The Qattara Depression Project

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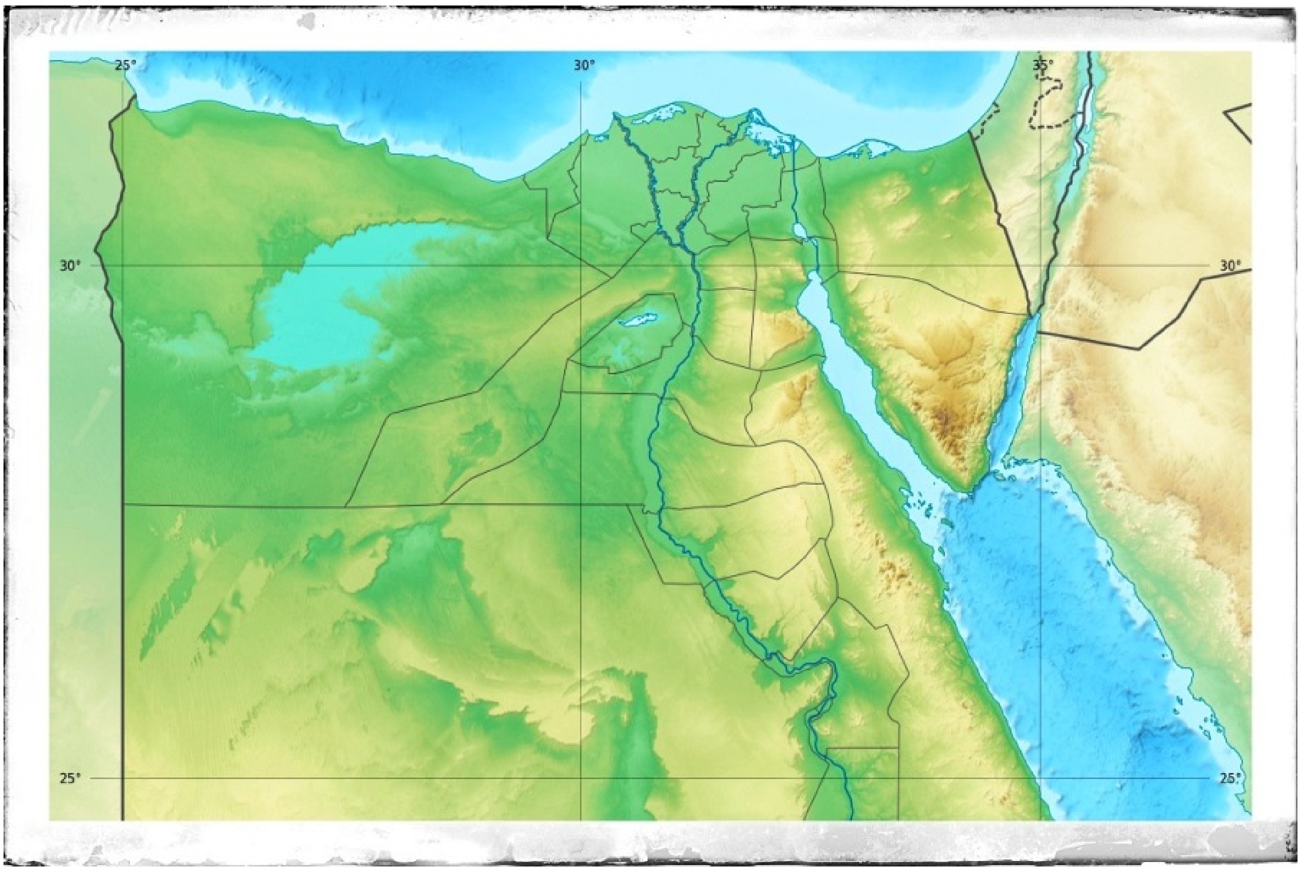

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It is a concept for a large civil engineering project in Egypt, rivaling the Aswan High Dam, intended to develop the hydroelectric potential of the Qattara Depression by flooding it.

By connecting the region and the Mediterranean Sea with canals, water could be let into the area. The inflowing water would then evaporate quickly because of the desert climate.

With this continuously flowing water hydroelectricity could be generated. Eventually this would result in a hypersaline lake or a salt pan as the water evaporates and leaves the salt it contains behind.

The proposals call for a large canal or tunnel being excavated of about 55 to 80 kilometres depending on the route chosen to the Mediterranean Sea to bring seawater into the area. Several proposed lake levels are -70, -60, -50 and -20 m.

–Fonte: en.wikipedia.org

Challenging the numbers

At -90m level with a 80km navigable channel it would require to move 20 mln m³ of terrain. The best would to recycle it for building the channel and related infrastructures.

The slope would be 0.1% which is about 113cm each km and the water speed would be about 1 m/s (4 km/h). It would take 20h from the sea to the depression evaporating at 1 kg/km•s rate are about 6 mln tons which would be ⅓ of the 18 mln tons water in the channel.

