



Formalization of sand mining in Dar es Salaam, Tanzania

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ARTICLE INFO

Keywords:

Sand governance
Artisanal and small-scale sand mining
Formalization
Dar es salaam Tanzania

ABSTRACT

While artisanal and small-scale mining have for decades gained attention of both policy makers and academic researchers, very little is known about the organization and governance of sand extraction. Sand extraction is often related to violence and mafia organization. This article goes beyond criminalization and mafia to interrogate different governance regimes around sand mining. It further the debate of sand governance by looking at the formalization process of artisanal and small-scale sand mining in rivers in the Dar es Salaam Region of Tanzania. Based on the interview with different stakeholders, the paper unpacks the key aspects and rationales of the formalization by looking at the roles of different institutions and their relations, the way the formalization process has been perceived across the sand commodity chain and community and the environmental impacts of sand mining. Given booming sand extraction in many parts of Sub-Sahara Africa, policy makers, both at the national and international level, should take stock of governance efforts for sand mining in the Dar Es Salaam area and the integration of, and even clear focus on artisanal mining formalization in this.

1. Introduction

Sand extraction has boomed globally in the last twenty years and is estimated to have tripled in this period, although the exact or even approximate quantity of sand extracted is unknown for most parts of the world (Katz-Lavigne et al., 2022; UNEP, 2019; Marschke et al., 2021). Large scale urban infrastructure development has been the key driver of growing sand demand. Extraction is quite varied (for an overview, see: Bisht, 2021, p. 4), with rivers, beaches, lakes and quarries being common sources of sand. Extraction methods likewise diverge with large scale dredging of both marine, but also river sand (Marschke et al., 2021; Rahman & Suykens, forthcoming); smaller dredging operations in rivers and lakes; fairly large-scale quarry sand mining using excavators (Lahcen & Suykens, forthcoming), or more short-term variants of the same (Dawson et al., forthcoming); to Artisanal and Small-Scale Sand Mining (ASSM), predominantly on riverbed and beaches, which is the focus of this article.

Despite the seemingly ubiquitous presence of the resource, interest in the policy and academic community remained limited until very recently. However, journalistic and activist accounts of the destructive nature of sand mining have boomed (for influential accounts, see: Beiser, 2018; Coastal Care, 2022; Delestrac, 2013), often focusing, on the illegal, violent and criminal aspects of the sand trade. In its landmark

report, the United Nations Environment Programme argues that ‘part of the challenge is that the sand industry is [...] significantly informal in some parts of the world [, ... with] artisanal and small scale mining legion in the sector’ (UNEP, 2019, p. 6). While noting the importance of a number of major commercial supply chains, certainly in marine dredging, they continue by stating that ‘large quantities’ are also extracted ‘illegally’ in ‘some regions of the world, at times by organized crime “sand mafias”’ (UNEP, 2019, p. 7). Also in academic work, sand has been associated with the tragedy of the commons (Torres et al., 2017) and with resource frontiers (Bisht, 2021) which further build the image of ungoverned and indeed ‘wild’ (Harriss-White and Michelutti, 2019) spaces.

To be clear, this attention to criminal networks and illegality in the context of sand extraction is warranted, given the proven role of violence and coercion in sand extraction in the cases mentioned above. Moreover, the attention to environmental destruction as part of sand mining operations, across the range of technologies and sources mentioned above, is equally warranted (for overviews, see: Bisht, 2021; Katz-Lavigne et al., 2022; Marschke and Rousseau, 2022; for a critique on the sand ‘crisis’, see: Lamb, forthcoming). However, an exclusive focus on criminal and illicit—in the definition of Abraham and Van Schendel (2005)—forms of extraction, provides us only with a partial view of sand extraction, and as such only partial policy options to forge

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<https://doi.org/10.1016/j.resourpol.2023.103589>

Received 25 October 2022; Received in revised form 11 April 2023; Accepted 11 April 2023

Available online 18 April 2023

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better and more sustainable frameworks to govern sand.

