

interafrica



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I N T E R A F R I C A

INDEX

- 1) WATER, SOURCE OF CIVILIZATIONS**
- 2) A COMPARISON BETWEEN TWO CATCHMENT AREAS**
- 3) THE LAKE CHAD**
- 4) INTERNATIONAL AID**
- 5) THE “GREAT MAN MADE RIVER”**
- 6) “INTERAFRICA” PROJECT**
 - 6.1) Objective n.1: Water in the sahel**
 - 6.2) Objective n.2: Opportunity to consolidate ground-waters of the libyan sahara**
 - 6.3) Objective n.3: Agricultural development and international network of transport**
- 7) THE ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACT OF INTERAFRICA**

INTERAFRICA

PROPOSAL FOR A PROJECT TO REPLENISH LAKE CHAD AND SAHARAN AQUIFERS

1) WATER, SOURCE OF CIVILIZATIONS

In the last thirty years at least, the problem of water has attracted the attention of politicians, scientists and international organizations in an ever more pressing way, as one of the great problems potentially capable of triggering disasters and famines of epic dimensions.

The climatic imbalances of the last decade, while having provoked enormous damages caused by extraordinary floods which occurred in regions of the planet generally not accustomed to exceptionally high precipitation, at the same time emphasized or perpetuated situations of particular aridity in other regions already hit by progressive drought in decades.

Water for feeding, irrigation and industrial use is revealing itself as an ever more scarce resource for some areas of our planet and the need for this primary good has generated a series of large and small projects around the world, all aiming for the accumulation, stabilization and rational use of this resource which conditions development and sometimes the survival of entire populations. More often than in the past, many future conflicts, in some parts of the planet, will be disputed for the property and use of water.

It is superfluous to remember that the great civilizations of the past all developed themselves along waterways which were perennial and abundant: the Nile, the Tigris, the Euphrates, to mention only the ancient Middle Eastern civilizations which have much influenced even the European continent. Instead it is not superfluous to note that civilizations extraordinarily developed themselves along these waterways which crossed semi-arid or even desert areas which were cultivated using these same waters through irrigation. The catchment which supplied, and still supply, these "historical" rivers were distant hundreds, sometimes thousands, of kilometers and were, as they are, represented by mountainous areas, subject to intense precipitation, often covered by forests and anyhow inadequate, both for agricultural cultivation and cattle breeding. Rivers such as the Amazon River, under siege by the forests generated due to the excessive rain, have not allowed the evolution of particular civilizations, but only the sustenance of native communities which remained within the same vegetation of the forests which, at one time, had protected and isolated them.

2) A COMPARISON BETWEEN TWO CATCHMENT AREAS

Differing hydrologic and climatic conditions such as those outlined above can equally be observed in the central part of Africa. In particular, at slightly more than one

thousand kilometres' distance as the crow flies, two huge catchment basins adjacent to each other – the Chad basin and the Zaire basin – have extremely different, or even opposite, climatic and environmental conditions.

Chad, in the heart of the Sahel area, plagued by decades of draught, saw the homonymous lake, which used to be a source of living for nearly ten million inhabitants settled on its banks, shrink by two thirds, thereby increasing the risk of livestock extermination by hunger and forcing a large part of the local population to a massive outflow to the residual exploitable pastureland located south and west of lake Chad.

In geomorphologic terms, the Democratic Republic of Congo (formerly Zaire) essentially consists in a large basin straddling the equator and is consequently marked by abundant rain caught by the Zaire river throughout the year. The latter river ranks second in the world, after the Amazon river, in terms of catchment area extension, i.e. 3,690,000 sq km; in addition, its average continuous flow rate of nearly 60,000 cubic metres per second causes a flow of nearly 1,900 billion m³ a year into the Atlantic Ocean. At the estuary, the huge mass of water flowing from the river into the ocean creates a fresh-water area extending for more than 20 km. The river stream is highly perceptible, reaching up to nearly 50 km off the estuary, where the brown colour of the river water can be distinguished from the blue of the ocean.

