

3.2.7 The emerging conflict of using Nile water for irrigation purposes, especially between Egypt and Ethiopia, due to the disturbance of the reliability of the arrival of the Monsoon season as triggered by European/Asian brown cloud

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SUMMARY: 80% of Nile water stems from Ethiopia, i.e. about 100 billion m³/year 'job' Sudan, but up to now nearly zero % is used in Ethiopia for irrigation purposes. Ethiopia is blessed with about 1.500 mm/year precipitation, rain fed agriculture is feasible and consequently common. But this feasibility depends crucially upon the regularity of the occurrence of the Monsoon.

Downwards, in semi- and fully arid Sudan and Egypt, no further influx takes place, but, at the other hand, evaporation is very high. Agriculture in Sudan as well as in Egypt totally depends on the utilisation of Nile water, which is calculated at 86 billion m³/year 'job' Khartoum. Especially Egypt is actively following a strategy of increasing the area cultivated by irrigation. Each of the three countries involved face an increase of their population to be fed, with Ethiopia on top, expecting a tripling of its population up to 2050.

It is this regional background, against which the interference of developments initiated far away, in South-east Asia, is to be anticipated: I.e. the interruption of the regularity of the Monsoon's occurrence due to Asian Brown Cloud. But irrespective of the naming, there is probably also an European influence, which has to be further assessed. It is expected, that this development, via an atmospheric interference, will undermine the feasibility of the rain fed option for Ethiopia's agricultural development and will consequently lead to an increase of the tensions between Ethiopia and its downstream neighbours. The Nile Basin Initiative will face an unexpected challenge.

RThe Nile – A unique river on Earth

The Nile is the origin of the advanced civilisation, which has developed in Europe in modern times and which meanwhile has taken world supremacy. In the general consciousness, the Nile is linked to the specific type of ruling »invented« by the ancient Egyptian Empire, even if the word ‚Nile‘ is of Semitic origin. Generally, everybody is aware of the famous search for »the origin« of the Nile in the equatorial lakes in the second half of the 19th century. To a much minor extent people are aware, that only a small amount of the Nile water, which arrives in Egypt, stems from »this« origin, from the lakes – it is only 14%. The main part of the water, the formerly fertilising sludge included, comes from Ethiopian Highlands. One side-effect of the (modern) Assuan dam was, that what formerly was a much demanded good, the eroded Ethiopian crumb, switched into a bad – today, the effect is mainly that the eroded mass is filling up the reservoir, while in Egypt's fields artificial fertilisers, produced under highly energy consuming conditions, are common. At least 500 years later, it has been calculated, the Assuan reservoir will be totally filled up with mud¹.

Specific for the Nile basin are some characteristics, which are without precedence at any other cross-border river at Earth. The Nile is with a length of 6,800 km, the longest river on Earth, its catchment comprises 10% of Africa. Abutters are ten African countries, Uganda and

Ethiopia at the headwaters as well as Sudan and Egypt at lower reaches are the most important ones. In these neighbouring countries 40 percent of Africa's population is living. The globally unique, as initially mentioned, as well as dramatically unbalanced feature is, that the inflow totally originates from the abutters at the headwaters. During its long (3,000 km!) passage through Sudan and Egypt, the Nile passes semi-arid as well as totally arid areas, without any further inflow. Evaporation during the long »journey« is correspondingly high, multiplied by the erection of further dams, at the moment four in Sudan and eight in Egypt.² These dams in arid areas are, besides the very high rates of evaporation in the swamps of Sudan, the reason, why so often figures mentioned in the literature don't really sum up to what looks like a consistent water balance.

The total flow of the Nile at the point, where the Ethiopian tributaries of the Nile arrive, i.e. »free Sudanese border«, is reported by the Ethiopian side³ with about 100 billions m³/year (= bcm/year)⁴. This figure is based at least partly, as has to be admitted, on a very short series measurements (12 to 75 months), the calculation of averages seems to be not yet stabilised. The figure which the Sudanese side gives for the flow at the same point is merely 76.5 bcm/year.⁵ It is as ever: So called ‚facts‘ in cases of conflicts prove to be not really well measured, and consequently, they are doubtful. The difference is related to »the« key figure of the conflict. In the »Nile Treaty« of

1959, which will be commented below, 86 bcm/year have been allocated »free« Khartoum. An average 86% of this water comes from the Ethiopian Highlands with its high rates of precipitation and low rates of evaporation (max. 600 mm/year only) (TAFESSE 2001). The water is running down from two to three thousand metres height, with an average precipitation figures of about 1,500 mm/year, until it arrives at the border between Ethiopia and Sudan at 490 m above sea level. The sediment load from Ethiopia, which is connected with it, is 60 to 110 million t/year.