This almost single-minded attention to the criminal and destructive side of sand-mining is to some extent reminiscent of earlier and ongoing debates on the criminal nature of ASM and its (alleged) role in fuelling violent conflict (see e.g.: Benites, 2022; Rigterink, 2020; Tschakert, 2009; Vogel, 2022). It is however necessary to go beyond a criminalization and mafia to interrogate different governance regimes around sand mining. While we have seen a large increase in desk studies (see e.g., Bendixen et al., 2021; Bisht, 2021; but also: Peduzzi, 2014; Torres et al., 2017), we know surprisingly little about the organization and governance of sand extraction on the ground. This article aims to further the debate of sand governance by looking at the formalization process of Artisanal and Small-Scale Sand Mining (ASSM) in rivers in the Dar es Salaam Region of Tanzania. Sand mining in Tanzania has received scant attention, with whatever limited work available focusing on coastal sand mining in Tanzania (Masalu, 2002; Shaghude et al., 2012) and the semi-autonomous region of Zanzibar (Ladlow, 2015). Given booming sand extraction in many parts of Sub-Sahara Africa, policy makers, both at the national and international level, should take stock of governance efforts for sand mining in the Dar Es Salaam area and the integration of, and even clear focus on Artisanal and Small-Scale Mining (ASM) formalization in this and the semi-autonomous region of Zanzibar (Ladlow, 2015).

Theoretically our arguments draw on the large literature on the legalization and formalization of different types of Artisanal and Small Scale Mining. As such, this paper also wants to provide ground work for the integration of ASSM into ASM formalization debates. As this article will show, while the formalization process of ASSM studied here resonates well with ASM formalization debates more in general, and also should be understood in the context of a closer attention to ASM in Tanzania in the last 15 years, there are key differences between those resources studied mostly (gold, diamonds, gemstones, but even coal) and sand. As we will show in more detail below the geological and material specificities of sand, and connected issues of sustainability, provides its own set of opportunities and challenges. Moreover, for the case itself, the discursive logic operating to legitimate the formalization of ASSM in Dar Es Salaam, makes it to some extent unique.

This paper contributes to debate on ASM (formalization) in Tanzania, which to date have mostly focused on gold and gemstones (see e.g. Bryceson et al., 2014; Kinyondo and Huggins, 2019; Merket, 2018; Pedersen et al., 2019; United Nations Environment Programme, 2012b). This is crucial as, ‘the extent and potentials of formalization in Tanzania remain under-researched’ (Huggins and Kinyondo, 2019, p. 3).

We will start by outlining the theoretical framework, build on ASM formalization debates, also looking at the Tanzania specific literature. This will not only allow to evaluate better some of the policy choices in ASSM in Dar es Salaam, but also to show later how sand is both similar and different from the resources mostly covered under ASM formalization debates. After providing the methodology of the study, we will focus on the development of the sand mining sector in our field area, before turning to the key aspects and rationales of the ASSM formalization process in Dar es Salaam. Key will be to understand the role of both local, regional and national state institutions, their rationales to formalize sand mining, the relations between different types of extraction, the way the formalization process has been perceived across the sand commodity chain and community and environmental impacts of sand mining. We will conclude by providing a critical reading of the lessons learned and clarify the need to further research to understand the long-term effects of ASSM formalization, for the miners, riverine communities as well as the environment.

