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Energy trends in Palestinian territories of West Bank and Gaza Strip: Possibilities for reducing the reliance on external energy sources

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ABSTRACT

The Palestinian territories (PT) is dependent on external sources to meet their energy demands. Around 80% of their energy sources come from neighboring countries. This dependency renders the price of different fuel types, despite the fact that the per capita consumption is among the lowest. The goal of this work is to reduce the energy dependency on external energy sources, with the express hope that a more stable and reliable energy security can be realized. This paper will attempt to detail the current energy demands in the PT, and evaluate the different possibilities in reducing the reliance on external energy sources. Adopting clear and transparent energy policies that result in strategies and action plans directed to encourage the exploitation of renewable energy is the first step in achieving this goal. Investments in renewable energy is one of these measures where PT have good potentials of solar radiation, huge amounts of biomass, good wind speeds at certain sites and success in utilizing geothermal energy for domestic applications. The analysis of a number of pilot projects being installed or are running in the PT for different renewable energy fields are indicative of their viability and potential in the context of the PT. The development of a clear energy conservation policy is also an important tool that can be used to reduce the energy consumption in the PT, which will in turn reduce the dependency of the PT on external energy sources.

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Abbreviations: GS, Gaza Strip; IEC, Israeli Electrical Company; LPG, liquefied petroleum gas; NGOs, non-government organizations; PIF, Palestine Investment Fund; PT, Palestinian territories; PV, photovoltaic; TJ, tera Joule; WB, West Bank

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1. Introduction

Energy is essential to the livelihood of the people. Its availability is salient vis-à-vis the realization of welfare and sophistication in the standard of living of citizens, and forms the yardstick of economic success of a nation [1–6]. It is actually very important in accelerating the wheel of economy.

The economy of the Palestinian territories is severely underdeveloped due to the decades being under Israeli military occupation. During this period, the infrastructure of the PT was severely neglected, electricity being one of them. This, in fact, created different energy problems and impeded any real growth concerning different energy scenarios.

PT is divided into two territories: West Bank (WB) and Gaza Strip (GS). Fig. 1 shows the PT map. There is a lack of physical continuity between WB, GS and East Jerusalem, which is also a part of WB. Moreover, different portions in the PT suffer from military occupation, settlement activities and control. The land in WB is divided according to OSLO agreement into three types of areas: A, B and C, where most of the land is in area C. Any project in this area cannot be implemented without the express approval from the Israeli authorities. These insurmountable obstacles almost make it impossible to developing a reliable infrastructure for the energy sector and the related activities that are needed in relation to it.

For many years, different Palestinian communities suffered from dwindling or nonexistent energy resources. As a result of this, the economic development in these areas is adversely affected, while the price of energy skyrocketed relative to their adjacent neighbors. Moreover, attention to renewable energy and their utilization do not reach a satisfactory level, and the environmental pollution from conventional resources actually threatens different aspects of life. With the notable exception of solar water heaters, other applications in the renewable energy sector are very limited due to poor investments in this sector. In the electrical energy sector, the bulk of the electrical supply to the Palestinian territories comes from Israeli Electrical Company (IEC). This monopoly also affects the price of electricity, and creates shortages of electricity, with the threat of a future energy crisis looming over the horizon in the near future [7].

Quite a number of small remote communities in the PT lacks a source of electricity [7,8]. Connecting these communities to the available grid is difficult due financial and political constraints, since most of these communities are located in area C. Sometimes, diesel generators are used to electrify part of these communities for a limited period of time, mainly during the night. In addition to the high cost of generation, the gases emitted from these small diesel generators pollute the environment.

The different circumstances (economic, political, geographic, environmental and infrastructural) facing the energy sector in the PT, and the presence of natural resources required for the production of fossil fuels is rather limited, the development of the renewable energy sector to meet the increased requirements of energy demand is obviously advantageous and attract considerable interest. This sector has the potential to be effectively targeted by the investors.

This paper will attempt to detail the current energy policies, energy demand, environmental impacts for the production and

consumption of energy, renewable energy in the PT, and the institutional and legal situation of the energy sector.

2. Energy demand

The area of the PT is 6020 km², whereas the area of WB is 5655 km², and the area of GS is 365 km² [9]. The majority of PT is surrounded by Israel. Other small portions of the boundaries (west boundary of GS with Mediterranean Sea and east boundary of Jericho with Jordan) are under actual Israeli control.

The PT is located in a transitional climatic zone between the Mediterranean and arid tropical zones. Climatic conditions of Palestine vary widely. There are three climatic zones in PT, which are coastal areas, hilly areas and Jordan valley. The coastal zone is mild (average of 15 °C) during winters, humid and hot (average of 24 °C) during summer, while hilly areas in WB are cold during winters, and mild in the summer. Jordan valley climate is warm and humid in winters, and hot and dry during summers. Temperatures in Jordan valley are always higher than coastal areas, while in hilly areas, they are usually low [9].

Palestine is a net importer of oil and petroleum products. Total energy consumption in the PT is considered the lowest in the region, while its costs are relatively high compared to its neighbors. The majority of this consumption goes to the residential sector. The largest portion of different types of imported fossil fuels consumed in PT originates from Israel, while the remainder comes from Jordan and Egypt.

Fig. 2 shows the energy imported and produced by the PT in 2010. The majority, 80%, was imported from different sources. This imported part consists of electricity, all types of fossil fuels, and other types of energy sources. The remainder, produced locally, consists of solar energy, wood, coal and olive cake. The exported energy to neighboring region this year was about 155 TJ (coal and wood), so the total energy available from different energy sources was about 55,863 TJ [10]. Details of what is imported, produced and exported are presented in Table 1. From this table, the amount of energy produced from petroleum derivatives accounted for about 53.2% of the needs of the local market of energy. Table 2 shows different types of energy sources imported by PT in physical units in year 2010 [10].

Table 3 presents the average annual price for the consumer for different types of energy sources in the Palestinian territories in 2010 [10].

3. Electricity sector

Connection of households in different parts of the PT to the electric grid increased in the last decade, from 96.8% in 1999, to 99.8% in 2010. However, a high percentage of households receive an interrupted power supply. Moreover, the electrical network suffers from high transmission losses; indicative of low quality supply. Table 4 shows the percentage of households connected to the grid in different years in the period of 1999–2011, while Table 5 shows percentage of number of hours of electricity services in both WB and GS, and for PT in general [11].

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