



River sand commodity chains in Tanzania

**STAKEHOLDERS, GOVERNANCE
AND ENVIRONMENTAL IMPACTS**

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& Bert Suykens

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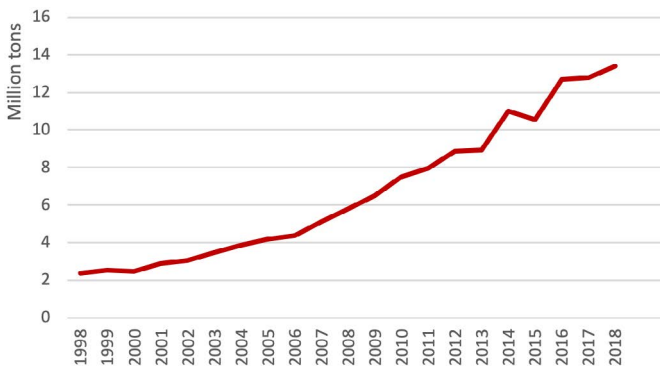
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Introduction

In recent years, Tanzania has experienced the growth of investment in development of public infrastructure such as construction of roads, bridges, railways and public buildings. Sand and gravel have become important resources for the accomplishment of these big projects. Consequently, sand extraction in Tanzania has seen a steep rise (see figure 1)¹. While coastal sand mining in Tanzania (see e.g. Masalu 2002) and the semi-autonomous region of Zanzibar (see e.g. Ladlow 2015) has received most attention, the Dar es Salaam region has also seen a significant increase in the extraction of sand from rivers to cater to both private and public sectors demand.

Figure 1: Sand mining in Tanzania



For a long time, sand mining in Dar es Salaam has been undertaken illegally, at areas not allocated for that activity and without any technical advices

¹ For details on the methodology used, see: Pandey, Katz-Lavigne and Suykens (2022). The key element is the use of cement as a proxy for use of sand and the use of a 1:3 cement-sand ratio in calculating sand volumes. Other instances take a higher 1:6 or 1:10 ratio and this affects the absolute volumes. As such, the trends are more important than the absolute figures. Unfortunately we do not yet have data to check the impact of formalization on expected sand extraction.

from the experts². Consequently, the activity became a large informal industry. While youth depend on the extraction activity as the major source of livelihood, other stakeholders such as food vendors at the extraction points, transporters and vehicle owners also earn their living from sand mining.

The arbitrary extraction of sand has caused extensive environmental damage such as erosion of riverbanks and lowering of river beds. As a result, most parts of Dar es Salaam are being flooded during the rainy season. Environmental damage such as floods have devastating effects on public infrastructures as well as on civilian property and settlements. In the areas where people's properties were affected, conflicts between residents and artisanal sand miners have emerged.

In response to the impact of arbitrary sand mining on rivers and valleys, the Minister of State, Office of the Vice President – Union Affairs and Environment, formed a Committee of experts in February 2019 to evaluate sand mining activities in rivers and valleys and advise on the best ways to conduct extraction activities. It was decided that river cleaning through sand extraction and solid wastes removal is an environmentally friendly way to conserve rivers. Thus, the government through the ministry of environment issued a guideline to provide a framework for river training (river cleaning system through sand mining). While we will discuss the framework in more detail below, it is this framework that has allowed the transformation of sand extraction as an illegal activity, to one which is governed by a framework on river cleaning, at least in the Dar es Salaam area.

The report aims to provide insight into the nature of sand mining in the Dar es Salaam area, the actors involved, as well as impacts on communities and the environment. It uses a commodity chain framework to better understand sand governance. After (1) providing the methodology of the study, (2) we zoom in on the commodity chains of sand as a starting point to (3) understand governance of the sand commodity chain as well as the role of different (government) authorities. In the last sections of this report we want to (4) understand the impacts of sand mining on nearby communities and (5) on the environment.

² One respondent from the sand labor association indicated that sand mining from rivers had first started in the Dar es Salaam area in 1989.

Methodology

The Governance of Commodity Chains (GoCC) framework (figure 2) forms the backbone of this case study Tanzania (and for the case-study of Morocco, which is part of the same project, see Lahcen & Katz-Lavigne 2022). Inspired by both Bernstein's (1996) work on the maize filière and Ribot's work (1998) on the charcoal commodity chain, the GoCC framework wants to understand commodity chains not simply as processes in which firms source resources to then transform them into marketable commodities, but wants to understand them as sets of social relations and foreground the governance or the institutional set-up enabling the functioning of the chain. Governance is not simply understood as the formal legal and administrative rules pertaining to a particular sector or activity, but is focused more on the implementation of rules and regulations at different point in the chain. Grounded in political economy, the GoCC framework wants to foreground relations of power linking resources and commodities with a wide set of (formal and informal) authorities, as well as with labor and capital (for more details on this commodity chain framework, see Suykens 2010; Dutta and Suykens, 2017). Within the context of this study, we not only try to understand how different stakeholders share an interest in the sand trade and how value is created and distributed in the chain, but also understand potential environmental impacts. It is intended to be flexible and can contain as many (or as few) chain nodes as have been empirically established.

