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## Near zero energy islands in the Mediterranean: Supporting policies and local obstacles

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### HIGHLIGHTS

- A complete upgrading of the energy system and policy feasibility studies have been carried out.
- Implementation of renewable energy sources aiming at creating an energy autonomous system.
- Main difficulties for the implementation (national energy policies, specific local situation).

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### ABSTRACT

Based on a recent technical–economical analysis on the island of Pantelleria, a policy feasibility study for a complete upgrading of the energy system of this Mediterranean Island is carried out. Pantelleria, situated between Sicily and Africa, owns a large potential in terms of renewable energy resources, although there are some obstacles in turning it into a Near Zero Energy system. Starting from a deep energy system audit, the study proposes the project for a near zero energy island, through the efficient transformation of the different existing natural energy resources into electrical energy and heat: the solar, the wind-based and the geothermal systems. In this way, the island can be turned into an almost autonomous system. The main difficulties connected to the implementation of the project can be identified in the national energy policies as well as in the specific local situation, characterized by a strong private monopoly on generation and distribution of electrical energy which has no incentive for supporting the costs connected to the energy requalification of the island. On the other hand, the local administrations, involved in the project through bottom-up European policies, do not have the cultural and economic tools to go on with the implementation.

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### 1. Introduction

Since the seventies, the environmental issue is considered to be central in industrialized countries, in the increasing need to preserve the quality of the environment and with the consciousness that, while the resources of the planet decrease, the development models need a thorough revision (Ward and Dubos, 1972; IUCN et al., 1980). From the understanding that harmonizing land ecological management and human activities was the way to reach economic growth and improve the quality of life, the concepts of “Sustainability” and “Sustainable development” were elaborated. In 1987, the report of the Commission Brundtland on environment

and development, called “Our Common Future” was claiming that the world is facing a global challenge that can be dealt with only through the adoption of a new development model defined “sustainable”, namely “a development that meets the needs of the present without compromising the possibility of future generations to satisfy their own needs” (World Commission on Environment and Development, 1987). ‘Sustainable development’ therefore is an integrated concept where the three main dimensions about Environment, Economy and Society are conjugated. It is indeed clear that the environmental action cannot by itself face the challenge: each action plan or policy, indeed must take care of the cited aspects. In the same way, sustainable technological progress is therefore a necessary tool to reach the objective of rational use of natural resources while reducing the consumption of non-renewable sources, limiting the waste produced by human activity, as well as stopping the substitution of the natural heritage (territory, material resources, living species) with built heritage

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(transformed natural resources). One of the main pillars of sustainable development is the Kyoto protocol (1997) which indicates the international objectives for the reduction of polluting emissions, considered responsible for global warming that could lead to unforeseeable negative effects on climate. The protocol is an important step forward in the fight against global warming, since it includes constraining objectives that can be quantified in terms of reduction of the polluting emissions. Globally, the States listed in annex I of the agreement (namely industrialized countries) commit themselves to control their own polluting emissions, in the period 2008–2012, in order to reduce them by at least 5% compared to the levels in 1990. More recently, in January 2008, the European Commission presented an integrated proposal about energy provisions, climate changes and industrial development: the “Package on climate change 20–20–20”. The package summarizes the objectives that the European union wants to reach before 2020: 20% reduction in EU greenhouse gas emissions from the 1990 levels; raising the share of EU energy consumption produced from renewable resources to 20%; 20% improvement in the EU’s energy efficiency. Among the tools to be used to reach the emissions reduction, there is a strong change in the European Emissions Trading system. With the new package, new limits are indeed imposed to other polluting emissions except carbon dioxide: nitrous oxide (N<sub>2</sub>O) and perfluorocarbons (PFC). Besides, renewable energy sources are employed in three main fields: electricity, heating and cooling, and mobility.

