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Water supply and demand and a desalination option for Sinai, Egypt

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Abstract

The development of non-conventional water resources in Egypt is a must in order to respond to the continuously increasing demand. The present paper presents the results of an investigation undertaken in order to evaluate technically and economically the installed desalination units in Sinai. The available water resources were evaluated. Forecast study was undertaken in order to evaluate the expected shortage. The future need for desalination units was identified. The main objective of this work is to identify the potential sites for desalination project implementation.

Keywords: Sinai; Water resources; Desalination

1. Introduction

Egypt is facing a water scarcity due to over-population, industrialization and agricultural expansion. The Sinai and Red Sea areas are suffering from water shortages. These two areas are identical in geographical conditions. They are away from the Nile with limited underground water resources. Both areas are important for Egypt's economic growth. The present study is focused on Sinai. A detailed analysis was undertaken dealing with: (1) water resources (including non-conventional) and (2) water use.

Sinai, particularly the Gulf of Aqaba region, is promising for Egypt's economic growth. The only disadvantage for the development of this area is water. The study has shown clearly that water desalination is the most appropriate way to respond to the water shortage problem.

A Geographical Information System (GIS) tool was used to identify the areas under risk and the necessary plant size and technology; the expected water cost was also calculated. The study also gives an estimation of the required

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projects to solve the water shortage problem. Water resources and their use were evaluated. Finally, scenarios were developed in order to estimate the desalination projects required.

2. Water resources in Sinai

The function of water resources management is to:

- assess the present water resources
- provide reliable information on the availability and quality of surface and groundwater
- provide scenarios for the development and use of water.

Below is a general description of Sinai and the assessment of resources, its availability and quality.

The Sinai Peninsula has an area of 59,438 km^2 (Fig. 1). Sinai includes some plains and highlands (Fig. 2). The weather in the plains is similar to other parts of Egypt, mainly dry and warm. The weather of the highlands differs from other parts of the Sinai in temperature and rainfall, It is colder, with a minimum of 10°C difference in temperature. In this district, the rainfall increases and reaches that of the Mediterranean district.

The total population is 254,000, which is mainly Bedouin (60%) and the rest is located in small cities such as El-Arish and Sharm El-Sheikh. The population growth rate of 2.87% is the highest in Egypt.

The water resources in Sinai can be classified into the following categories:

- renewable resources from rain
- underground water
- potable water transported by pipeline
- desalinated water

2.1. Renewable resources from rain (precipitation)

Despite that in Sinai some places possess a

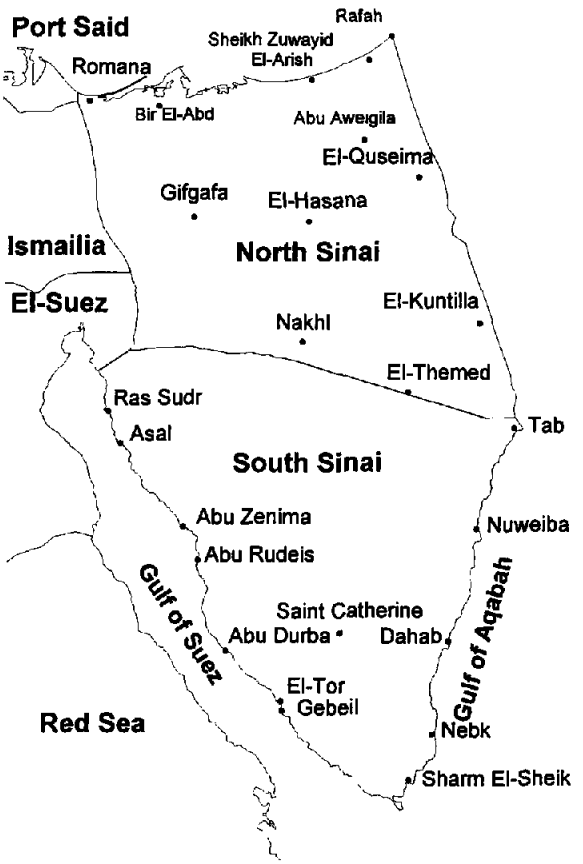

Fig. 1. Sinai Peninsula and North and South Sinai governorates.

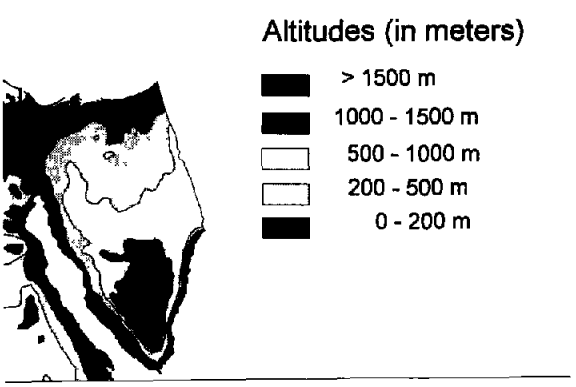

Fig. 2. Topography of Sinai.