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Jean-Rémy HUGUET, Sébastien LE CLEC'H & Damien BONNEFOY
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Nile Delta: The end of miracle?

Sebastien.le-clec-h@etumel.univmed.fr
jean-remy.huguet@etumel.univmed.fr
damien.bonnefoy@etumel.univmed.fr



Abstract:

The Nile Delta is located in the North of Egypt, it's the area where the Nile flow into the Mediterranean Sea. It forms a triangle, on a surface of 24 000 km² (2% of the Egypt surface). Most big cities of Egypt are included in this region, because climate is more pleasant for population and ground is a very fertile. So, farming is the main activity. Thus, population's density is very important, it is even the strongest of the world.

These high density has consequences on nature, in order to feed all the population cultivation become intensive, fertilizer are used badly, so, many factories have moved into this region for answer at the demand. All that, induce water pollution. Moreover global warming lead to a rising Sea level, which has several impacts, like soil become salty, big cities are flood, fresh water become salty. Unfortunately, global warming is no the only danger, local politics have build in 1970 a dam (in Aswan, upriver the Nile) and this building block all sediments that come from Ethiopia watershed and which regenerate the Nile Delta. Fish are also affect, because Sardines feed with it sediment, but without it silt, sardines go away and larger fish don't find food in Nile Delta, so, fishermen have increasingly difficult to find fish. But the dam also has a positive impact on the comfort of people, electricity and clean water for consumption and irrigation. The future of the Nile delta is very compromised by the rising sea levels, and the growing population. Quickly the delta can no longer accommodate everyone and to avoid climate exile of millions of people few solutions are proposed by the Egyptian government whose priorities are, coast protection for protect cities, new cultivation for feed all the population, and pisciculture.

Key Words: Nile Delta, Pollution, Rising sea level, Global Warming, Egypt, Salty soil, Aswan dam, Sediment, Culture, Fishing, Fertilizers.

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Introduction

The global warming has had no real impact on our daily life yet, but this one is soon going to affect us. The rising sea level is one of dangerous effect of this reheating. Indeed, whole zones of the planet are going to disappear under waters before some years. As a great majority of the human beings live near the sea, it is the disaster which is going to bring numerous persons to avoid their land.

The question is to know what are the zones which will be affected in the first one.

When rising sea level will be really influential?

What countries are going to have to spend fortunes to defend itself?

What solutions do they exist for these regions?

According to the scientists, the Nile Delta is one of the region which is going to be affected in first by rising sea level. Its geographical situation, its altitude and its exploitation make that the inhabitants of this region risk to undergo quite hard this rising sea level.

So we are going to begin with a presentation of the Nile Delta region, then we shall see impacts of rising sea level already felt and influence of the river hydraulic exploitation, and finally we shall approach the region's future.

I - Nile Delta Presentation



Figure 1 - Google Earth – Nile Delta

«Triangle of fertility », " Kingdom of waters ". The Nile Delta is the richest and the most populated region in Egypt. The sovereign Lagides, successors of Alexandre le Grand, gave it this name, because its shape looks like literally Greek of the same name. It was created by alluviums accumulation in an ancient marine golf there are several tens of thousands years. The whole zone is situated on average 2 meters above the sea level.

1) Geography

The Nile Delta is a triangle of 24 000 m² surface, managed southward, situated in the North of Egypt and following the Mediterranean Sea. It begins at the level of the Cairo, 150 km of the bank, and is bounded on the West by Alexandria and in the East by Port Said. In its entrance to the Delta, the river divides in two arms, that of Damiette in the East, and that of Rosette, on the West.

