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Land and Water Grabbing in an East African Coastal Wetland: The Case of the Tana Delta

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ABSTRACT: The delta of the Tana river in Kenya, an important wetland in Eastern Africa, is at a major turning point. Key decisions regarding its future are on the verge of being made, some of which may dramatically alter its characteristics. At present, in a landscape that is a mosaic of floodplains and forests of high biodiversity, small-scale farming, fishing and livestock-keeping are the main activities practised by the local communities, all relying on the occurrence of floods in November and May. Private investors with the backing of governmental bodies or parastatals, including the river basin authority, have planned the conversion of the lower Tana into irrigated sugar cane and *Jatropha curcas* plantations for biofuel production. In this paper, we discuss the land and water grabbing aspect of this new biofuel production trend, 'grabbing' being defined as cases of land acquisition or water abstraction where established user-rights and public interests are disregarded. We focus on two case studies: a planned large-scale sugar cane plantation in the central floodplain and a large-scale *Jatropha curcas* plantation on the floodplain terraces. We demonstrate through a water budget analysis that their potential impacts on the water balance and quality, on the environment of the Tana delta and therefore on the flood-dependent livelihoods have not been adequately addressed in the Environmental Impact Assessment documents.

KEYWORDS: Land grabbing, water grabbing, sub-Saharan Africa, Kenya, biofuels, floodplains, ecosystem services, water balance, Environmental Impact Assessment

INTRODUCTION

'Land grabbing' is not a new phenomenon in Kenya. Since the beginning of colonisation when land titles were created without due consideration for user-rights and customary tenure, legitimate and legal rights to land were divorced. After Independence, the involvement of political leaders in land patronage was highlighted and illegal land allocations were analysed in this context by Klopp (2000, 2002), Southall (2005), and Médard (2010). The scale of the phenomenon in Kenya can be assessed from the estimated 200,000 illegal titles created between 1962 and 2002 (Ndung'u Report, 2004 in Southall, 2005). According to Manji (2012), these estimates are even conservative. If some prefer to use the terms 'land privatisation', which is regarded more neutral, in this paper we have deliberately adopted

the words 'land grabbing', defined as cases of land acquisitions where established user-rights and public interest (such as environmental conservation) are disregarded. We relate the phenomenon to a neo-patrimonial mode of governance (Bach and Gazibo, 2012) characterised by the weakness of institutional safeguards separating public and private interests and spheres of power.

In recent years, land grabbing in Kenya has extended to areas of great environmental importance such as forests and wetlands and has taken a new dimension in the context of the global trend of large-scale land acquisitions or 'land rush' (Anseeuw et al., 2012). In this new phase, external investors are acquiring vast areas of land, mainly for biofuel production. This new trend benefits from the Kenyan context of land grabbing, building on the existing mechanisms of land acquisition and in particular the failure of the environmental law to protect people and the environment from being affected by ill-conceived projects.

This new trend is happening despite efforts made in recent years to introduce institutional safeguards and ensure the interests of the public at large. The introduction of the framework of environmental impact assessment (EIA) under an independent body, the National Environmental Management Authority (NEMA), was seen as a major landmark when it started operating in 2000. This was meant to streamline decision-making, introduce consultative mechanisms and address environmental concerns in the event of major land-use changes. But in practice, EIAs are far from playing their role (Marara et al., 2011; Ogada, 2012; Mbonde, 2012).

Much recent large-scale land grabbing is taking place in the Tana river basin, an area targeted for development under the government's 'Vision 2030' (Government of the Republic of Kenya, 2007). Most of the planned projects designate the floodplain areas as 'unused land' and its adjacent terraces as 'empty dryland'. In reality the land targeted is delivering vital ecosystem services to the floodplain users and the nation as a whole. The adjacent supposedly 'empty dryland' has close ecological and economic ties to the floodplains and, through its proximity to the river, has a high irrigation potential. Proposed changes in land use that require changes in water use will impact on a much wider area and affect a much wider range of ecosystems services beyond the converted land. For these reasons, beyond 'land grabbing' it is the 'water grabbing' part of the phenomenon that has attracted our attention. By analogy with 'land grabbing', our definition of 'water grabbing' applies to cases where established user-rights and public interest are disregarded by powerful actors who are able to take control of water resources for their own benefit, depriving local communities whose livelihoods depend on these resources and ecosystems (Kay and Franco, 2012).

In the Tana delta, it is essential to analyse the water aspect of planned investments in biofuels since deltaic ecosystems are characterised by their functional dependence on floods for a wide range of ecosystem services, e.g. forest regeneration and productivity, groundwater recharge, deposition of fertile loams and clays that constitute an agricultural resource, fisheries and grassland productivity, etc. In this delta, all the main economic activities (recession agriculture, livestock keeping, fisheries and forestry) are practised in accordance with the flooding rhythms of the river, occurring twice a year, once in November and once in May in the natural pre-dam system. Thus the flooding regime is key to the ecosystem services delivered for human well-being. Since the 1980s, when the flooding pattern was disrupted by the construction of five dams (Masinga, Kamburu, Kindaruma, Gitaru and Kiambere) (Maingi and Marsh, 2002), livelihoods in the delta have been affected (Hamerlynck et al., 2010). Associated with recurrent and major droughts affecting the Horn of Africa and more specifically Kenya, these changes created water scarcity in the lower part of the Tana river basin which has had major social and economic impacts on local communities.

The objective of our paper is to evaluate the efficiency and adequacy of the EIA for two biofuel projects in the Tana delta and especially assess whether they address the hydrological dimensions of planned developments comprehensively and their consequences on livelihoods in a wider region. First, we provide the background and methodology of the study, then we detail two case studies focusing on the water balance of planned investments in biofuels and, subsequently, discuss their potential impacts

on ecosystem service delivery to local user groups. We then look into the causes of the failure of the planning process and make suggestions for the future.

