Afghanistan's aspirations for energy independence: Water resources and hydropower energy

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Afghanistan’s aspirations for energy independence: Water resources and hydropower energy

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Abstract
This paper presents the historical developments (since 1893) and opportunities for the future direction of water resources and hydropower in Afghanistan. The importance of water resources for hydropower energy production and irrigation, to ensure national security and prosperous socioeconomic development, is also addressed. At present, Afghanistan relies heavily on electricity imported from neighboring countries (80%, Breshna Sherkat, 2016). However, Afghanistan is endowed with substantial renewable energy resources. Among these, water potential is the main clean source available for electricity generation and irrigation. The water resources of Afghanistan mainly comprise five major basins (36 sub-rivers), and the rivers of three of these basins flow into neighboring countries, which has caused water resource trans-boundary disputes and is a challenge for the government of Afghanistan. The lessons learned from past trends, and recommendations for future development related to Afghan water resources and hydropower, are discussed. The establishment of sustainable development practices that account for social, technical, technological, political, and environmental concerns for long-term sustainability is evaluated. In the future, renewable energy technology exploitation will contribute to emerging economies. This study is the first of its kind to address water resources and hydropower development in Afghanistan.

Keywords
Afghanistan; Hydropower; Water Resources Management; Irrigation Systems; Economic Development

1. Introduction
Rapid economic growth and changes in human civilization have led to dramatic increases in demands for water resources and electricity. Nations are therefore faced with the challenge of maintaining cost-effective and clean energy production. With today’s cutting-edge renewable technologies, we must move forward with sustainable preservation of water resources and generation of electricity from renewable energy sources. Efficient exploitation of hydropower technologies for residential, commercial, and industrial uses, with comprehensive management of water resource for multiple purposes, provides an opportunity to mitigate energy dependence, ensure efficiency and reliability, reduce pollutant emissions, and develop an economy. The specific merits of hydropower, such as in applications other than electricity generation (e.g., irrigation and mill operation), the ability to handle seasonal changes in electricity demand and production, and its predictable behavior, make it preferable over solar and wind technologies.

The aim of this paper is to present hydropower development and exploitation in a broad context. Deployment of renewable energy technologies (especially hydropower) is considered essential for modern societies. Herein is an overview of various aspects of national water resources and hydropower, based on the present status and future trends, to develop cost-effective hydropower technology feasibility for sustainable long-term mitigation of
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