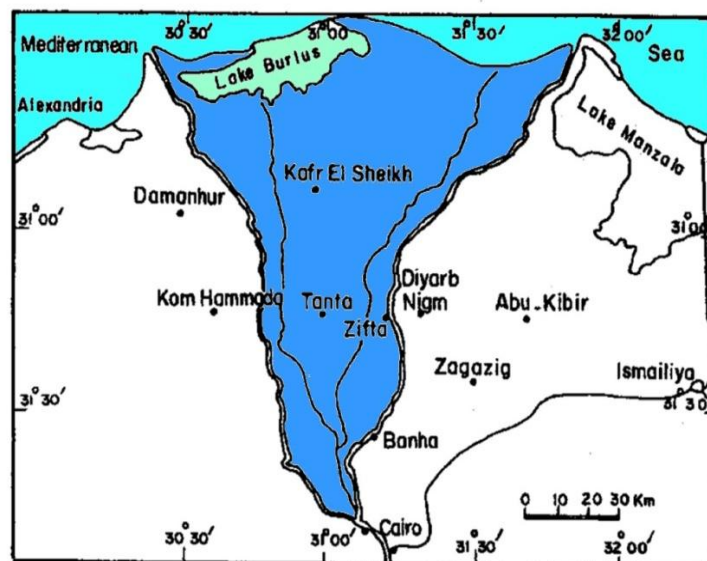


Figure 2 - Map – Nile Delta.

2) Climate

The climate is soft thanks to the Mediterranean influence. The coastal region includes most of the Egyptian big cities which benefit from a moderate climate. Temperatures rarely lower below 9 ° in 10°C the winter. The summer, they can exceed 40°C. During intermediate seasons, temperatures are next to 15°C. The region receives an average of rainy fortnight a year. The summer, there is no haste. In spring, blow Khamsin, wind burning with the desert, which provokes sandstorms.

3) Farming

With about 24 000 km of drop pipes and irrigation, the Delta is a vital region for Egypt. Indeed, it is a zone convenient to the farming thanks to silt brought by the river. We cultivate some cotton, wheat, corn, rice, citrus fruits, groundnut, henna there. The space is optimized and farms are adapted to the requirements of the intensive farming and the capitalist system. Egyptian papyrus comes largely from this region.



Figure 3 - Papyrus plants

4) Population

More than 70 million inhabitants group together into this zone, what represents half of the Egyptian population while it represents only 4 % of the country surface. Density of population is about 2 miles inhabitants by km², what constitutes the world record. The Delta is thus overpopulated and its inhabitants depend strongly on the farming.

5) Biodiversity

The Delta swamps are refuges for numerous birds, as herons, swans, flamingos and pelicans. These swamps are also stocked with a big quantity of fishes, representing 60 % of the nature fishes reserve of the country. Furthermore, fish farming is in strong expansion and allows to feed the important population.



Figure 4 - White swan

The Nile Delta is thus a vulnerable, over-populated and over-exploited balance, which is under an important threat which could force to avoid a big part of the population.

II - Impact of Sea and Human on the Nile Delta

1) Sea Impact.

The Nile Delta is since 5.000 years an intensive farming zone thanks to his rich soil. The richness of this soil is due to the Nile Rivers which carry lot of fertile sediments that comes from Ethiopia watershed and it drop off all along the Nile River and Nile Delta. But with the expansion of the population, farmers Egyptian have needed to become more productive. For that they begin to use fertilizer. More and more peasant farmer practices these techniques and this makes the land increasingly more polluted, the principal elements that pollute this zone is the Nitrite. Furthermore, the cultivator meet a new problem since some years, the land is covered by a layer of salt more and more far inland. The reason of this damage is the increase level of the Mediterranean Sea. Expert make research on this subject in Nile Delta and say that the level of the Mediterranean Sea increase because she is expend by hot temperature which increase between 1.5°C and 4.5°C in 100 years, is representing an increase of sea level of 1m between now and 2100. It's important to know (or to remind) that the Nile Delta has an altitude of 45cm above water. In 1985 a satellite view has been taken above Rosette headland on the Nile Delta (Figure 5), and one else in 1999 on same place (Figure 6), after analysis, scientists saw some lake behind land in 1985, but in 1999, lake are near the sea, they estimate that the sea has submerged 1400m of ground in 14 years, its represent 100m by years.