BACKGROUND AND METHODOLOGY

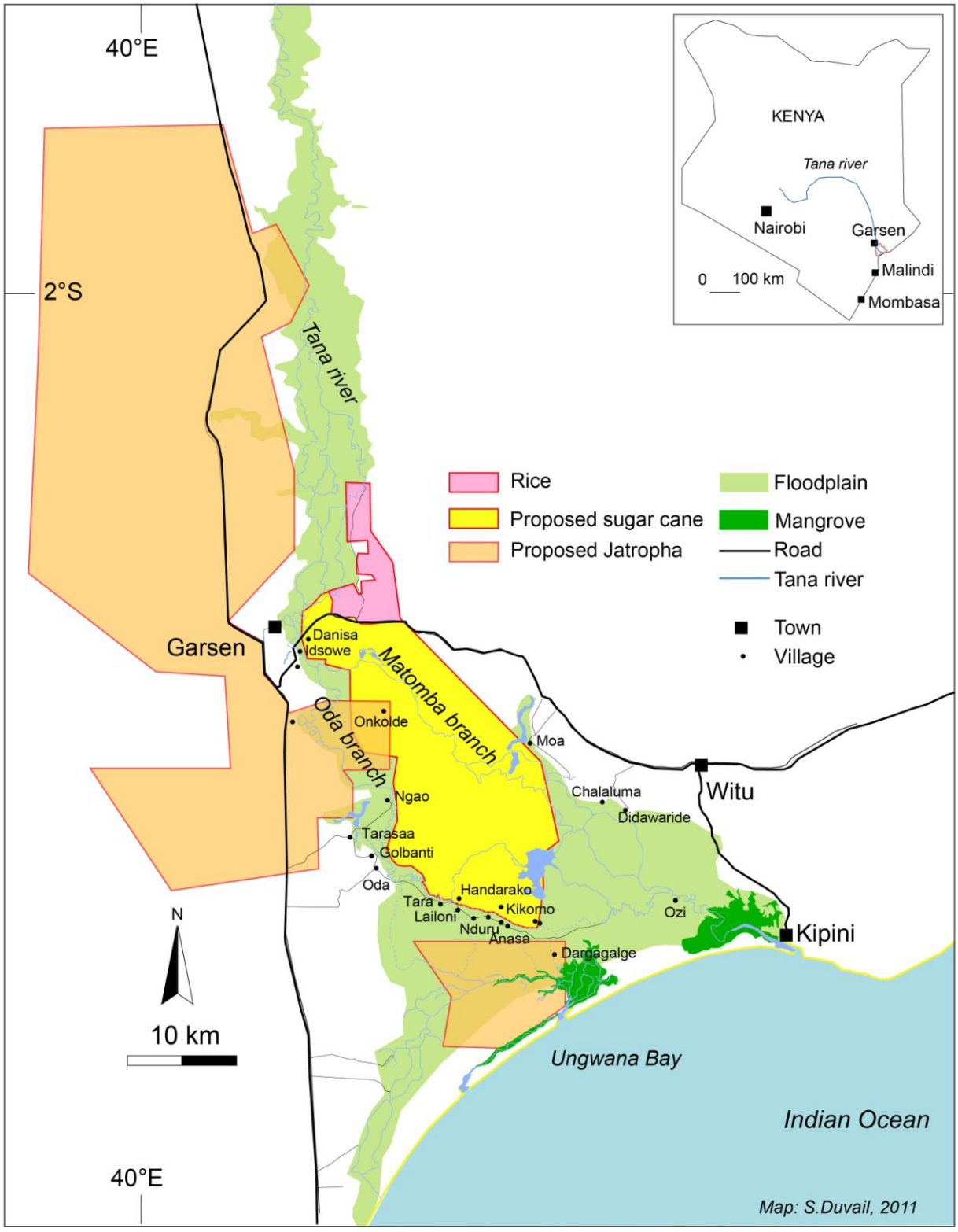
Land and water issues in the Tana delta

The Tana river is the largest river in Kenya in terms of length (1000 km) and discharge (average of 156 m^3/s at Garissa for the period 1941-2010). Its main sources are found in the highlands (> 3000 m altitude) of the Aberdares and Mount Kenya just north of the capital city Nairobi. After a cascade of five dams and having run one-third of its course, when reaching an altitude of 200 m, its floodplain enlarges and it meanders through semiarid lands (< 500 mm annual rainfall) until it divides to form a deltaic floodplain just south of Garsen. It reaches the Indian Ocean at Kipini through today's main mouth, and also, during floods, through a number of secondary river mouths fringed by mangrove systems (figure 1) south of Kipini.

The Tana delta landscape, a complex mosaic of forests, woodlands, floodplain grasslands and various wetland types, accommodates exceptional biodiversity values. Botanically, over 650 species have been recorded (Luke, 2011) and the few hundred hectares of riverine forest that grow along the smaller river branches are characterised by the presence of numerous endemic or restricted-range species of plants (Luke et al., 2005). Two threatened endemic primates are also found: the Tana River Red Colobus *Procolobus r. rufomitratus* and the Tana River Mangabey *Cercocebus galeritus* (Hamerlynck et al., in press). Significant numbers of migratory waterbirds, including red-listed ones, make use of the deltaic floodplains and, during favourable flood years, there are important colonies of breeding waterbirds (Bennun and Njoroge, 1999; Hamerlynck et al., 2011b). The lower Tana also harbours a number of endemic fish species (Seegers et al., 2003; Nyingi et al., 2011).

For centuries, these rich and productive ecosystems have constituted a multi-user and multifunctional area of high socio-economic value for a number of local communities which have interacted in the delta (Terer et al., 2004). Livelihoods are commonly considered as markers for different local identities. Though to some extent they have been shifting in a context of water scarcity, ethnic differentiations remain strong in the Kenyan context of competing access to resources (forests, land, water, pastures) and of flawed political mediations promoting autochthony (Médard, 2008). The Wataa, traditionally a hunter-gatherer society, are generally recognised as the earliest inhabitants of the delta. They are now marginalised within the delta (Hamerlynck et al., 2010). Historically, the Pokomo practised recession agriculture along the riverbanks and made use of the riverine forests (Terer et al., 2004). Currently, they produce recession and tidal rice but, mainly due to the reduced peak flows (Maingi and Marsh, 2002), they have diversified into rain-fed maize, mango and banana cultivation, fishing and small livestock-keeping. The Orma are pastoralists who use the pastures of the floodplain to graze their cattle during the dry season. They have progressively settled in the delta since the mid-20th century (Ensminger and Rutten, 1991) and have built permanent villages. Wardei and Somali pastoralists also visit the delta with their livestock during the dry season, and some have settled in the delta year-round. In addition, Luo (migrants who originate from lake Victoria) have been living and fishing in the delta for several decades now, mostly next to the floodplain lakes. Kikuyu settlement schemes are found north of the delta. Mijikenda/Giriama from the South have also established base locally, practising rain-fed agriculture on increasingly marginal soils. For the past 5 years, with the area less affected by 'banditry', small towns are sprouting up along the main road which goes around the delta. Charcoal burning has considerably increased and has become a major supply for the entire coastal region.

Figure 1. Map of the Tana Delta and spatial extent of the proposed projects.



The cohabitation between various users of the wetland is organised through informal rights of access to the river and to the wetland natural resources: the Pokomo have historically settled along the southern

branch of the delta (Oda branch) and mainly cultivate the southern deltaic floodplain with flood-recession techniques (Duvail, fieldwork; Léauthaud, 2009) while the Orma are mostly settled around the northern branch of the delta (Matomba branch) which has become the channel receiving most of the flow for over a decade now. Solidarity mechanisms exist between the two groups (as for example, the *Malka* agreements, negotiated by the Orma and Pokomo elders' committees during drought periods and giving the possibility to the Orma to graze cattle on the southern floodplain, on the Pokomo farms, while in exchange the Orma take care of the Pokomo cattle) (Duvail, fieldwork). Still, the history of Pokomo-Orma relationships is characterised by raids and recurring conflicts to which competition for access to the rich floodplains and river is key. In recent times, the historical tensions have often been exacerbated for political gain (Kagwanja, 2003). The most recent clashes, which happened in 2001, were very violent: over 180 victims were recorded within a year after the revision of the spatial distribution of farming and livestock-rearing. A project of land allocation designed for the Pokomo was contested by the Orma and Wardei who perceived this as restraining their access to the river (Kenya National Assembly official record, 2001; Alhuwahlia, 2007).

Access to land and to the river is therefore the result of harsh social negotiations and, as the land in the central deltaic floodplain is strongly appropriated, this makes any change in spatial organisation of the land use a very sensitive subject. There is however a total disconnection between the complexity of these customary rights and the official point of view according to which the central floodplain falls under the category of 'government land', previously 'crown land', placed under the direct authority of the central government. This means it is widely regarded as 'free' land, i.e. 'free' of people and therefore available for development activities. Only small portions of the floodplain were categorised as 'trust land' and as such were supposed to be managed by the county council on behalf of the people usually resident in the area. The status of the terraces surrounding the delta, fitting into the government land category, has evolved differently: since the end of the 1960s, the land has been leased through commercial or group ranches, following the ranch model promoted by the World Bank under the Kenyan Livestock Development project and introduced in the Kenyan Law by an act of parliament in 1968 (Keya, 1991). The idea was to promote private property by allocating land to a limited number of ranch members, to give them access to credit and encourage them to commercially manage livestock and link up with the market economy. It was thought that this would encourage livestock keepers to restrain their cattle within the ranch boundaries and to limit their number. But, in the whole of northern and north-eastern Kenya, most of the ranches failed and were quickly confronted with financial problems, which became a source of social friction. Just as in other parts of the country, management committees of such companies were manipulated by politicians (Keya, 1991). In addition, they were faced locally with harsh environmental conditions and major security constraints. In the lower Tana the establishment of ranches also contributed to increased pressure on communal Orma grazing areas and impacted on their lifestyle as a whole (Johansson, 1991). Still, with management failure, the boundaries of some of these ranches were not enforced and access to land remained open. These 'open' areas are especially targeted for new large-scale investments as their leases appear to be easily transferable.