2. ASM formalization and sand

While sand is a recent addition to policy and academic interests in ASM, the debates on other commodities, and on formalization of ASM, and in particular of gold, have a long history. In most overviews (see e.

g., Hilson, 2020a), the mid 1990s are the key moment when international organisations start to take note of the problems and opportunities of ASM and to promote a formalization/legalization agenda (Barry, 1996; United Nations, 1996). Since, legalization—creating legal frameworks conducive to ASM—and formalization, a process going beyond simple legalization to also include e.g. providing geological information to miners, empowering them to access capital or providing services (including training) to improve on environmental and social impacts of ASM (Singo and Seguin, 2018) has been extensively debated, both in general and also in relation to case studies (see e.g. Cuvelier et al., 2022; Geenen, 2012; Hilson, 2020a; Hilson et al., 2019, 2022; Hilson and Maconachie, 2017; Hilson and McQuilken, 2014; Huggins and Kinyondo, 2019; Maconachie and Hilson, 2011; Siegel and Veiga, 2009; Singo and Seguin, 2018; Siwale and Siwale, 2017; United Nations Environment Programme, 2012a; Verbrugge and Besmanos, 2016).

The thinking behind formalization in Sub-Saharan Africa was originally geared towards creating laws and regulations through which ASM could operate within the legal framework (Buss et al., 2019; Barry, 1996; Siegel and Veiga, 2009). The formalization was further expected to support entrepreneurs to secure property rights and to expand their operations to become more mechanised (Hilson and Maconachie, 2017; Verbrugge and Besmanos, 2016). As time went on, more people were attracted to the ASM, and it became an important source of livelihood to escape out of poverty. The role of ASM in supporting livelihood is also well documented in the literature and has become an aim of ASM formalization itself (Hilson et al., 2022; Hilson and Maconachie, 2017; Geenen, 2012). ASM creates opportunities to earn income through either direct involvement in mining or in providing goods and services to the quarries and mining sites. While central governments may be tempted to formalize ASM activities for fiscal motives (Hilson, 2020b; Kinyondo and Huggins, 2019), taxation can also be an important channel to spread the benefits of sand mining to surrounding local communities. However, the accrual of these benefits depends on whether a part of collected revenues is sent back to local communities and the extent to which the revenue received is of course put into good use. Local communities will benefit if local institutions are strong enough to channel the increased revenue to the improvement of public services and infrastructures (The World Bank, 2015). Otherwise, the local communities may bear the costs of mining while being deprived from accrual of the (fiscal) benefits.

To understand the implications of ASSM regularization in Dar es Salaam we build on this extensive tradition and in particular on number of critical issues which impede ASM regularization or its implementation. These not only provide the theoretical background to our analysis of ASSM regularization in Dar es Salaam, but also provides the groundwork to integrate ASSM formalization in more general ASM debates.

First, formalization debates have particularly zoomed in and debated the role of property. Mining titles are often considered the basic starting point of any legalization and formalization effort (Barry, 1996; Siegel and Veiga, 2009; for a critique, see: Geenen, 2012; Huggins, 2016). Sand, and particularly river sand’s geology, however, might not always be best suited for fixed territorial titles. Unlike many other mineral deposits, sand is a fluid resource (see also Pandey, forthcoming), with river geology leading to shifting sedimentation making geographically fixed mining titles potentially problematic. Moreover, also environmental concerns might impede fixed points of extraction along a river system. A more mobile system of mining rights might thus be needed (see also: Geenen, 2012). Rights to access sand labour along a mineable river might be more crucial for small scale and artisanal sand miners than territorial fixity.

Second, conflicts between large-scale mining (LSM) and ASM, or the pro-LSM bias in many countries has impeded the development of suitable legal frameworks for ASM (Hilson, 2019). As Hilson and Maconachie (2017, p. 446) argue:

‘in most countries, people struggle to comply with specific

procedures, including those attached to bureaucratic permitting systems and regulatory processes more suitable for large-scale operators, that must now be followed to obtain small-scale mining licences.'

