S O L U T I O N S ?

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The world population is still further growing; the climate seems to change, more or less also influenced through the human caused emissions. The glaciers, the ice cover at the northern Polar Regions shall may disappear, the marine shelf benthic and the pelagic ecosystem are menaced to extinguish because of the fishery, as the sandy shores, the mangrove forests, the salt marshes and the salt lakes.

The freshwater scarcity will grow, particularly there, where the population grows. Hotter climate and development efforts will demand more freshwater for irrigation, sanitation, stock breeding, industrial production and just for fun.

We can clean and reuse wastewater, we can forcing the field drainage as saving against salinity growth. We can pump up fossil groundwater, we can desalinate brackish and seawater, using fossil and/or nuclear fuels.

We can import freshwater from countries, where it is still abundant, also because of the there dammed rivers.

These are, respectively could be solutions for the next 20-30 years. And thereafter? We cannot stop the likely through human influences speeded climate changes. We cannot stop by force the population growth (and the thirsty refugees). We can reuse a certain quantity of treated wastewater, but likely not as drink-, bath- or wash water.

Groundwater and fossil/nuclear fuels are not endless. One day we have also to substitute these. A complete substitution will last at least 40-50 years. It will be

a very long and costly way (may be, we are already too late…). And all this by today's violent religion wars and their consequences …

But also the longest way begins with the first step, as a Chinese would say.

NOW, WHO WILL BE ABLE TO CUT THESE GORDIANS KNOTS, AND HOW?

The MENA region is one of the places, where the questions population growth and water scarcity are, yet today, particularly serious. Therefore we will take it as example and begin (MENA means "Middle East North Africa").

A solution could be here to purchase freshwater coming from the Turkish Mediterranean Coast. This solution involves many problems:

- Purchasing water from a foreign country, here from the remnant of their former sovereign, the Ottoman Empire, means not only to spend a lot of money, but to become, in the long run, also politically again dependent, and vulnerable, specially if the water transport would be made through pipelines traversing many Countries, as Syria, Lebanon, Israel, until Saudi Arabia ("Peace Water Pipeline").

- The Mediterranean Sea becomes every year warmer and saltier, not only because of the warmer getting climate, but also because most of in the Mediterranean basin flowing rivers are been (or will further be) dammed, like the Turkish ones. (Don't forget the Persian Gulf).

- The Mediterranean outflow in the Atlantic Sea influences the thermohaline exchange of the Gulf Stream. Nobody knows, if and when this warmer and

saltier getting outflow will disrupt its actual balance, already yet menaced by the ice melt. The consequences could be a breakdown of this current, with a new Ice Age at least for West-, Central- and North-Europe. (This is the reason why, some years ago, the American scientist Johnson proposed to build a dam across the Gibraltar Strait, in order to stop al least 80% of the Mediterranean outflow).
Another big, yet today not soluble problem, is the water sharing on the Nile River. There are 10 riparian states. Six of them furnish 14% of the water really reaching the north (White Nile), two 86% (Blue Nile, Athbara, Sobat, almost Ethiopia, very few Eritrea), AND TWO, Egypt and Sudan. PRATICALLY NONE. And these two states use (and waste) the whole Nile water, especially Egypt, which adduces its “historical rights” only for its needs. For the other riparians is in the end forbidden, if necessary by menace of force as ultima ratio, to use their Nile water for irrigation. Some of them have, every often, million of deaths through drought and famine, as Ethiopia, where, I can just repeat it, 85% of the Nile water are coming from. But also today needs Egypt more water than the only with Sudan concluded agreement concerning the shared quotes would allow, because of every new, implemented irrigation projects (just 5% of the high polluted Nile water reaches today the Mediterranean Sea).
Water gifts for the other riparian states are simply impossible. Mors tua, vita mea. A similar problem hosts the Jordan Basin. Libya has the great man made river, the Arabian Peninsula huge desalting plants, as long groundwater and fossil fuels will allow this.

Who want to conserve his independence and water security, has to produce its own freshwater. Who will get freshwater also in the future, has to find solutions without fossil fuel and with the (not renewable) fossil groundwater (if not saline or polluted), just as emergency reserve.