In the Central African territory, the two catchment areas are separated by a watershed splitting the Central African Republic into two parts – East to West. South of the watershed, heavy rainfall creates large swampy areas that prevent any substantial agricultural development, whereas in the North the Sahel draught presents one of the bleakest and most concerning views of the African continent. The extensive exploitation of forests located south of the watershed prevents the most rainy areas in the region from going through suitable social and economic development, while in the North the autochthonous population has for many years run out of pastureland, or even trees and shrubs burnt to cook the scarce food available in the region.

The contrast between these two realities seems even more “unacceptable” against the dark scenery of the Sahel draught.

3) THE LAKE CHAD

A "historical" presence which allowed the survival and dignified development of some million people in the area of the African Sahel, is represented by Lake Chad. Due to its dimensions, more than a lake, it is a real sea in the open desert.

Lake Chad, which exists currently, or better as it existed a few decades ago, is the remains of an ancient lake which extended beyond the current dimensions and constitutes the largest African endoreic basin. It covers a part of the territory of Chad, Nigeria, Cameroon, and of Niger, in the heart of the Sahelian region, a bulwark to the advancing desert.

Since it is an endoreic area, thus without outward draining, the surface of Lake Chad has suffered, during the years, considerable variations in surface due to the climatic changes, seriously prejudicing the maintenance of the agricultural "polders" realized around its banks, the reduction of fishing activity and the obstacles posed to transport over water between the populations of the four countries facing its waters.

From the rather inaccurate archival data, it seems that at the end of the 800s the lake had reached its maximum water level (50000 Km² surface ?) such that it flooded Bahar El Ghazal for hundreds of kilometers, fertilizing this vast "enclave" for some years during which agriculture, stock farming and fishing flourished. On the contrary, around 1910 a great drought occurred which continued for a few years, reducing the lake to the surface of its southern basin, and later to reach its "normal" state after a few years which has remained so until the beginning of the 1960s, covering a surface of around 25000 Km². Since then a continued decrease in precipitation in the basins of the affluents to the lake have progressively lowered the level, compromising its very existence.

Periods of great drought were alternated, in the past few decades, with periods of greater rain, where the former always prevailed on the latter. Seasonal drought is a constant characteristic which causes lowering in the level of the lake by one/two meters, reducing seasonally the surface by up to 8/10000 Km², but in the past few decades there occurred a lowering of the waters up to 6/7 meters and seasonal reductions in surface up to 15000/20000 Km². This tendency in the past 35/40 years indicates that Lake Chad is now part of the more general phenomenon of the progressive desertification of the Sahel. It forms the most imposing and dramatic proof of this phenomenon which is well known to all countries of central Africa.

Currently the northern part of the lake, the so-called "Northern Pool" practically exists no longer, since the influx from the river Yobe' was reduced to the minimum due to the progressive reduction of precipitation in northern Nigeria in which the catchment of the river lies. The southern part still resists the drought, the so-called "Southern Pool" which is supplied by Chari, by great lengths the most important affluent to the lake, which carries 70% of the lakes' water input.

The weather forecast data from recent years has confirmed itself as generally unfavorable and what remains of the Northern Pool seems destined to slowly dry out. The Southern Pool, fed by the Chari, also receiving water from the Logone River, whose catchment areas still allow water contributions of a certain importance, has nevertheless strongly been affected from the changes to the climatic conditions to endure ulterior surface reductions.

The lake's water equilibrium seems to have been definitely compromised and the progressive reduction of this inner sea, and its feared disappearance, implies disastrous consequences for the agricultural, stock farming and fishing economies of the numerous populations of Chad, Niger, Nigeria and Cameroon. The "death" of Lake Chad would eliminate what still today seems to form a natural barrier against the

process of desertification which is occurring and which could push a mass of ever poorer and hungrier people even further south.