## 2. Environmental policies for small communities and islands in Europe

In this general frame, the small Euro-Mediterranean islands have been interested by many different supporting policies for communities set out by the EU. As an example, the “Covenant of Mayors” is an initiative promoted by the European Commission to actively involve the European cities in a common strategy towards energy and environmental sustainability. The initiative was launched by the commission on January 29th 2008, within the second edition of the European Union Sustainable Energy Week (EUSEW). The Covenant, to which more than 1600 cities of any dimension, among which are 20 European capitals, have applied along with numerous cities of non UE member states, involves more than 140 millions of citizens. It gives the local administrations the opportunity to actively start bottom up actions against climate change. The actions are mostly oriented to the modernization of the administrations and directly have an effect on the quality of life of citizens. Clean mobility, energy requalification of public and private buildings and raising consciousness of citizens about responsible use of energy are the main sectors on which the actions of all the signatories administrations are designed. The latter commit themselves to meet the objective of reducing the polluting emissions by 20% before 2020, as conceived in the 20–20–20 strategy of the European Union. The Covenant of Mayors also represents an opportunity for the growth of the local economy, supporting the creation of new employment and leading to the development of Green Economy over their territory. The objective of the Covenant is also to help local administrations to take a leading role in the process of implementation of the policies. The subscriber administrations are engaged in sending their action plan for sustainable Energy (ISEAP), namely the tool in which policies and measures to be implemented to reach the posed objectives are outlined. The plan is a key document that aims at showing in what way the municipality wants to reach the objectives of reducing polluting emissions before 2020. Also the island of Pantelleria – which is analyzed in detail in this study – has subscribed recently (2011) to the Covenant of Mayors and the

Isle Pact. The latter is a European tool specifically designed to support the European island communities; the signatories commit themselves to meet the objectives fixed by the EU before 2020 guaranteeing, as specified in the decision approved by the European parliament in march 2007, that the particular environmental features of the islands are adequately protected. The aim is reached through the elaboration of adequate regional development plans controlling the building activity, and by the definition, with the European Commission, of integrated programs for the preservation of the cultural heritage and natural resources (European Parliament decision of march 9th 2007). More recently, the European institutions have focused their attention on cities and communities. Cities use about 70% of the energy consumed in EU. The European institutions rely on this enormous potential of energy saving to attain the global objectives as well as to develop a low carbon economy before 2050. Europe therefore encourages the growth of “intelligent” communities going towards “integrated and sustainable solutions able to reliably offer clean energy at good prices for consumers, reduce consumptions and create new markets in Europe as well as in other places” as defined by the European commissioner for energy Günther Oettinger. The term “Smart” for EU is referred to, in particular, those communities that are able to positively affect the urban quality following an evaluation based on economical, social, environmental, living and management parameters. The project call ‘Smart Cities and Communities’ is in the frame of the FP7 ‘Cooperation’ program concerning two main themes; Technologies for Information and Communication (FP7-ICT-2013.1.4; FP7-ICT-2013.6.2; FP7-ICT-2013.6.4; FP7-ICT-2013.6.6) and theme 5: Energy (Area Energy 7.1; Area Energy 7.3; Area ENERGY.8.8). It comprises the larger and ambitious European project to create a network of European smart cities before 2020. The cited call is part of the plan “Investing in the development of low carbon technologies” more commonly known as SET Plan (Strategic Energy Technologies for Long Term). It should create a prototype model of energy and cost efficient economic and urban development. The first call for the Smart City project is about 70–80 millions for restoration of the public and private buildings and energy infrastructures. The issues of energy autonomy and sustainable development in islands and remote communities are particularly important due to the fact that they serve to support the argument that a shift towards a more autonomous and sustainable energy model is achievable. As identified in Hain et al. (2005), remote community-level projects are ideal for the application of the principles of sustainable energy autonomy; this type of applications, often small – scale nature, constitutes testing grounds for methods, practices and technologies that could be used to facilitate a switch to a more autonomous energy model throughout the rest of the wider society (Michalena and Angeon, 2009; Indradip, 2006; Chen et al., 2007). Moreover a wide range of issues are central to the development of higher levels of energy autonomy within sustainable communities and are of critical importance. In fact whilst the generation and utilization of renewable energy is primarily a technical challenge with economic and environmental aspects, the social and political consequences of the increasingly prominent role of renewables in modern society cannot be ignored. It is clear that these areas play an important role in facilitating increased renewable energy deployment and maximizing the benefits from doing so (Rae and Bradley, 2012).

In this frame of national commitments and incentive policies, the European minor islands of the Mediterranean are in a particular situation. On one hand, it is much more expensive to produce energy from fossil fuel for them due to the transportation costs, on the other hand, they have a quite strong touristic vocation that influences the large loading level variations along the year. In the following section, these features are outlined and

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