

TRANSAQUA

AN IDEA FOR THE SAHEL
THE CONGO-CHAD INTERBASIN TRANSFER

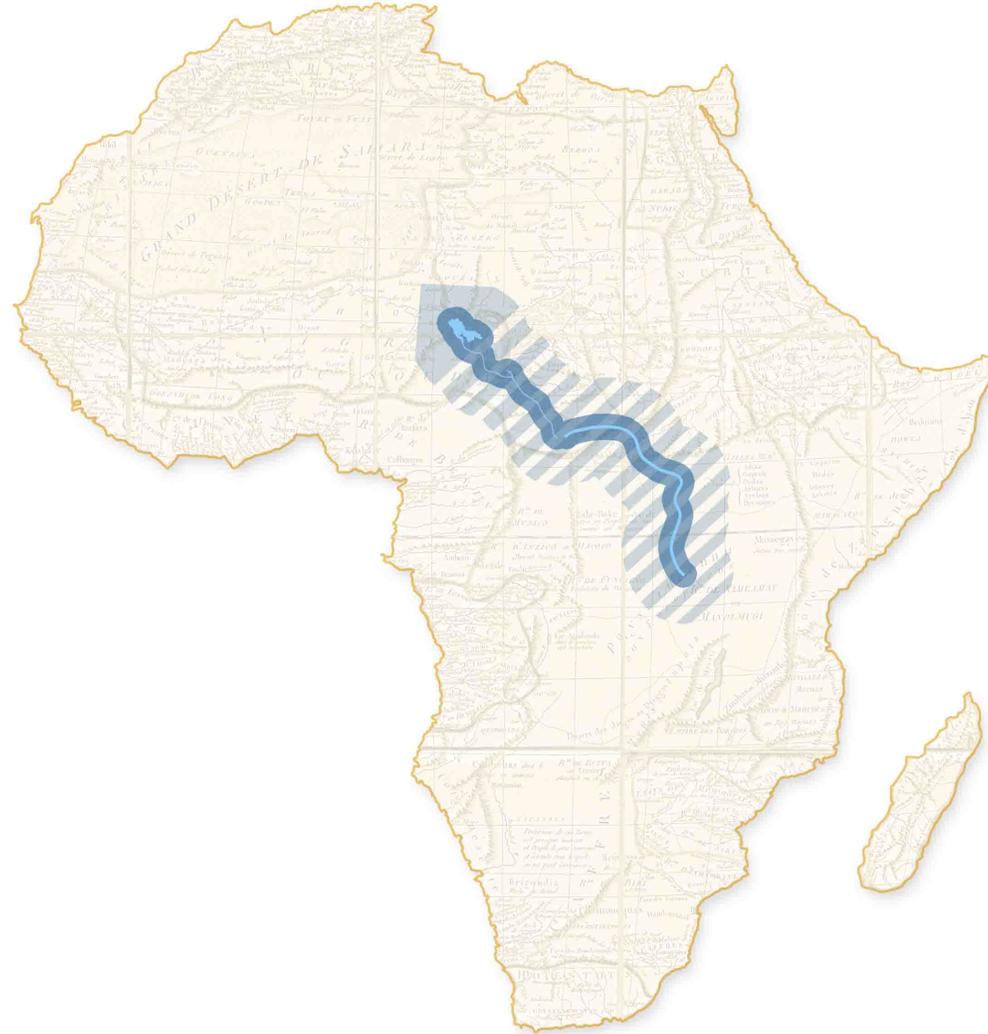
A contribution for discussion by:

Marcello Vichi
Andrea Mangano

*Fostering Development and
Facing the Economic, Environmental,
Humanitarian and Security Crises*