4) INTERNATIONAL AID

Millions of dollars have been spent in the past 40 years to attempt to contrast this ecological catastrophe which is consuming itself in the river areas of the four most important countries of the Sahel, through the drilling of thousands of wells for the use of humans, cattle, reforestation programmes, creation of small irrigated complexes starting from the use of aquifers no longer supplied by the lake's water and many other "microprojects" realized in a such in a noble attempt to limit a progressive environmental and social degradation. Such interventions, numerous and timely, have had the merit of saving some human lives and slowing down the consequences of desertification but have left the principal problem unsolved: the gradual disappearance of the lake.

Notwithstanding the generosity and emergency which have often characterized such interventions, of which we must recognize the immediate beneficial effects, it is necessary though to note that, in several occasions, they have demonstrated to be, after the end of the brief period of positive impact, the cause of further environmental degradation since the concentrated influx of populations and cattle in project areas emphasized the exploitation of the residual natural resources such as the termination of aquifer resources caused by their excessive use, irreversible phenomena of degradation of the earth's surface for "overgrazing" due to the excessive concentration of cattle, destruction of the last residues of the Savanna due to the excessive use of wood for domestic use, and so on.

Not only "timely" projects were realized in the attempt to help the local populations: in the 1960s great works were performed to irrigate territories around Lake Chad. Today, 40 years later, no trace is left of the 4000 Km of canals which were supposed to guarantee the survival in terms of food for the populations living on the shores of Lake Chad.

Reality is much different and nobody can be under the illusion of being able to modify it with a myriad of interventions, laudable on the human level, but destined to being rapidly "absorbed" by the Sahel which can be saved only by returning the altered water equilibrium, viceversa the desert dunes are destined to replace the waters of the lake with all the ecological and social consequences which such a phenomenon is able to provoke.

5) THE "GREAT MAN MADE RIVER"

About 1500 Km north of Lake Chad, in the Libyan desert of the Al Khaliij region, close to the oasis of Kufra, the greatest "field" of wells in the world for the pumping of aquifers, feeds an incredible and marvelous "modern fairy tale": the "Great River".

The greatest aqueduct on Earth, transfers, now for about 15 years, a "river of water" from the depths of the Sahara desert up to the Mediterranean coast of Libya. This gigantic work, the "last wonder of man", will be completed in 2007.

The "eighth wonder of the world" is a huge work: a system of aqueducts which transports fossil water buried under the desert, up to the Mediterranean. Thousands of trucks for years have tread new paths in the desert - the "river roads" - to transport hundreds of thousands of reinforced concrete pipes from the production plants of Marsa al-Brega and as-Sarir to the water basins and to the trenches dugout in the desert having a depth of about 6 meters where they had to be deployed.

Once completed, the Great Rivers will be able to distribute, through a capillary distribution network able to cover all the Libyan Mediterranean area, 6 million cubic meters of water per day, equal to approximately two billion and two hundred million cubic meters a year which can supply an entire population.

No doubt, the substantial economic and social development that Libya is likely to experience over the next few decades will be dependent on this huge infrastructure, whose water supply will be indispensable to a rapid growth of the agricultural, industrial and tertiary sectors.

6) "INTERAFRICA" PROJECT

INTERAFRICA has three basic objectives:

- Transferring 70 billion cubic metres of water a year from the Zaire river basin to lake Chad;
- Opportunity to consolidate ground waters of the Libyan Sahara;
- Activating an international waterway and land transport network linking central Africa to the three large commercial harbours of Tripoli, Lagos and Mombasa.

6.1) Objective n. 1: Water in the sahel

INTERAFRICA is aimed at reversing the current hydrologic trends of lake Chad and hydro-geologic trends of the Libyan Sahara aquifer. More specifically, a solution is proposed for these two large geographic areas in which millions of people live that are utterly concerned about the uncertain future of their children.

In short, INTERAFRICA envisages the construction of a broad navigable canal running across the North-Eastern side of the Zaire river catchment area and covering a distance of 1,700 km, of which 900 km in Congolese territory and 800 km in Central African territory. Along its full course, the canal will possibly intercept – at a height ranging from 800 to 900 m above the sea level – all of the right tributaries of the Zaire course, starting from the EPULU river, an ITURI affluent, which in turn flows into the ARUWIMI river, i.e. a major right tributary of the Zaire river.