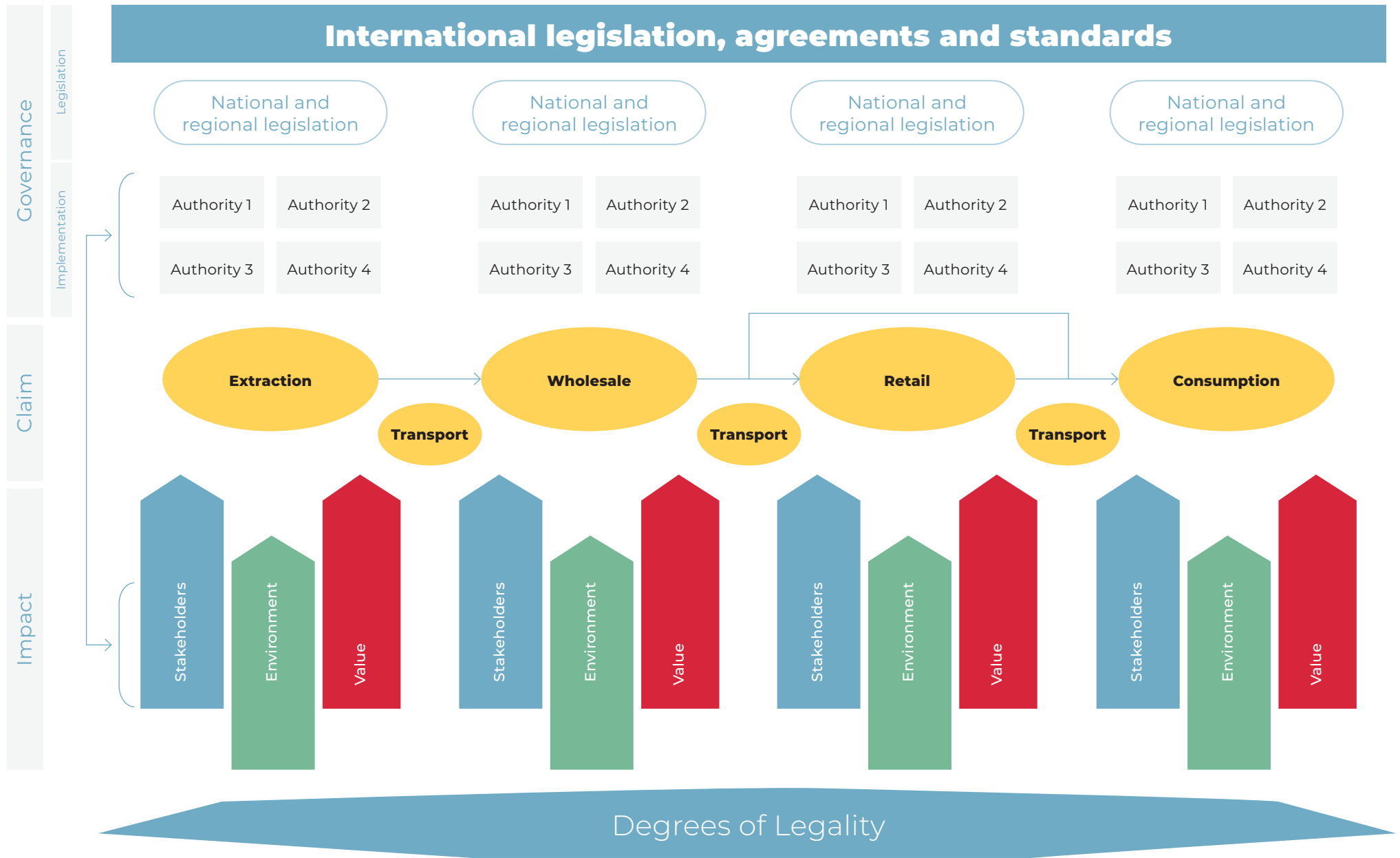
The field study itself was conducted at Kinondoni District in Dar es Salam region under the leadership of first author Christina Shitima. The region was

chosen because of the increasing demand for building material such as sand due to a rapid growth of the city. Dar es Salaam is reported to be one of the fastest growing cities in the region and the world, expecting to be a mega city by 2030 (Todd et al., 2019). In addition the region is chosen because of the presence of the big government projects such as construction of bridges, roads, flyovers and other public that demand the massive supply of sand.

Sand mining activities are conducted at several rivers in Kinondoni district. Tegeta and Mpiji river were the focus of this study. Sand mining at River Tegeta has taken place since 1980s. Sand mining in River Mpiji started in the mid-2000s. River Mpiji is more remote vis-a-vis Dar es Salaam and forms a border between Dar es Salaam and the Coastal regions. In the past, the area along River Mpiji was covered by forest and has no human settlements. Unlike in River Mpiji, illegal sand mining activities are still conducted in some parts of the River Tegeta.

Four sites located at the two rivers were visited. Sites A and B are located at River Tegeta and sites C and D at River Mpiji. Sites A, C and D comprise of formal groups registered by government authorities and hold a permit to clean rivers at the sites where they are located. Although sand laborers at site B have organized themselves in an informal group, they are not formally registered and do not hold a permit to clean the river, thus their activities are considered illegal.

Figure 2: Governance of Commodity Chains (GoCC) framework



The commodity chain

There are two different basic chains operating in the study area. The first chain starts from a group of sand laborers who use manual equipment such as shovels/spades to extract sand from the rivers. These sand laborers are known as *Chepe* (shovel/spade in Swahili). The second chain starts from what are known as contractors, who use machines such as excavators to extract sand.

Chepe

As mentioned, *Chepe* are groups of sand laborers who hold a river cleaning permit at a specific site on the river. They use manual tools to extract sand (and waste) from the river bed and load them into trucks. While our respondents had been in the sand business for between one month and 43 years, for the majority it was their first job, sometimes in combination with other employment, for instance during the rainy season. They considered it tough and demanding work, but also one which was open to young people with low education levels. It also provided almost guaranteed money for daily needs. Labor groups would consist both of registered members, and assistants (*Ngara*) to these members. *Ngara* are recruited by members and their pay is often shared between member and *Ngara* (see below).

Many sand laborers used to extract sand illegally. Initially they would not excavate river sand—they mined what they called underground sand or *Kuluthum*—, but long-term sand laborers told the research team that

There was a certain Chinese or Japanese company called Konoike who had the tender to construct bridges. Konoike demanded sand from rivers. They said that sand from the underground is not compatible for the construction of bridges.

Shifting demands thus led to shifting extraction practices. Obviously this activity was at that time illegal, and thought to be environmentally destructive, leading to floods affecting roads and bridges as well as housing.