TURIN

November, 2020



Lake Chad and Sahel

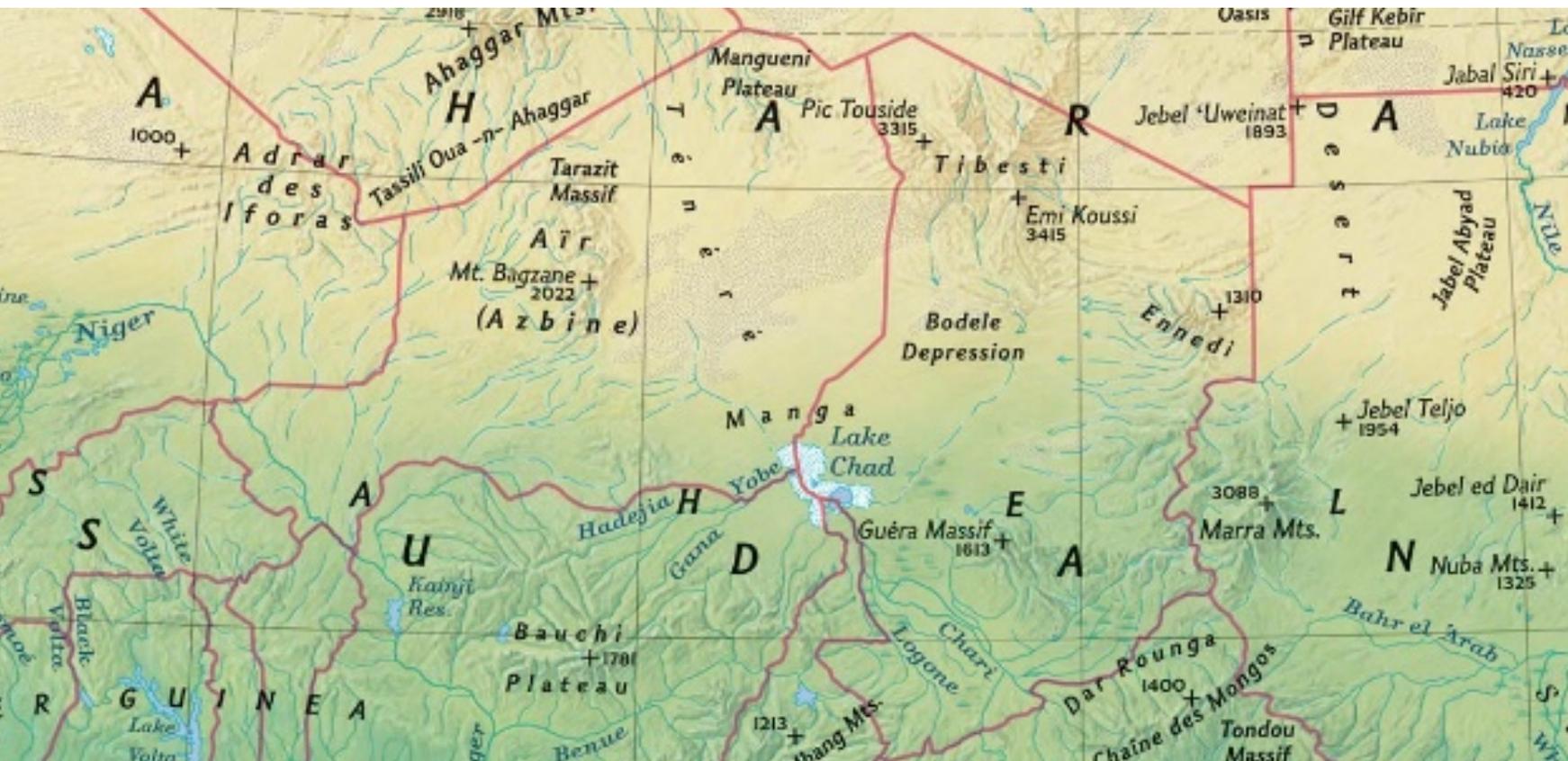


LAKE CHAD is (was?) one of the largest **endorheic lakes** in the world and the largest in Africa.

The lake is situated in the Sahel region at the crossing of the borders of four countries: Niger, Chad, Nigeria and Cameroun.

Its virtual watershed covers approximately 2,381,000 km², the effective one about **km²**, where about 50 million people live (2019 estimate)

The Chad hydrographic system



Main tributaries:

Hadeja – Komadugu – Yobe
at the Niger/Nigeria border

Logone – Chari

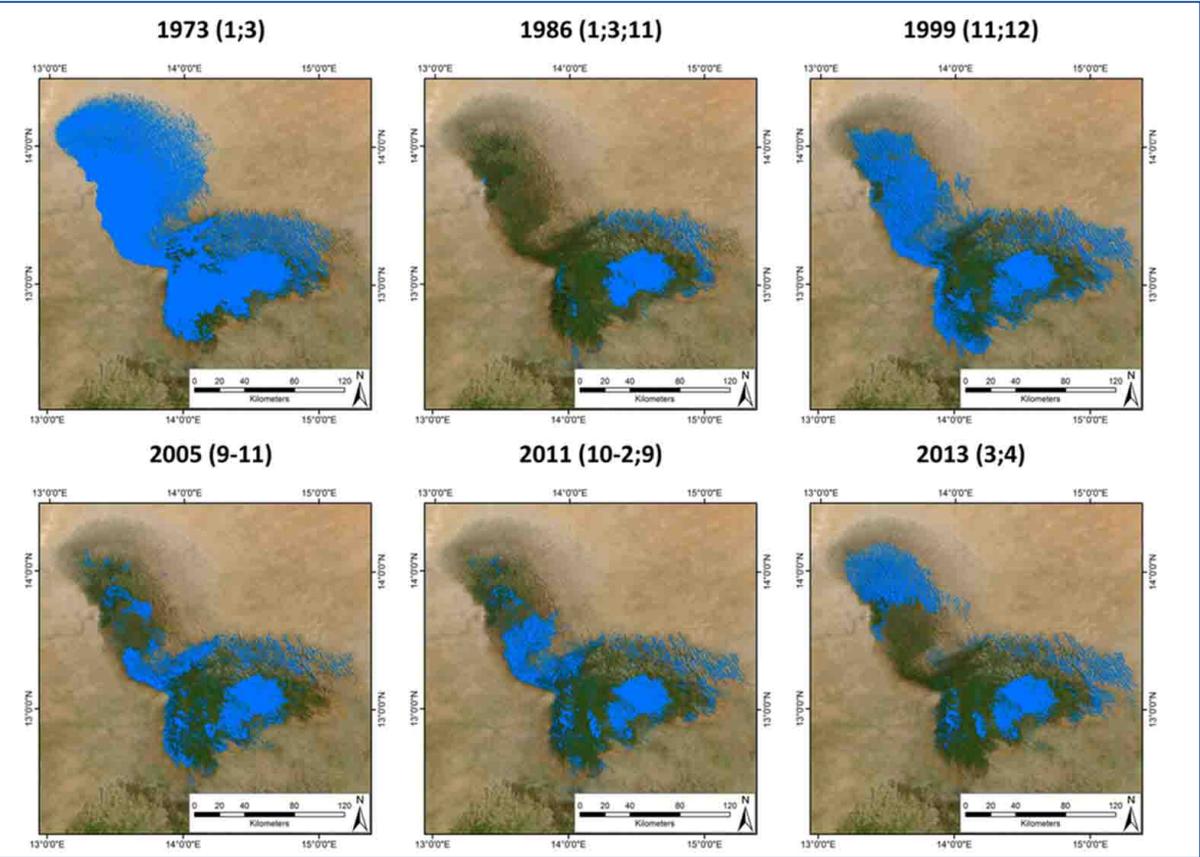
In Cameroun, Chad and Central
African Republic

Rainfall

Annual average rainfall within
the basin varies between almost 0
in the Northern desert and more
than 1200 mm in the southern
part and has decreased by about
15% in the last 30 years
(hysohiets have shifted southward
by some 150 km due to the
displacement of the Tropical
Convergence Zone)

Lake Chad

ENDORHEIC BASINS have a very unstable equilibrium as there is no surplus water flowing to the sea. The only outflows are infiltration and evaporation. If inflow decreases, the lake cannot but shrink and viceversa.



Besides seasonal variations, LAKE CHAD always had great oscillations in dimensions due to natural climatic fluctuations. The images by NASA, even if somehow misleading on scientific terms, give an idea of the changes in the last decades.

