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Renewable energy sources today and tomorrow

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ABSTRACT

Renewable energy sources (RES) have significant potential to contribute to the economic, social and environmental energy sustainability of small islands. They improve access to energy for most of the population, they also reduce emissions of local and global pollutants and they may create local socioeconomic development opportunities. A majority of the communities around the world rely heavily on oil, natural gas and coal for their energy needs. These fuels draw on lots of resources that will eventually diminish, which in turn makes them too expensive or too environmentally damaging to recover. This review article discusses the advantages and disadvantages of renewable energies; therefore based on the benefits of these energy resources, the use of renewable energies, instead of, fossil fuels will be a good solution for the control of the environmental, social and economical problems of our communities.

Keywords**:** Renewable Energy Sources; Environment; Sustainability; Green Energy

1. INTRODUCTION

A solution to the problems of climate change, air pollution, water pollution, and energy insecurity requires a large-scale conversion to clean, perpetual, and reliable energy at low cost together with an increase in energy efficiency [1-7,30-47,63].

Renewable energy sources (RES) have significant potential to contribute to the economic, social and environmental energy sustainability of islands. RES improves access to energy by most of the population, but also reduces emissions of local and global pollutants and may create local socioeconomic development opportunities [8-11,13-39].

Table 1. Large-scale development of renewable energy.

Study	Energy mix by sector		Time frame	Geographic scope
This study and Jacobson and Delucchi (2009)	Electricity transport heat/cool	100% WWS	All new energy: 2030. All energy: 2050	World
Alliance for Climate Protection (2009)	Electricity transport	100% WWS+Bm	2020	U.S.
Parsons-Brinckerhoff (2009)	Electricity transport heat/cool	80% WWS+NCBmBf	2050	UK
Price-Waterhouse-Coopers (2010)	Electricity	100% WWS+Bm	2050	Europe & North Africa
Beyond Zero Emissions (2010)	Electricity transport heat/cool	100% WWS+Bm	2020	Australia
European Climate Foundation (ECF) (2010)	Electricity transport heat/cool	80% WWS+NCBm	2050	Europe
European Renewable Energy Council (EREC) (April (2010)	Electricity transport heat/cool	100% WWS+BmBf	2050	Europe

Note: WWS¼ wind, water, solar power;
FF¼ fossil fuels; Bm¼biomass;
Bf¼ liquid biofuels;
N¼ nuclear;
C¼ coal-CCS. Cleetus et al. (2009) is not included only because its focus is mainly on efficiency and demand management, with only modest increases in renewable energy.

Table 2. Power available in energy resource worldwide if the energy is used in conversion devices, in locations where the energy resource is high, in likely-developable locations, and in delivered electricity in 2005 or 2007 (for wind and solar PV)

Energy technology	Power worldwide (TW)	Power in high-energy locations (TW)	Power in likelydevelopable locations (TW)	Current power delivered as electricity (TW)
Wind	1700[a]	72–170[b]	40–85[c]	0.02[d]
Wave	42.7[d]	2.7[e]	0.5[d]	0.000002[d]
Geothermal	45[f]	2g	0.07-0.14[d]	0.0065[d]
Hydroelectric	1.9[d]	o1.9[d]	1.6[d]	0.32[d]
Tidal	3.7[d]	0.8[d]	0.02[d]	0.00006[d]
Solar PV	6500[h]	1300[i]	340[d]	0.0013[d]
CSP	4600[j]	920[j]	240[j]	000046[d]

Note:
a - Fig. 1 here; accounts for all wind speeds at 100 m over land and ocean.
b - Locations over land or near the coast where the mean wind speedZ7 m/s at 80 m (Archer and Jacobson, 2005) and at 100 m (Lu et al, 2009).
c - Eliminating remote locations.
d - Jacobson (2009) and references therein.
e - Wave power in coastal areas.
f - Fridleifsson et al. (2008).
g- Includes estimates of undiscovered reservoirs over land.
h Fig. 2 here, assuming use of 160 W solar panels and areas determined in Jacobson (2009), over all latitudes, land, and ocean.
I - Same as (h) but locations over land between 50S and 50N.
J - Scaling solar PV resource with relative land area requirements from Jacobson (2009).