This in turn was one of the reasons for the government to try to formalize and regulate sand extraction (see intro and below). Most respondents were positive about the formalization. They now extracted sand from a specific site on the river where the group had the monopoly (of *chepe* extraction), but this appears to have been the site where the workers also used to work illegally.

Important to understand current, formalized extraction practices are truck sizes. Four types of trucks are distinguished, of which only the first three (and in one of the researched sites only the first two) are loaded at the river. A small truck that is capable of carrying only four CBM is named *Bajaji*. This name is derived from an Indian brand of small three wheeler trucks called Bajaj. A truck with 4 tyres and a big board carrying between four and ten CBM is commonly known as *Mbawa* (feather in Swahili). A big truck with six tyres, capable of up to 15 CBM is given a name of *Mende* (cockroach in Swahili). The biggest trucks that carry more than 15 CBM are famous known as *Hoho* (green bell pepper in Swahili). In most sites, the big trucks that carry more than 15 CBM do not go to the rivers because of the damage they cause to the roads. These trucks usually load sand from the dumping sites (see contractors below). *Chepe* laborers in turn are supposed to have the monopoly over loading the two smallest types of trucks. Specific teams (called scales) within the *chepe* groups are assigned to load specific trucks. Before formalization, individual and groups of sand miners would scramble and fight to load incoming trucks. Now, however, depending on the truck size, a specific scale automatically will be assigned to load the truck.

Given that sand laborers depend very much on trucks coming to load sand, and unlike contractors do not have contracts to deliver sand, truck drivers play a key mediating role between the *chepe* extractors and customers. The drivers we interviewed were not the owners of the trucks they drive. The owners loaned the truck to the drivers, usually at Tsh. 300000 per day³. The owners had to cover the cost for maintenance and repair. The drivers were responsible for fueling the truck. The truck drivers first have to find enough orders to collect the fee for the owners. The remaining balance they use to

³ All amounts in this report are in Tanzanian Shilling. The average exchange rate at the time of research and writing (August 2021 to February 2022) was € 1 = Tsh. 2651.

fuel the car and to earn their daily wages. The truck owners are not responsible for finding customers or orders, nor do they want to know, according to the truck drivers interviewed, whether the driver has received orders or not as long as they receive their daily fee.

Truck drivers would park their cars at designated parking spots frequented by potential customers:

I bring the car to this spot to start looking for a job. Different people who need sand come to this spot. Some of the customers are brokers, builders and some are bosses themselves. To me, this spot is the office. Sometimes, even if I do not have orders, a fellow driver can give me a job to supply to his customers, especially when he has many orders to attend.

While some customers would directly engage drivers, maintaining relations with middlemen and brokers was also important to secure transporting jobs.

After securing a job, drivers would bring their trucks directly to the sand extraction sites near the rivers to be loaded on the spot. Before the formalization of sand mining in Dar es Salaam, river sand was collected mostly from the quarries in River Mpiji, they told us. After formalization, drivers could collect sand from any river where river cleaning permits existed and deliver to any location. As private transporters, they are free to buy and deliver sand anywhere. As mentioned, at the *chepe* mining site a specific scale would be in charge with loading a particular type of truck. After paying taxes and receiving the transport permit (see below) they would deliver the sand directly to their customers.

Truck drivers reported hardly any rivalry between them and bargaining over prices between potential customers and different drivers was common. Drivers stressed the importance of honesty in their profession. Truck owners handed over expensive machinery and had to be sure the driver would both be able to pay the required fee and keep the truck in good order.

While our respondents did not own their trucks, they reported that quite a number of colleagues had been able to acquire their own trucks, pointing towards the income-earning potential of transport of sand and other

construction materials. One respondent invested in a business selling construction material, like sand, cement and stones/pebbles, which provides him full-time employment during the rainy season.

Getting precise figures on the income and value side proved difficult as many respondents gave widely diverging figures⁴. Sand labourers at the extraction site seem to charge relatively fixed priced: The 15 CBM *mende* trucks, pay Tsh 40000 for a loaded trip and the 4 to 10 CBM *mbawa* trucks are charged Tsh 20000 per truck. These prices do not include the government taxes and charges. The driver is the one who pays taxes to all institutions that administer the sand mining business (see below). These 'normal' prices may vary according to seasons. During the rainy season few trucks come to the river because the roads are not passable. During this season, the price per truck may decline (although respondents also indicated that they simply did not work in sand during the rainy season). When the roads are in good conditions the normal prices are charged.

At least some of the money paid is saved. In one site, for each big Tsh. 40000 truck, Tsh. 5000 is deposited into the group account as the saving. For the smaller Tsh. 20000 trucks, Tsh. 2000 is deposited into the group account. In another site, they usually set aside Tsh. 2000 as savings for each loaded truck. In the last formal site, each member contributes an amount equal to Tsh. 2000 to a group's fund every day they work. The workers in the unregistered, illegal extraction site did not have an system of daily savings, although they would contribute in case of emergencies.

Individual income could diverge widely. One respondent stated: 'I cannot say I get Tsh. 20000 per day while there are days I earn only Tsh. 2500'. Most would report daily earnings between as low as Tsh. 1000 and as high as Tsh. 30000. Payment of *ngara* can again diverge widely, as their income often comes out of the pockets of a registered member. Respondents gave numbers between forty and fifty per cent of money earned.

⁴ A more extensive livelihood survey could potentially overcome this.

In the unregistered group which comprises of male and female's sand workers, the daily earnings differ between men and women. While men can earn up to Tsh 20000 per day, women said that they can earn that amount in three days. The Tsh. 20000 mentioned is the cost of loading one small truck in the unregistered site. While a man can extract and load one truck in a single day, woman can do it in three days. At this site people use to carry sand uphill on their heads to where the trucks are loaded. The size of the sand bag that people can normally carry per trip is equivalent to one basket of 10 litres. Depending on someone's ability, some people can carry a sand bag of two baskets in one trip.