The increase in population and decrease in water surface:

	1973	2019
Lake surface (km ²)	25,000	7,500
Population within the basin (million)	8	50

Lake Chad : expected evolution

Some Authors think that Lake Chad is evolving towards a new equilibrium: that of a «Small» Lake Chad about 10,000 km² in surface area, capable of ensuring traditional agriculture, cattle raising and fishery to the present riparian population.

The northern pool of the lake would be quite vulnerable and remain a marshland in most of the years, thus affecting the bordering regions of Niger, NE Nigeria and Western Chad.

The NW tributaries are no longer contributing to the lake, being almost completely tapped upstream for drinking and irrigation purposes.

Evaporation is expected to increase, due to climate change; it is uncertain whether rainfall will increase or decrease.

Population is expected to continue increasing at a 3% yearly rate or more and double in the next 20 years, reaching 100 million around 2040.

Can we reasonably expect that people will go on making their lives with subsistence agriculture without any perspective of progress and development?

Or are they entitled to look for a more human future of wealth and safety ?

Other closed lakes at risk

Lake Aral: the first victim of over exploitation of water resources



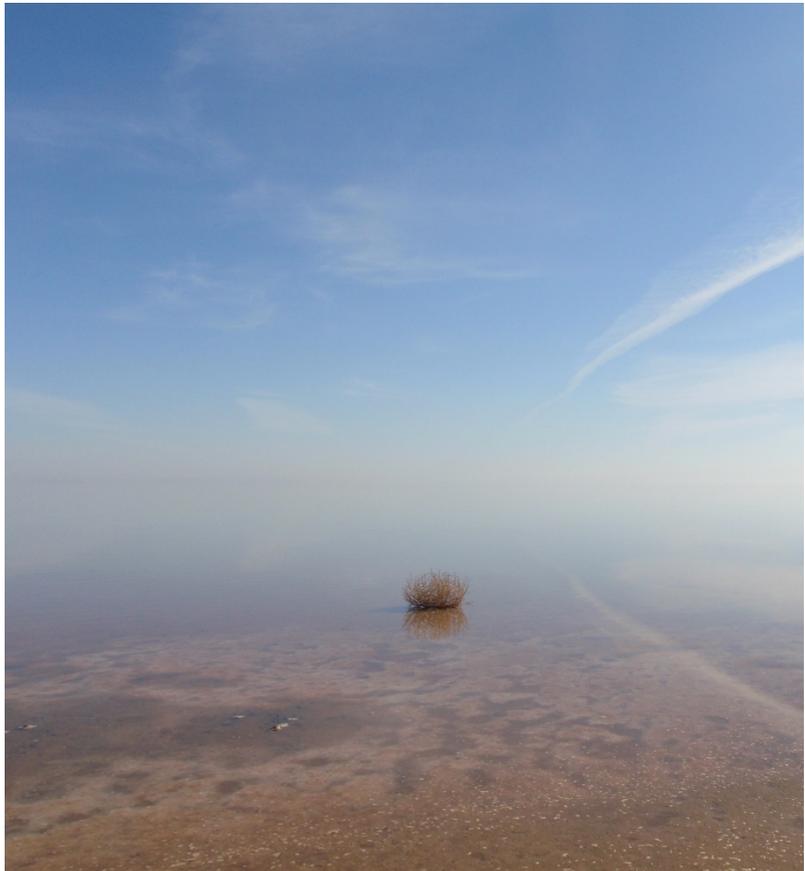
LAKE ARAL , between Kazakhstan and Uzbekistan, is world wide known as one of the largest **man-made environmental disasters**.

Lake Aral has been almost completely –and consciously– dried up because of the diversion of its main tributaries, rivers Amu Darya and Syr Darya, for irrigation purposes, starting in the 1940s.

Cotton irrigated agriculture was decided by the Soviet authorities to be the work-task of Uzbekistan among the provinces of the Soviet Empire.

The result is a dried internal sea, polluted dust storms and a semi-slave population forced to work in the cotton fields. Attempts are ongoing to recover it in Kazakhstan.

Lake Urmia



LAKE URMIA, in Western Iran, has also been almost dried-up in the last few decades.

A **salty endorheic lake** at about 1500 m asl elevation, Urmia **was a migrating birds sanctuary** and the center of high quality agricultural production, due to its special microclimate.

Lake Urmia: what shall be done about it?



The graph shows how much the lake has shrunk since 1984.

Due to the increased salinity, **lake waters do not presently host any form of life**, salt wind storms from the dried up surface ravage the region. Fish and algae have disappeared and **MIGRATING BIRDS HAVE LOST THEIR SANCTUARY.**

If over exploitation of water resources continues, and remedies are not found, unheard disasters will affect the area and force the population to migrate.

The Government of the Islamic Republic of Iran has launched a special *Urmia Lake Restoration Program* worth 500 M\$ a year for the study and implementation of remedial measures, mainly:

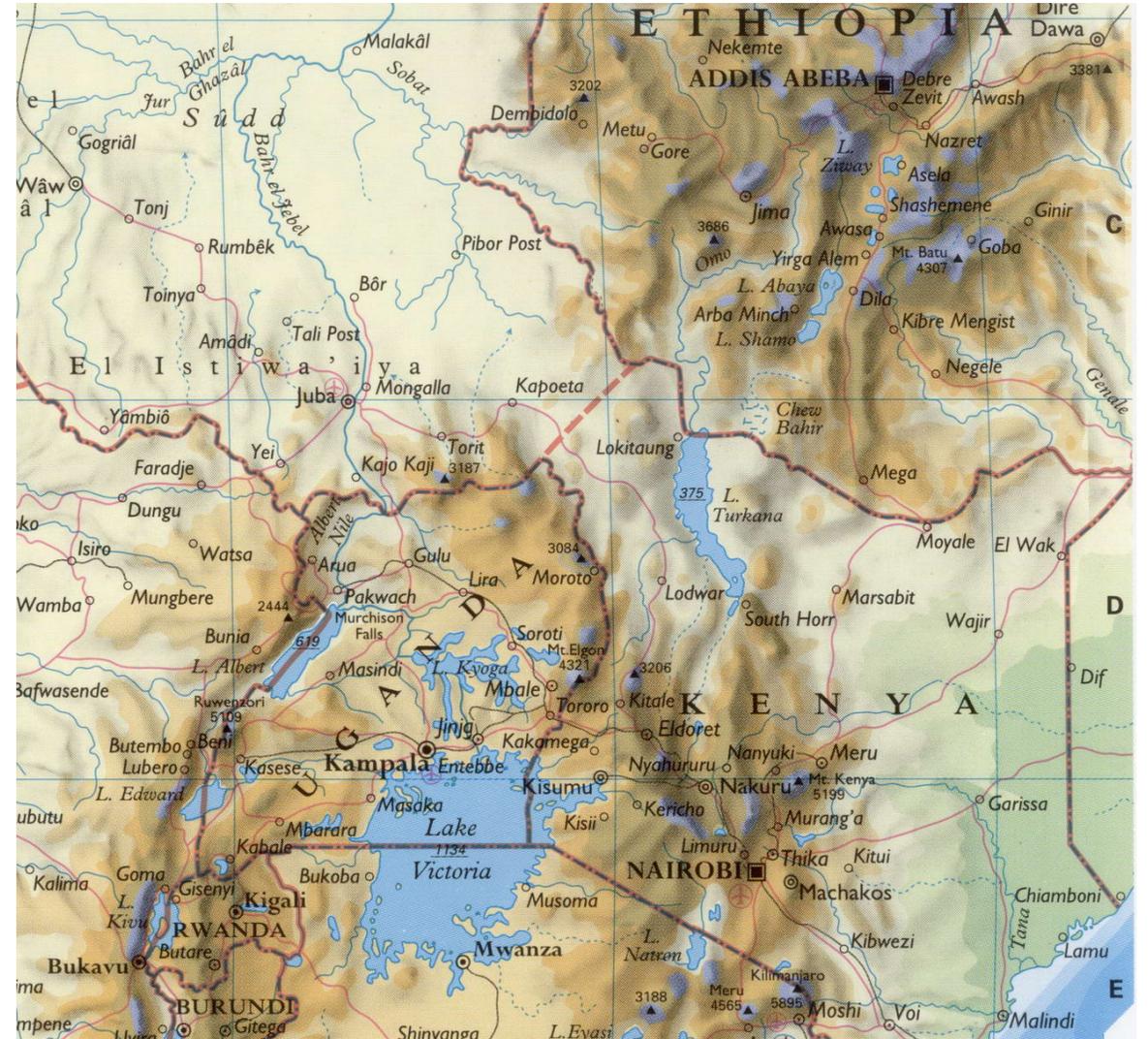
Water transfer from Turkey

Reduction of irrigation consumption

Lake Turkana; next lake in the death row?

LAKE TURKANA, in Kenya, is fed by River Omo, flowing southward from the Ethiopian highlands.

It has been classified as an Unesco's World Heritage Site and is considered the *"cradle of the human kind"*.



Turkana, the jade lake



Ethiopia is developing a dam and an hydroelectric plant, Gibe III, on its main tributary, the Omo River.

There are concerns that, if not properly managed and if used also for irrigation purposes, the reservoir might alter the hydrological equilibrium of the lake and affect the living conditions of the Turkana tribe and other people in the Kenya, and environment.

Do we remeber Aesop's fable?

Dead or Red ?



The increasing exploitation of River Jordan waters is causing the shrinking of the most famous (and lowest: 427 m **below** sea level) salty lake: the Dead Sea.

The lake is the object of intense tourism and a source of good selling mineral-rich salt products.

The Red – Dead project of bringing sea water from the Red Sea would allow to use fresh Jordan waters up to the last drop for thirsty Israel and Palestine, foster the salt industry and produce hydropower (possibly to be used for desalination)

WHY TO “SAVE” ENDORHEIC LAKES?

To safeguard drying lakes is not a «mere» environmental matter.

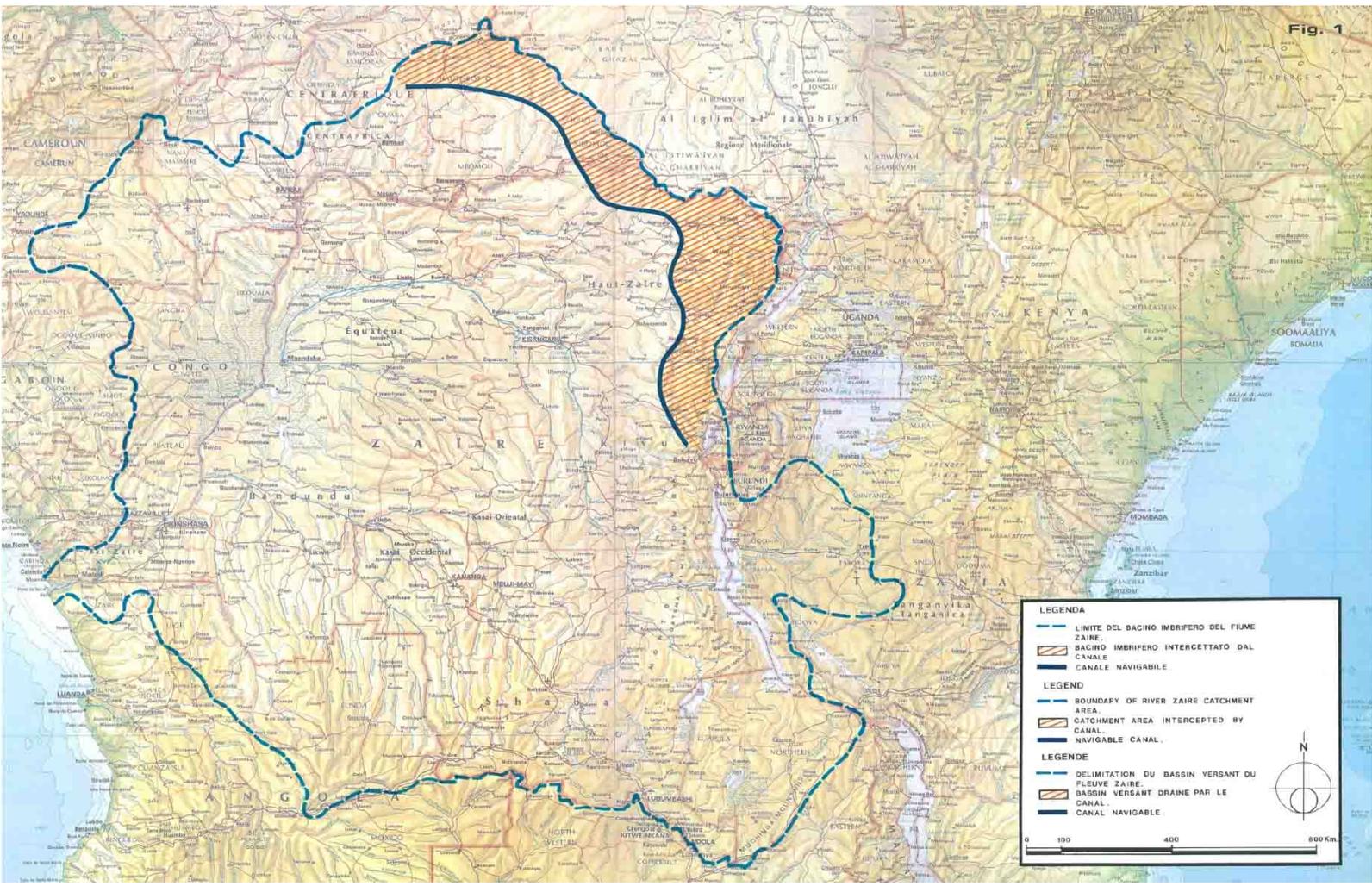
The environment has to be protected together with the human beings living there.