Since 2007, large tracts of land have been acquired or sub-leased by private companies (figure 1) and at present four projects are known for the delta and its surroundings: two projects have had their EIA approved by the NEMA; two more projects are still at the land negotiation stage.

The idea of converting the lower Tana floodplain and delta to large-scale irrigation projects is not new. In the 1980s, large-scale irrigation projects for cotton production were established at Bura and Hola but were economic failures (Ledec, 1987; Adams, 1990). Further downstream, the 16,800 ha Tana Delta Irrigation Project, funded from 1987 by the Japanese cooperation was characterised by very low yields of less than 2 tonnes of paddy per hectare (Mbonde, 2012), and was mismanaged and finally abandoned after the destruction of its main embankment by El Niño floods in 1998 (Lebrun et al., 2010). Some 2000 ha of the scheme are currently being rehabilitated but none of its structural deficiencies have been resolved (Mbonde, 2012). Closer to the river mouth, a Greco-Kenyan company was planning

to build a large-scale shrimp farm in the 1990s but the project was halted by the Kenyan President Moi in 1992 in an electoral context where he needed the votes of the coastal people (Duvail et al., 2010).

The scale and nature of the new wave of land acquisitions is unprecedented due, first of all, to the size of the land acquired or sub-leased (more than 160,000 ha for the production of *Jatropha curcas* and over 40,000 ha for irrigated sugar cane); secondly due to their objective to produce biofuels; and finally due to the origin of the investments coming mainly from private international actors (instead of bilateral or multilateral donor money).

Methodology

We have gathered available information and conducted fieldwork to try and answer a number of questions. In a context of water scarcity, how much water will be consumed by these large-scale projects? Did the EIA correctly assess the impact of these projects on the water balance? Will the legal 30% reserve flow be maintained? What are the main environmental impacts on the wetland going to be? Will there be enough water for the delta to functionally remain a wetland? Will livelihoods relying on the availability of land and water in the delta be prioritised or will they be marginalised?

Fieldwork consisted of hydrological and meteorological monitoring, sociological in-depth interviews from 2009 to 2011, interactions and interviews with key actors and analysis of project documentation, especially the EIA reports. As it is compulsory under Kenyan law (Government of the Republic of Kenya, 1999 Environmental Management and Coordination Act article 59-1) that any EIA received by the NEMA should be made public, the EIA documents were made accessible to the general public through the Internet. We concentrated on the parts describing the planned water abstraction of the projects.

The water abstraction calculations made in the EIAs were compared to the available hydro-climatological data. Historical daily flows were provided by the Water Resources Management Authority (WRMA) for two stations: Garissa (code: RGS 4G01) and Garsen (code: RGS 4G02). For Garissa, the series covers the period May 1941 to March 2010 and is relatively complete (6% of missing data). For Garsen, the series covers the period September 1950 to May 1998 and is less complete (21.5% of missing data). Mean monthly flows, mean monthly minimum flows and extreme minimum values were calculated for each series.

Meteorological data were provided by the Kenyan Meteorological Department. Data on daily rainfall were available for the period 1965-2007 for the Garsen station (Station n° 9240010). Out of the data on 42 years those on 33 years are comprehensive and were used for the monthly and annual rainfall calculations.

TWO CASE STUDIES

In this paper we focus on two case studies: a planned large-scale sugar cane plantation in the central floodplain of the Tana delta and a large-scale *Jatropha curcas* plantation on the terraces surrounding the delta. We will find out if their potential impacts on the water balance and on the environment of the Tana delta have been adequately addressed in the EIAs.

Project A

The project proponent is a Kenyan private company. The project is intended to grow irrigated sugar cane on the central floodplain of the Tana delta (figure 1).

The land targeted for the project is located between the two main river branches and just upstream from the tidal freshwater wetland. Part of this land has the status of 'government land' while another part is registered as 'trust land' and is therefore managed by the county council. In 1995, Tana and Athi River Development Authority (TARDA) received a 10-year lease in order to implement a development project on this central floodplain. In 2007, TARDA sold it to the private company for the implementation of an 'integrated' project but retained a 15% stake. This sale occurred after the 10-year lease period

expired and this irregularity was brought out in a subsequent court case. In December 2007, an EIA of the project was prepared by two agribusiness-oriented companies (HVA and MA Consulting, 2007).

Water balance of the project

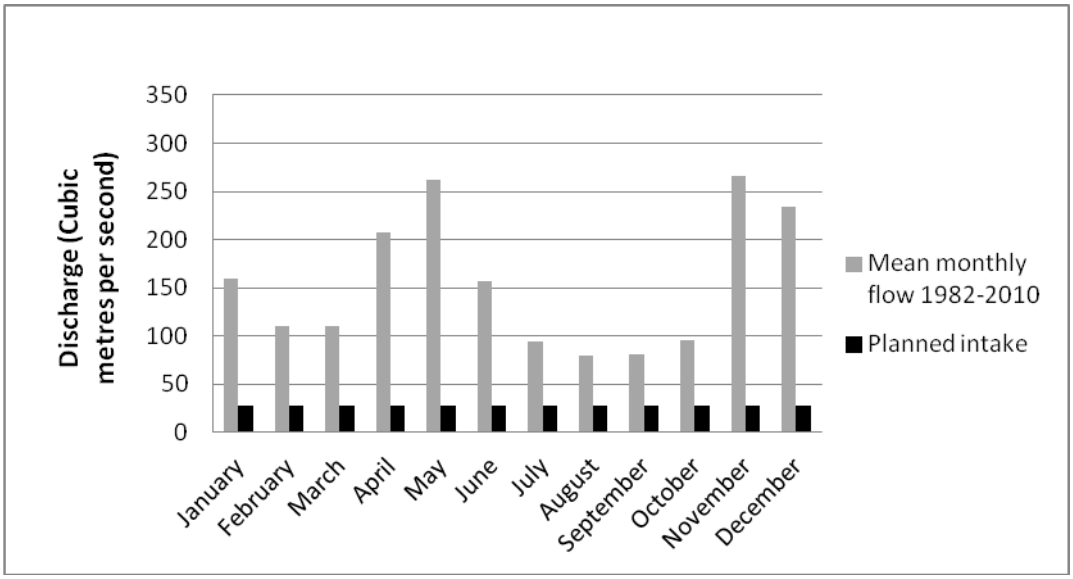
The success or failure of the project and its environmental impacts are to a very large extent tied to water availability and flows in the delta but this aspect does not receive an appropriate treatment in the EIA document. Only two mentions are found:

> [a] Preliminary inspection of the discharge data shows that planned abstraction of water from the Tana river can account for up to 1/3 or more of the discharge during dry months e.g. September or even during the drought periods; … [b] River Tana is the proposed major source of water for the project. Presently water abstraction permits from the Tana River has (sic) been granted to various users for domestic, irrigation, power generation, etc. The flow of water at Garissa is approximately 151 cubic meters per second. The allocation for the Lower Tana alone amounts to about 98.4 cubic meters of water per second leaving a balance of 56.2 cubic meters per second. At a requirement of 28 cubic meters per second, the [project] will take up half of the said balance.

No sources of data are provided in the text of the EIA but both statements most likely refer to the flows recorded by Water Resources Management Authority (WRMA) at Garissa. The first statement refers to the mean monthly flow and the second to the mean annual flow.

We did a similar calculation using the daily flows at Garissa provided by WRMA. As the hydrological river regime changed substantially after the establishment of the Masinga dam in the 1980s (Maingi and Marsh, 2002), a time series of 1982-2010 was used (figure 3).

Figure 3. Garissa station: Mean monthly flows after the dams and planned intake.