For truck drivers, again it was hard to clearly calculate income and value. Amounts mentioned were between Tsh. 200000 and Tsh. 150000 for a 10CBM truck load. On good days a driver could earn Tsh. 600000 or double the amount of the rental fee to be paid to the owner of the truck, however they could also struggle to get to the owner's fee. Whatever the exact amounts, it is clear that transport rather than mining labour adds a lot of value to the final price of sand on the market.

An important price factor are taxes as well. Table 1 below provides an overview of legal taxes to be paid to different government institutions. For *chepe* loaded trucks, taxes have to be paid by the drivers when leaving the quarry (for more details see below).

Table 1: Official taxes in Tsh.

| | 2-5 CBM | 5-10 CBM | 11-25 CBM |
|---|---------|----------|-----------|
| Ward Executive Office | 1000 | 1500 | 2000 |
| Municipal Executive Office | 5000 | 7500 | 10000 |
| Water Board Office | 5000 | 7500 | 10000 |
| Tanzania Mining Commission | 4000 | 6000 | 8000 |
| National Environmental Management Council | 5000 | 7500 | 10000 |

Contractors

Unlike *chepe* laborers, contractors are supposed to control the full value chain of sand, as well as owning both excavators and (large) trucks to deliver large quantities of sand. Among our respondents only one in fact owned his own material. The others had to rent their excavator at Tsh. 700000 per day. Adding Tsh. 300000 for the consumption of 120 to 130 liter of diesel, and Tsh. 50000 for the operator, they were looking at a daily investment of more than Tsh one million for the operation of the excavator alone.

The contracts for cleaning the rivers did not allow contractors to use trucks that carried less than 10 CBM (see also below). According to the respondents, contractors are supposed to load truck from 10 CBM and above while the *chepe* sand laborers are supposed to fill the trucks of 10 CBM and below. At the time of data collection, the contractors used relatively small trucks of 10 to 15 CBM (or even smaller) to transport sand from the quarry to an open space where sand was deposited and accumulated. From the depositing area, sand was transported to the customers by using big trucks. A respondent stressed that contractors usually supply sand to big (government) projects and some of these projects were located far away from the quarries. Small trucks cannot be used to transport sand from the quarry to the final destination because of their insufficient capacity. Using smaller trucks would effectively double the amount of trips to be made and increase the cost accordingly as well as being detrimental to the roads.

The main customers of the contractors were reported to be the government agencies involved in construction of roads, bridges and public facilities such as hospitals and schools. Contractors have also been supplying sand to private companies who are involved in construction of big buildings. They also supplied to a few individual customers who demanded sand. During the interview period, large volumes of sand were supplied for road construction in Madale and to Mbagala where the construction of the rapid transport road was going on. Also large volumes of sand are being shipped to Zanzibar for the construction of public facilities, as sand extraction in Zanzibar itself has been banned.

Contractors were unwilling to share details of their daily income (or a full breakdown of their value chain). They however were clear that they charged a higher price than *chepe* sand. Still many of the big costumers preferred contractors as they could supply much larger quantities of sand on a short term basis, both by deploying larger 20 CBM *hoho* trucks, and quicker given the use of the excavator. They reported that apart from the taxes levied at the extraction site, they also had to pay corporate tax as owners of registered companies. Sand extraction could be combined with other businesses, sometimes in construction materials.

Relations between *chepe* and contractors (commodity chains)

Officially, contractors and *chepe* have distinct roles. Contractors supply large quantities of sand to large trucks, while *chepe* laborers takes care of smaller trucks. Different customers (and their brokers) might make different decisions, based on price, speed and quantity to select drivers and truck sizes that fit best to their needs.

However, most *chepe* respondents reported conflicts between contractors and themselves. They asserted that most contractors do not own their own machinery (as they are supposed to, see above) and are not more than middlemen. Their main point of contention was however that contractors would also load normal trucks that are supposed to be loaded by *chepe*. Drivers would prefer to be loaded by contractors given the speed. Even at higher prices, this would allow them to do more trips and effectively increase their daily income. As one *chepe* leader argued:

Contractors often do not have orders to supply to big governmental projects. They bring the machine here and then like us wait for trucks to load. They applied for the permit at ministry of water and WamiRuvu basin authority as suppliers of sand to the government, but in reality they do not have these orders. They always want to load the trucks that are supposed to be loaded by us. And because contractors have machines, drivers prefer the contractors to save the time. Sometimes, we end up quarrelling.

Localised solutions have been found. At one site the contractor supplied a weekly list of trucks (and their registration numbers) that would be loaded by the excavator, leaving all others for *chepe* laborers. In another site, the dispute became so heated that the government closed the quarry. While a first agreement between contractors and *chepe*—that *chepe* would get Tsh. 10000 for every truck loaded by excavator—was disapproved by the government (as they saw it as an illegal levy by a private organisation), they finally agreed that for every two trucks loaded by machine, a third would be loaded by *chepe*.

Some *chepe* groups wanted to become contractors, but their specific permit was only for manual labour and not for the use of heavy equipment. A leader of the sand association however maintained that many of these people also would have not the right qualifications to apply to work as a contractor.

Governance

In our discussion of the operation of sand commodity chains in the Dar es Salaam area we have already touched on different issues of governance, including the recent formalization, the permits to extract sand and various taxes to be paid. In this section we want to expand on this to show the different actors involved in governing and regulating different parts of the sand commodity chain.