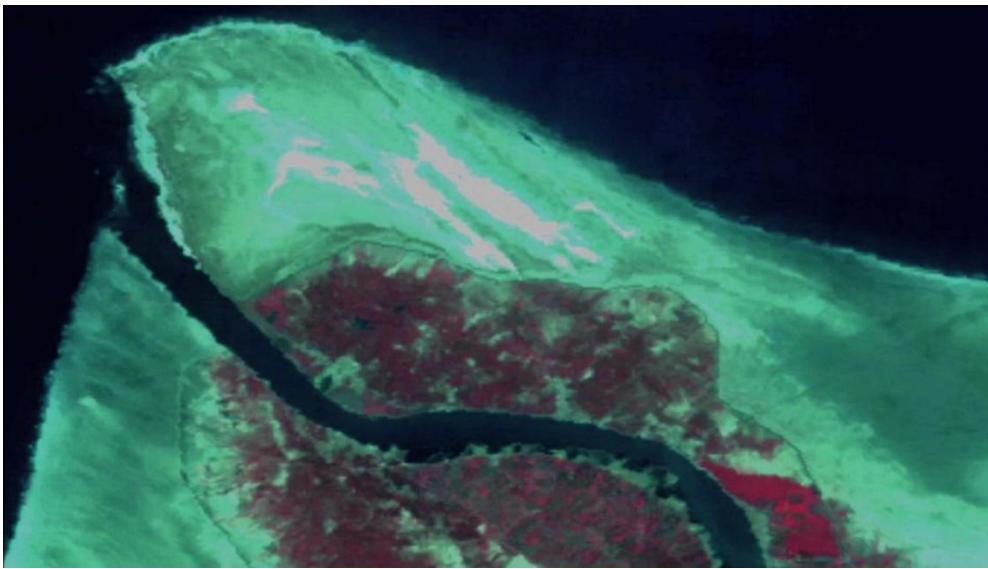


Figure 5- Rosette headland in 1985 with in bright white the lake.

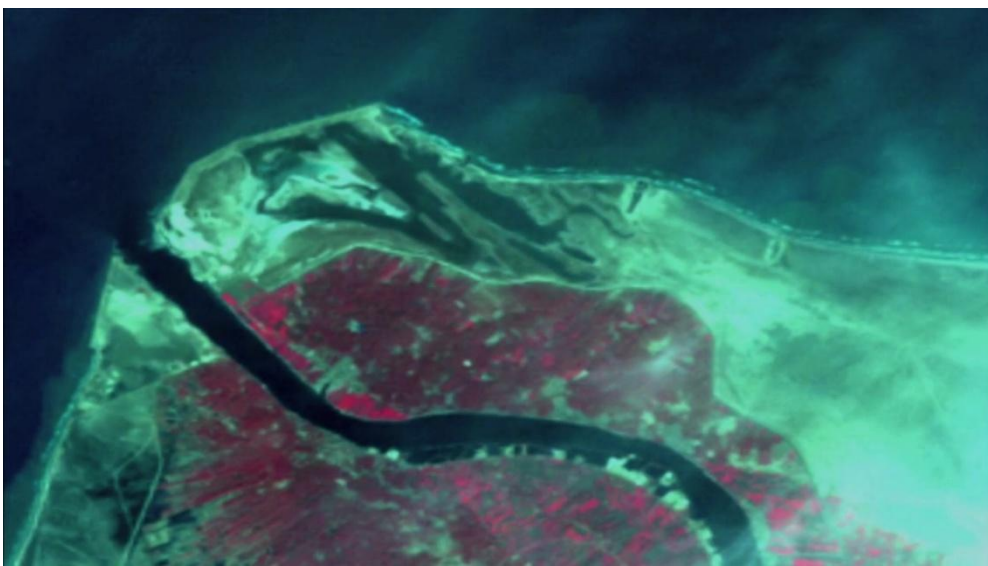


Figure 6 - Rosette headland in 1999 with in black the lake (same bright white in pics of rosette in 1985).