According to this calculation, and contrary to what is mentioned in the EIA, an abstraction of 28 cubic metres per second or 'cumecs' exceeds 1/3 of the mean monthly flow at Garissa during 2 months in the year (August and September, placing it at 35%) and is very close to 1/3 (exceeding 25%) for another 4 months (February, March, July and October) (figure 3). If we look at the mean monthly minimum flow, which would be a more relevant variable to measure, the impact of the project abstraction exceeds 1/3 of the minimal monthly flow for 6 months in the year.

Furthermore, the data used in the EIA come from the Garissa gauging station (RGS 4G01), 250 kilometres upstream of the project and not from the more relevant station of Garsen (RGS 4G02). In the dry season there is substantial loss of water between the two stations through abstraction, evaporation and evapotranspiration and also occasional water input from the seasonal streams. As a result, flows at Garsen are lower than those at Garissa with a mean annual flow of 165.2 m^3/s at Garissa for the period 1950-1998, but only 105.1 m^3/s at Garsen (figure 4).

Figure 4. Mean monthly flows at Garissa and Garsen (1950-1998).

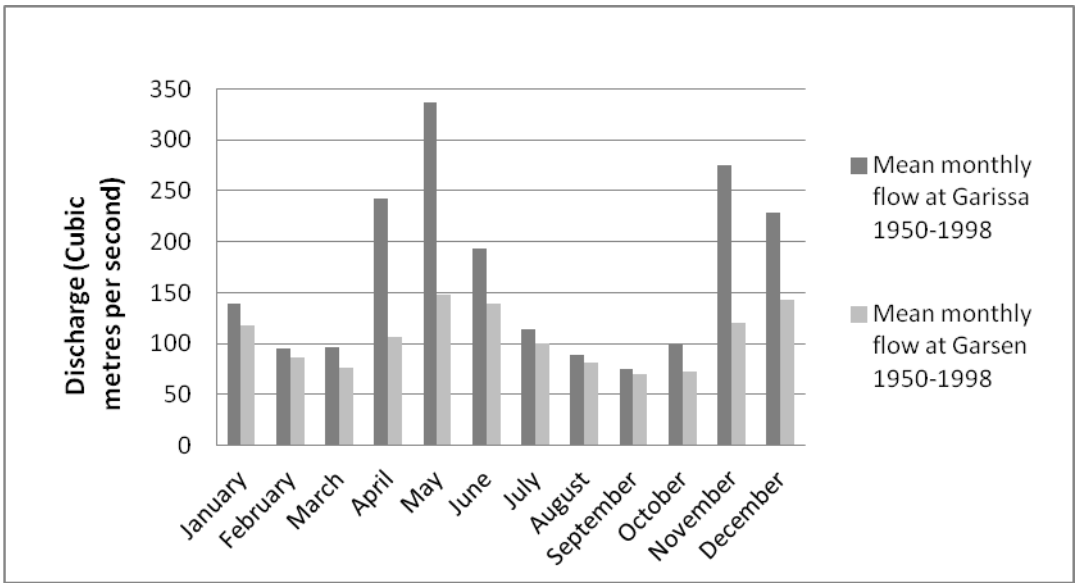
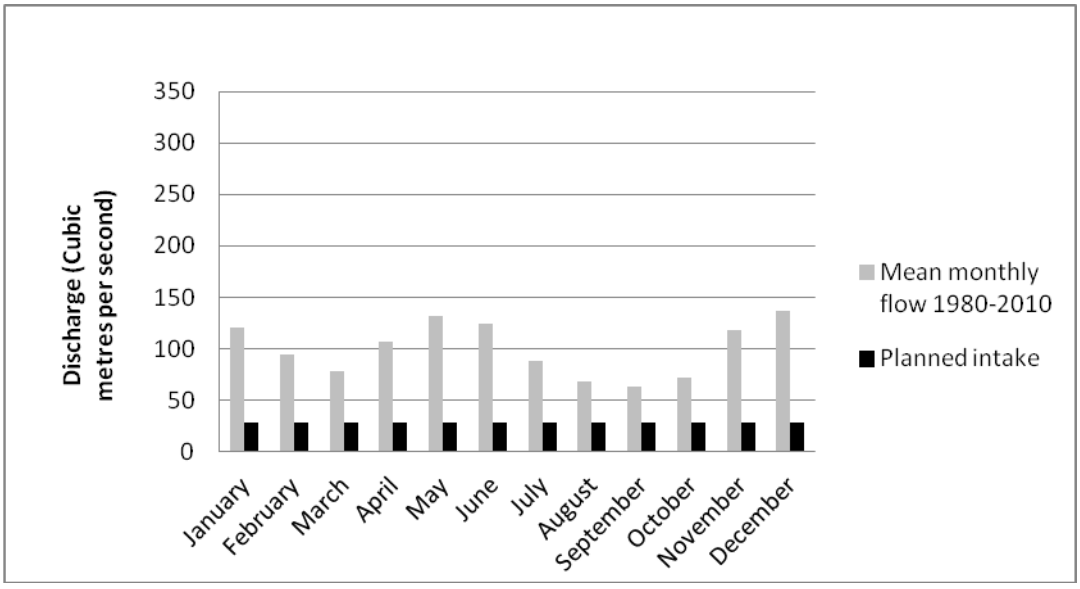


Figure 5. Garsen station: Mean monthly flows after the dams and planned intake.



The same analysis applied (i.e. comparing the proposed intake volume to the mean monthly flow and to the mean monthly minimum flow) shows that an abstraction of 28 m^3/s exceeds 30% of the mean monthly flow at Garsen for 5 months of the year (February-March and August to October) and exceeds

1/5 (exceeds 20%) of the flow in the rest of the year (figure 5). If we look at the mean monthly minimum flow at Garsen, then abstraction exceeds 1/3 of the minimal monthly flow during 8 months of the year.

Impact on water quality

It is proposed that the Matomba channel would serve as the main drainage from the irrigated part of the system. This means that high concentrations of pesticides and fertilisers will end up in the central Bilisa Boka lake which is home to large numbers of hippopotami, crocodiles and piscivorous waterbirds. None of these potential impacts are analysed in the EIA.

The EIA document states that "sugar cane is cultivated with relatively few pesticide inputs" but does not provide any standards with which this is compared.

Johnson and Ebert (2000) have quantified the pesticide inputs from sugar cane farming into the coastal waters of north-east Australia and have found significant use of organophosphates (such as chlorpyrofos), of atrazines and ureas (Diuron) and of fungicides (both mercurial and azoles). Organophosphates, used against cane grub, are less persistent than the previously used organochlorines (DDT) and are essentially immobile in soils but, during flood events, they can be associated with soil erosion, and easily contaminate surface waters. As they have acute toxicity for aquatic organisms this, and also accidents with storage or transport, can lead to massive fish kills. Diuron (or alternatively 2,4 D) is mostly used in the first year of sugar cane growing. Diuron is persistent (half-life of 21 days to 20 weeks) but not highly mobile while 2,4 D is more mobile but less persistent. Diuron has been shown to have a significant impact on photosynthesis of seagrasses (Haynes et al., 2000) and could therefore affect productivity in Ungwana bay, an important fishing ground at the mouth of the Tana delta (Fulanda et al., 2011).

Therefore, monitoring soils, groundwater and surface water and a range of organisms, especially filtering bivalves, should be obligatory for all pesticides used but this is not mentioned in the EIA.

The EIA also skips over the impact fertilisers have on coastal ecosystems. There are very clear links between increased nutrient loads and the development of algal blooms (Anderson et al., 2002) some of which are toxic and can cause paralytic shellfish poisoning and thus have detrimental effects on coastal fisheries and tourism. As the dynamics of the flow through the Matomba channel will be reduced and as it will become the main drainage of the sugar cane plantation, high quantities of fertiliser may end up in the water bodies downstream of the project and cause anoxia and other problems there.