The background of the conflict: Geopolitics and food security for a strongly increasing population

Egypt and Sudan at one hand, and Ethiopia at the other, are each confronted with similar strong dynamics of their population development. In all three countries, the main strategic aim is to secure food for a dramatically increasing population. To put it quantitatively, using an illustrative example: A growth rate of the population of two to three percent per year as in Egypt means, that every ten months one million humans more have to be nourished. Precondition of any essential increase of food production in its own country is water. Against this background, it is so striking, that the three mentioned adjacent countries use the Nile-water at present with a very unequal degree of intensity. The partners at lower reaches derive their rights from this historically unequal, but existing situation – and from the fact, that they, unlike Ethiopia, are not blessed with rain fall. That is the reason, why they claim that Ethiopia’s entry in using Nile-water for irrigation purposes shall be dependent on their consent – frankly spoken: they deny Ethiopia’s access. It is this situation, which contains »explosives«, which in case of a blast will not only affect the neighbouring countries in the region mentioned. Mitigation of such a situation is only conceivable with the help of a compromise, including elements, which deliver a net value for both parties. One of those »synergetic« elements which could be helpful in getting a compromise, is that measures of erosion control as well as (mini-)dams, both on Ethiopian territory, are capable to retain the mud; that would provide an advantage for the Assuan dam⁶ as well as for upwards located Nile dams on Sudanese territory.

The »explosiveness« of the situation is still unfolding, triggered by two developments.

- First, large-scale irrigation projects are pursued, especially in Egypt but also in Ethiopia, aiming at providing their respective populations sufficient food from irrigated agriculture.
- Second, the potential disturbance of the reliability of »rain fed agriculture«, through the »Asian Brown Cloud«

(ABC), which touches upon the reliability of the Monsoon season.

Background of the evolving conflict are the dynamics in population development as well as the weak economic and government system in those countries concerned. Before giving figures, one has to admit the ethical dilemma, which is today unavoidable: Every given population projection does only hold as long as one denies the impact of AIDS.

Ethiopia expects, according to its First National Communication to the Framework Convention on Climate Change (UNFCCC 2001⁷) (Fed. Dem. Rep. of Ethiopia 2001, 21), until 2030 an increase of its population from now 62 million to 129 million. This implies a drop of its now very high growth rate from 2.92% to 1.85% per year until the time span between 2025 and 2030. The growth potential inherent in its population structure, will be become very clear with one figure only: 45% of the population is adolescent, is below 15 years of age. Ethiopia is quasi the »top runner« in population dynamics and therefore it is regularly brought up in the literature as an example (cf. FLEISCH 2002, 20).

Egypt is reporting its recent population status in its First National Communication to the UNFCCC (EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY 1999, 4) as being about 65 million inhabitants. The UN population projection (2000 revision) reports for the year 2000 68 million. According to these figures, Egypt is, still, the country most abundant with inhabitants. But that will at once totally reverse due to the striking difference in the dynamics of population growth vis-à-vis Ethiopia. The growth rate of Egypt’s population is in meantime decreasing to 2% per year, the quota of adolescents (below 12 years) is at 34% – both apparently below the respective figures for Ethiopia. The implication, in figures of the UN-population projection (mean variant) (cf. *Table 3.2.6-1*): In 2050 the population of Ethiopia is expected to reach 190 million, Egypt’s on the other hand »only« 115 million – the Sudan’s population will increase in the same time to about 65 million. The same information given in rates of increase: Ethiopia’s population will triple, but Egypt’s population will increase by less than 50% and Sudan’s population will be doubled. In absolute terms: The

Table 3.2.6-1: Development of population in three large Nile countries, 1950–2050, in million (according to UN population projection 2000, mean variant). Source: PEICHERT 2003, Tab. 44.1.