A shrinking endorheic lake is the symptom that the water resources within its basin are over exploited (specially if runoff is decreasing and evaporation increasing due to climatic changes).

To transfer water resources from one basin having a surplus flowing to the sea to another deficitary one, potentially very fertile, permits increasing water availability – especially for agricultural purposes – when population is growing and rainfall decreasing, and to protect the environment.

If water is scarce in a given area, either you bring it there or conflicts for water will arise and people will migrate elsewhere.

The Congo River



An immense, scarcely populated, river basin discharging into the Atlantic Ocean an average of 42,000 m³/s, equivalent to 1300 billion m³ per year, i.e. 26 times the discharge of river Po at its mouth.

How much of this amount could be possibly diverted into the Chad basin has to be studied.

TRANSAQUA : the idea

to bring water

FROM THE RIVER CONGO basin,

TO the thirsty CHAD region and to

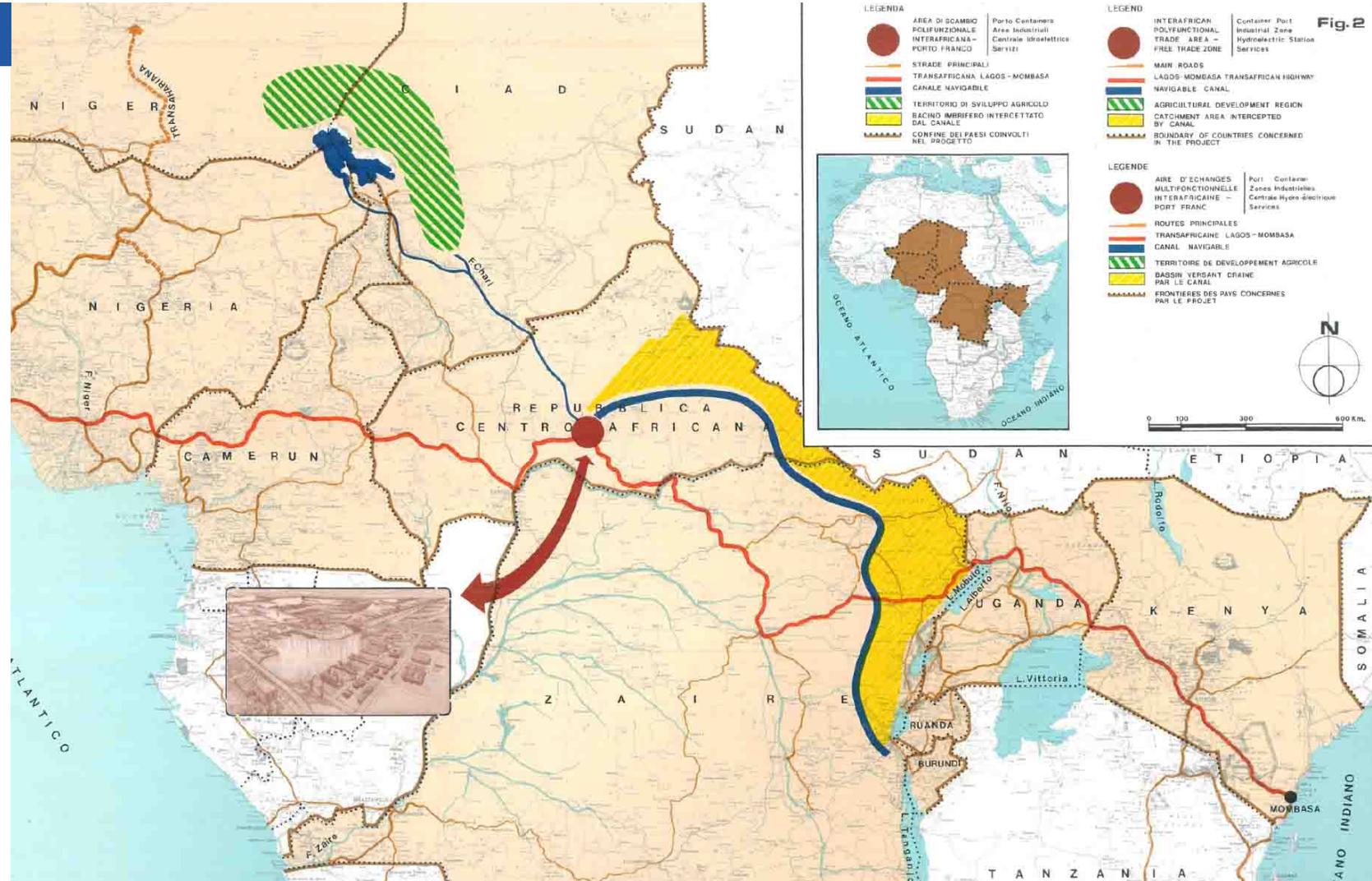
INCREASE IRRIGATED AGRICULTURE,

RESTORE THE LAKE, produce

HYDROPOWER

and improve

inter-african TRANSPORT



TRANSAQUA : the idea

A series of dams and canals would have to intercept part of the discharges of the right hand tributaries of the Congo River and convey them across the water divide between the Congo and the Chari basins.

