

The domino effect, a downstream perspective in water management in Southern Africa

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Abstract: This presentation is on cumulative effects of inappropriate water management that impact on a downstream location. In Africa, the principle of Integrated Water Management at river basin level is recognised as the best option, the practice, however, is not yet implemented (Okidi, 1997:177). Between SADC countries alone, there were 23 agreements signed in the last century on international management of rivers. Although these treaties and the literature agree on the urgent need to implement the intentions, in reality the alterations are lagging behind and meanwhile the downstream effects become more visible. The case study illustrates how upstream water conflicts cause downstream trouble and that solutions are left to be found at places with little power and resources.

We argue from a downstream perspective that the river basins in Southern Africa should be managed from head to the mouth in order to optimise the development potential of the region and minimise the negative impacts for the human population and environment. Sector programs on energy, irrigated agriculture, industrial and urban development should be reviewed at that level. In doing so, conflicts can be avoided and co-operative solutions for water scarcity and abundance can be found by adjusting the water rights and prices, by using appropriated irrigation technology and changing cropping patterns and allowing water transfers between sectors and areas on a commercial basis.

Example: In December 1999, South Africa proposed according to its National Water Act (no 36, 1998) an Authority for the management of the Komati River Basin. The Authority includes Swaziland but excludes Mozambique (DWAF, 1999). As if the river ends at the Ressano Garcia border whereas the Incomati flows 280 km further through Southern Mozambique before ending in the Maputo Bay.

As any downstream country, Mozambique is confronted with the consequences of upstream management practise of South Africa, Swaziland, Zimbabwe and Zambia. It suffers reduced flows during the dry period, increased flows during the wet period, artificial floods that upset the downstream environment and infrastructure, landuse induced sedimentation load in the wet season, salt intrusion as result of reduced flow and water quality reduction.

This is true for the all nine international river basins Mozambique shares with SADC countries; the Maputo and the Umbeluzi basin with Swaziland, the Incomati and Limpopo basin with South Africa, but even so for the Save and Pungue river basin with Zimbabwe. Only one out of the nine, the Zambezi river is intended to be managed at a basin level since 1987(see map 1).

The combination of the downwards orientation of a river -providing the cumulative effect- and the relatively backward status of the economy makes Mozambique extra vulnerable for all impacts of uncoordinated upstream/downstream management. As domino stones, one after the other, the local water potentials fall as a consequence of upstream management practise. The cumulative quantitative and qualitative effect of water use for energy, irrigation, reforestation, industrial and urban development in the upstream countries cut off development downstream.

Whereas the downstream rivers in Mozambique are for the greater part in a 'natural state' in contrast with the upstream situation where large dams and professional water managers control the flow in the river, very soon the downstream rivers will be in a degraded state. The water will not even be suitable for domestic use. This is a crucial phase in Mozambique where, because of lack of infrastructure, thousands of people use the Incomati river as a direct source of domestic water (Kranendonk, 1980, own observation).

The total irrigated area in the downstream Incomati basin is less than 17.5000 ha, not even 1/6th of its suitable land, that must be farmed to feed the future population of the region. There are eight irrigation schemes of which two sugarcane plantations, Xinavene and Maragra. These are recently privatised and being rehabilitated at the moment. The lag of sufficient reservoirs and dams makes the Incomati water almost beyond human control on the Mozambique side. Floods in Mozambique blow overnight irrigation infrastructure, bridges and roads away, as we saw this month. All most every year the Mozambican farmers have problems keeping their subsistence harvest, either because of the droughts, or because of the floods. Capital investments in water management are not available and must be borrowed at unsustainable rates from the development banks. Therefor an important input of development in the region, usable water, will stay often scarce and unpredictable in Mozambique.

In contrast to the UN- Law of the Non-Navigational Uses of International Water courses, the South African National Water Act and the recent SADC statement on Shared Rivers, South Africa does not always practise good neighbourhood in the Incomati river basin. Building the Injaka dam in South Africa, and a weir at the border of Ressano Gracia/Komatipoort, are examples of uncoordinated development actions. These add up to a minimum flow at the border that either not reach the 2 m³/s minimum flow, as agreed with South Africa in Pigs Peak (1991)(Vaz, 1999); or is beyond control and floods the lower basin as last months, Jan/Feb 2000.