Environmental impacts

Many of the major impacts of the project will be linked to the decrease in water flow and quality and the exclusion of vast areas (much larger than the project boundaries) from the beneficial biannual flooding. Many of these impacts will occur in the estuarine and coastal zones downstream of the project, an area not studied by the EIA. For example, the fisheries sections of the EIA, though interesting from the freshwater species point of view, seem to have been written from a lake perspective, without any understanding of the importance of the flood pulse, which is the main engine behind the productivity of the freshwater fisheries in the deltaic floodplain (Bayley, 1991; Hamerlynck et al., 2011a; Opperman et al., in press). The brackish water, estuarine and coastal fisheries,and eventually the health of the mangrove systems are all intimately linked with pulsed freshwater flows(Nagelkerken et al., 2007). These aspects are ignored by the EIA while the nursery functions of the mangrove and the estuary probably present one of the greatest economic values of the Tana delta, values that will undoubtedly be seriously affected by any substantial reduction of flow and/or damage to the mangrove stands.

The increased abstraction by the project will also affect the floodplain forests of the Tana delta, a highly threatened and valuable ecosystem (Hamerlynck et al., in press).

More generally speaking, the EIA does not provide a comprehensive list of all the vulnerable and threatened species that will be influenced by the project and makes no mention of other important risks such as soil subsidence and acidification, and salinisation of aquifers and soils.

Socio-economic impacts

The loss of the prime floodplain grazing land of the delta would be one of the main impacts of the project. The spatial extent of the project covers the central part of the delta where the richest pastures exist. The exact area of the project is unknown. The EIA project announces that the sugar cane plantation will cover 22,000 ha of the floodplain. But the maps presented in the documents are not georeferenced, and the limits of the irrigation scheme are defined by geographical elements such as the main Tana river branches. We reproduced the spatial extent of the project following the same geographical elements and found that, using georeferenced satellite images, the project area in fact covers over 38,000 ha.

The proposed mitigation measure for the pastoralists is the opening up of the dryland grazing of the Galana ranch. But that area, which has pasture only during the rainy season, cannot compensate for the loss of the dry season pastures confined to the central deltaic floodplain. Therefore, both nomadic livestock keepers and wildlife dependent on floodplain grazing (e.g. topi, buffalo and elephant) will incur substantial reduction of available pasture.

In case of drought, the Tana delta is the safety net for tens of thousands head of cattle ranging between the Somali border and the Tsavo East National Park. Pasture will be lost: not only the grazing land set to be converted by the project, but also all the areas that will be excluded from flooding by the embankment and by the reduction of flooding frequency linked to the abstraction of a substantial proportion of the flow.

Furthermore, other activities such as fisheries and recession agriculture will also suffer from the change of water regime in the delta. Some areas will be directly impacted since they have been included in the project areas, others indirectly through loss of pasture, fishing zones and farming opportunities. Entire villages are not represented on the EIA maps (e.g. Kikomo, Kipao and Onkolde) though included in the project areas. In the EIA document these villages are described as "squatter villages". As a consequence, when the public hearings were held, these were conducted far away from these villages. Community representatives came from non-impacted areas. In some cases, it was even reported that unemployed youth were transported to the hearings and paid to endorse the project (Lebrun et al., 2010).

On the positive side, the main promise made is that the project will create 20,000 jobs. It remains unclear whether these employees will be recruited locally or not as was the case in the former TDIP irrigation scheme (Lebrun et al., 2010) on which model the sugar cane project is built. Such figures produce a magical effect and are not backed by any job description and time-frame.

Project B

The second project differs in many aspects from the first example: the project proponent is a Canadian private company. Their project is to grow *Jatropha curcas* on 64,000 ha on the terraces surrounding the deltaic floodplain.

The company negotiated directly for 45-year sub-lease agreements covering a total of 160,000 ha and dealing with six separate ranch owner committees (Ida-sa Godana, Giritu, Haganda, Kibusu, Kitangale and Kon-Dertu). Within these 64,000 ha 40% of the area was earmarked for planting *Jatropha curcas*. The contracts corresponded to sub-leases meaning that the ranch owners retained the leases in their name. The company investing in *Jatropha curcas* agreed to make all the payments necessary to regularise the leases and sub-leases: the arrears in land rents were paid to the county councils and the ranches' debts were taken over in order to get official clearance for the project.

The Environmental and Social Impact Assessment (ESIA) study for the project was prepared by a private company called African Business Foundation (African Business Foundation, 2010) and was approved by NEMA in May 2011.

The document contains an extensive description of the project. It is also supposed to cover issues related to the environmental and social impacts but the document seems to miss main points: no proper water balance for the project was presented, impacts on the environment and especially on the biodiversity are not detailed and virtually no data to support the expected economical outcomes were supplied. These three points will be analysed in more detail below.

Water balance of the project

There are several scattered paragraphs describing how this vast project will be supplied with water. It is argued that *Jatropha curcas*, being a drought-resistant plant, will grow in semiarid conditions. However, no mention is made of the rainfall conditions required for optimal plant development and oil production which would have pointed to the fact that the area might be drier than required. As in the higher rainfall coastal strip, north of the Tana delta where *Jatropha curcas* cultivation was perceived as a failure by some farmers (Hunsberger, 2010), there is a need to look into detail at the water balance of the project.

In the document, the rainfall analysis is scanty: a list of the annual rainfall in a wide area around the project is presented (without mentioning the source of the data). Using the closest data collection points – Garsen in the eastern part of the project (297.2 mm), and Tarasaa in the southern part of the project (400.7 mm) – the ESIA has considered an average annual rainfall figure for the project area of 350 mm. Strangely, the data mentioned in the ESIA document (which again does not mention any source) are different from the available Kenyan Meteorological Department (KMD) data and underestimate the rainfall in the area. The average annual rainfall according to the KMD for the period 1965-2007 is 560.3 mm for Garsen, with a high variability (in 3 years out of 4 it is less than 650 mm and in 1 out of 5 years less than 400 mm).

Furthermore, nowhere in the study are the water needs of *Jatropha curcas* properly described. There is no figure on the expected water consumption of the project and no water balance is made though this is critical information for such an ESIA. The figures on the water needs of *Jatropha curcas* are available and accessible in the literature and show that, although it is able to survive in a dry environment, it does need large quantities of water to thrive (Pohl, 2010). The water footprint, defined as the total volume of freshwater used annually for the production of a crop and expressed per unit of bioenergy [m^3/gigajoule (GJ)] shows that, for the 12 crops compared, the total water footprint of *Jatropha curcas* was the highest at 574 m^3/GJ of electricity i.e. five times more than for sugar cane (108 m^3/GJ of electricity) or 20,000 litres for 1 litre of biofuel produced (Gerbens-Leenes et al., 2009). These figures are derived from FAO data: authors have used average figures of *Jatropha curcas* production over 5 years (1997-2001) in five countries (India, Indonesia, Nicaragua, Brazil and Guatemala) (Gerbens-Leenes et al., 2009). The study was however contested by Maes et al. (2009), who put the water requirement of *Jatropha curcas* at 65 m^3/GJ, instead of 574 m^3/GJ), based on only one example in Egypt. A third team suggested the figure of 148 m^3/GJ with a need of 4052 m^3/ha (Jongschaap et al., 2009).

But even at 4052 m^3/ha (the equivalent of 405.2 mm of annual rainfall), *Jatropha curcas* is far from being the miracle plant that can produce oil without water as it has been presented. According to the Ecotrop database (FAO, 2007), the minimum rainfall for optimal growth of *Jatropha curcas* is 500 mm. Quinvita, an agribusiness company specialised in *Jatropha curcas*, and whose standards are followed by project managers recommended 650 mm as a minimum for commercial production (Quinvita, 2011). Other researchers (Ouwens et al., 2008, cited by Pohl, 2010) have calculated that for optimal growth, *Jatropha curcas* needed 1000 mm to 1500 mm.

If we use the figures mentioned in the ESIA, we can roughly estimate that at least an additional 300 mm of rainfall are necessary to reach a threshold of viability for the commercial plantation. This

represents 3000 m^3 per hectare annually and this amount of water will have to be supplied by irrigation (192 million cubic metres for 64,000 ha annually, which represent, approximately, 6 m^3/s).