However, the increase of Sea level is not the only problem in Nile Delta that explain the layer of salt in land, the groundwater, near to the sea, have is concentration in salt that increase with the time and with the augmentation of the level of sea because sea water seep in silt. To better understand, a scientist has dig a hole in water at a distance of 500m of the Mediranean Sea, after 30min, the hole was filled with water up to 45 cm from the surface and this water is brackish water. In fact the sea water penetrates the ground by capillarity and contaminates all fresh water. Farmers, continue to use this fresh water despite the concentration of salt for irrigated theirs parcels then over time the land become salty. A trouble is that some plant species tolerate a high salt concentration, and therefore the diversity of cultures is reduced. The only species that accommodates are date palm (Figure 7). But the quantities that are harvested, may fall the price and its culture is very little profitable. The

increase level of sea not just contaminated the groundwater, but also floods the land and worsens the situation.



Picture 7: Date Palm and its fruits.

2) Human impact

The principal problem is only the global warming, in 1970, Egyptians politics conclude to build a huge weir upriver the Nile. The objectives of this structure is to alimnt in water all the country which is principally a desert, the dam contain 42,7 million of m³, secondly, is to feed all the population in electricity, The hydraulic dam of Aswan produce 2.1 million KW per years (it's 231.000 Egyptian home), thirdly, the dam permit to control Nile flood and allows the farmers to have an irrigation system throughout the year, regardless of the season.



Figure 8: View of Aswan Dam, the Nile Delta is at north.

Unfortunately, There are not only positive advantage, that have for result to stop sediment that come from Ethiopia, so the Nile shell out in silt, the Nile Delta can't renew sediments and the outcome make suffer the coast of the Nile Delta. The lack of sediment don't permit the protection of coast, wave demolish building, road, etc. and sea water flood cities. Before 1970, Egyptian cities like Alexandria are thriving town, but today they are threatened by Sea Water because the increase of sea level and the decreasing protection of the coast has for consequence to make the Nile more salty that continuous damaging this region. One more effect of global warming is the increase temperature, the consequence is that the Nile Delta suffers of frequently severe drought, dry out soil and with the weight of dry land the level of the Nile Delta is decreasing and facilitate flood, also due to the lack of new sediments. The land is sinking 4mm per year since 8.500 years but 10mm since the last centuries by gravity under its own weight.

Another impact of the decreasing concentration fertilizer sediment in the Nile River is that farmer have need to use fertilizer for theirs crops. Soils get poorer every year, and this is the only solution to have enough to harvest and for feed all Egyptian families. Parcels polluted by chemical elements contaminate water more and more and increase this effect for farmer. Moreover, for answer to the demand of fertilizer, many factories have settled on the shore of the Nile to produce fertilizers, but these factories discharge their wastes directly into irrigation water, the Nile is still more polluted. we must also know that all the Egyptians have not sewage system, and so they release their wastes into the Nile.

The Nile flows into the Mediterranean Sea increasingly polluted and without sediment, that are nutrient for life, and it is not without consequence for aquatic life. Fisherman are force to go always more far. There were a decades, anglers found a lot of sardines around the Nile Delta, because these fish are species that love to eat the small plankton found in sediments from the Nile. Except that since some years fishermen don't find sardines in Nile Delta, but this is not the only species to have disappeared. Sardines, which are small, were at the base of the food chain, and now, like there are disappeared, larger fish can no find food, so they go away and fishermen must go away too. It's a real problem for local people who have more and more difficult to feed and to find food.

Combination between increasing sea level and absence of sediment cause a veritable curse.

The Aswan Dam block all sediments, sediments that make fertile the Nile Delta, and without silt, populations are in danger. Of course, the dam is necessary for convenience, but we must let nature decline for convenience?

III - The future of the Nile Delta

1) Rising sea levels and the growing population

By the end of the XXI century, researchers estimate that the Mediterranean will rise by 30 to 100 centimeters. From a meter, Alexandria should be submerged, while at least 20% of the surface of the Delta would be flooded.

