleria (there are many historic ones but also some newly built ones that have similar characteristics) which present high potential for energy efficiency and installation of renewable energy systems but also notable barriers linked to the historical, architectural and landscape aspects that they hinder the implementation of typical interventions carried out on other buildings.

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

A: The project made possible to analyze different types of dammuso, both ancient and newly built, to try to standardize energy efficiency interventions and integration of renewable sources in line with current regulations. The collaboration with NESOI made it possible to involve a multidisciplinary pool of technical experts (architectural, plant engineering, financial, etc.) both local and international dedicated to the execution of the project, overcoming the barriers linked to the reduced availability of technical experts for the institution. Furthermore, potential sources of financing for the implementation of the interventions were identified.

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

A: The last step of the project involves meetings with the Superintendence to define a replicable approach to the implementation of the interventions studied on the dammusi, to avoid proceeding on a case-by-case basis, which requires considerable effort and long times to obtain authorizations. Further activities will be focused on finding funding for the implementation of interventions on the dammusi, taking into account the potential funding sources identified in the project. The island of Pantelleria has joined the CE4EUI initiative; the Pantelleria national park collaborates, together with the Municipality of Pantelleria, with the Polytechnic of Turin to identify technical solutions to achieve energy self-sufficiency based on renewable sources by 2030. Furthermore, interactions are underway with the Sicilian region regarding the possibility of installing mini-wind farms, currently prohibited by regional legislation on the smaller islands.

THE IMPACT

ON LOCAL COMMUNITY



Local Economy

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- Improvement of living conditions, thanks to an increase in the thermal comfort of buildings (which are nowadays largely under-heated in the winter season due to the absence of adequate thermal plants)
- High capital attraction in the area
- Beneficial effects on the overall island economy (included accommodation facilities for imported manpower).

Social Acceptance

- Three engaged authorities (PNIP, Pantelleria municipality, Superintendence for the cultural heritage)
- Local stakeholders' engagement (technicians, ESCos, construction sector, installation companies) and creation of a public register of companies
- High use of local manpower and import of manpower from mainland
- Commitment of human and economic resources by PNIP in communication campaigns



RENEWDAMMUSI Renewable and energy efficient solutions for local dwellings dammusi – Technical Data

FOCUS ON TECHNICAL SOLUTIONS FOR THE RENOVATION OF TYPICAL LOCAL DWELLINGS

RENEWDAMMUSI investigates, enables and encourages the application of several cutting-edge technological options for the energy efficiency and self-sufficiency of Pantelleria listed buildings. Dammusi, the most largely diffused construction on Pantelleria (~70% of the overall building stock, >90% within the National Park area), are unique vaulted buildings, dating back to the Byzantine era and made with local volcanic stones (ignimbrite). Over the centuries, this type of building has undergone considerable architectural changes. Nonetheless, there's nowadays a need to make further progress to enable the integration of advanced energy technological solutions within such precious architectural heritage elements.

As a consequence, RENEWDAMMUSI analyses a batch of representative buildings, studies their thermophysical characteristics and evaluates the applicability of the following technological solutions on the building stock: (1) Coverage of thermal loads (heating/cooling and DHW) by heat pumps, in substitution of electric fires and fireplaces, which are highly expensive and do not ensure the comfort standards; (2) Shell thermal insulation through different techniques; (3) Replacement of windows, doors and glasses of the building envelope; (4) Distributed electricity production through building-integrated PV systems, in particular on terrace coverings and outbuildings; (5) Thermal energy production through building-integrated solar thermal panels; (6) Thermal energy production through geothermal probes; (6) Implementation of projecting roofs for EVs recharge and PV systems installation.



Dammuso of Pantelleria island, Italy (2013) Photographer: Sabbo65; Source: https://commons.wikimedia.org/wiki/File:Pantel leria-dammuso.jpg; License: CC-BY-SA-3.0; Modifications: none

EXPECTED ENERGY AND CARBON EMISSION SAVINGS

Primary energy savings are estimated in 9,700 MWh/yearThis value is calculated using the primary energy conversion factor related to the specific island electricity supply mix (98% diesel generation), i.e., 0.31 MWh_el/Mwh_pe. The factor was calculated from data provided in Pantelleria CETA (reference year: 2018; total electrical consumption: 31'070 MWh/year; diesel consumption for power generation: 100'170 MWh). Avoided GHG emissions were estimated in 2,600 tCO₂/year. This value was calculated using the CO₂ emissions conversion factor related to the specific island electricity supply mix (98% diesel generation), i.e., 861 kgCO2/Mwh_el. The factor was calculated from data provided in Pantelleria CETA (reference year: 2018; diesel combustion emission factor: 0.267 tCO₂/MWh; total electrical consumption: 31'070 MWh/year; diesel consumption for power generation: 00'170 MWh).



The RENEWDAMMUSI project combines local and international experts in energy transition, analyzing technical solutions for a dammuso building on Pantelleria. Although unique to Pantelleria, the approach can be replicated in other islands. Promoting the RENEWDAMMUSI project's results with regional, national, and European authorities can minimize difficulties faced by small, non-connected islands.

Picture in title page, photographer: copini, source: https://commons.wikimedia.org/wiki/File:Pantelleria_%281%29.jpg, license: CC-BY-SA-2.0, modifications: none Picture in page 1, photographer: mauro, source: https://commons.wikimedia.org/wiki/File:PANTELLERIA-dammuso.jpg, license: CC-BY-SA-2.0, modifications: none



REPLICABILITY

IN OTHER ISLANDS

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