

## Chapter 53

# Environmental and Economic Impacts of Wave Energy: Some Public Policy Recommendations for Implementation in Turkey

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### ABSTRACT

*The wave energy is one of the most important renewable energy sources and it has many advantages compared to other renewable energies. First, it is more reliable. Second, the cost of wave energy is competitive with other sources when it is used as a primary power source. Third, its energy density and deployment potential are higher than the wind and solar energy. Fourth, the wave energy has minor negative environmental impacts and production amount of the wave energy is more predictable. In the study, the applications of wave energy production are discussed in European Union countries in which have started to operate wave energy, recently. It is also tried to evaluate the feasibility of wave energy production opportunities in Turkey. As a result of the study, it can be said that the Black Sea has the highest wave energy potential in Turkey. Industrial production of wave energy actualized by fiscal incentives and this may lead to many social benefits such as increasing employment, reducing external dependency and diminishing greenhouse gases emission.*

### INTRODUCTION

The fossil fuels were used as the main energy source in many countries after the industrial revolution because they are affordable and easily accessible. The issues of global warming and climate change came to the fore and the harmful environmental effects of fossil fuels have begun to be discuss in most countries. In this context, countries have tended to use less environmentally damaging resources to

DOI: 10.4018/978-1-5225-3817-2.ch053

reduce greenhouse gas emissions. Renewable energy sources such as solar, wind, geothermal, biomass, wave and tidal energy are defined as energy that comes from resources that are naturally replenished.

Wave energy is unlimited, clean, and environmentally friendly. Moreover, it does not destroy favorable agricultural areas. Hence, many countries are interested in it. Also, wave energy has reduced dependence on foreign energy sources. This kind of energy is new and has a growing importance in other renewable energy sources. The wave energy has many advantages compared to other renewable energy sources. For example, electricity power extraction from wave energy is continuous 90% of the day, but that ratio is 20% for the wind energy and 30% for the solar energy.

In Turkey, there is no industrial electricity generation from wave energy. Due to geographical location, Turkey has high wave energy potential. There is less study about the wave energy resources in Turkey in the literature. This study is expected to contribute to the literature by discussing the issue of electricity generation from wave energy in Turkey.

The study is organized as follows. In the first section, renewable energy sources are defined and wave energy is presented. Besides, wave energy has been compared with other energy sources and the cost of wave energy is clarified. In the second section, the environmental and economic impacts of wave energy are discussed and the problems of externalities are investigated. In the third section, the situation of wave energy is unfolded in the European Union (EU) member states. In the fourth section, the status of wave energy and wave energy potential for Turkey are evaluated. The fiscal policy recommendations for implementation of wave energy in Turkey are also noted. The study is completed with a conclusion and recommendations.

## **THE RISING TREND OF RENEWABLE ENERGY RESOURCES: WAVE ENERGY**

Climate change is one of the great challenges of the 21st century. The United Nations Framework Convention on Climate Change (UNFCCC) define *climate change* as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”. It is obvious that “a low-carbon energy revolution” (IEA, 2009, p. 45) is required in an effort to achieve climate change mitigation. Increased gas emissions accelerated after the Second World War has started to change the Earth’s climate. The environment has been exposed to negative impacts due to exploiting of industrialized countries’ insatiably and welfare increase and use of the resources has increased among developed and developing countries (Chichilnisky, 1997, p. 467).

World energy consumption has been rapidly increasing and it is estimated to rise considerably over the next decades. It is known that fossil fuel resources have a fundamental role in meeting rising energy demands across the globe. It is further known that fossil fuels are shown to be contributing to the global climate change so virulently. Global climate change and energy security concerns constitute two central issues in today’s world energy policies.

The International Energy Agency define renewable energy as “the energy derived from natural processes that are replenished at a faster rate than they are consumed” and clarifies geothermal, hydropower, bioenergy, solar photovoltaic, solar power and wind and marine (tide and wave) energy as renewable (IEA, 2015, p. 2). However solar, wind and wave energy and other renewable energy sources are replenished and not exhausted. As they constantly renew themselves, destocking cannot happen.

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