

DESALINATION: AN AMBITIOUS APPROACH TO SOLVING OVERPOPULATION IN EGYPT

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Abstract

The lack of fresh water and energy pose the largest risk to any nation's development and prosperity. This paper shows that locally designed and manufactured mega desalination plants will prove useful to sustainable development in Egypt.

A number of international Egyptian experts, with both the knowhow in designing and building advanced membrane desalination plants, and hands-on experience, are available. In addition, there are a few national organizations that possess the capabilities of manufacturing plants locally. By combining these two elements, Egypt can build cost effective locally manufactured mega size desalination plants outside the Nile valley.

The region's renewable energy resources will help in building and running those plants.

Setting up a strategic plan to build the necessary plants will help create new societies in the desert, which in turn, will lead to a viable solution to the over-population epidemic around the Nile valley.

Keywords: Desalination, Renewable Energy, Nile, Membrane, Egypt, Water Poverty

Introduction:

Overpopulation in the Nile valley is a leading factor behind Egypt's crisis. For years, governments failed to find practical solutions for this ongoing dilemma.

Experts suggest that invading the desert that constitutes approximately 95% of the country's land is the solution, but this approach would prove costly because of the infrastructure necessary to extend pipe lines, electrical energy transfer lines, and roads from the valley.

Fresh water and energy are the main resources that nations need to develop.

Despite Egypt's dependence on the Nile, the future of its existence depends on decisions made by other countries. Egypt is an estuary country, and a number of source countries of the Nile have started building a series of dams that will undoubtedly reduce Egypt's yearly water quota.

Today, Egypt's water quota of 55.5 billion m³ per year is not enough to cover the multiplying population and 21st century living standards.

Consequently, water desalination is a vital solution to water scarcity in Egypt like many countries around the globe.

Goal:

The goal of this study is to highlight the possibility of the economical fabrication of mega size membrane desalination plants locally in Egypt.

Approach:

Egypt is gifted with endless beaches along the Mediterranean Sea and the Red Sea.

The salinity of the unlimited sources of underground water in the Eastern desert, Western desert, and Sinai is a limiting factor for its use.

Foreign companies charge a lot for desalination plants because they keep the experience, and the know-how secrets.

Egypt lies in the region that has the most intensive renewable solar energy in the world.

This clean energy is not utilized.

A mega size sea water desalination plant with a capacity of 300,000 m³/day is sufficient for 1.5 Million inhabitants. International companies sell plants of this size for about \$300 Million. The power required for such plant is about 40 MW, which can be produced by renewable solar energy. The regional solar power plant will help save the cost of long lines needed to transfer power from the valley, besides it saves transmitted power losses that would be in the order of 20%.

The only economical way for Egypt to develop desalination plants is to become self-dependent in building mega plants, using Egyptians minds and manpower.

If such size of plants is locally built, costs would be reduced by about 50%.

Gradually, building twenty such plants in carefully-chosen areas will be sufficient to move 30 Million inhabitants out of the valley for a budgeted cost of \$3 Billion.

The cost of the proposed solar power plants is not included in the above estimate.

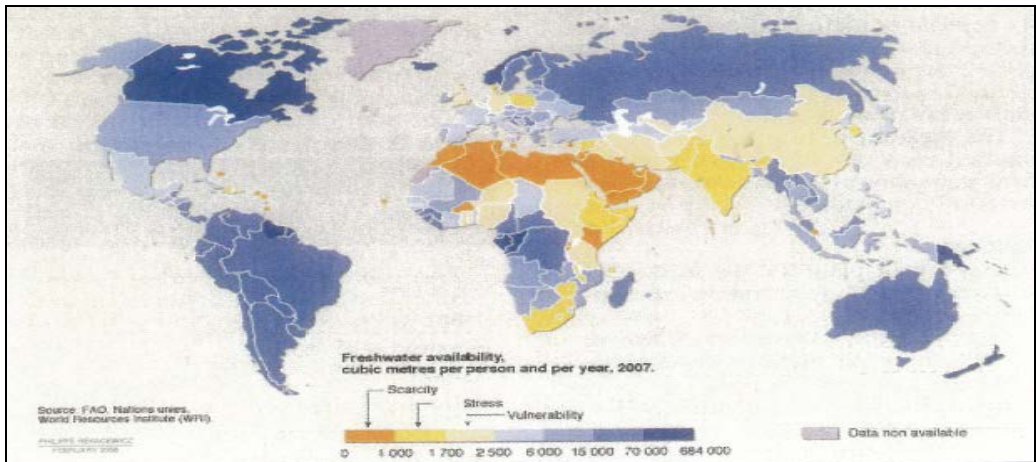


Fig. (1) All Arab countries, including Egypt, are below the international fresh water poverty limit of 1,000 m³/person/year, despite possessing unlimited water resources from surrounding seas