Along its 1700 km course, the canal will catch waters from the upper catchment basins of intercepted rivers. The contribution of such catchment basins in Central African territory – with rainfall between 1,500 and 1,000 mm yearly – was estimated at nearly 10 billion m³ a year, while basins in the Congo territory– with rainfall between 1,500 and over 2,200 mm a year – would contribute in the order of 60 billion m³ a year, for an overall amount of 70 billion cubic metres to be annually offtaken from the Zaire river. Despite such sizeable drain of water, this would only amount to 3.5% maximum of the Zaire river capacity and the river would continue to flow in the Atlantic Ocean at a rate of more than 1,800 billion cubic metres a year.

The INTERAFRICA Project includes transport of this amount of water – for an overall flow rate at the end of the 1,700 km channel course of nearly 2,200 cubic metres per second, or nearly 1/3 more than the Nile rate in Asswan – up to a region of the Central African Republic, where the Congo-Chad watershed is at its lowest height, i.e. 600 m above sea level.

The Project further includes the creation of a large artificial reservoir in this region, located in the middle of the Central African Republic, in an area between the towns of Yangalia and Bamingui. Water from the reservoir will flow to the natural bed of the Chari river, i.e. the most important tributary of lake Chad.

The envisaged 70 billion cubic metres of water, caught in the artificial reservoir of the Central African Republic at a height of nearly 600 m above the sea level, would flow into the Chari river after having fed a large hydroelectric power plant at the foot of such reservoir. A series of sub-reservoirs and hydroelectric power plants will subsequently be fed up to lake Chad, located at a height slightly below 300 m above the sea level.

The hydroelectric power output that this mass of water would produce when flowing into lake Chad was estimated at around 20 to 25 billion kW/h, or over 10% of the overall energy production in Italy.

Such a huge quantity of energy, which can be produced in the heart of the Central African Republic, in line with objective 3 of the INTERAFRICA project as defined in paragraph 6.3) above, suggests the idea to create a container harbour on the artificial basin, for the inflow of raw materials from Zaire, via waterways. This opportunity will promote agro-industrial activities, such as the processing of agricultural, zootechnical, fishery and forestry products by manufacturing plants that may suitably establish themselves in the free port area on the banks the artificial reservoir providing abundant low-cost energy. In addition, the finished products of the local agro-industry would benefit from safe market outlets (see paragraph 6.3), whether in Africa or in other continents, via the large harbours of Tripoli, Lagos and Mombasa.

The abundance of electricity produced in the Central African Free Port area may ultimately be instrumental in the electrification of the Chad territory as well as of

the numerous agricultural areas to be established along a waterway distance of 800 km in the Central African Republic and 900 km in the Democratic Republic of Congo. Along the navigable canal, mooring sites and river harbours may be established with civic centres and warehouses for the collection and storage of agricultural, zootechnical and forestry products. Harbours may suitably be equipped with power supply from alluvial valleys having undergone agricultural, zootechnical and forestry development.

6.2) Objective n.2: Opportunity to consolidate ground waters of the libyan sahara

It has been calculated that it would take about 200 billion cubic meters of water to bring Lake Chad back to its natural dimensions: 20000 – 25000 Km² of surface area. Once having re-established the optimal level of the lake, it was calculated that, according to the seasonal changes in precipitation on the basins of rivers Chari and Logone – two main affluents of Lake Chad – it would take about 20/30 billion cubic meters of water a year to maintain the water levels, while 40/50 billion cubic meters may be used for the purpose of irrigation.

The “residual” quantity of water available is still large: nearly 1,400 cubic metres per second. It is as if an imaginary river were to be located downstream of Lake Chad, with a flow rate of nearly 80% of the Nile rate at the Aswan.

Given the water quantity available, the opportunity can be considered to consolidate – if need be – the Libyan Sahara waterbeds located at a distance of 1,500 km North-East of Lake Chad. In fact, feeding 5% of the available water quantity into Saharan aquifers would suffice to add more than two billion cubic metres of water a year to the Saharan ground waters, with a residual rate of more than 1,300 cubic meters per second to be used for irrigation in the coastal areas of Chad, Nigeria, Niger and Cameroon.