In fact, from 2020, the Mediterranean should start hunting the Egyptians urban areas nearest to the coast. And according to a recent government report on the coast of Alexandria, the second largest city : "water elevation of 30 cm is expected by 2025, flooding about 200 km²" and causing an exodus of half a million persons.

In fact the delta contains near the two thirds of the Egyptian population, and 45 % of the agricultural production of the country. Consequently, any rise of the sea level will have a major impact in Egypt. Look at this simulation. If the sea rises of 1 meter in 30 or 40 years which come, 15 % of the lands of the delta will be flooded, a lot of drops would be lost, and 6 million persons will be moved.



Figure 9 – Map of rising sea level, in bleu the level of sea after increase of 1m. On left bottom, diagrams represent percentage effect of water after increase on population and on culture.

Yet, in 2010, the rate of fertility was, on average, 3 children by woman, it is the high index, that is going to carry the Egyptian population to 100 million inhabitants in 15 years.



Figure 10 – Evolution of the population on the Nile Delta.

The increase of the population will lead to the desertification of the delta because there will be new construction to accommodate people in an area where population density is already very high. In addition there will be an intensification of unsustainable agriculture, deforestation and overgrazing. It is, with rising sea levels, and soil salinization, one factor of the destruction of the Nile Delta.

Rising sea levels would also lead to the destruction of the weak points of the sand belt, which is essential for the protection of lagoons and lowlands cleared. The consequences are very serious because one third of fish caught in the Egyptian lagoons. Rising sea levels affect the quality of water, affecting most freshwater fish as fingerlings.

2) The solutions

Be aware that for now the fate of the Nile Delta is not in the priorities of the Egyptian government. However, some measures have been taken. Submerged dikes are being built along the Mediterranean coast to slow coastal erosion and to avoid as much groundwater infiltration, but this should put an end to the existence of beaches. A Chinese company is currently building a barrier of concrete blocks facing the port of Rosetta, and some 200 million Euros were allocated for the construction of such walls in Alexandria.



Figure 11 – Submerge Dike in headland Rosette.

In addition the Egypt budget not allowing it to invest all over the coast, so they will need international assistance. But these are not sustainable solutions to avoid potential exile of climate refugees. Necessarily Egyptians must go on the desert even if the conditions are very rough, and some of them have already understood this:

- Between Alexandria and Cairo there is a monastery where monks cultivate vegetables such as beets. They draw water from the basement using wells and distributed by miles of lightly salted water pipe (at a rate of 2.2 liters per hour) and fertilizer it is a “fertiligation”.
- At 100km of Cairo, are grown with few water, jojoba seeds, rich in protein and can be used in many products such as medicines, fuels, food supplements.
- Fish farming is necessary to provide the protein for the entire population because in some lagoons rich in silt due to the Aswan Dam fish are becoming increasingly rare. With new channels in which water is not contaminated by heavy metals from fertilizers, fishes are caught after a meticulous selection. The water of the basins, rich in nitrogenous waste is then naturally filtered before being use for the surroundings drops which divide in two the need of water.

IV – Conclusion

The Nile Delta is a rich area, since its colonization, the Delta has always been a welcoming land for African population who often has trouble for finding food. Sediments make the Nile delta fertile and thus enabled the farmer to keep of their family. But the charms of this pleasant area compared to life in desert, quickly overpopulate the Nile Delta. Today, the waters are polluted, the lack of sediments prevents lands become fertile and decrease the protection of the coast. Furthermore, with global warming, cities and its inhabitants are threatened. Of course residents have electricity, but if there is nothing to eat, what will happen to people?

The government has some solutions, like building dikes, setting up fish farms. However they will not stop the effects of global warming, and people will be forced to move to avoid having their feet in water. Some inhabitants have returned to the desert, and adapt farming techniques to these conditions, but how to live constantly with a temperature at 50°C and a severe drought? That is why the future of these populations is uncertain, or will these millions of families gone? What will become these populations? How will it get food if the density continue to increase? There are so many questions without answer that it is high time that the different government of each Grand country of the world work together to find the answers to the questions.

Because soon it will be too late...

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