Using the figures provided by the KMD for Garsen, rainfall in the central part of the project area is below 650 mm, the minimum threshold for commercial production, in 3 out of 4 years. For these years, either production will be sub-standard or additional water will need to be provided. For the years with less than 400 mm (1 out of 5 years), when flows in the river may already be critically low, substantial irrigation would be required (5 m^3/s).

The ESIA states that extra watering will be done from on site boreholes and from dams collecting run-off water. A preliminary hydrogeological study was conducted by the consultants but according to the map provided in the ESIA, samples were not taken on the terraces where the plantations are planned but in floodplain sites which were very close to the river. It is indicated that further studies will be carried out to determine water availability. There is no technical description of the water-collecting dams and mention is made of the fact that water could also be obtained from the *lagas* which are small temporary tributaries to the Tana river. From our own research findings, when looking at village wells, it seems that most groundwater under the terraces is salty and an unlikely source for irrigation from boreholes (Bouchez, 2010).

Furthermore, though the ESIA report states that the *Jatropha curcas* trees will not be irrigated from the Tana river, which is acknowledged as already over-utilised or 'stressed', the idea was not completely ruled out, as this sentence from the ESIA document illustrates: "[i]t is unlikely that the project will need to rely on river water at all for its operations. If it does become necessary, appropriate abstraction permits or licences to take water from the river Tana will be sought". Our calculations show that irrigation is highly probable (when using the figures of the KMD) or even unavoidable (if using the figures from the ESIA). The fact that the project site is located on the Tana delta terraces, within 10 km from the river, reinforces an irrigation scenario. Indeed, a truly drought-resistant crop could be grown anywhere else in north-eastern Kenya and would not need to be located on highly coveted land next to the main river bed.

Impact on water quality

The ESIA document remains vague on that point, only mentioning some 'limited use' and 'safe use' of fertilisers and pesticides but without figures. Pohl (2010) shows, from examples in Tanzania, Swaziland, Mozambique and Nicaragua, that *Jatropha curcas* is not pest-resistant and that its cultivation does require the use of pesticides.

Environmental impacts

Paragraphs on the project's impacts on biodiversity remain sketchy. The soil and vegetation maps presented in the ESIA are of very poor quality, with spatial extent of the forest not seemingly based on any maps, aerial photographs or satellite images and as such highly speculative. Without proper reference to the spatial organisation of the ecosystem, the description of the supposed impacts therefore remains very general. No proper biodiversity assessment was made. The lists of species are erroneous and not based on surveys while the solutions suggested to mitigate the impacts on the biodiversity seem unrealistic: the report suggests reserving five corridors to allow wildlife to migrate from the inland ecosystem to the delta floodplain. These corridors are narrow (the larger one being 2 km) and limited in number (with only three corridors within the plantation, every 10 to 20 km, and two at the extremities of the plantation, outside the project). Moreover, the proposed wildlife migration corridors coincide with corridors providing access to the river for the livestock, a rather unfortunate combination where wildlife is likely to be losing out.

The ESIA also claims that the project qualifies as compatible with the Kyoto protocol, on the basis of the fact that *Jatropha curcas*, being a tree, will sequester carbon and also because the oil will be used as a replacement for diesel. However, this statement does not take into account the fact that 64,000 ha of

bushland and woodland will be cleared to pave the way for the plantations. A proper carbon balance of the project should have been done.

Social and economical impacts

The social and economic model described in the ESIA differs from the one provided in the sugar cane project assessment. The company demonstrates a clear will to provide benefits to the local economy and many promises were made and helped to secure sub-lease agreements.

During a public consultation exercise, consultants collected the wishes from the local population, NGOs and various government departments. This included the need for livestock improvement, selective clearing, grazing rights in the plantation, establishment of wildlife and livestock corridors, delivery of social projects like the building of schools and dispensaries, the establishment of companies to favour local employment etc). The wish-list is clearly detailed but from the document it is not clear how actual implementation will be carried out.

The social development promises are built on three elements:

- A promise of implementing a 'humanitarian' project after the plantation is successful. The ESIA mentions that they will develop a "humanitarian development programme" but that it is conditional and will be funded through external investment. The nature and location of the project are not yet defined.
- The company also promises to develop an out-grower scheme. It is clearly stated that this scheme will be funded after each area of plantation is successfully established and that the funding will be part of another project. But again there is no clear spatial description of this out-grower scheme.
- The main social benefit relies on the expected employment provided by the plantation. The project promises to offer seasonal employment, mainly casual unskilled labour. As stated in the ESIA:

> One of the main positive impacts during project's development stage and operation will be the generation of employment opportunities. Directly, [the company] will be employing labourers, foresters and horticulturalists, nursery and plantation workers, livestock managers, artisans, drivers, security personnel, clerks, masons, carpenters, joiners, electricians and plumbers. Many jobs will be seedlings, land preparation, weeding, fruit picking and pruning, and infrastructure construction and maintenance.

The ESIA acknowledges that the whole project is risky by stating that "knowledge on Jatropha is low and especially on large-scale farms" but the ESIA does not contain a description of what will happen if the project is a failure.

Community support and social tensions

The project seems to be getting the support of Pokomo leaders. Interviews conducted in July and November 2011 showed that the Pokomo villagers have high expectations.

On the other hand, Orma leaders approach the project with a lot of suspicion. Contacted in 2010 by the company they declined the offer to sub-lease a ranch, situated on the eastern side of the river. This seems to point to one of the other shortcomings of the ESIA, and of the project in general: it appears to underestimate the importance of, and negatively assess, pastoralism as conducted by the Orma and Wardei communities. By creating an imbalance between the Pokomo and the Orma in their participation in the project, there is a risk of exacerbating an ongoing conflict between the Orma and the Pokomo.

All along the project document mobile pastoralism is presented as an "unproductive and destructive way of managing the natural resource". The company has a clear will to modernise livestock-keeping.

They see the project "as a major change in land use from subsistence pastoralism and dormant wasteland to intensively managed plantation and pasture". They intend to solve the "livestock problem" by "introducing modern livestock husbandry skills".

Such a negative opinion of the traditional mobile pastoralism, as conducted in the lower Tana leads them to underestimate the importance of the terraces (called 'balo' in Orma) as a key ecosystem unit in livestock management practices: from our interviews conducted in 2009, 2010 and 2011 it appears that these terraces are an essential grazing area at the start of the dry season, when the herds are back from the hinterland pasture and waiting for the flood to recede. The Orma and Wardei keep their cows as long as possible in this intermediary dryland pasture, in order to save on the richer floodplain pastures.

Proposed solutions for taking into account mobile pastoralism are both inadequate and inappropriate: the project offers the pastoralists the use of a 300 m wide strip around the main B8 highway and expects them to use the three corridors that are also dedicated to wildlife migration. But most of the areas along the B8 road have been invaded by *Prosopis juliflora* and are considered of low value by the pastoralists (Mworia et al., 2011).

As a result of this negative attitude towards the traditional livestock management practices, the company wants to promote a 'commercial' model of livestock-keeping exclusively for the benefit of the ranch owners, without bearing in mind the Orma or Wardei communities. The company will allow the ranch owners' cattle to graze on the plantations, and plans to give them advice on improved livestock breeding and husbandry practices, on cross-breeding and on ways to improve the pasture. Noting that these ranches were created by local elite and that they were aimed from the first instance at introducing modern ranching methods, one can wonder if we are now going back to the initial dream which failed.

DISCUSSION AND CHALLENGES

The two large-scale projects share some characteristics: the EIAs fail to provide quality hydro-climatic data and a proper water balance of the projects while the environmental and social impacts of the projects are not properly assessed.

Evaluating the findings of EIAS

Faulting water management at the river basin scale

If implemented, the two projects will impact on the water balance of the Tana delta. For the sugar cane project, the abstraction will directly affect the floodplain hydrology, while for the *Jatropha curcas* project irrigation is most likely. In addition both will affect the water quality of the delta through pesticide and fertiliser use.