This mass of water, which could be fed back into the Sahara’s aquifers, originates from rainfall and may therefore be continuously renewed, thus making up for a permanent source of replenishment.

Such opportunity may amount to a kind of “water insurance” for the future social and economic development of the country and the rapid evolution that Libyans will have to sustain over the next few decades.

It is evident that – if the INTERAFRICA is found to be feasible – there is no doubt that even the transfer of about 2.2 billion cubic meters per year for the restoration of the Sahara’s aquifers will result equally feasible since it has to surpass technical difficulties which are inferior to those represented by the construction of the artificial canal, lower investments in the remaining project and representing the transfer of water resources necessary to solve the problem of replenishment, just about 3% of the volume of water “transferred” from the basin

of Zaire to that of Chad and 4%-5% of the volume available for irrigation below the lake which could be brought back to its original dimensions and maintained so in time.

6.3) Objective n.3: Agricultural development and international network of transport

INTERAFRICA has in itself an enormous potential for agricultural development in the waterside area of Lake Chad, but mostly in Chad's Sahara. One needs only to consider that using the "residual" waters remaining after the stabilization of the lake's level, it is possible to irrigate intensely about one and a half million hectares, the most part of which will cover the traditional agricultural areas around the lake, but also some large flood valleys in the basin of Chari taking water from the intermediate reservoirs which may be realized for the production of electricity and maybe also to allow navigation in certain parts of the river. To the north-east of Lake Chad, the depression of Bahr-El-Ghazal covers 400Km towards north-north-east to end in Kiri lake, today completely dry, but in distant times it was apparently a place inhabited by populations dedicated to agriculture and stock farming. All these areas, of recent or remote agricultural use, could be recuperated and developed in an efficient agricultural and zootechnical manner.

However, one and a half million of irrigated hectares of land, possibly covering about 25,000 Km² of territory, are a vast amount: almost 60 million Egyptians live on an irrigated surface of slightly more than 3 million hectares and therefore it is possible to forecast a production in the INTERAFRICA project which is so exuberant that over a certain limit it is not convenient to produce food when considering the consumption needs of local populations. When adding to this potential agricultural production the agro-industrial productions coming from the Central African Free-Trade area, the production forecast of the project would not make sense unless complemented by an efficient communication network capable of moving the goods produced out the heart of the African continent, mostly towards rich European countries, but also towards seaways open to markets of the East and West of the planet. The same communication network, complemented by a 1700Km navigable canal, will obviously be able to link the main central African markets covered by the project which also represent equally important consumer centers.

The two main international backbone road links which must be integrated in the TRANSAFRICA project are the LAGOS – MOMBASA road, already existing in large parts, and the planned future N'DJAMENA – TRIPOLI road.

INTERAFRICA can be instrumental in making this African dream come true via integrated waterway and road links. The "dream" is neither unrealistic nor impossible. After all, thousands of long haul vehicles are now travelling distances above 3,000 km in Europe – say between London and Istanbul – which distances are indeed comparable to that of the future N'djamena-Tripoli road link.

The Central African Free-Trade area which has been planned in correspondence of the water borders of Zaire and Chad in Central African territory, will meet in its immediate vicinity the backbone road links, in advanced state of construction, which will link six central African countries (Nigeria, Cameroon, Central African Republic, Democratic Republic of Congo, Uganda and Kenya), through a 6000 Km path, with the two ocean ports of Lagos and Mombasa.

A few kilometers west of the Central African Free-Trade zone, a link road could be realized between the Lagos – Mombasa backbone road and N'djamena. The link from the capital of Chad to the Mediterranean in the north could be guaranteed by the planned N'djamena – Tripoli road, thus providing an outlet on the Mediterranean for the inter-African goods trade.

Such a communication network would link nine large African countries – Libya, Chad, Niger, Nigeria, Cameroon, Central African Republic, Democratic Republic of Congo, Uganda and Kenya – putting them at the same time in communication with two oceanic ports and a mediterranean port.