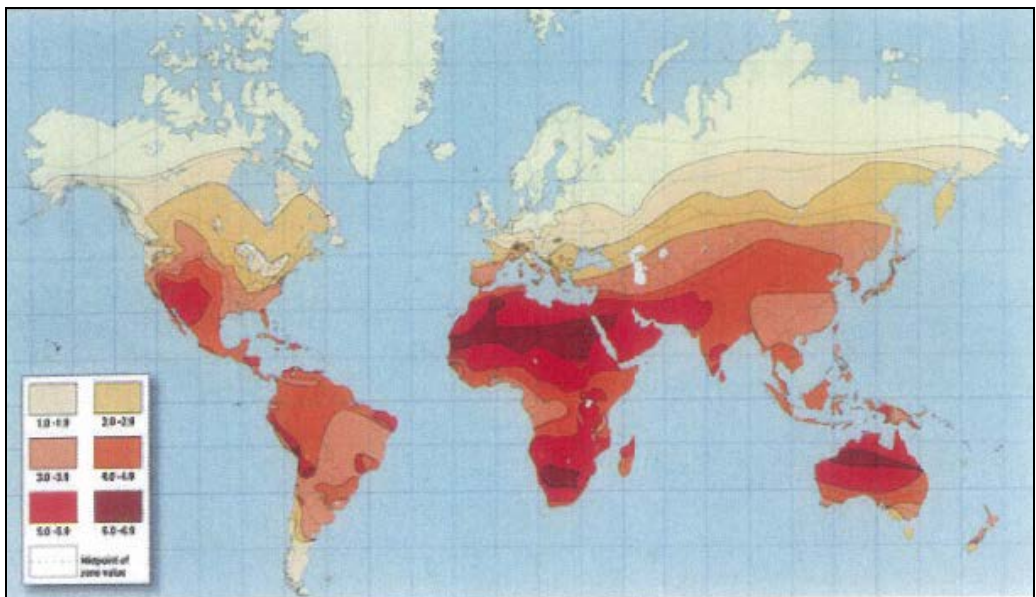


Fig. (2) Egypt lies in the great desert region that has the most intensive solar energy source in the world year-round



Fig.(3) The international trend is using solar power plant to provide power for desalination plants for remote areas and deserts

Methodology:

Fluid Machinery and Pacific Aqua Technologies are two American corporations that have Egyptian engineers living abroad as main share holders in the companies.

The two organizations have gained extensive hands-on experience in designing and building membrane desalination plants.

On February 2012, a protocol was signed by Fluid Machinery Engineering and the Arab Organization for Industrialization (AOI) to provide the knowhow and the design of the high pressure pumps, and the energy recovery systems to build the above-mentioned components locally. Two sets of prototypes are now under manufacture of such components at AOI factories.

The cost of these components constitutes about 30% of the cost of desalination plants.

On April 2014, the Italian company Oltremare Liquid Separation has provided AOI with a proposal to build desalination membrane factory in Egypt.

The membrane's cost constitutes about 25% of the total cost of the plant.

All of the above will facilitate the local building of desalination plants.

Pacific Aqua Technologies (PAT) has built desalination projects all over the world with a total capacity of 3.5 Million Cubic Meter per day of fresh water. More than one third of this capacity is in the Middle East/Africa

region. PAT is ready to transfer its technology to train young Egyptians engineers from AOI on the design, build, and operate desalination plants based on BOOT projects system. PAT will provide the fund from abroad such that AOI as a semi-governmental organization will secure the award of the projects.

PROJECTS DONE BY PAT MANAGEMENT

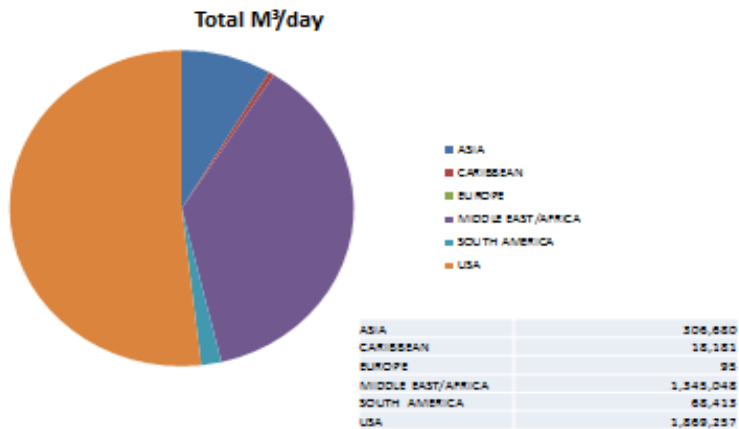


Fig 4. Pacific Aqua Technologies (PAT) management has built desalination plants producing more than 3.5 Million cubic meters of fresh water per day all over the world, more than one third of them in the Middle East and Africa

Conclusion:

Building desalination plants in the Egyptian deserts will help solve over-population around the Nile.

Building desalination plants locally yields numerous advantages, including faster delivery of equipment and spare parts, developing national experts in the field, lower costs due to partial local manufacturing of the components, and the most important factor is being self-dependent in providing local fresh water sources and not relying on foreign plants manufacturers nor on international political decision makers.