Countries	1950	2000	2050 MV	Increase expected 2000–2050
Egypt	21.8	67,9	113.8	45
Sudan	9.2	31.1	63.5	32
Ethiopia	18.4	62.9	186.5	123
Totals	49.4	161.9	363.8	200

total increase of population in the three Nile countries will be 200 million humans, of which about two thirds are living in Ethiopia.

Irrigation projects: Status of preparation and implementation

The dynamics of the conflict is further characterised by a totally diverse degree of concreteness, with which irrigation projects in both countries are being pursued. Egypt implements on a large scale, Ethiopia does hold not much more than some feasibility studies.

Today in *Ethiopia* mini-dams with associated irrigation are in the planning process plus the Tana-Beles-Project. The water demand of such mini-dams is estimated at max. 1 million m³/year per dam. According to former plans there was once talk about 1,000, built are about 50. But the »sustainability« of these dams is being questioned – in the catchment area of one of the mini-dams erosion revealed to be so intense, that already after one year the basin was full of sediment. However it was possible to purge the reservoir. The Tana-Beles-Project, developed since 1988 using funds from the Italian government, was lost at once in the whirlpool of the military contest with Eritrea and does, until now, only exist on paper.

But Ethiopia is really facing a high pressure due to its population development and it urgently needs an escape, which in its perception is crop from irrigated agricultural areas. Others are casting doubts on the prospect that for Ethiopia, given its present socio-economic status, really projects of a »high-tech« agriculture, i.e. irrigation, are adequate. Their conviction is: Since a rain fed agriculture is possible in Ethiopia, contrary to Egypt, its undeveloped potential has to be made available and priority should be given to solving the problem of storing food in Ethiopia.

Egypt, contrary to Ethiopia, is no longer in a stage of mere planning, but is already implementing, especially two projects with a very high water demand. Ethiopia declares that both projects utilise Nile water for purposes beyond the boundaries of the Nile basin – denouncing both projects as being serious »foul plays« according to international law, as the downward adjacent countries violate the River Basin Agreement of the United Nations. Egypt in return assures, that it will respect the obligation of limiting the use of Nile-water to a volume of 55.5 bcm/year as established in the agreement with Sudan from 1959. It assures to be determined to balance the extra-demand inside the own territory by gaining the additional amount of water needed for the projects by increasing the efficiency of the existing water utilisation, e.g. by increasing water recycling as well as by increasing the portion of less water demanding agricultural strategies (e.g. decrease of sugar cane cultivation). The basic idea of the concept developed by

Egypt has obviously been to utilise the Nile water completely, like the »model« Colorado River in the USA, before it flows off into the Mediterranean Sea totally »useless«. As a consequence of the Assuan dam the discharge into the Mediterranean Sea declined from 32 to 6 bcm/year. Today only »sewage«, about 1.8 bcm/year, is flowing into the Mediterranean Sea, but no drop of usable water.

The *Southern Valley Development Project*, formerly called Toshka Canal and today under the heading Sheikh Zayed Scheme, develops a desert valley in South-west-Egypt (Oases Kharga and Dakhla) which prompts a water demand of 5.5 bcm/year from the Lake Nasser and additionally from groundwater utilisation. The reported agricultural effect is an increase of »168 till 970 tha« irrigated area. The pumping station at Toshka as well as the first part of the canals of about 50 km length have been completed, their commission took place in 2003, the full utilisation of the capacities of the project is planned for 2017. Consortium manager is the Norwegian company Kvaerner, in Germany well known as investor in shipyard factories in the »Länder« in former Eastern Germany. The *El Salam Canal Project* channels Nile water from the estuary mouth to the Sinai, until about 40 km distance from Gaza – in a canal, 242 km long, mostly subsurface, running parallel to the coast of the Mediterranean Sea. That gives rise to 250 tha additional arable area with a demand of further 4 bcm/year of water. Both projects have been started on 19 January 1997 by President Mubarak personally.

All together, Egypt is demanding additionally 9.5 bcm/year water, aiming at developing of 400 to 1.200 tha, while at the upper reaches of Ethiopia about 2.3 million ha arable land could be gained using only about 6 bcm/year. But even if the figures would have been calculated in a commensurable approach: A decrease of discharge in Ethiopia by 6 bcm/year is, due to the much smaller evaporation at higher elevations, not equivalent to the same decrease into Assuan dam.