This is certainly an important element to consider if we look at global efforts at regularizing sand extraction. In some cases, ASM was effectively pushed out as large-scale dredging operators emerged (see e.g. in Bangladesh: Rahman & Suykens forthcoming). Moreover as Hougard and Vélez-Torres (2020) have shown, small-scale miners might provide more sustainable forms of sand mining, while being pushed out as illegal for the benefit of large scale mining operations. In river sand mining the relation between ASM and LSM often again is to some extent dependent, like with other resources that can be mined both by ASM and LSM (Hilson et al., 2021), by geological features and the nature of sand deposits. While large-scale dredging can be seen mostly in large river systems, many smaller rivers are still under ASM as large scale dredgers can either not operate or just exhaust the sand deposits too rapidly.

Third, when legal procedures exist (that are not simply attuned to the needs of LSM), they are often considered too costly and cumbersome for many miners, who consequently prefer to continue to work informally (van Bockstael, 2014). The already mentioned analysis on Colombia by Hougard and Vélez-Torres (2020) confirms this to some extent. Long term artisanal sand miners, whose mining methods were more sustainable, were unable to acquire formal mining licenses, and thus continued to work illegally. Obviously, a legal framework in itself is not enough—whether for ASM or LSM—given the political interests who are often invested in sand mining (see e.g. Ameziane & Suykens, forthcoming; Harriss-White and Michelutti, 2019), making the implementation of legal frameworks, let alone ASM sensitive legal frameworks difficult.

Fourth, as Hilson and Maconachie (2017) have argued, for donors and policy makers, formalization entails legalization. However, scholars, but also some policy makers have argued that formalization should go beyond legalization (Barreto, 2011; Buss et al., 2019; Marshall and Veiga, 2017) to include many more extension activities and support and training programs for ASM operators. This includes technical training, but also access to credit. This to not only enable environmental and workplace safety, but also to allow ASM operators to scale up and potentially exit from the subsistence trap in which they are often located. Continuous government support to improve working conditions and enhance the skills of artisanal workers are important. Interventions such as training on the formation of cooperatives, management of finances and access of credits are needed to enhance mining techniques and other skills. For sand this is quite relevant, given the environmental risks associated with sand mining (UNEP, 2019), which makes training on environmental safety and compliance warranted. Moreover, in some contexts a scaling-up of activities, moving from fully manual labour to small-scale dredging or the use of an excavator might be both desired by (groups of) artisanal miners and be environmentally sustainable. Here access to credit would be necessary to avoid artisanal miners being pushed out by those having more ready access to capital.

Finally, formalization can lead to exclusion of more vulnerable groups, and specifically women (Buss and Rutherford, 2020). While we still lack good insights in the socio-economic and gendered composition of sand miners (see for starting points: Hattlebak, forthcoming; Rahman & Suykens, forthcoming; Hougard and Vélez-Torres, 2020), this is clearly a point of attention. While in some case women have been part of informal sand mining (either as diggers and carriers; in other cases as carriers), given the limited cases of ASSM formalization we have limited insights on how formalization impacts on this female presence.

When we look closer at Tanzania (for an overview, in the context of gold, see: Jönsson and Fold (2014)), it is important to note that work on ASM in Tanzania has almost exclusively focused on gold and gemstones. The country's ASM framework has undergone a number of important changes in the last fifteen years. ASM was first recognised in Tanzania in the 1979 Mining Act and supported to some extent under the 1983 Small-Scale Mining policy paper (Huggins and Kinyondo, 2019). The

1998 Mining Act continued to recognise ASM, although as Merket (2018, p. 14) argues 'in 1979 the predominant focus was on establishing strong state control and ownership over the sector, while the emphasis in 1998 was on attracting large-scale foreign investment'. The 2008 Bomani report, named after the chairman of the Presidential Mining Review Committee, fed into the 2009 Mineral Policy and 2010 Mining Act which among others tried to decentralized the issuing of ASM Primary Mining Licences (PLMs), make environmental protection plans mandatory as well as designate particular areas for ASM (Merket, 2018). While some progress has been made, as Huggins and Kinyondo (2019, p. 2) argue: 'Based on th[e] review of recent laws, claims that the government prioritises ASM seem problematic'. Moreover, the legal frameworks seem to benefit more mining businessmen, who can secure (and pay for) a license for mining, rather than the ASM workforce which remains largely informally employed (Merket, 2018). More recently, the late president John Magufuli seemed to have taken a more pro-ASM stance, although this might have been more an effort to pressure LSM to allow for more revenue extraction from this sector. While ASSM operates under a quite distinct logic from other forms of ASM in the country, these changes are at the same time crucial to understand some of the pro-ASSM measures within the policy framework for sand mining in Dar es Salaam. The 2019 guidelines that currently govern sand mining in Dar es Salaam could be understood in this context of pro-ASM, populist politics.