7) THE ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACT OF INTERAFRICA

A “continental” project, such as INTERAFRICA, is destined to provoke enormous direct and indirect effects on the natural, economic and social environment which can be briefly summarized as follows:

- **Stabilisation of a barrier against desertification**

The contribution of an estimated rate of nearly 70 billion cubic metres a year of water will possibly stabilise the surface of lake Chad at its ideal values, by using about 1/3 of waters “transferred” from the Zaire basin, to the full advantage of the Republic of Chad as well as of countries that are directly dependent on – among other things – the lake’s lot, such as Niger, Nigeria and Cameroon.

- **Unprecedented agricultural, and zootechnical development**

The waters “available” for the regional development of irrigation, left over from those used for the stabilization of the lake’s volume, can be used both starting from the resources on river Chari in the Sahel zone, south of the lake, and around the lake itself in the Saharan region of the country and in the waterside areas of Nigeria, Niger and Cameroon, starting with direct use of Lake Chad, thus returning this “sea in the desert” to its original function as a water reservoir for about one and a half million irrigated hectares of land.

- **Agro-industrial development in the heart of Africa**

The great production of energy expected in relation to the great artificial lake which could be realized in the Central African Republic and the consequent

setup of a Free-Trade zone with agro-industrial establishments on its shores, allows one to predict a verticalization of a large mass of agricultural, zootechnical and forestry products coming from the regions of Upper Zaire through economical river transport.

- **Agricultural use of large areas in the upper course of the Zaire river**

In its 900 Km course in Congolese territory, the artificial canal, sided by a high voltage line departing from the Central African Free Port, may be equipped with a set of river ports located at alluvial valleys. These in turn are likely to undergo agricultural and zootechnical development. Each alluvial valley, in fact, will no longer be secluded but rather linked to the industrial area of the Central African Free Port and thence to the rest of the African continent, which will consequently encourage the exploitation of its natural resources and ensure market outlets. When benefits from, among other things, electrification are considered, each new area will be able to drive its own social, economic and civil development.

- **International development of transportation**

The 1700Km of navigable waterways, their link with the road backbone Lagos – Mombasa, the planned link between this backbone and N'djamena, the designed road link N'djamena – Tripoli, would form the most formidable communication network in the entire african continent from which, directly or indirectly, nine countries would benefit: LIBYA, NIGERIA, NIGER, CAMEROON, CHAD, CENTRAL AFRICAN REPUBLIC, DEMOCRATIC REPUBLIC OF CONGO, UGANDA and KENYA, countries which represent one third of the entire African continent in terms of territory.

- **Opportunity restoration of the libyan saharan aquifers**

The proposed consolidation of Saharan ground waters may be implemented, whenever needed, by constructing an aqueduct 1500 km long connecting lake Chad to the aquifer of Kufra, with electricity produced by the Project to be used for water pumping. Other connections to other aquifers, such as the ground waters of As-Hasawnah or Jabal Fezzan , will equally be possible, if deemed necessary.

- **Employment for generations of africans in Africa**

At least twenty years of building activity – earth movements, containment dams, hydraulic works in concrete, canals, hydroelectric plants, roads, bridges, villages, civic centers, electrical lines, irrigation systems, reforestation projects, etc. – require some ten million working days utilizing every kind of manpower. The generations which will be involved in the realization of these works will leave their place to the next generations which will surely find employment in the subsequent management of technological systems, services and agricultural, zootechnological, forestry, agro-industrial activities as well as in the numerous tertiary activities connected to such a vast and uneven, but at the same time integrated, development.

INTERAFRICA will be the greatest center of African development – maybe one of the greatest on Earth – which will employ local manpower and manpower from all the Countries of the continent. It will be able to offer generations of Africans an enormous job market without forcing them to gamble on going to Europe – which is a job market often very hard for Africans coming away from their climatic and cultural environment – realizing in their continent, even though with inevitable differences due to ethnic and cultural groups – but nevertheless still African – a series of local development models generated by this great inter-African infrastructure.