The diverted flow would reach the Lake Chad through one of the Chari tributaries, properly reshaped.

A very preliminary estimate gives an amount of up to 100 billion m³ per year could be diverted, i.e. less than 8% of the Congo discharge, ensuring the restoration of the Chad and irrigation of up to 3 million ha.

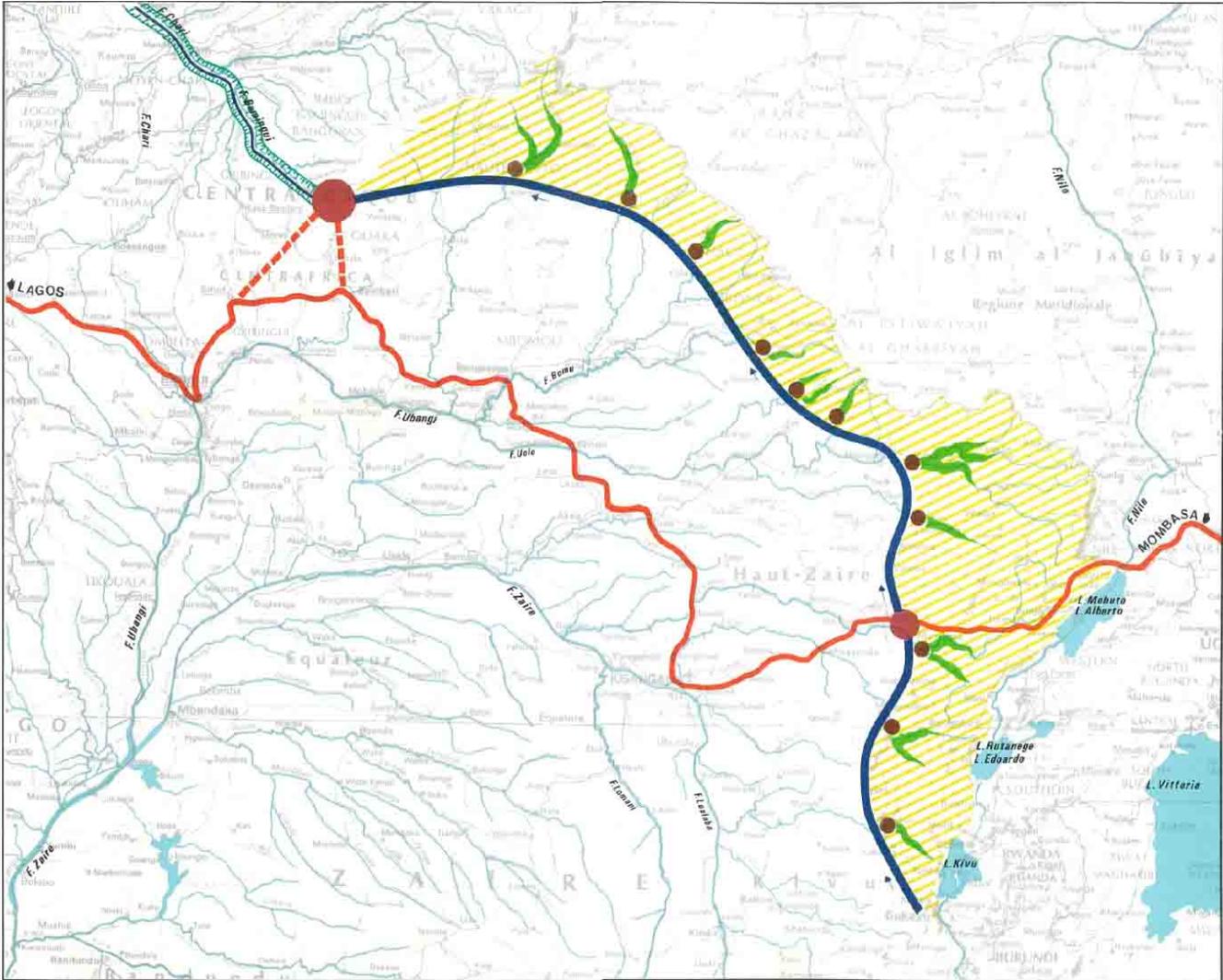
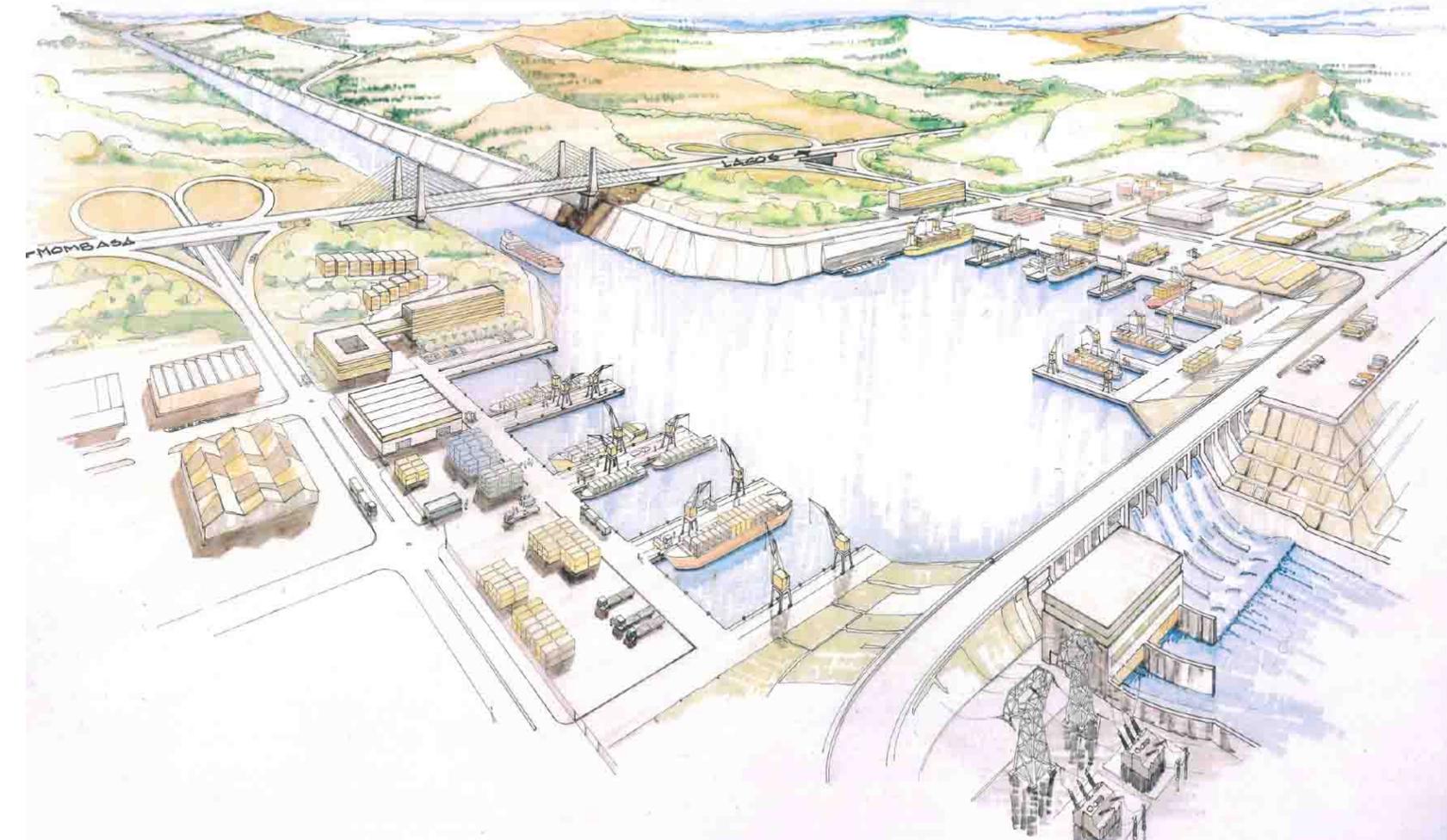