A major water transfer takes place from the Incomati to the Olifants basin for Eskom's cooling activities in the coal/energy production without compensation to any downstream users. The existing irrigation practise by South African farmers that is subsidised through a low water prize and a high sugar price, preventing innovative irrigation technology and shifting cropping patterns according to efficiency rules, that free the scarce water for the best user. In the dry season, the reduced low flow in the Incomati results in salt intrusion at the river mouth, up to 70, 80 km inlands.

These complains could be easily dealt within a basin wide Incomati Authority, that can find co-operative solutions in a political atmosphere. Part of the sugar could be produced in wetter areas of Mozambique, where as South Africa can keep their scarce water for higher value crops. Mozambican cheap labour force could stay home and work on their own plantations instead of migrating illegally to Swaziland and South Africa. Electricity might be sold or exchanged for water in the region. Such solutions on a river basin or regional scale offer a more productive way out, than Mozambique claiming compensation at the High Court of International Law in The Hague, with a full account of their environmentally harm from uncoordinated upstream activities.

The Incomati river basin

The communities sharing the Incomati basin sum up to a current population of 2.294.542 people and are estimated to grow towards three million people in the coming ten years. The population in the basin as a whole is almost under Water Stress according to the indicators of Falkenmark (Water Stress < 1.700 m³/p/y). However, the communities have very different levels of population density, development and water use (see table 1).

Whereas in many river basins, the population density is low in the headwaters of a river, and higher in the lowlands, in the Incomati basin, it is just the other way around:

In the first part of the last century, the colonial history turned the upstream area of the Incomati into a major sophisticated agricultural area for the white Afrikaners and their labour force. Here the population density is now about 65 persons per square kilometre. With 1561m³/p/y the South African part of the Incomati faces already Water Stress.

The black population in the lower Incomati (Mozambique) has historically been thinly spread cattle farmers, and only since 1955 the Portuguese colonial government stimulated large scale agriculture along the Incomati river by constructing infrastructure for eight irrigation schemes of which two sugar plantations. The current population density is only around 17 persons per square kilometre. The water use is still only a fraction of share of the upstream

countries due to poorly developed and maintained infrastructure and agriculture. The water availability (2440 m³/p/y) is still sufficient according to Falkenmark indicators.

In the Swazi-part of the Incomati basin, large scale sugar plantations are the main water users and the infrastructure to support the irrigation is up to date. The available water per person is relatively positive (3350 m³/p/y).

Table 1. Water density indicators for the three national entities in the Incomati Basin.

Adm. origin of the area	area (km ²)(%),	population (%)	population density
Incomati Catchment (Mozambique)	14.900(32.3%)	258.122(11.2%)	17 p/km ²
Komati Catchment (Swaziland)	2.600(5.6%)	151 900(6.6%)	58.4 p/km ²
N'Komati catchment (South Africa ¹)	28.700(62.1%)	1 884 520(82%)	65.6 p/km ²
Total Incomati Basin	46.200(100 %)	2.294.542 (100 %)	49.6 p/km²
Irrigated Area (ha) MAR (*m ³ /a), pop, wateravailability m ³ p/a ²			
Incomati Catchment (Mozambique)	>20.000(17%)	630	258.122
Komati Catchment (Swaziland)	14.060(12%)	509	151 900
N'Komati catchment (South Africa ³)	83.382(71%)	2.943	1 884 520
Total in Incomati Basin	117.442(100 %)	4.082	2.294.542
			1779

The population pressure in the upstream basin puts the Water Stress over the whole basin. To balance the inequality in economic development in the basin, people migrate to the upstream areas looking for employment opportunities that are not available in the downstream area. Most of these migrations are illegal, Mozambicans walk through the Kruger Park, finding a first entry in the South African society in the densely populated area of Manyeleti. This makes the water stress only higher.

