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A Strategic Water and Energy Project as a Climate Change Adaptation Tool for Israel, Jordan and the Middle East

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Abstract : Water availability in most of the Middle East (especially in Jordan) is among the lowest in the world and has been even further exacerbated by the regional climatic change and the reduced rainfall. The Araba Valley in Israel is disconnected from the national water system. On the other hand, the Araba Valley, both in Israel and Jordan, is an excellent area for solar energy gaining. The Dead Sea (Israel and Jordan) is a hypersaline lake which its level declines at a rate of more than 1 m/y. The decline stems from the increasing use of all available freshwater resources that discharge into the Dead Sea and decreasing natural precipitation due to climate change in the Middle East. As an adaptation tool for this humanmade and Climate Change results, a comprehensive water-energy and environmental project were suggested: The Red Sea-Dead Sea Conveyance. It is planned to desalinate the Red Sea water, supply the desalinated water to both Israel and Jordan, and convey the desalination brine to the Dead Sea to stabilize its water level. Therefore, the World Bank had led a multi-discipline feasibility study between 2008 and 2013, that had mainly dealt with the mixing of seawater and Dead Sea Water. The possible consequences of such mixing were precipitation and possible suspension of secondary Gypsum, as well as blooming of Dunaliella red algae. Using a comprehensive hydrodynamic-geochemical model for the Dead Sea, it was predicted that while conveying up to 400 Million Cubic Meters per year of seawater or desalination brine to the Dead Sea, the latter would not be stratified as it was until 1979; hence Gypsum precipitation and algal blooms would be neglecting. Using another hydrodynamic-biological model for the Red Sea, it was predicted the Seawater pump from the Gulf of Eilat would not harm the ecological system of the gulf (including the sensitive coral reef), giving a pump depth of 120-160 m. Based on these studies, a pipeline conveyance was recommended to convey desalination brine to the Dead Sea with the use of a hydropower plant, utilizing the elevation difference of 400 m between the Red Sea and the Dead Sea. The complementary energy would come from solar panels coupled with innovative storage technology, needed to produce a continuous energy production for an appropriate function of the desalination plant. The paper will describe the proposed project as well as the feasibility study results. The possibility to utilize this water-energy-environmental project as a climate change adaptation strategy for both Israel and Jordan will also be discussed.

Keywords : Red Sea, Dead Sea, water supply, hydro-power, Gypsum, algae
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