Fig. 3

TRANSAQUA : *the idea*



At intercepting dams as well as in the fall toward the Chad of the diverted flow huge amounts of hydropower would be produced.

A road would run along the canal, to become the back bone of inter-african land transport.

The infrastructure would also permit inland navigation.

The idea has been studied by Bonifica, an Italian consulting engineers firm, in the 1980s and requires to be deepened with a proper Feasibility Study, including assessment of social and environmental impacts .

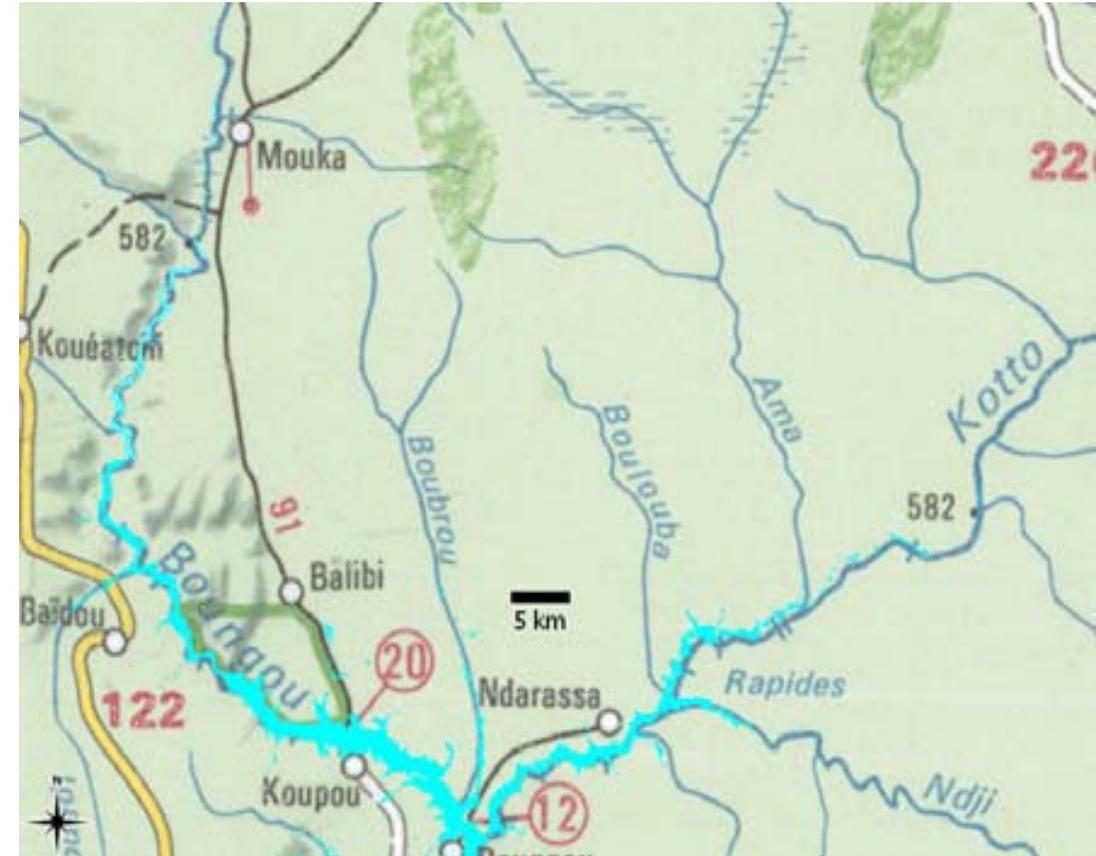
IS TRANSAQUA FEASIBLE?

In 2011 the Lake Chad Basin Commission entrusted the Canadian engineering company **CIMA International** of studying the feasibility of a **water transfer toward Lake Chad from the Oubangui river basin** (main right bank tributary of the Congo river)

The study concluded that a dam on the river **Kotto** (a tributary of Oubangui), North of the town of **Bria** (Central African Republic), would permit the transfer by gravity across the water divide with the river Bamingui (a tributary of the Logone-Chari and hence of lake Chad) exactly **“at the end of the route of the Transaqua project”**.