As mentioned, efforts to regularize sand mining as part of river cleaning started in 2019. Before riverine sand mining was simply illegal. We have already mentioned a number of issues related to the illegality of the activity. From a governance perspective, the key people at the then illegal extraction sites were called Wakurungwa or Wakongwe and are also known as 'legends'. Wakurungwa gave other workers instructions concerning daily activities and at the end of the day they paid them. It was not possible for someone to just come with his shovel and start working without the permission of the legends. If a person tried by force to at the sites, he would be considered as a volunteer and would not receive any payment from the Wakurungwa. These Wakurungwa should however not be compared to sand bosses we see e.g. in discussions on sand mafias in South Asia (Michelutti 2019). While in Tanzania, (transnational) criminal networks have been active in the wildlife trade (Environmental Investigation Agency 2014), we did not see any indication of criminal presence in the sand business. Also other (elite) political networks, which are discussed in other cases, often in relation to sand mafias, did not seem to have a strong stake in the illegal mining business in our case

study areas, nor have they entered in great numbers after regularization. Sand mining simply did not appear as a steady income earning possibility, also given the clear visibility of sand mining and government prohibition of working within 60 meters of rivers.

Before regularization, different government institutions responsible for law and order, environmental and river management would however try to curb sand extraction and drive away the sand miners. A long-term *chepe* sand miner told the research team:

I started this activity in 1978. At that time sand was extracted from underground and not from rivers. In all six phases of the Tanzanian government, with the exception of the fifth and the current, sand mining was considered an illegal activity. Government policies did not allow artisanal sand workers to extract sand, thus the government kept on chasing us away from the sites. However, when the government officials left we would come back and continue with our activities.

In the one research site which was still illegal, sand miners in fact initially ran away when the research team arrived. This was in line with what a *chepe* miner in another research site told us:

All the time we had fear of being caught by government officials. For example, if we saw people like you guys wearing such nice outfits, we would think that you were government officials. Therefore we would scatter, making sure that we were not found in groups.

After sand left the extraction site, drivers had to contend with roadblocks. As one truck driver told us:

In the past, even if you had a permit [given the illegality we are not sure what this permit could be], when authorities caught you, you were supposed to pay them a large amount of money [mentioning the amount] to solve issues out of the office. If they took you to their offices, you would end up paying the amount ranging from three to five million shillings.

In 2019 the formalization process was officially started. This policy change seems to have been the outcome of a combination of factors: increased demand for sand for government infrastructure projects, increased conflicts

between *chepe* miners and government agencies, and a growing awareness of the livelihood impacts of sand mining, certainly for uneducated youth⁵. One of our key respondents summarized it thus:

During the last term of governance, the minister that was responsible to environmental issues, Honourable minister [mentioning her name], mad big changes in sand extraction. The minister helped us to take our complains to the top management. The late president gave permits to contractors with heavy machines to extract sand to feed big governmental projects for the construction of roads, bridges and railways. However, at the same time, the government requested us to organised ourselves in the groups, and we were given permits to extract sand for normal private uses. The minister called us in a stakeholder meeting which our leaders attended together with supervisors of construction projects and contractors.

Beside this, there seems to have been a change of mind on the relation between sand mining and floods. While sand mining was considered detrimental to the environment and one reason for the erosion of river banks leading to floods, sand mining now became part of a larger effort of river cleaning, in which sand but also solid waste was seen as a reason for the choking of rivers leading to flooding. A final element our respondents indicated was to gain revenue for different institutions if the activity would be regularized.

As mentioned in the introduction, a committee was organized by the Minister of State, Office of the Vice President – Union Affairs and Environment to study both the impacts of sand mining and advise on how extraction activities in the Dar es Salaam area should be governed in the future. The committee was led by the office of Dar es Salaam Regional Administrative Secretary and included key stakeholders from different agencies such as the National Environmental Management and Conservation Council (NEMC), Tanzania Mining Commission (TMC), Wami Ruvu Basin Water Board Authority (Water Board Authority; WBA), Dar es Salaam Municipal Council and Security agencies. One of the Committee's recommendations was that the Minister responsible for the environment should provide guidelines on how human activities

⁵ There might also have been purely political incentives trying to mobilize support in the then upcoming elections.

can take place within sixty meters from river banks⁶ including how sand extraction can be carried out in a sustainable manner.

As a response, the government, through the Ministry of Environment, issued a guideline to provide a framework to guide river training (river cleaning system through sand mining; thus not involving coastal, beach sand mining). The basis of the guide is to ensure that the following key factors are taken into account:

- Informal employment exists and is formalized;
- The environment of river basins is maintained and managed;
- The cleaning of rivers by extracting sand and removing solid waste is technically coordinated to prevent flooding and to prevent river banks from being damaged thus leading to the flooding of rivers;
- Bridge and road infrastructure are protected from floods during the rainy season with the participation of communities in the area;
- The royalties and appropriate taxes related to sand mining are paid to the relevant authorities.

The river cleaning guideline further stipulates that a task force involving experts from different institutions should be formed to coordinate all activities related to river cleaning in the Dar es Salaam and Coastal regions. The task force should be coordinated by the respective Regional Administrative Secretaries (RAS) as chairpersons and Directors of NEMC as secretaries. The task force is responsible for coordinating and advising on effective and sustainable river clean-up operations for sand extraction and solid waste disposal. Unauthorized extraction of river cleaning is not permitted. A permit to clean river is issued by the Wami Ruvu water board authority and administered by

⁶ The Environmental Management Act of 2004 stipulates that any permanent human activities or activities that by nature may endanger or adversely affect environmental protection are not permitted within sixty meters from the banks of rivers, lakes, dams or natural shores of the lake.

the relevant institutions, each with specific implementation responsibilities as specified.

- NEMC coordinates the river clean-up operation consisting of both sand extraction and removal of solid waste and its disposal in collaboration with the RAS office. RAS is the Chairman of the Task Force.
- Wami Ruvu water board offices are issuers of permits and custodians of rivers and valleys;
- The Mining commission coordinates river cleaning for the extraction of sand within the rivers by following the maps that the Wami Ruvu basin authority identifies, including advising the depth of the river where mining shall not proceed below (Maximum mineable depth).
- Local Government Authorities (Municipal/ City Directors) establish guidelines for the formation and registration of river cleaners groups and coordinating the registration of such groups through the office of the City/Municipal/Urban Director.
- Tanzania National Roads Agency (TANROADS) and Tanzania rural and urban road authority (TARURA) are responsible for infrastructure such as bridges and roads. These agencies coordinate and direct the correct method of river clean-up by and disposing of solid waste that will take place in areas adjacent to infrastructure such as bridges and roads without affecting the infrastructure.