Additional irrigation from the Tana river is also planned in the upstream areas within the 'Vision 2030' (Government of the Republic of Kenya, 2007). Three additional dams are planned: a large storage reservoir at High Grand Falls site (700 km from the delta), with a maximum storage capacity of nearly 6000 million m^3, four times Masinga (which, with 1410 million m^3 is currently the reservoir with the biggest storage capacity), and two dams between High Grand Falls and Garissa in order to regulate the flow. As the new dams will be able to store approximately the entire annual flow it can be expected that the natural flooding regime will be severely altered unless there is a strong political commitment to forego a certain amount of hydropower production in order to maintain the downstream ecosystems and livelihoods through managed flood releases.

The issue arising from planned hydraulic infrastructure and large-scale irrigated agricultural investments for biofuel projects is a lack of water management coordination for the entire river basin, taking into account the variety of uses and services. The various EIAs do not take into account the other planned development schemes in the river basin and do not refer to a common water balance, i.e. a

strategic impact assessment approach is lacking. This is likely to lead to over-abstraction that will especially affect the downstream users. If we consider that the project A described above is already planning to abstract 30% of the water, it is very unlikely that the legal requirement to leave at least 30% of the natural flow in the river (the 'reserve' flow) will be implemented. In that sense, the expression 'water grabbing' provides a metaphor i.e. water taken away from the delta and its users. Just as in the case of land grabbing, established user-rights are disregarded. In addition, water is not valued properly and environmental services, which depend on its availability in the wider river basin, not taken into consideration.

Reallocation of benefits from a multi-user shared territory to private interests

For centuries the lower Tana wetlands have provided a wide range of mostly flood-dependent ecosystem services to the different users. These services have been described by Hamerlynck et al. (2010) and classified as provisioning services (provision of food through recession agriculture, small-scale flood irrigation, mobile livestock-keeping, capture fisheries, collection of wild plant and animal food products, provision of fibre such as timber for canoes and construction, beehives, roof thatch and weaving products from palms, wood fuel, provision of clay for the construction of mud houses, brick-baking, pottery, fertilisation of soils, provision of natural medicines and pharmaceuticals, provision of freshwater for various uses and groundwater recharge, etc), as regulating services (dynamic forests in different life stages with efficient carbon fixation, barrier to wind erosion, evapotranspiration by forests, oxbow lakes, etc), attenuation of the flood peak between Garissa and Garsen (erosion regulation, water purification and waste treatment, etc) or as cultural services, most notably the tourism potential of intact landscapes with high biodiversity values and high waterbird concentrations. However, access to these ecosystem services is ruled through customary tenure and with no legal protection for the local users.

Both projects are underestimating the value of these ecosystem services. The two EIA documents respectively state that "the 'without project scenario' from a socioeconomic perspective would mean that the use of the site continues in a marginal manner with substantial underutilization of resources" (HVA and MA Consulting, 2007) and that "the 'Not proceeding with the project scenario' is not viable because it perpetuates general poverty and underdevelopment for the landowners, the community in the surrounding area and the nation of Kenya, and will not assist in improving any conservation outcomes in the area" (Africa Business Foundation, 2010).

A proper economic valuation of the delta provides a different perspective. For example, the mangroves of the Tana delta are estimated to provide US$4.6 million worth in terms of re-establishment and maintenance expenditures avoided for coastal protection (World Bank GEF, 2002). It is likely that a full evaluation would show that the values (ecosystem services and natural capital) lost by implementing the project would far exceed any hypothetical gains from sugar cane (Mireri et al., 2008) and/or cultivation of *Jatropha curcas.*

The two projects also share the common characteristics of minimising the role of the delta for pastoralism and the importance of nomadic pastoralism in this semiarid region. Though nomadic pastoralism is one of the most efficient land uses of such areas, its economic value has consistently been underestimated (Hatfield and Davies, 2006), especially in Kenya (Davies, 2007). Inherent to their mobility is the difficulty to properly count the number of cattle and other livestock depending on the wetland. For an estimate, the 2009 Census puts 212,000 as the number of head of cattle in the Tana delta district (Government of the Republic of Kenya, 2010).

Official figures for 2004 (Nyariki, 2004 cited in Davies, 2007) mentioned 342,000 head of cattle in the Tana river district but Davies (2007) recommends applying a 2.14 correction factor to this official figure which will therefore reach 732,000 head of cattle. Emerton (2003), when assessing the economic value of the lower Tana wetlands, used an even higher figure, over 1 million head. This figure includes all the cattle in the larger Tana river district, not only in the delta and it gives an indication of the importance

of the activity in the region. It is very far from the figures cited in the EIA reports (the EIA provides the figure of 70,000 head of cattle for the whole district citing the 2008 annual report of the Ministry of Livestock Development).

Such a discrepancy in figures calls for a detailed economic analysis of the current and future value of the Tana delta for livestock which is currently not available. This survey is a requisite before any conversion of the delta region into to large-scale irrigation schemes is attempted.

The failure of Environmental Impacts Assessment mechanisms

Both EIAs were approved by NEMA even though they did not address critical issues. They did not analyse the environmental, social, economic and cultural impacts of a proposed development activity; they did not develop plans to mitigate those impacts, including a monitoring plan that would suggest required adaptations while the activity is ongoing; and they did not perform a cost/benefit analysis of alternatives for the proposed activity, three elements considered as standard in an Environmental Impacts Assessment (Jay et al., 2006). In both cases the EIAs were done in the absence of a detailed project document. In Kenya, EIAs are often considered as a formal procedure that needs to be ticked off on a 'to do' list before implementation, and that can be dealt with through all available means, legal or otherwise (Mbonde, 2012). There are many strategies to subvert an EIA, starting with the selection of the consultants who will perform it. In our first example, the company, well known for selling irrigation equipment has no experience in conducting EIAs. In the second example, the company does not have skills in mapping or in biodiversity assessments. Indeed, according to the Environmental Management and Coordination Act (EMCA), it is possible for any company or individual expert to ask for registration at the NEMA (Government of the Republic of Kenya, 1999, article 58-5), which can encourage small companies, not entirely independent from the proponent, to register.

In the Tana delta, TARDA has a history of EIA subversion (Hirji and Ortolano, 1991). TARDA was set up in 1974 as an integrated river basin development agency but rapidly became a technocratic agency promoting hydropower and irrigation development without playing any role in coordinating the different activities and balancing the water needs between the various users (Rowntree, 1990).

This reflects the non-neutral role of the national administrations which are supposed to guarantee the quality of the EIA and the coordination of the water uses between the different users. Marara et al. (2011) have compared the EIA legislation and implementation in Kenya, Tanzania and Rwanda. From their work, it appears that, although the Kenyan law is appropriately enabling EIA, its weakness lies in the autonomy of the competent authority, NEMA in Kenya. It also showed that EIA integration into the planning system is slow and that EIAs are conducted more or less as a separate technical exercise divorced from the technical and economic aspects of project planning and design and that public participation is low. Another flaw of the process highlighted was the very poor quality of the follow-up activities such as monitoring and evaluation (Marara et al., 2011). The lack of institutional control over the EIA process allows various stakeholders to influence the outcome of the process and promote project implementation irrespective of its impacts.

Public contestation and way forward

The sugar cane project was taken to court after validation by NEMA. No such steps have been taken with regard to the investment on *Jatropha curcas.* Still, NEMA refused the licence of a similar project in the Dakatcha woodland (Kenya Wetlands Forum, 2012), close to Malindi some 130 km further south, on the basis of lack of evidence that a) the local people consented to the project; b) *Jatropha curcas* is viable in the country; and c) a land use plan existed. Similar arguments could be brought forward in relation to the proposed development of *Jatropha curcas* in the Tana delta.

