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Hydropower in Turkey: Economical, social and environmental aspects and legal challenges

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ABSTRACT

Turkey, as a rapidly developing and industrializing country, is in need of reliable, inexpensive, and high quality energy. The main energy sources of Turkey are coal, natural gas and hydropower. However, almost all the natural gas and high quality coal is imported. Thus, hydropower is the main domestic energy source. According to the State Hydraulic Works (SHW), the primary executive state agency responsible for the planning, operation, and management of water resources, Turkey has an economically viable hydroelectric potential of 140,000 GWh/year. Currently, around 35% of this potential is utilized. Increasing the share of hydropower in the energy budget of Turkey will reduce dependency on foreign energy sources. However, development of the unused hydropower potential, especially through run-of-river plants, has caused many problems in the country. Run-of-river plants are small hydropower plants (SHPPs) usually with no storage. Electricity Market Law No. 4628 which came into effect in February 2001 was a major step towards the privatization of the electricity sector. The law enabled planning and construction of SHPPs by the private sector. This created a big market for consulting firms which prepare feasibility reports, construction companies, and companies that own and operate these SHPPs. However, due to inadequate water resources management strategies, rivers are impaired; their natural flows are disturbed to generate electricity without paying necessary attention to components of the ecosystem and the needs and concerns of local residents. Thus, Turkey faces a challenging problem: Maximizing the utilization of hydropower which is the main domestic energy source while maintaining environmentally conscious and sustainable development. This study aims to explain the change in the contribution of hydropower in the energy budget of Turkey with time and current social and environmental problems associated particularly with SHPPs. Issues requiring immediate attention to facilitate sustainable development of hydropower potential are identified.

1. Introduction

Energy plays a critical role in economic growth and social development. However, the International Atomic Energy Agency (IAEA) (2005) states "But however essential it may be for development, energy is only a means to an end. The end is good health, high living standards, a sustainable economy and a clean environment." Thus, energy resources that serve this end with relatively fewer adverse impacts on public

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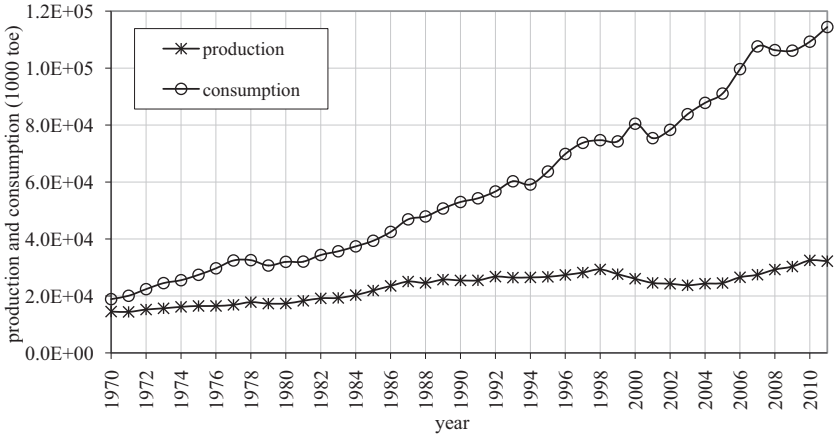

Fig. 1 – Energy production and consumption in Turkey from 1970 to 2011.

health and the environment need to be preferred. Yet many areas of the world have no reliable and secure energy supplies which limit economic development while in other areas, environmental degradation from energy production and use inhibits sustainable development (UN and IAEA, 2006). In these areas, governments are responsible for identifying and promoting appropriate policies that will lead to sustainable development. Turkey's energy balance in the previous four decades reflects that the share of foreign energy sources in the total primary energy supply is very high and the main domestic resource, hydropower, is not appropriately utilized. Thus, Turkey is among those countries for which suitable energy policies need to be immediately developed. This paper presents the change in the energy budget of Turkey within the past four decades, the role of hydropower, and social and environmental problems associated especially with small hydropower plants. Various suggestions which may provide guidance in developing appropriate energy policies for Turkey, are provided.

Turkey is a developing country and its energy consumption has increased continuously in the last four decades. Many researchers have evaluated Turkey's energy policy and provided future energy predictions (Toklu, 2013; Benli, 2013; Yüksel, 2013; Akpinar, 2013; Melikoglu, 2013). For example, Melikoglu (2013) states that electricity consumption of Turkey is expected to reach 530,000 GWh at year 2023 and 30% of this demand will be produced from renewable energy sources. Among all the potential energy sources in Turkey, importance of hydroelectric energy is going to increase due to high hydropower potential and restrictions related to the carbon emissions.

The change in energy production and consumption of Turkey from 1970 to 2011 is given in Fig. 1. The energy demand of Turkey was 114 million tons of oil equivalent (toe) in 2011. In terms of oil, natural gas and hard coal, over 90% of this demand and around 80% of the total energy demand in 2008 was supplied through imports (MENR, 2013). The contributions of "hard coal" (hard coal, asphaltite, secondary coal and petrocoke), petroleum and natural gas in total energy consumptions from 1970 to 2011 are given in Fig. 2. As can be seen in Fig. 2, contribution of these three sources in the total energy consumption of Turkey was around 60% in the 1970s and increased to approximately 75% in 2011. Thus, currently hard coal, petroleum and natural gas are main energy sources for Turkey.

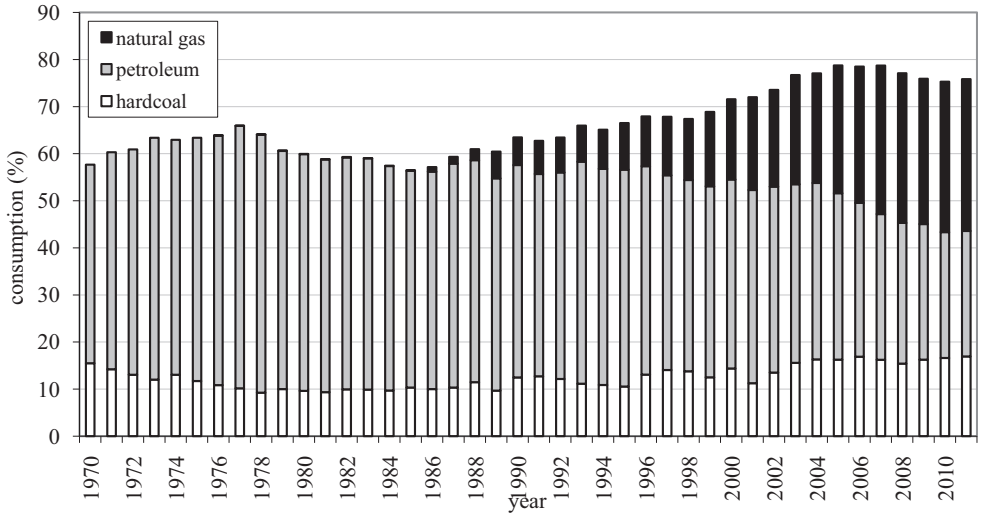

Fig. 2 – Contributions of hard coal, petroleum and natural gas in the total energy consumption from 1970 to 2011 in Turkey.