Restructuring of the Sugar Industry

Sugar is the main agro-industry in the Incomati basin. In South Africa, Swaziland and Mozambique, large scale infrastructure has been set up to deliver the irrigation water. For this water, the farmer does not pay, the infrastructure including dams and reservoirs has been constructed with government funds. The South African farmers can still sell the sugar at a national market at a constant price, higher than the World Market Prices.

The Incomati supplies water to 120.000 ha irrigated sugarcane plantations, six sugar mills and more than 40 dams. Sugar, especially at the upstream plantations in South Africa and Swaziland, absorbs the major part of the Incomati river, 41 to 73 percent of the MAR (Mean Annual Run Off).

Decolonisation and the civil war hampered development in the downstream area in Mozambique. Colonial sugar mills were established in Magude, Xinavane and Maragra. Only the Xinavane mill kept on producing during the difficult twentyfive years, but is now 'super-cansado' as the manager puts it. No new investments since the colonial time (1974) The infrastructure and the factory are worn out. After the privatisation, South African and Mauritius management took over and can attract new investments.

Still South Africa is committed by their new water law to sustain good relationships with the neighbouring countries, and in practice come to terms with their over consumption of the water resources. The question is what are the best options 'levelling the playfield' between

¹Population of the N'Komati Basin in RSA: Komati Catchment 550300, Crocodile Catchment 497640, Sabie-Sand Catchment 794 900, Massintonto,840,Uanetze 840, Source Mozambique: 1997 census.

² Falkenmark's indicator for water use at national level:100p/1000.000m³ arid conditions, 600p/1000.000 m³ Water Stress and 1000p/1000.000 m³ Water Scarcity

the South African, Swazi and Mozambican part of the Incomati to reach a sustainable tripartite situation? How could the irrigated agriculture and the sugarcane industry be reorganised, what reallocations of water should take place, and how can water pricing and demand management help to solve the scarcity?

Sugar is a government protected crop, we may say, sometimes protected at the direct cost of the local subsistence farmer. In the below presented case of Xinavane, in South Mozambique, the local farmers suffer from water excess and losses during the planting season. Flooding of their fields is initiated by a local sugar plantation, which on its turn has to cope with a low flow, caused by extractions in the Incomati River in South Africa. The case study illustrates how upstream water actions cause downstream trouble and that solutions should not left to be found at places with little power and resources.

When the Incomati becomes a threat.....

Over one muddy dyke, then across the river by boat, another muddy dyke, then five kilometres of slippery stumbling and at last we arrive in a desolate 'street' of mud, a -by civil-war destroyed, ex-colonial- settlement in Southern Mozambique. This was.... This is the service centre for 20.000 people living, in the year 2000, on an island in the Incomati River; Iha Josina Machel. However, the biggest headache for the islanders is not the mud or the distance to the road or the empty shops, it is the three months of flooding, caused by the Incomati Sugar company, 8 kilometres upstream.

Wet lands

A flood as such causes no problems for the islanders. They have lived with the river all their lives and are well aware of the fertile loam that comes with the flood. Their habitat is the wetland, life between land and river, which forms the basis of their existence on the island. Floods have come every year in January, February, March. No, that is not the problem. The problem is with the new floods, in the Marilaphuvo and Xissavanine areas, caused by Incomati Sugar company, which come in June, July and August: just as the maize is ripening on the field, and the first crops can be harvested.

Now there is no time left for planting, growing, weeding and harvesting crops on the fertile soils of the river valley. Water is everywhere, almost the year around. "The river used to be our best friend," states Donna Cecilia Fulan, president of the Farmers Association, but now the Incomati has become a threat..."

Delicate balance

The delicate balance between river and land, which once supported the lives of 20.000 Islanders has been affected. The lower part of the island suffers from a manmade flood during the dry winter months and the upper part of the island suffers from water shortage. This is caused by the intake of Incomati Sugar Company, and on a larger scale by the intake for irrigation across the border.

Since the Incomati river in South Africa has been dammed for agriculture is there little water left when the river comes to it last big bend in Mozambique, along the Xinavane Sugar Plantations, where 'Incomati Sugar' is located.