Who will not risk to die at the Mediterranean coasts, because of the Gibraltar dam or because of a war with the through the presumed Gulf Stream breakdown menaced western powers, has to at least partially reopen the most of the Mediterranean rivers. And the biggest dammed one is the Nile. What the matter, by these lots and lots of problems? What we want to do, when the Renaissance Dam, in Ethiopia/Blue Nile, will get operational? Do we have solutions?

The only possible way, I hope not only in my opinion, is to develop solar/wind driven desalination plants, big, middle and little ones. Facilities, circumstances permitting and if feasibles, combining together already developed, but until now not constructed technologies, e.g. as the energy tower with the solar chimney power plant, and with vertical axis wind turbines (VAWT), and so on. (Don’t forget the use of vacuum).

The soils under these facilities could be used as farmland for the cultivation of salt tolerant plants (halophytes), for stock breeding, breeding/hatchery chains, beginning with algae/shrimps/fishes, and others more.

The very first begin could be made, with small facilities, at the Dahlac Islands in Eritrea, than with bigger, at the pipeline, which shall connect the Red Sea

with the Dead Sea, not only for refilling this dying salt lake until its former level, for producing electricity through the height difference between the two basins (hydropower), but also for desalting huge quantities of brackish and seawater, in order to make blooming the Negev Desert ,- as supplementary home for the Israelis, as dreamed from their fathers -, and the south of Jordan. This solution would also offer a real basis for the begin of a viable and durable peace between Israel and its Arab neighbours, if all they want…

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In North Africa, there are numerous Depressions, mostly of them under the Sea Level (usl). The biggest one is the Qattara, in Egypt.

In a further Step, could be create a 20.000 km² wide lake in this Depression and in the near lying little ones, all under the sea level, with inflow through a channel from the Mediterranean Sea, as basis for living and working for million of Egyptians, WITH FEWER NILE. (The old projects to use this Depression as one way discharge basin for a hydropower plant are gone, because of the then 12.000 km² large, every saltier getting lake, which would arise there, 60m under the sea level. A new, giant Dead Sea). This new lake would fill the Qattara until to the sea level, as basis for fishery, tourism, urbanisation, reclamation, salt-industries, breeding, solar/wind powered energy plants for desalination and for the production of hydrogen and oxygen for the whole world, as substitute for the one day ending, respective may be just for burning forbidden/ too precious fossil fuels.

But this solutions could be only viable, if the salt content in the lake would remain in between certain figures. This matter presupposes also the erection of many, huge, middle and little desalting plants just for this purpose, like at the Red-Dead pipeline, beneficing from the there made experiences on this matter. (If it would be really necessary to equilibrate the thermohaline balance of the Gulf Stream, because of lacking saltwater in the north (ice melt) and for avoiding that this stream sets its turning point further in the south, we could then use for this matter the salt coming from the Qattara desalination plants).
A third step could complete this proposal, in an extension as also foreseen by Dr.Ahmed Idrissi in http://happy-arabia.com.

Now we will take a brief look at the meteorological conditions on the MENA region and the actual state-of-art. The warm air around the Equator rises. On its rising, the air cools and sheds rain. This now dry air move then north and south and descends again to the earth surface. On descending, the air compresses and warms up. The earth rotation diverts these flows (Coriolis Effect), which were concentrated in two belts between 15° and 35° grad north and south of the Equator, from where they flow back again (Trade Winds). That explains, why here are positioned the desert belt. It is the hot and dry descending air that produces the desert and not the desert that warms up the air. This meteorological cycle was discovered 1735 by Hadley, therefore the denomination Hadley Cells for these two belts. This hot and dry air can be used

as fuel. And within the northern Hadley Cell are lying the MENA Countries. By transforming that heat to mechanical energy/electricity, a km² desert can deliver an average amount of 1.25-2.5 MW electricity. A so called “Convection Tower” uses the downdraft for producing wind. The hot and dry air from above is cooled by a spray of (salt-) water (evaporative cooling). The cooled air contracts and obtains a higher density, thereby falling and creating a downdraft. If the tower is tall enough, the downward airflow reaches high speeds and actuates turbines, which generate electricity. The downdraft sucks in more and more dry and hot air from above, which is continually cooled by a spray of (salt-) water, continuing the process, night and day.