Conflict and conflict management - The legal perspective⁸

The emerging clash of interests between Egypt and Ethiopia in the utilisation of the Nile water has the potential to get out of control. The situation is furthermore complicated, as a multilateral regime with criteria for dispute settlement, which would be effective in such cases, has up to now not come into being – the Nile Treaty from 1959 concluded between only two of the Nile adjacent countries, Sudan and Egypt, shortly after the end of colonial status for Sudan, is of central importance. But for obvious reasons it is from Ethiopian's side not perceived as a fair agreement. It is therefore rather exacerbating the conflict.

In principle, there are three legal institutions available for dealing with this kind of conflict:

(1) The so called »Helsinki Rules« from 1966, elaborated by the International Law Association (ILA). They were setting the course for the development of the multilateral water law and establish customary international law. The ILA is »privately« initiated by leading experts in international law, which discussed the issue in their circles and consequently published the results of their discussions. The effect of the publication, that they created international law, even if only a customary one, is apparent as it has been used to some extent in bi- and multilateral negotiations concerning the utilisation of resources in cross-border river basins. Specific is that ILA has tried to elaborate quantitative indicators, which allow to relate legitimate claims of water utilisation to hydrological data, i.e. part of total basin area and volumes of water.

(2) The River Basin Convention of the United Nations⁹. It has abstained from the approach of establishing relations to hydrological criteria as just mentioned – they had not proven to be helpful in reality. Also this Convention only constitutes customary law, as it was impossible to bring it into force. The reason: the necessary quorum of members has not been reached. Nevertheless it begins to develop political power in a multitude of conferences and negotiations. In the course of negotiations in the Legal Committee of the UN General Assembly, it has been reported, that the faction of the upper riparians consisted mainly of Turkey and Ethiopia. This faction tried hard, to alter the substance of the draft in such a way, that its liability decreases. The proposals and discussion remarks, contributed by Turkey and Ethiopia, evoked the impression, that they tried, either to achieve the Convention less binding or to delay at least its coming into force, until they have implemented their controversial utilisation plans at the upper reaches of the respective water courses.

(3) The Nile Treaty of 8 November 1959 between Sudan and Egypt. The negotiations which resulted in this treaty started just after the independence of Sudan in 1956. Subject was the revision of a first Nile Treaty which has been agreed between both countries on 7 May 1929 – for the Sudanese side its colonial »warden«, the British government, was negotiating and did eventually sign the Treaty. In both treaties, the Nile water at Assuan is allocated to both Nile countries, which participated in the negotiations, without any rights reserved for Third Parties, i.e. upwards abutters – which might be seen as appropriate under the given historical circumstances. It assumes a constant inflow, which has been divided into rights for water use among the two parties involved¹⁰. In 1929, the inflow had been determined as 52 bcm/year, which has been divided according to the proportion 12 : 1 between Egypt

and Sudan (48 : 4). In 1959, as the construction of the Assuan dam was already conceivable, inflow »fob Assuan« has been determined at 84 bcm/year. Of these 84 bcm/year, 10 bcm/year have been calculated – and deducted – as loss due to the evaporation from the Lake Nasser, the remaining part has been divided according to the proportion 3 : 1 between Egypt and Sudan; that is the source of Egypt's present legal position, a 'claim' of 55.5 bcm/year.¹¹ The right of Sudan accounts consequently for 18.5 bcm/year at Assuan, roughly equivalent to 20.5 bcm/year in the river's upper course – the difference corresponds to the loss due to evaporation underway.