The guidelines requires the manual *chepe* sand laborers to organized themselves in groups, formalize their groups by seeking registration from the local government authorities and then apply for a permit to clean rivers. Municipal and city councils are responsible to facilitate the formation of groups of sand miners. Like the sand laborers, contactors must receive permits to clean the rivers. From our discussions with contractors, permit length has changed quite a lot from three months at the beginning, to one year later, and now only two months. While these short-term permits allow authorities to monitor and adjust sand mining contracts easily, they provide (at least on paper) a lot

of insecurity. On the other hand, *chepe* labor did not mention permit length to be an issue and seems to be able to work the full year (sometimes barring the rainy season when the water levels are high and the roads unpassable).

Both contractors and sand laborers are required to plant erosion-resistant trees such as bamboo to protect boundaries and riverbanks (see environmental impacts below). The contractors should also ensure that the dumping of solid waste from river basins is controlled and delivered to security agencies who set up dumps in river areas.

Most, if not all, *chepe* laborers in registered groups interviewed were positive about the formalization process. The freedom from harassment while being able to continue their activity seems the most important benefit. One effect seems to have been the influx of new laborers in the sand business with some respondents even mentioning that new groups were formed daily. It has to be seen, whether this increase in groups and laborers goes against the goal of environmental protection and anti-flood measures defined at the onset of the formalization process (see also below).

The formalization process seemed to have gone relatively smooth. Initially there seemed to be some misgivings, given that money had to be accumulated to start the registration process:

Some people disagreed [to go for registration] because of the experience of other group who also had tried but failed. So they were like 'aaah this cannot work'. Some of us decided to continue with the plan. Because you cannot achieve something without money, we started saving money to continue the whole registration process smoothly. Some of our colleagues dropped mid-way because they had a feeling that their money was being stolen. Those who continued cooperating, succeeded in getting registered and we continue working together.

Important was also to find a good leader or organizer to help with the registration process; someone familiar with working with the government. In one of the sites, this person later became one of the leaders of the sand workers association. He actively went to the site and motivated the workers to form a group and start the registration process. He helped them and the group now possesses a permit.

On the ground, and as indicated in the guidelines mentioned above, a relatively large number of government ministries, commissions, agencies and authorities have an everyday presence. Their key role is to collect the different taxes. Some of our respondents indicated that taxation was one of the factors that lead to the formalization. As the government thought the sector would not simply disappear given the growing demand for sand and it is impossible to tax an illegal activity, regularizing the sector would both allow more leverage and an ability to gain tax income.

As mentioned before, Table 1 above provides an overview of legal taxes to be paid to different government institutions. Truck size is taken into account when deciding on tax levels. The smallest trucks officially should pay Tsh 20000 in taxes, the medium ones Tsh 30000 and the large ones, operated by contractors Tsh 40000. It has to be noted however that the NEMC is currently not charging any tax as they are not legally allowed to do so. We were told that amendments are currently made to the law to enable this. The taxes mentioned are stipulated in the permits for river cleaning.

Specific checkpoints have been set-up to inspect the trucks before they leave the quarry. At the checkpoints, there are representatives from all institutions who collect tax and issue receipts. It is important to note that all these taxes have to be paid to on-site representatives of the different institutions and not to a single officer who then redistributes. For *chepe* loaded trucks, the taxes have to be paid by the drivers, contractors (at least when loading their own trucks) are responsible for paying excavator loaded trucks. The tax receipts they get are key in managing checkpoints along the road.

This has greatly improved the conditions for truck drivers. As mentioned, law enforcement officers would sometimes catch sand trucks and extract heavy bribes. The situation has now improved:

The situation has become little better at least because we now get the permits at the river. The disturbances from government authorities [mentioning the specific government service] have declined. Although some of their officers still bring trouble even if you have a permit. He

may still want you to give him ten thousand, twenty-thirty. They are used to get money from us, now that the activity is formalized so they use force to get paid.

Respondents also mentioned the officers at the weighing stations as one of the challenges. Sometimes the officers show behaviour that may end up in paying bribes. The fines for exceeding the limit of the truck depend on the distance the driver has travelled. The exceeding weight and the distance determine the damage that was caused to the road. The fine for exceeding the weight ranges from Tsh. two hundred thousand to Tsh. ten million. These fines are paid in dollars, hence vary with exchange rates, so escaping the (risk of) fines might lead to corruption.

Important as well, is that for contractor loaded trucks, the government has stipulated the value per truck of sand at the quarry including government charges. This is put at Tsh 100000 for the smallest trucks (2-5 CBM), Tsh. 150000 for the medium sized trucks and Tsh. 200000 for the largest trucks. thus revenue received by the contractor is equal to the price per truck minus the government charges. In contrast, and as mentioned before, 15 CBM *mende* trucks, pay Tsh 40000 for a *chepe* loaded trip and the 4 to 10 CBM *mbawa* trucks are charged Tsh 20000 per *chepe* loaded truck. Even when adding the required tax, the *chepe* laborers are substantially cheaper than contractors (see also above), with total cost at the quarry for trucks of 11-15 m³ only being Tsh. 80000 (Tsh. 40000 in labor and Tsh. 40000 in tax), and trucks between 5-10 m³ only costing 50000 at the quarry (Tsh 20000 in labor and Tsh. 30000 in tax). Investment costs for the contractors, as well as the speed of loading explains the price difference.

Impact on local communities

Our respondents within the village communities indicated that sand mining had taken place in the area before regularization. This consisted both of local people harvesting sand for local, everyday needs, as well as (smaller) groups of illegal *chepe* sand laborers. Respondents indicated that sand mining by groups started within the last twenty years.