The biggest and may be best (not yet built) implementation of this solution could be the Energy Tower (Arubot Sharav) by Prof. Dan Zaslavski/Techion Haifa.

But there are Pros and Cons. In desert areas there is no water. Foreseen was to use saltwater from the near Red Sea. Beside the idea to desalt in the tower seawater by reverse osmosis, the salty-humid air flows out of the turbines and covers large soil surfaces. That salt-enriched water, respective the precipitated salt has to be collected and brought back to the sea. A very expensive and dangerous task also for soil and groundwater, if the then large lined surfaces and canals leak, respectively when at 1.200m height a strong wind is blowing.

For working properly, a 1.200m high and 400m wide Energy Tower requires a own 20 x 20 km area, in order to collect enough descending hot air, producing 4.000 GWh/year (but 43% of them are needed for pumping up the water). Another, very simply, dry working, but more expensive solution because of the collector, with a lower grade of efficiency, uses the updraft. (Prof. Schlaich/ Germany). The desert air flows here in a 7.200 large, with glass covered, lightly inclined collector, warms further up from 20° in the middle to 60° C and grows to a central chimney. There are positioned turbines, which generate electricity. This function can be extended, if beneath the collector roof are positioned black pipes containing water, which collects heat during the day and give it back, during the night, to the turbines. THE HOT AIR ESCAPES HERE FROM THE CHIMNEY WITH 50°C, WITHOUT FURTHER USE (dry Adiabatic).

- Both facilities need a tall, 1.000-1.200m high chimney/tower, which was not used for further purposes. Why do not combine both constructions in a synergetic one?
- In the desert regions blows a quite strong and constant wind (Trade Winds, as consequence of the global meteorological cycle, see above).
- We could also use the anyway built tower as vertical axis for a very huge wind rotor. The electricity generation occurs here through ring generators.

These are the reasons, why I would like to propose a threefold combined facility, which have to be verified, using:

- At least eight single updraft chimneys around the downdraft-tower, also for strengthen it, together with the generator rings, also as further reinforcement.
- The from the updraft chimneys coming hot air as supplementary feed for the downdraft tower (a third more hot air inflow, reducing so the needed area for each energy tower).
- The below, sealed part of the anyway existent hot air updraft collector section as escaping way for the 22° C warm and nearly saturate salty-humid air from the energy tower, with others, connected functions, as e.g. for feeding halophyte trees, stock breeding, salt tolerant crops, also hosting breeding chains and so on. Through the large daily thermal amplitude cools the from the downdraft tower coming humid air during the night and sheds further water for the irrigation. Drainage takes care for washing the soils. The brine flows then in the Dead Sea, respective in salt ponds, producing so further processing heat.
- The combined and reinforced tower as vertical axis for a huge wind rotor, a VAWT, which works on ring generators. (HAWTs reach now the limits of their economical and structural feasibility).
- These three facilities work independently each from another.

The here produced electricity could be used for desalting brackish and/or seawater, respective for every production which needs electrical power.

Other, littler solutions are conceivable, also using the vacuum, where feasible.

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Similar solutions could be also implemented at the Mexican Peninsula Baja California, in order to produce freshwater and fuel (hydrogen) for the US-State with the same name.

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Supposed, Australia would also want to realize on its own land such an implementation, respectively a similar solution like proposed at the Red-Dead channel and at the Qattara Depression. Such a project could be possibly realized, if any, at the Lake Eyre Basin, as already proposed in the far and near past, because of the conditions there:

1. Many large, mostly dry, resp. dying salt lakes, as Lake Eyre north (8.430 km², 15m usl), Eyre south (1.260 km², 12m usl), Lake Torrens (5.900 km², 30m asl, Lake Gairdner (4.300 km², sea level x?), and so on.
2. The north of this Basin lays in between the Southern Hadley Cell, with
    a. rainfall between 150 and 400mm/y, a semiarid zone;
    b. a very erratic river inflow (Diamantina/Georgina/Cooper/Neales/ Macumba/Frome etc.) of 3-28 km³/y;
    c. proximity to the sea (60 km from Port Augusta to Lake Torrens, 155 km from Whyalla to Lake Gairdner. Besides this, between Torrens north and Eyre south lay just 65 km);

d. a average annual temperature of 21°C/24°C in the north (18/24°C July, 36/39°C January, with a sunshine ratio of 3.250-3.500 hours/y and a global radiation of 2.150-2.220 kw/m²/y.