Off these three legal institutions obviously no solution of the conflict can be expected. Realistically, confidence can only be given in a conflict management approach, which the institutions of the global community regularly follow in river basin conflict cases. Mainly UNEP and the World Bank, which became aware of the potential conflict, looked after the conflict. Since 1967 regularly talks are taking place, aiming at establishing a forum, in which each riparian state should take part. At the beginning, issues of the dialogue are typically – also in this case – technical issues, with the World Meteorological Organisation (WMO) co-operating. Such debates are quasi path finding talks, building confidence as well as capacities. After the Cold War the very long-term investments in confidence building began to bear fruits. In 1992, an important further step was possible, a Technical Commission (TECCONILE) was founded; since February 1999 the Nile Basin Initiative (NBI)¹² is working, its Secretary is located in Entebbe/Uganda. Highest body is Nile-COM, a council of the ministers of all adjacent countries which are responsible for water issues. The NBI mandate includes the issue of (re)allocating water utilisation rights the reason why it attracts a high interest of the Ethiopian side. But there is no prospect for unanimous solution¹³.

Planning the »development« of the Nile – History of feasibility studies*

In circles of hydraulic engineers, there are very definite ideas, how to optimally exploit the resources of a river. Already in 1902, the British Government acting as colonial power, legally on behalf Egypt, initiated a plan for the development of the Nile as a whole (*Century Storage Scheme*), according to those professional ideas. Background was the United Kingdom's interest, to secure the irrigation of the plantations which were run by British »cotton barons« for supplying their domestic industries. Such plantations were also located on Sudan's territory. That was the reason, why the British government especially in the 1920s tried to develop the upstream part of the Nile, in Ethiopia. Accordingly the basin of Lake

Tana should have been converted into an artificial water reservoir. The implication would have been, that the surface of Lake Tana would have been greatly expanded. The young Haille Selassi could not adequately respond to these offers as he had just come to power and was still struggling for his stabilisation – the rulers at the region around the Lake Tana were naturally opposing such a far reaching plan.

In the 1950s, the United States took initiative for Nile water in Ethiopia, the US Bureau of Reclamation managed to table a Blue Nile Master Plan in 1964. The plan identified five big possible dam-projects, totalling a capacity of 51 bcm/year, which is equivalent to the yearly discharge of the Blue Nile¹⁴. Connected should be a capacity to produce electrical power of 4.4 GW, additional 434 tha could be irrigated, the discharge to neighbouring countries at lower reaches would decrease by 6 bcm/year (TAFESSE 2001, 48). Implemented is, up to now, almost nothing. The effect: Ethiopia was in the past not participating in the course of the largely not co-ordinated construction of dams along the Nile river. The present situation, extremely unequal concerning the amount of water utilisation, is a result of very special historic constellations, especially during the Cold War between East and West.

A second approach from the Ethiopian side took place after the change in power in Addis-Abbaba at the beginning of the 1990s. Obviously without co-ordination with the World Bank, a new master plan for the development of the Blue Nile has been commissioned, its completion was expected in 1997 (CONWAY 2000, 50). The plan has been elaborated by a French consultancy, is completed according to hearsay, but its availability is very restricted.

Having given a portrait of the history of the development (and conflicts) around the utilisation of Nile water, a very interesting connection becomes apparent. There is the art of professionally planning how to »optimally« utilise the water of a river; and there are implementations along the Nile, which are – seen from a professional perspective – clearly suboptimal. The construction of the Assuan dam is, in this perspective, a kind of »occupational accident«, that happened at the times of the East-West confrontation – its mere location implies a huge loss due to evaporation, which would have been avoidable. Its implementation at such an »unfavourable« site under the Nasser regime has been made possible by following a planning idea, which was mainly intending »water security« for Egypt. But instead of creating security, at Assuan an idea of security has been implemented, which is based on the illusion, security may be possible independent of the adjacent countries. This is the reason why Lake Nasser, created with the Assuan dam, exists on the climatically totally inappropriate Egyptian territory. As the US denied financial assistance based on the argument, that

no common agreement of all Nile countries exists, Nasser exploited the East-West confrontation, and managed to realise this huge project with the aid of the Sowjet Union. The benefit from the project for the Sowjet Union, on its side, was to get the chance, to enlarge its influence in the region.

With the Toshka Canal project, the same kind of »misdevelopment« seems to reiterate. Also in this case Egypt is able to implement »unilaterally«, without looking for consent with its up-stream neighbours, and the reason is the same: It was able to get access to private financial sources, in this case from Arabian countries. Therefore, it is able to abstain from financial assistance granted by multilateral Development Banks, which make their grants conditional to conflict-avoiding manner mentioned. Ethiopia on the upper catchment of the Blue Nile is unable to create facts by itself, as it has to rely on financial flows from multilateral sources.