Community respondents were divided about the impact of sand mining in their community. Those positive about the trade would both highlight the employment opportunities that sand mining provided, as well as the benefits for the business of providing building materials more in general. They would be critical of those pointing at environmental destruction because of sand mining. As one respondent explained:

From my opinion, the business should continue because it is not a source of soil erosion or environmental destruction to the nearby houses along the river bed. The solution to the erosion is for the government to control the water flow from upstream. People upstream have built houses along the rivers and block the natural flow of the river. About dumping waste in this site, it is because the dumping areas are very far, about sixty kilometres from here. In Dar es salaam the dumping area is at Pugu and we are here at Tegeta. Thus people have to dump the wastes in any nearby area. Moreover, these wastes were brought here long time ago to control soil erosion and since then people have continued to do the same.⁷

⁷ Other respondents also indicated that solid waste had been dumped in the past, with the assent of the municipality, to protect houses at the edge of the river. This, environmentally unsound, practice was later discontinued.

Other respondents clearly disagreed, pointing to increased erosion and riverbank degradation as a result of sand mining.

In fact, the river was very far from this settlement. [...] But because of sand mining, the river has widened and reached our houses. The extraction work is a major source of soil erosion in this area. Some years back, I don't remember what year it was, the boy from that house (pointing the house of his neighbour) brought his trucks here and said that he was going to extract sand from the river close to his house [this was probably before regularization]. When he was engaged with this, heavy rain came and the river migrated from its original path to the residential area. The migration of the river brought erosion. I, myself, contacted the then minister of the Environment (mentioning his name) and the trucks that destroyed the river were banned to come to this place. There was small-scale extraction ongoing, but that was controlled. As for now, no measures are taken to prevent extraction of sand at our area... nothing is going on.

This respondent seems to indicate that the groups with permits are now able to freely extract sand, without much control.

People from the offices of the taskforce that oversee river cleaning activities and the DC came to visit us with their measuring equipment to check this whole area. They put sticks to demarcate the area that can be extracted. But what happens is sand workers picked up the sticks, move them away and they then extract sand along the edges.

Chepe respondents denied this allegation. One leader argued:

Villagers complain that we are destroying the environment through widening the river banks. However, we try to explain to them that we avoid destroying riverbanks by extracting sand within the riverbed. In addition, since we had to organize ourselves into groups, we work by adhering to government regulations. The authorities who deal with environmental degradation do come here and put demarcation points (limits) along the river banks to avoid soil erosion near the residences. We only extract sand within the areas that are demarcated by authorities.

Respondents were moreover negative about the *chepe* sand miners themselves. They saw them as undisciplined youth, often with little or no alternative employment, also indicating (somewhat in contradiction with the demanding nature of sand labor) their laziness. After regularization the number of people involved, mainly youth, was considered to have increased.

Representatives from the sand labour association CHAWAMADA were very much aware of this negative image of sand laborers. The activity attracts mostly unskilled laborers with low education, and as such is often perceived, one of our respondents argued, to attract people whose behaviour is not acceptable in the community (e.g. thieves). As an organisation, they actively tried to combat this negative perception, and through regularization making it into a decent profession. Also our *chepe* respondents were very aware of this issue, and mentioned that new members had their background checked to be sure they were bona fide.

Finally, the lack of direct benefit to the community was lamented. Although both the ward and the municipality taxed sand mining, respondents did not see the benefits accruing to the neighbouring communities.

In at least one area, the *chepe* group tried to actively counter this negative perceptions by actively collaborating with the community. The group bought steel rods, toilet pipes and supplied three 'trips' (trucks) of sand for the construction of the village office. They also donated cement and sand for the construction of school toilets. They volunteered at the community through their community support group. Stationeries and office chairs to be used at the local government (ward) office were donated. Whatever the impact of these efforts, it is clear that integrating the local community in developing sand extraction, including monitoring and the follow-up of complaints seems necessary.

Environmental impact

Given the fairly recent nature of regularization and the fact that the research team did not conduct a classical environmental impact assessment (for which e.g. longer term data on river flow patterns, river bank erosion or river biodiversity would be necessary), it is not straightforward to clearly delineate the environmental impacts of sand mining. However, as is already clear, there are a number of environmental risks which have to be taken seriously.

First, however, it is important to stress again that river cleaning and river training was one of the key starting points for the whole regularization process. Whether or not one considers employment and taxation as being of more or similar importance, this starting point should be taken seriously. It should be kept in mind that also in rivers that have seen much longer term regulated sand extraction, e.g. the Rhine in Europe, sustainable sediment management is considered one of the key issues, which also poses limits to the extraction of sand (see e.g. Spreafico & Lehman 2009; CHR/KHB 2021).

A number of efforts have been undertaken. As was already mentioned the area under which sand mining can take place is demarcated by field staff of the environmental management committee. It is however unclear how this demarcation was adhered to and how monitoring took place. Given that there is a daily presence of a representative of the environmental management committee, this certainly should be possible. However, as some respondents indicated the removal of the stakes, more clear monitoring should take place (even if it goes against the taxation objectives of the regularization campaign). Moreover, it is not fully clear if and how the mining commission both indicates and monitors mining depth in the area. The leader of one mining group however contended that:

the situation of river environment is still good because we follow the instructions that are given by Wami/ Ruvu valley officials. These officials instruct us on what to do and how to control the destruction of riverbanks. The basin authorized people visit the site thrice a week to give direction on the mining limits such as the angles to conduct sand mining. I can say that now we are more knowledgeable about the river management.

This was echoed by many of our *chepe* respondent who indicated their role in environmental protection, rather than destruction and their increased awareness about river management and potential environmental impacts of sand mining

While this is positive, there are a number of concerns as no respondents indicated that they were forced to stop their extraction as maximum extraction levels (both in area and depth) had been reached. *Chepe* groups and contractors also did not indicate that they sometimes had to shift to another extraction site to do river cleaning. Quarries seem to be fairly stationary. This of course might also be the result of specific choke points where most waste and sand accumulates.