3. Methodology

Fieldwork for the case study was conducted at Kinondoni District in Dar es Salaam (see Fig. 1) region under the leadership of first author. 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 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 was chosen because of the presence of the big government projects such as construction of bridges, roads, flyovers and other public facilities that demand the massive supply of sand. Important to note, is that ASSM formalization at the moment is restricted to this area, and our findings cannot be generalized to the whole of Tanzania.

Sand mining activities are conducted at several rivers in Kinondoni district. Tegeta and Mpigi river were the focus of this the study. Sand mining at River Tegeta has taken place since 1980s. Sand mining in River Mpigi started in the mid-2000s. River Mpigi 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 Mpigi was covered by forest and has no human settlements. Unlike in River Mpigi, 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 Mpigi. 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 workers/labourers at site B have organized themselves in an informal group, they are not formerly registered and do not hold a permit to clean the river, thus their activities are considered illegal.

Semi-structured interviews were conducted with sand labourers, contractors, and truck drivers, as well as members of adjacent villages, government officials and members of the sand miners association. The interviews tried to better understand the role of different actors both in the sand commodity chain and in governing this chain. It included questions on the history of sand mining and the impact of the recent formalization (e.g. on labour arrangements and on relations between sand miners and the state), but also on environmental and community impacts.



Fig. 1. Map of Dar es Salaam with study rivers.
Source: Edited from Google Maps 2022

4. Unpacking the formalization of river sand mining

4.1. The origins of sand mining in Dar es Salaam

While currently sand is mostly extracted from rivers, initially sand mining was not focused on river sand—they mined what they called underground sand or *Kuluthum*. A long-term sand miner told the research team¹:

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.

The switch to river sand was driven by changing demand. A long-term sand laborer at the same site 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.²

As mentioned by the first respondent above, this activity was at that time illegal, and thought to be environmentally destructive, leading to floods affecting roads and bridges as well as housing. According to one of our respondents river sand mining started in 1989.

Illegality did however not mean that sand mining was ungoverned or under the sway of criminal enterprise. The key people at the then illegal extraction sites were called *Wakurungwa* or *Wakongwe* and are also

¹ Interview with sand labor leader and one of the oldest sand laborers encountered, site C, 29 September 2021.

² Interview with long-term sand miner, site C, 29 September 2021. All names of respondents and exact research sites have been withheld for confidentiality reasons.

known as ‘legends’. *Wakurungwa* gave other workers instructions concerning daily activities and at the end of the day they paid them. These *Wakurungwa* should however not be compared to sand bosses we see e. g., in discussions on sand mafias in South Asia (Harris-White and Michelutti, 2019). We saw little indications of criminal enterprise, nor of networks of politicians and businessmen controlling illegal extraction.

Before regularization, different government institutions responsible for law and order, environmental and river management would try to curb sand extraction and drive away the artisanal sand miners. 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 an artisanal *chepe* (shovel) 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.³

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.⁴

4.2. Formalization of ASSM in Dar es Salaam

Formalization of river sand mining started in 2019. Two elements are key to understand the implications of this formalization exercise. First, river cleaning and river training, and not sand mining per se, was the stated aim of the formalization exercise. Removal of waste—solid waste, but also sand—was deemed necessary to prevent frequent flooding of Dar es Salaam during the rainy season, which caused damage to public as well as private infrastructure. Secondly, the guidelines we will discuss further below only pertain to Dar es Salaam and not to the whole of Tanzania, where the river cleaning narrative might not have the same urgency.