The annual evaporation rate from this Basin amounts to 1.800-2.000 mm/m²/y. A sunny (and windy) area.

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The whole water surface of these three Lakes, if filled until their highest possible level, would be quite the same as at the Qattara Depression. Supposed an evaporation rate of 2.000mm/m²/y, the water loss (without considering the Percolation), would then amount to nearly 40 km³/y.

The river inputs give today, in the middle, 16 km³/year. But by growing of the evaporation rate, may be would also grow the precipitation rate in this area a little, with figure by perhaps 350-400 mm/m²/y and a river inflow of 20-30 km³/year.

However, the almost water must come from the Ocean.

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The biggest pump station of the world, the Toshka facility in Egypt, built for 450-500 million US$ from Hitachi/Kvaerner, uses 18 pumps (+3 as reserve) for lifting up to 54m 300m³/sec, = 25 million m³/d, = 9 km³/y, consuming, on the whole, 375 MWh electricity.

That means, Australia would need and must erect, in steps, pump stations with nearly 70-80 such pump units, in order to balance and to keep these three lakes constantly full filled.

The needed energy would be of 1.640 MWh and could came, Australia is a coal rich land, e.g. from “Clean Coal Technology Power Plants”, with a output of 800-850 MWh each, like the JEA CFB of Foster Wheeler Energy Corp., or the German KOMET 650, respectively from a Australian solution.

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A old proposal planed to ditch a 10 billion US$ expensive (1986 prices), 400-500 km long canal, with estimated 10 km^3 of excavation, only for the partial refilling of the Lake Eyre, starting at the Spencer Gulf. A newest proposal planed to ditch even TWO 2.000m wide (!) channels, to be used as inflow/outflow channels, using the tidal height of 1.8-2m difference, just for filling both Lakes Eyre. A really very expensive solution.

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Now we will see if other solutions, built in some steps, could be better/cheaper. The aim must be to implement a tailored, general development plan for the whole Region, as model like foreseen for the Qattara surroundings. We will also try to propose a more rational, wider, in the whole cheaper solution:

FIRST STEP (5 years, 2/2.5 billion US$):

Erection of a Clean Coal Technology Power Plant and a station with 30 pumps in the Port Augusta area, together with pipelines to the lake Torrens. The seawater would be pumped up until 45-50m asl. From this peak the pipelines fall back and follow the soil level, then again arising until 30-35m asl at the southern border of the Torrens.

SECOND STEP (5 years, 3/3.5 billion US$):

Erection of a second Power Plant and a further station with 30 pumps in the above mentioned area. Also these pipelines, laying over the first ones, grow up, fall until the soil level, grow up again at the Torrens and discharge there. At the Torrens northern border the seawater falls down, producing electricity through a hydropower plant and flows, always through pipelines, to the Lakes Eyre South and North.

THIRD STEP (may be 8-10 years, in between the first two. Investitionsvolume depending on the proposed schemes):

Solar-Wind driven desalination plants, salt chemical facilities, salt ponds, fishponds, reclamation areas, halophytes cultivation, brine shrimps breeding in the lakes, - as at the US Great Salt Lake -, as feed for fishponds, and much more.

LAST STEP (if desirable, 5 years, 2 billion US$):

Third station with 20 pumps, pipelines to the Lake Gairdner. Further reclamation areas also there, as by the third step. If Australia want, could be also possible to use tunnelled pipelines to the Lake Frome.

If You want to get more particulars and drawings, please go to www.Die-Kattara-Utopie-de , by Dr. Antonio Mascolo (Sorry, only in German).

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