* *Further reading:* SREENATH et al (2002), WATERBURY (1979, 2002).

Rain fed agriculture in Ethiopia under threat due to region-wide air pollution in Asia or Europe

The conflict which has been described so far, is still evolving, but each of the countries involved is fully aware of it. It is this situation which is being aggravated, as has been announced at the beginning, by a second development: The conceivable impairment of the reliability of the Monsoon season due to the so called Asian Brown Cloud (ABC). It is this development, which questions the feasibility of the alternative option which is the only available at present for Ethiopia, »the rain fed agriculture«. The insight in this disturbing possibility, the interference of air pollution with the Monsoon, is not get substantiated but needs to be investigated urgently. This interference is a new moment in history, as it is able to introduce a new dimension in the conflict described between Ethiopia and its neighbours at lower reaches, especially Egypt.

This mechanism, better this mere possibility, was first published in an UNEP-Report titled »The South Asian Brown Cloud: Climate and Other Environmental Impacts« (C4 2002). But the effect elaborated on here, the influence across the Indian Ocean to African's Eastern coast has not yet been made a subject there – the original report is focussing on effects in Asia. But to someone who thinks the subject through, the importance of the triggered Monsoon unreliability for Ethiopian's Highlands is obvious. Additionally it has to be mentioned, that there are papers, which relate the possibility of an African Monsoon disturbance with ordinary air pollution from European sources (Zitat).

To sum up, the conclusion in general is: In the Nile basin, the occurrence of a »new«, even »modern« type of conflict is to be expected. The conflict between Ethiopia and Egypt could attain model character, irrespective of an eventual solution or failure. It is quasi a superposition of the usual type of conflict, common in the field of river basin management and food security, with two other events: (1) strong population increase in one of the countries of the region, which is already at the brink of the 'natural' carrying capacity, and (2) an interference, initiated by agents from remote areas, which are until then unknown in the region concerned, mediated via the atmosphere, adds in totally unexpectedly to the existing conflict field. That may trigger a very new constellation of responsibilities ♦

¹ The conclusion: Also hydropower reveals to be not really a »renewable« but an »exhaustible« resource – at least in an extended temporal perspective.

² Mainly near Assuan.

³ See http://espejo.unesco.org.uy/part4/1_africa/ethiopia/index.htm. In detail: Tekeze (at Embambadre) 4,51; Blue Nile (at the Sudanese border) 83; Baro (bei Gambella) 12; in total 99,51 bcm/year.

⁴ TAFESSE (2001, 28 und Table 3.2.6.-I) gives 86 bcm/year, but is ambiguous, as in the corresponding table the same figure is indicating a percentage.

⁵ According to: Sudanese Ministry of Irrigation and Water Resources, Ali Mohamed Kamal (2001), in detail: Atbara

(Mündung) 12,1; Blue Nile (Roseiries) 50,7, Sobat (Mündung: Hillet Doleib) 13,7. In total 76,5 bcm/year.

⁶ Sediments are accumulating mainly at the Sudanese part of the Nasser-Lake.

⁷ Framework Convention on Climate Change (FCCC 2001).

⁸ An introduction in this field if expertise I owe Jörg Barandat. Cf. BARANDAT (2002).

⁹ Resolution of the General Assembly of the United Nations (A/51/869): Convention on the Law of the Non-Navigational Uses of International Watercourses, in: International Legal Materials, 3/1997, S.700-720 (36 I.L.M. 700(1997)). <http://www.un.org/law/ilc/texts/nnavfra.htm>Status:<http://untreaty.un.org/ENGLISH/bible/englishinternetbible/partI/chapterXXVII/treaty39.asp>.

¹⁰ The conclusion is, that under altered conditions the agreement has to be negotiated again.

¹¹ Egypt's negotiation position reads: It is willing, to renegotiate the Treaty from 1959, but only on the basis, that its historical rights are accepted.

¹² <http://www.nilebasin.org/nbiprocess.htm#Outline>.

¹³ For the most recent state of development cf. PEICHERT (2003).

¹⁴ For comparison: The reservoir volume which has been created by the modern dam at Assuan is two and a half as big as the yearly discharge of the Nile (at Assuan).

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