While the problem of floods had existed for a long time, there seems to have been a change of mind about the relation between sand mining and floods. While sand mining had been considered detrimental to the environment and one reason for the erosion of riverbanks 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 number of factors—well in line with factors explaining more general ASM regularization (see theoretical background above)—help to understand the policy change: increased demand for sand for government infrastructure projects necessitated at least some form of legal sand extractions; increased conflicts between artisanal *chepe* (shovel) miners and government agencies⁵; and a growing awareness of the livelihood impacts of sand mining, certainly for uneducated youth, demanded a policy response.

Regularization also allowed a host of different institutions to gain revenue. Although most infrastructure in Dar es Salaam relied on sand from the nearby rivers, no government taxes had been levied on—the then illegal—sand mining. While in the initial stages of formalization few institutions charged taxes at the quarry toll gates, more charges are introduced gradually.⁶ Taxation has been an important driver of change in the Tanzanian mining and ASM sector in particular. As has been argued by Huggins and Kinyondo (2019, p. 6): Taxation has been an

³ Interview with sand laborer (*chepe*), site A, 30 September 2021.

⁴ Interview with truck driver, site A, 30 September 2021.

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

⁶ Interview with sand contractor, 25 September 2021.

important driver of change in the Tanzanian mining and ASM sector in particular. As has been argued by Huggins and Kinyondo (2019, p. 6):

It is clear that recent policy changes have prioritized collection of royalties, taxes and fees by the government. Government personnel have repeatedly emphasized the importance of revenue collection, rather than issues such as health and safety.

4.2.1. The framework

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. The larger number of concerned authorities involved also shows the complexity of governing river sand mining and the multiple government stakeholders involved.

As an outcome, the Ministry of Environment issued a guideline to provide a framework to guide *river training*. A number of key elements formed the basis of the guideline: Informal employment exists and should be formalized; The environment of river basins should be maintained and managed; The cleaning of rivers by extracting sand and removing solid waste should be technically coordinated to prevent flooding and to prevent river banks from being damaged; Bridge and road infrastructure should be protected from floods during the rainy season with the participation of communities; The royalties and appropriate taxes related to sand mining should be paid to the relevant authorities. As can be seen, labour and revenue incentives, as well as preventing further flooding were key drivers of the formalization exercise.

The different institutions mentioned above also became part of a task force to coordinate and advise on effective and sustainable river clean-up operations, with the Regional Administrative Secretaries (RAS) as chairpersons and Directors of NEMC as secretaries. They also were assigned specific roles in the management of sand mining and solid waste removal. The Wami Ruvu Water Board offices, in charge for the rivers and river valleys, were made responsible for issuing sand extraction permits, while the Mining commission, following maps prepared by the Wami Ruvu basin authority, would coordinate the actual mining operations, including advising on the maximum mineable depth. The NEMC was responsible for monitoring environmental impacts and guiding and monitoring mitigating actions. The Local Government Authorities (Municipal/City Directors) had to establish guidelines for the formation and registration of river cleaner groups and coordinating the registration of such groups through the office of the City/Municipal/Urban Director. The Tanzania National Roads Agency (TANROADS) and Tanzania rural and urban road authority (TARURA), responsible for infrastructure such as bridges and roads, should monitor river cleaning as to not endanger this infrastructure.

Finally, most of these authorities would also be able to benefit from revenue from sand mining. Taxation levels depend on the size of the trucks. As can be seen in Table 1: two local government bodies, at the ward and the municipal level, collect taxes, as well as three national bodies (in the future): the Water Board, the Mining commission, and (in the near future) the NEMC. Taxes are to be paid when exiting the extraction sites, where all taxation bodies have a representative that issues tax receipts (see also below). In comparison, the most local governmental body, the ward, collects the least amount of taxes. While they also have limited responsibilities vis-à-vis river cleaning coordination and management, ward level taxation, could have played a bigger role in distributing benefits from sandmining to the community (see also below).