Low flow

For the last ten years, the water level has been very low during the dry months. Too low for the water intake of the Xinavane Sugar Plantation, where 4.000 to 6.000 ha of sugarcane needs irrigation from June onwards. It is also too low to maintain the minimum ecological flow in the river; the Incomati is full of reeds and plants.

As a solution to this problem, Incomati Sugar decided several years ago to improve its water intake by closing off a left branch of the river, that floods into lake Chuade, and from there flows back into the Incomati at a lower point. Every year, the Incomati Sugar workers close off a bit more of the river branch, by putting up a dyke of sand between the existing river dunes, using a drainage machine. During the floods in January and February, this dyke is eaten away by the force of the water. Meanwhile, the local subsistence farmers try to survive under the new conditions.

Hole in the dyke

Of course, the Islanders have not let the matter go by without protest; they have been discussing the problem within their associations, the president of each association discussed the problem in the union of associations, and the president of the union was sent to the Administrator of the Island. He had visited the Governor, who -in his turn- laid the problem on the table of ARA-Sul, the Regional Administration Unit for the Incomati River. The case has now been under discussion for at least four or five years. Last August, a tripartite meeting took place, between the farmers, Incomati Sugar and the government. Incomati Sugar promised to solve the problem, but no solution is yet in sight.

It is a fact that many Islanders find employment at the sugar plantations, it might be only the men, and only for hard work during harvest time, but still the plantation offers the only chance to earn a salary, apart from migration to South Africa. And in order to produce its 10.000 tonnes of sugar, the plantation needs irrigation water. So, the Administrator, Inacio Muchanga and many others in the government, take the plantation's side, although they understand the Islanders' grievance.

The Islander themselves have been waiting so long for some support from outside, that it is hard to believe it will come. Either they make a hole in the dyke, or open other parts of the river system to release the water into other areas, avoiding flooding of their main fields, pushing the problem downstream. Last year, the Sugar Plantation was kind enough to help with the latter action and provide the islanders with the machinery needed to open up another area.

Linking land and water

This temporary solution will not settle the case. As the area has very fertile soils and enough water, the pressure on the land is increasing. In the near future, the area should become a major food producing area in the region. The land and water problems have to be solved in order to reach that goal.

The large sugar companies were recently privatised and the new management have made substantial investments and brought in competent technical staff from South Africa or Mauritius in order to push up the production figures. In the near future, the Incomati Sugar company wants to start using the upper part of the island, which the company formerly used as pasturage, in colonial times. That land is now occupied by farmers who fled the flooded area. The ground is very fertile, after years of cattle farming in the colonial time. The local farmers, although without official land titles, might claim the customary right to stay on the land, as they have been using it for more than ten years.

If the Incomati Sugar wants to obtain the official title and use of these pastoral grounds, they could opt to settle two problems in one go: free the land by resettling the farmers, back in the flooded area, after putting dykes around the area. That will solve a water issue, and avoid a land conflict.

The question is, who is going to organise and pay for this?

Upstream-downstream

As always, with river issues, the origin of the problem lies upstream, with the decreasing flow at the border, caused by increased abstraction of water for irrigation in South Africa. Downstream, this low flow triggers a solution, to dam part of the river in order to create sufficient intake for irrigation. It's the farmers further downstream again who bear the consequences.

A related problem is that those people downstream, those farmers, don't have strong connections with the people in power. Their say in the issue is limited, their influence even less. The governmental structures that should take into account the position of the small farmers, are either not strongly developed enough or, in the case of ARA-Sul, do not represent the small farmers.

If you ask the local farmers, their solution would be to open the dyke in the river, so that everything will be as in the past. Or maybe as second option, to work together and build dykes around their fields, in order to avoid the flooding in the dry season. The water could be

regulated with sluices, and irrigate the fields during the wet season. Incomati Sugar should help in building these dykes.

The construction of a dam and a reservoir in the Incomati, just beyond the South African border, could be a solution on a larger scale. Better co-ordination between the South African and Mozambican officials could then regulate the flows and floods in a way that is less harmful for the environment and the farmers downstream. With the rains of 6th January and the release of water from South Africa on 13th January and the floods of 6th of February 2000, small scale farmers lost their houses and virtually their entire subsistence crop.

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