Hydraulic pressure vs evaporation ratio

With a channel large 90m and depth 5m at the beginning of the seashore and ending 5m wide and 90m depth at the reaching of the depression the total amount of terrain to move with a 25% plus for the channel concrete envelope would be 45 mln m³.

However the evaporation would be about 54 mln tons in a volume of 36 mln tons. The water in the channel would be drained before reaching the depression.

This means that the width/depth of the channel matters a lot under two contrasting important criteria: hydraulic pressure and evaporation ratio.

In order to obtain back the 6 mln tons of evaporation over the overall passage, it needs to be cover 3.4 mln m² of the channel surface. Both sides of the navigable channel would work like covered water tunnelling docks.

Fresh water from the docks

Being able to extract 12 mln tons of desalinated water from the channel in the first half of the way, it would be possible to irrigate/cultivate an area of between 2 and 1 mln m² depending the destination/vegetation.

In such case the speed of water will increase of (6+12)/36 = +50% to refill the extraction and the evaporation, ranging between 6km/h at the sea level and arriving at 4km/h at the depression.

Energy and water from the docks

It is reasonable to obtain a net energy output of 240 W/h per m² on the channel docks over 8h per day. The energy could be stored pumping the water from the channel and storing into elevated storages.

Desalinated water will obtained by evaporation and condensation. Mirrors could concentrate solar power on the elevates boiling water storage and the vapor pressure will move the water to another elevated storage without loosing the h-gravity energy gained by docks pumping but increasing more the elevation.

The solar panel efficiency is about 20% but the thermal transfer by concentrating mirrors is about 99% and doubling the pump elevation by vapor steam/condensation will make available the energy and the water both day and night, on demand for small needs. About 80W/h on h24 average per m² of solar panel + m² of mirror which both could be placed on roof.

> L'osmose inverse, procédé consistant à appliquer une pression sur un volume d'eau salée au travers d'une membrane semi-perméable retenant le sel et les autres impuretés. La consommation énergétique peut dans ce cas être réduite à environ 3,5kWh par m3.

Using watermills and dynamos which is a cheaper technology and offer h24 power drive it would be possible to initially discards solar panels or postpone their installation under future energy development demands.

Value creation along the time

However solar panels would give energy before the channel would be completed and the water flow. In such a way the colonisation of the area will begin before the completion of the entire opera.

Leveraging the power from the sun and the availability of the water from the sea, the creation of the land value will start after the first 4km of the channel will be completed.

Opera time spans 30 years divided in 4km slots.

Considering a production of $100 per m² per year the total net value production/increasing would be between 100 and 200 mln$ per year, on the average of 30 years span. This means that not all the available area would necessarily leveraged immediately but expanding from the sea shores to the desert interior.

Evaporation and climate change

Bringing water where the water were not, will add evaporation and starts the humidification of the air. So far, the climate change around the channel.

Using a progressive approach with a funnel design the areas nearby the seashore will be more impacted but the effect on the climate change will be less stronger because that areas were more subjected of humidification from sea wind.

Moreover, the docks pillars should be build before allowing water to get in the working slot. But the docks coverage should be delayed until the next slot would be ready.

This will create an evaporating pool on the last slot which will help to increase humidity. The progressive penetration would help the environment to adapt to the change without the waterfall effect of completing the entire opera and then let the water flow in.

Similarly, the hydroelectric power plant at the end of the opera could be delayed. For three reasons. Solar panels are going to go out of work but water mills distributed along the channel will start to works as soon as the water will flow.

The power plant in the depression

As stated before, there will be no any immediate need of having built the power plant because energy production would be distributed along the channel.

Once the water will flow in the depression, the climate will start to change. Within one or two years, the climate change will create a more comfortable environment to build the hydroelectric power plant.

Under such conditions, the working men temporary settlement could be tuned to became definitive urbanisation after the power plant will work.

In a desert, temporary settlement are a necessity but in an oasis it would be more reasonable create the seed of a definitive settlement and then build the power plant.

On overall this approach will take more time than a parallel building along the way but it will greatly reduce the risk of failure. Moreover, any kind of completing missing or delaying will not zeroed all the effort because desert colonisation would be progressive. Which means that the project will start to produce value before its completion.

Managing the risk by design

The risk of failure facing a huge project like these, strongly discourage its realisation. No one dares to begin because it could not grant the positive end.

Unless, designing the entire project in a multitude of modular progressive evolving steps, in which each steps would provide its own utility before overall completion and despite overall completion.

Moreover, while the channel get deep into the desert the slots behind are going to evolve. The working men settlement became colonisation settlement. Then they evolve in urbanisation.

Once the water will flow the mills will provide more energy for a further colonisation and more dense urbanisation.

Once the depression osasis will get in place the power plant construction will begin. Once this will competed more energy will be available for the whole country but also for the channel area.

The navigation will easily support heavy and large supplies. Building a large, deep, navigable channel of 80km into the desert in one single step will kill any budget because the risks it would bring.

Building the same opera in a set of progressively self-sufficient 4km slots, dramatically drop the overall risk because it will be accomplished, soon or later.

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