4.2.2. Artisanal and small scale operations: Chepe and contractors

Most interesting from a governance perspective is the formal inclusion of two types of (artisanal) mining: manual extraction, known as chepe (shovel) undertaken by registered groups of sand miners and mechanised sand mining by excavator, organized by contractors. The guidelines have tried to provide space for both the unmechanised artisanal sand mining, foregrounding the livelihood aspects of sand mining, as well as mechanised small scale sand mining, foregrounding the needs of large-scale infrastructure to acquire more sand at greater speed. While the latter could be considered too mechanised to fall under the ASSM framework, the use of a single excavator is far removed from truly large-scale sand mining which employs either teams of excavators in quarries or, in the context of rivers, dredging. This is at least partly the result of the geological realities which would make large-scale dredging difficult. However it is also reflective of both the relative pro-ASM stance of Magufuli and the interest to formalize the informal labour already active in the business.

One of our key respondents summarized it thus:

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 organise 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.⁷

4.2.2.1. Chepe mining. Chepe sand mining is probably the oldest form of sand mining in the area (see above) and formalization of this type of ASSM relates best to discussions of ASM formalization more in general. Chepe miners work in groups manually extracting sand from the riverbed and loading it manually into trucks. In contrast to many examples of ASM formalization (see above), the administrative procedure for chepe miners is relatively straightforward, to some extent decentralized and also cheap.

Chepe miners first have to register themselves as a group pursuing a particular livelihood or activity at the local level. This is a common procedure also followed by e.g. farmer groups or garbage collectors. Groups have to consist of a minimum of five members, but in the case of sand miners 25 or more members were common. They need a written constitution, and a president, secretary and treasurer. With this in place the local government office can provide them with a letter of identification. This then had to be submitted to the ward development officer and the Municipal Community Development Office, who both review the constitution. If they are satisfied, the group is requested to deposit a registration fee of TSH 10000 (€4.30) to the Municipal bank account to complete the procedure. The Municipal Council would usually only take a week to complete the registration. Once registered as a group, the chepe miners can apply for a river cleaning permit. Such a permit is very localised and pertains to the area (often a street) where the group is officially registered from. This however does not mean all individual

Table 1
Taxation of sand extraction.

| | 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 |

⁷ Interview with leader of CHAWAMADA, 2 October 2021.

miners also belong to this area. Getting the river cleaning permit can be slower as the Municipal Environmental Committee has to assess whether river cleaning is necessary in the particular stretch of river. Also at the level of the river cleaning task force delays are common as they were said to take their time to inspect and to satisfy themselves before issuing a contract. While not liked by the miners, from a sustainability perspective this could be seen as positive and point towards a certain level of rigor in making such a decision.

The sand labour association CHAWAMADA plays a formal role in the process and have to approve of the contract as well. Both the river cleaning task force, as well as CHAWAMADA receive a TSH 50000 (€21.4) fee for each contract. One inconsistency was the payment of a (larger, but yearly) fee of e.g. TSH 300000 (€129) to the Mining commission in some districts, but not in others. Minor instances of corruption were also flagged where local administrators sometimes request a fee/bribe to help with drafting the group's constitution.