The aim of this paper is to provide a review of the theoretical and empirical literature on the contribution of RES to the energy sustainability of islands (focusing on the main results and methodologies used) and to identify promising lines for future research on this topic [12-19,55-60,63].

It should be stressed that the review of the international initiatives on RES and islands is focused on the description of the political claims of each initiatives, rather than on specifying the size of intervention or the selected RES technologies [11-21,55-62].

Table 1 compares and summarizes several other recent largescale plans. While all plans are ambitious, forward thinking, and detailed, they differ from our plan, in that they are for limited world regions and none relies completely on WWS. However, some come close in the electric power sector, relying on only small amounts of non-WWS energy in the form of biomass for electric power production. Those studies, however, address only electricity and/ or transport, but not heating/cooling.

The triangular approach takes into account the three dimensions of SD (economic, social and environmental) and tries to assess the sustainability of a given development proposal according to them (Figure 1) [49,50,55]. This approach continues to be highly influential. It forms the basis of the structure of the indicators of SD collected by key organizations all over the world, including the UN, the OECD and the European Commission [51,52,56-63].

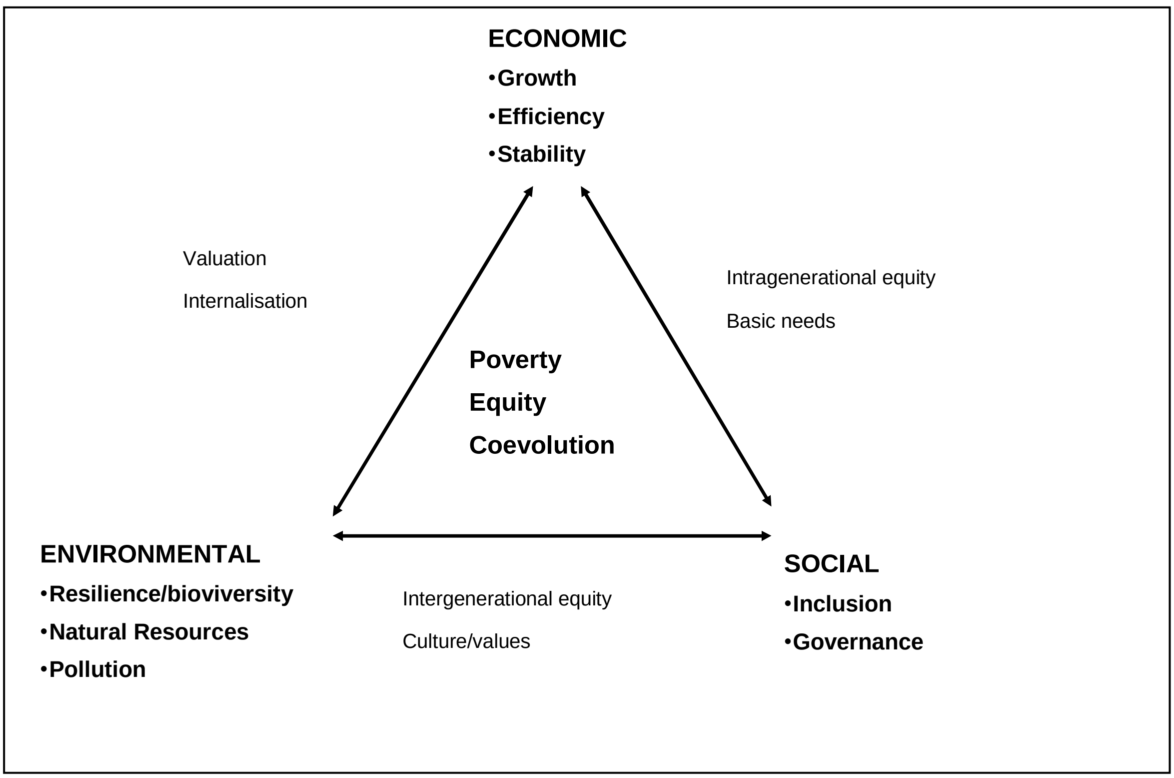

Figure 1. The dimensions of sustainability and their interrelationships.