The reservoir, alone, would supply only limited water volumes, without a major impact on Lake Chad.

But would represent the first link of a chain of similar reservoirs on the other tributaries of the Oubangui and Congo rivers, that would form the Tansaqua waterway.



River Kotto dam at Bria

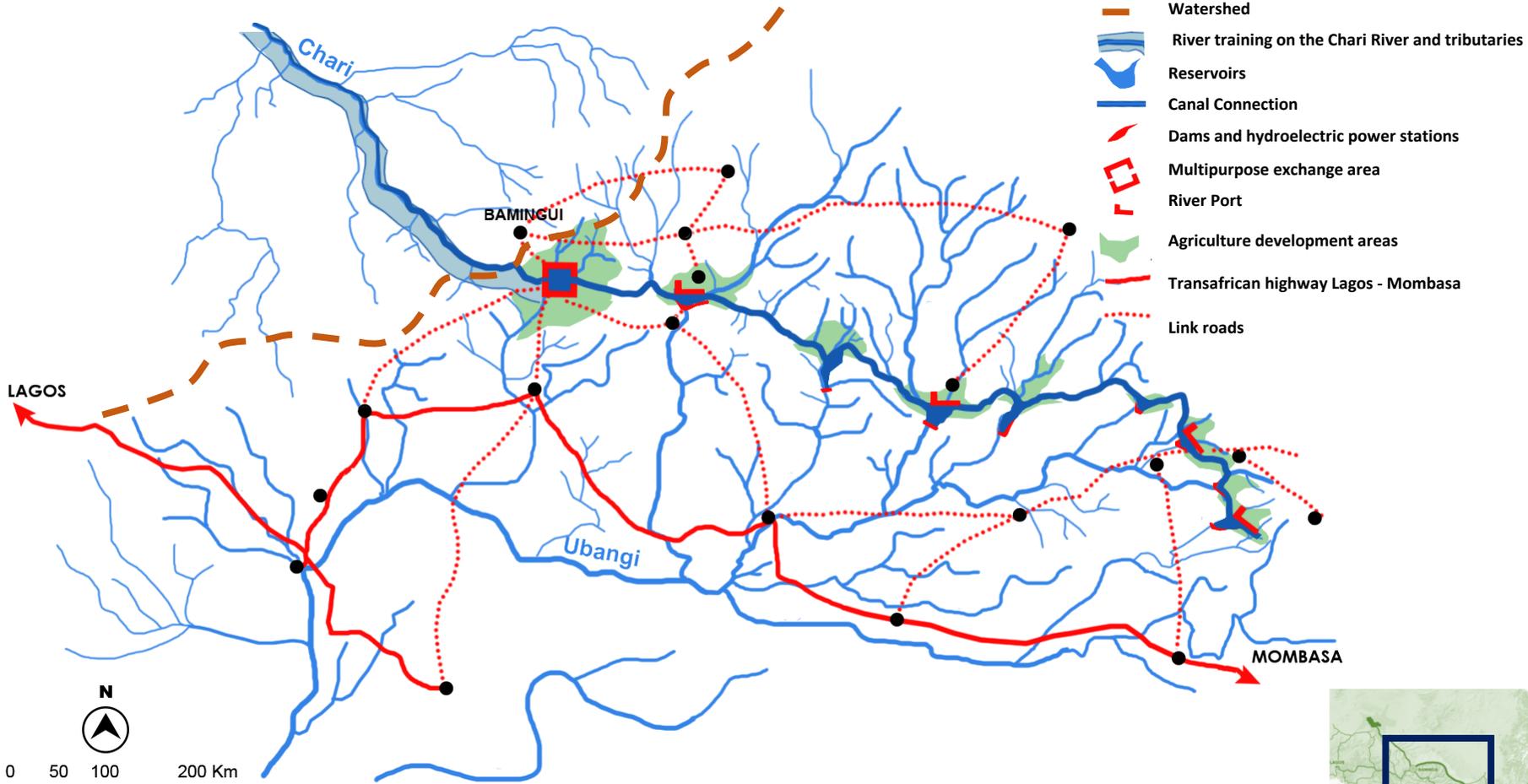
(from CIMA International report, 2012)

TRANSAQUA : the priority stretch

This first portion would intercept the right hand tributaries of the Ubangi river and divert part of their flows towards lake Chad.

This stretch could transfer about 20/25 km³ per year of water, i.e the estimated yearly deficit of the Chad basin at medium term.

The first stretch could be implemented in steps, each having immediate general and local results: energy, irrigation, river flow regulation.



THE STATE OF THE ART

Longtime considered a pagraonic idea, the water transfer is nowadays seen as the only solution adequate to the enormous size of the problem.

A feasibility study is required in order to outline the general scheme of the water transfer, its costs and benefits, the social and environmental impacts to be faced, so to put the decision makers in the position of taking action and start the relevant international agreements. The only sound progress made so far is that CIMA's study of 2011 has ascertained that the water divide crossing is **technically feasible by gravity**.

During the COP 21 meeting of Paris in 2015 the **Lake Chad Basin Commission** (CBLC, the regional body formed by all the Countries of the Chad basin) has shown the interest of implementing the study. No action has been taken afterwards for lack of funds.

In February **2018 the International Conference on Lake Chad of Abuja**, sponsored by UNESCO, **approved a resolution stating that the "the Inter-basin water transfer is no longer an option but a necessity"**.

During the Conference, the **Italian Government** announced a pledge of **1,5 M€ to finance the feasibility study**.

In October 2018, in Rome, a **Memorandum of Understanding** has been accordingly signed between the Italian Government and CBLC for the funding of the study, that has not been implemented so far.

Discussions on the subject have little sense without a serious step forward to assess the feasibility of the idea.

Meanwhile, time passes without any solution to the Chad region problems.

TRANSAQUA AN IDEA FOR THE SAHEL
THE CONGO-CHAD INTERBASIN TRANSFER

THANK YOU
FOR YOUR ATTENTION