Project A taken to court

The EIA document was deemed flawed by a range of stakeholders and environmental organisations (including individuals within NEMA) as well as by government departments (e.g. Kenya Wildlife Services). Following these negative comments, the NEMA created a task force to evaluate the EIA. The task force, whose competence in the evaluation of EIAs was not obvious, did not reply to the comments, nor did it bring in new elements but nevertheless it validated the EIA after which the government accepted the implementation of the project in June 2008. One month later a court case was filed at the High Court in Malindi by two local NGOs (the Tana River Pastoralist Development Organisation Group and the Tana Delta Environmental Conservation Organisation), two national NGOs (the East African Wildlife Society and the Centre for Environmental Legal Research and Education) and a Kenyan lawyer. The court case was based on irregularities in the EIA acceptance (no project document had been made available) and the complainants contested the initial land attribution to TARDA as the 10 years of the initial allotment letter had passed. The initial impact of the court case was to block the project implementation (Duvail et al., 2010) but in 2010, the high court declared itself non-competent to deliver a judgment. A second court case has now been filed at the High Court in Nairobi, this time by the representatives of two communities (Pokomo and Orma and the NGO Nature Kenya). A first hearing is scheduled for May 2012. Interestingly, during the lawsuit, tactical alliances between stakeholders appeared. For example, initially the environmental NGOs and the local communities teamed up against TARDA. Subsequently, the sugar cane company wanted to join the suit as it felt its deal with TARDA had not been implemented.

Project B: Challenges

The project on *Jatropha curcas* encountered some opposition from the Environmental NGOs at the national (Nature Kenya, East African Wildlife Society, Arocha Kenya) and international level (Birdlife international) and from the managers of ecotourism lodges in the Tana delta. A petition against the project was circulated on the Internet.

In May 2011, the project was approved by NEMA on a series of conditions (following the mitigation measures proposed in the ESIA document). The licence covers 'only' a 10,000 ha pilot project. Late in 2011, this approval would seem to have been retracted by NEMA though no official records from the meeting that would have decided on this retraction are available. As such, that retraction cannot be understood as being official.

Discussing land and water grabbing and large-scale investments

The flouting of the EIA process should be seen in the wider Kenyan context where illegal allocation of land for personal enrichment or for political gain has a long history. It is particularly interesting to compare the cases of 'irregular' allocation of land as mentioned in the Ndung'u report (Ndung'u report, 2004 in Southall, 2005) (i.e. occurring when the land concerned was in fact legally available for allocation but was allocated in such a way that the concept of public use was thwarted) and the way the argument of public and national utility is currently put forward in the Tana delta.

As mentioned by Manji (2012), there may be links between the historical process of Kenyan land grabbing and the arrival of international investors. It would be necessary to further investigate the possible national beneficiaries of land speculation around the project and clarify the role of the various actors intervening in the process including not only government and national agencies but also private intermediaries.

Though land grabbing appears as a legal issue and might be followed up in some of these cases, water grabbing does not appear in the limelight.

Acquired land rights are more or less formalised and recognised by the State. In cases where trust land was privatised, it has occasionally been possible to invalidate the move. But, once title deeds are

created in Kenya in defiance of established user-rights or public interest and especially on government land, the land is in general not redeemable. Yet it is now a fact that government land was extensively mismanaged during the Kenyatta and Moi regimes (Médard, 1996, 1998; Klopp, 2000, 2002). One can ask why the Tana delta land remained under the direct authority of the government at independence in the first place as this led to easy land transfers without any local consultation. The new constitution promises to deal with 'historical injustices' which might entail the cancellation of existing land titles. The new constitution also introduces the legal category of 'community land'. Yet it does not specify whether this corresponds to a narrow view, replacing the existing category of trust land by another one, or whether former trust land and government land might, in some specific cases, also be redeemed and fall into the new category of 'community land'.

At the river basin scale, 'water grabbing' is currently only tackled indirectly through legal battles against 'land grabbing'. Such legal battles suppose a considerable amount of funding without any assurance of success while facing powerful interests – both financial and political. Furthermore, as the large-scale irrigation sector is seen as a national priority and the billing of the water abstraction by the large schemes is based only on declaration of abstraction and not on measurements, over-abstraction is rarely subject to fines (interview at WRMA, October 2010). In this context, it is likely that access to water will favour powerful and large-scale irrigation schemes over small-scale users.

A framework might be developed and designed at the scale of river basins, defining and restricting possible land-uses – including on privately owned land – and this can be done within the framework of NEMA. Yet, in the absence of political 'goodwill', the issue of implementation and enforcement remains (Mwathane, 2011).

At the delta scale, the management of the wetland is highly controversial with two opposite visions of the future of the delta being carried by different stakeholder groups. On the one hand, the international and national NGOs acting in the environmental, cultural and human-rights domains, government agencies such as Kenya Wildlife Service and National Museums of Kenya and also private eco-tourism companies, support the listing of the delta as a wetland of international importance under the Ramsar convention. This is still an unfulfilled promise made by President Moi in 1992 even though the Tana delta fills all the criteria required for such listing. In this scenario, the Ramsar site designation is seen as a way of implementing a 'wise use' of the natural resources. The development model is an integrated livelihoods-based approach to the delta, with an empowerment of the most vulnerable groups, guaranteed access rights to sustainably managed resources and with the development of small-scale irrigation and ecotourism as an alternative approach to the large-scale irrigation-oriented approach. On the other hand, the Ministry of Regional Development Authorities, TARDA and the agro-business sector share the vision of a wetland converted to a large-scale irrigation scheme for biofuels. An intergovernmental task force was recently (2011) created under the Prime Minister's office with the objective of considering the various options for the delta development.

CONCLUSION

The direct impact of land grabbing is felt immediately with the transfer or denial of land rights, when usual residents on land are evicted and various user rights are drastically restricted. In contrast, water grabbing is generally less obvious as a lot of its impacts are indirect and take some time to become apparent. Still, when it affects the environment of an entire delta, its biodiversity and associated livelihoods, it has far-reaching consequences over an area much wider than the converted land area.

In our paper, we underline some of the major weaknesses of the Impact Assessments carried out in the case of the proposed biofuel projects in the Tana delta: they overlooked hydrology and its associated impacts, such as the consequences of decreased river flows for local communities relying on water for agriculture and livestock-rearing and for ecosystem services rendered in the delta (including maintaining coastal fish stocks). In addition, the exceptional biodiversity values of the delta, including

several species that would fall under international conventions to which Kenya is a party, were largely ignored. In response to such inadequacies, we looked into the matter of water abstraction.

Ideally, in order to discuss and evaluate the impact of such projects a strategic assessment at the river-basin scale should be undertaken. First of all, the minimal flows and their associated flooded surface areas needed to maintain the functioning of the deltaic ecosystems have to be defined, e.g. through an environmental flows approach (King et al., 2003). From these figures an analysis can be done of how much water can be abstracted without compromising these functions. Subsequently, proposals can be formulated on the potential surface areas of irrigated land, the suitable crops, and the appropriate irrigation techniques (furrow, sprinkler, drip etc.). Before changing the land use, a comprehensive economic valuation of the ecosystem service delivery and its links to local livelihoods and human well-being has to be done. This might indicate that large-scale land-use change may not be the best long-term option from an environmental, social and economic perspective and that, in fact, optimising the water allocation over various uses under different rainfall scenarios may be more appropriate. In some years, e.g. in case of a critical drought in the lower basin, flooded surface areas might be maximised while in others priority could be given to hydropower production.

Currently, the entire decision-making process seems upside down. Large-scale land-use change has already been 'agreed' upon as the only way forward, without proper consideration of the realities on the ground, and the assessments are formal exercises for validation a posteriori. The NEMA is encountering difficulties in asserting its independence based on scientific autonomy. Perhaps one of the ways forward would be to institutionalise contradictory EIAs, inviting environmental and human rights NGOs into the evaluation process at par with NEMA and vested government interests to bring out different perspectives on costs and benefits of proposed investments. It is clear that beyond the formal EIA review process, an analysis of the political and economic mechanisms allowing large-scale land acquisitions, and of their implications in terms of governance, would be beneficial.

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