Therefore, following this approach, a sustainable local policy must tackle the three dimensions of sustainability with the aim to increase the standard of living of its citizens, *i.e.*, it has to be sustainable from a substantive perspective:

- ***Environmental.*** Reduction of local and global pollution (among them, emissions of greenhouse gases), lower exploitation of the natural resources in the territory and maintenance of the resilience (ability to adapt to change), integrity and stability of the ecosystem [51-54].

- ***Economic*.** Increase of regional per capita income, improvement in the standard of living of the local population, reduction of energy dependence and increase in the diversification of energy supply [51-52].
- ***Social*.** Some authors stress that SD cannot be achieved without the sustainability of social and cultural systems, which includes the achievement of peace and social cohesion, stability, social participation, respect for cultural identity and institutional development [50,52-57,63].

Reducing unemployment and improving the quality of jobs (more permanent jobs), increasing regional cohesion and reducing poverty levels are key actions at local level to achieve social sustainability. For example, activities such as renewable energy deployment, which are an alternative to traditional agriculture, should be encouraged. This has a particularly positive psychological impact on the prospects of the young local population [50-63].

2. CHARACTERISTICS OF ELECTRICITY-GENERATING WWS TECHNOLOGIES

Wind

Wind turbines convert the energy of the wind into electricity. Generally, a gearbox turns the slow-moving turbine rotor into faster-rotating gears, which convert mechanical energy to electricity in a generator. Some modern turbines are gearless. Although less efficient, small turbines can be used in homes or buildings. Wind farms today appear on land and offshore, with individual turbines ranging in size up to 7 MW, with 10 MW planned. High-altitude wind energy capture is also being pursued today by several companies [52-55,60-63].

Wave

Winds passing over water create surface waves. The faster the wind speed, the longer the wind is sustained, the greater the distance the wind travels, the greater the wave height, and the greater the wave energy produced. Wave power devices capture energy from ocean surface waves to produce electricity. One type of device is a buoy that rises and falls with a wave. Another type is a surface-following device, whose up-and-down motion increases the pressure on oil to drive a hydraulic motor [52-55,60-63].

Geothermal

Steam and hot water from below the Earth's surface have been used historically to provide heat for buildings, industrial processes, and domestic water and to generate electricity in geothermal power plants. In power plants, two boreholes are drilled—one for steam alone or liquid water plus steam to flow up, and the second for condensed water to return after it passes through the plant. In some plants, steam drives a turbine; in others, hot water heats another fluid that evaporates and drives the turbine [52-55,60-62].

Hydroelectricity

Water generates electricity when it drops gravitationally, driving a turbine and generator. While most hydroelectricity is produced by water falling from dams, some is produced by water flowing down rivers (run-of-the-river electricity) [2-5,52-55,60-62].

Tidal

A tidal turbine is similar to a wind turbine in that it consists of a rotor that turns due to its interaction with water during the ebb and flow of a tide. Tidal turbines are generally mounted on the sea floor. Since tides run about 6 h in one direction before switching directions for 6 h, tidal turbines can provide a predictable energy source [52-55,60-63].

Solar PV

Solar photovoltaics (PVs) are arrays of cells containing a material, such as silicon, that converts solar radiation into electricity. Today, solar PVs are used in a wide range of applications, from residential rooftop power generation to medium-scale utilitylevel power generation [5-9,52-55,60-62].

Concentrated Solar Power CSP

Concentrated solar power (CSP) systems use mirrors or reflective lenses to focus sunlight on a fluid to heat it to a high temperature. The heated fluid flows from the collector to a heat engine where a portion of the heat is converted to electricity. Some types of CSP allow the heat to be stored for many hours so that electricity can be produced at night [1-8,52-55,60-63].

3. CONCLUSIONS

This assessment of renewable energy technologies confirms That These techniques have the potential to provide your nation with the alternatives to meet Approximately half of future world energy needs.

That develop this potential, the world would have to commit to the development and deployment of non-fossil fuel technologies and energy savings. The implementation directory of renewable energy technologies will reduce many of the current environmental problems associated with the production and use of fossil fuels.

The immediate priority of the world should be to speed the transition from the reliance on nonrenewable fossil energy resources to reliance on renewable energy technologies. Various combinations of renewable technologies should be developed, consistent with the characteristics of the different geographic regions in the world.

A combination of the renewable technologies listed in table 3 should provide the world with an estimated 45 quads of renewable energy by 2050.

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