Another effort at environmental management, was the mandatory planting of trees along the riverbank to control erosion and strengthen the riverbanks. The research team in fact witnessed some of the sand laborers taking care of bamboo planted along the river banks. Their leader explained that the activity of planting and taking care of trees is planned by group leaders. Each day, one person from each scale is selected by the leader. The selected member has the duty to water trees and perhaps plant more trees for sections where they are not planted yet. Group members said that planting the trees along the river banks is one of the directives of the river basin authority. Thus the group members said they had to be serious on doing this activity because if not done well it may affect the renewal of their permits. Each group has its own plans on planning and financing of these environmental protection activities. Mostly, members of sand labor groups use the group savings to buy bamboo.

Conclusion

It is quite clear that the regularization of sand mining in Tanzania, which only started in 2019 has had important impacts on the way sand mining is organized and on how it is governed and taxed. In the case studied here, concerns of river cleaning were key in starting the formalization process, alongside a high demand for (government) construction purposes, employment opportunities and taxation benefits. Tanzania as such forms an interesting case to further explore the possibilities and challenges for sustainable governance of sand mining in areas with a large demand for construction materials, in this case sand.

The Tanzania experience could feed into international discussions around sand and particular how to account and integrate artisanal mining. The Extractives Industries Transparency Initiative (EITI), of which Tanzania is a member, has for some time been debating to expand its scope from oil and gas and large-scale industrial mining to also include Artisanal and Small scale Mining (ASM). The potential impacts of formalization on revenue generation, community and environmental impacts, as well as ASM miners legitimacy have been prominent discussion points within EITI (2019), but also with the Extractives Global Programmatic Support (EGPS) of the World Bank. As this report shows the recent regularization of sand commodity chains in Tanzania could provide key jumping off points for all these discussions, first on a regional, but also on a global scale. This is particularly true as both *chepe* and contractors fall under the ASM label, and it is likely that sustainable extraction of riverine sand will in many cases not allow for large-scale mining. Of particular interest are the ways in which revenue has been generated from sand, how different types of sand extraction have both been accommodated as well as the ways—to be researched further—of how at least in the formal process issues of environmental protection have been taken up, if not provided the starting point for the formation of the new guidelines for sand mining.

EITI and EGPS could take the lead in bringing countries in dialogue around sand mining, using key examples like Tanzania as a starting point for their

discussion. As many governments are faced with the need to source sand for infrastructural development and, given the challenges of international trade in sand (see Katz-Lavigne, Pandey & Suykens 2022), many countries will have to devise national policy around sustainable extraction of sand (and how to limit sand extraction), including sourcing, extraction methods as well as environmental and social impact assessment. Key insights from countries like Tanzania, or areas like Dar es Salaam, that already have started a formalization process could help to devise global standards on sand mining based on both opportunities, challenges and pitfalls. As we received no indication of the presence of criminal or criminal-political networks in the sand business in our study areas—either before or after regularization—this case study also shows that we, while being critical of social and environmental impacts of sand mining, should not always take (well-publicized) sand mafias as the starting point for our discussions and should take other alternative forms of organization of (illegal) sand extraction into consideration.

More research is however necessary to better understand the (long-term) impacts of regularization. As mentioned by multiple respondents, more miners are attracted now to the business and new groups are regularly formed. While (government) data on the number of miners or miner groups was not available to the research team, this could lead to an extensive increase of sand mining in which it is yet unclear how the different policy goals can and will be balanced. Such an increase is moreover likely given continued expansion of Dar es Salaam (and other urban centers in Tanzania), as well as the importance of large scale infrastructural works as part of development policy in the country. It is also highly likely that this will create challenges and stress on the rivers, which cannot accommodate an infinite number of sand quarries. In the riverine communities there is already a debate on the environmental impacts of sand mining. Given the expected rising demand, the environmental, river cleaning agenda of the original framework might come under pressure, unless alternative sources for sand are found.

Moreover, the integration of community benefits within the sand mining framework—regardless of the role of local government in gaining revenue from sand—seems to be a challenge still in the case discussed here. Community benefits should not depend on the individual *chepe* groups—offering sand,

cement and office supplies—, but should be more clearly integrated in sand mining frameworks. Communities could also be empowered to play key roles, in consultation with civil society organizations, in monitoring the impacts of sand mining. EITI and EGPS could clearly offer advice on how revenue sharing with local communities might be improved and how sustainable development of riverine communities might be furthered as part of sand mining policy.

Initiatives like EITI, but also Delve, have a strong data component and could invest in further research on sand mining. This research should ideally be inter-disciplinary. Social scientists should focus on longer-term observation of mining sites to corroborate interview findings on how mining practices actually take place, in interaction between miners, communities and officials. Geologists could provide key insights into the longer term hydrological and sedimentary impacts of sand mining, as well as better data on how to select mining sites (or investigate how mining sites are selected by the basin authority (and its scientists)). Biologist could investigate the impacts of sand mining on (endangered) river fauna and flora (which seems not to be considered at all at the moment). Environmental scientist should conduct environmental impact assessments both upstream, at mining sites and downstream.

Such research would be warranted, certainly because at this moment only the Dar es Salaam and coastal areas have guidelines for sand mining and have started the regularization procedure. As such, our research findings do not extend to other parts of Tanzania where sand mining is still illegal. Extending the regularization process to the rest of Tanzania, which was expected by some authorities interviewed, should best be based on a thorough assessment of the existing program.

While Tanzania can count on its many top-level scientist to make this assessment, it might be interesting in the longer term to exchange ideas with other river management authorities, like the already mentioned International Commission for the Hydrology of the Rhine Basin to provide interesting jumping of points towards best practices. At the same time, it continues to be mandatory to search for alternatives to (river) sand.

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