It is clear that, maybe apart from the irregular fee to the mining commission that both the administrative process as well as the costs involved (a total of TSH 110000) did not place a very high burden on group formation. We did get reports that some people opted out because they did not trust the group to handle the finances well, but overall the costs seem affordable. Moreover, the administrative procedure to register as a sand miner group, was one already in use for other livelihood activities. Both elements are important as high fees and problematic administrative procedures are among the most listed hurdles to effective ASM formalization. Proximity to administrative headquarters Dar es Salaam of course made access to the relevant bureaucracy relatively easy, but a lot of key administrative procedures were decentralized to the local level and formulated within a pre-existing administrative procedure. A key concern however, and in some related to the property discussion mentioned above, is the relatively short duration of the river cleaning contracts. While obviously in line with the stated purpose (river cleaning), this might in theory make it difficult for miners to establish sustainable livelihoods, as their groups were registered in a particular area. However, in practice the effects seem limited, as miners did not report a lack of work or a closure of mining opportunities because of this. This however can also point to unsustainable over-extraction once an initial permit has been given.

Formalization of ASSM did in practice entail simple legalization. As mentioned in the overview on ASM formalization above, it is quite common that legalization does not go hand in hand with extension activities, training or credit opportunities. In ASSM in Dar es Salaam, the major motives of formalization have been to legalize the operations of the sector and to gain revenue. None of the groups reported to receive supports in terms of training or access to finances from government authorities.

Moreover, although the local government authorities (municipal and district councils) do provide loans to registered groups of youths, women and people with disabilities, the respondents reported not to have received any information from the authorities on such opportunities. In one of the wards, the councilor said that most male-dominated ASSM groups face the problem of age limit: men must be under 35 years to qualify as youth groups and receive one of these loans. However, importantly, the community development officer mentioned that the groups never showed any interest in receiving loans because they earned enough from the sand mining. This was to some extent contradicted by the chairman of the CHAWAMADA who mentioned that most groups did not possess knowledge about loans or financial management.

Access to loans seems most important when (groups of) chepe miners would want to upgrade their tools and use e.g. excavators. While a few respondents expressed such a wish, the leader of one group preferred to work in group, with *chepe*. He argued that if excavators would be allowed, people would lose their jobs. He also mentioned that the use of manual tools is one of the things that brought them to work together in a team: it assured the survival of the group. More in general, the limited opportunities to mechanize as chepe labourers was part of the central

distinction made in the formalization framework, organizing sand extraction either manually in groups, or allowing for mechanised extraction under a single contractor (hiring an excavator driver and maybe an assistant).

4.2.2.2. Contractors. Contractors, who were less willing to share details of their activities, fall under a different regulation. As was mentioned above, contractors are supposed (see below) to handle big contracts for major infrastructure, both public and private. According to our respondents, sand extraction by excavator first started with official permission in 2018 in river Mpiji. Chinese contractors were said to have surveyed different rivers around Dar es Salaam and found the sand in this river best suited for bridge construction. Earlier, a contractor said, they already had been supplying sand for large government projects, but according to respondents with both CHAWAMADA and the river cleaning task forces they had only been allowed to supply the material, but not extract sand with machines from the river. After 2019, sand mining with excavators was extended beyond river Mpiji to other rivers around Dar es Salaam.

In any case, contractors had first started to appear in the business as suppliers of sand for major government infrastructural works. They had to be registered not at the local level, but as private companies under the Business Registration and Licensing Agency (BRELA) as a qualification to get a river cleaning permit. Contractors would be expected to control the full supply chain and own not only the excavators digging up the sand, but also the trucks delivering directly to customers. In contrast to chepe miners, where the truck drivers taking the sand are responsible to pay taxes, contractors are themselves responsible to pay the necessary taxes. They would as such have to be fairly big operators and maybe surpassing the threshold to still be considered ASM operators in Tanzania. However, all contractors we spoke to did not own the excavator they used, nor the trucks but rather rented them, at considerable cost. It seems that without (government-supported) loans, acquiring expensive excavators, let alone a fleet of trucks, was beyond the means of the contractors.

4.2.2.3. Chepe-contractor competition. This clearly is one of the weak points of the formalization exercise. A clear division of both sand markets and labour was part of the guidelines. Chepe miners were supposed to load the smaller trucks up to 10 CBM, mostly supplying to a private market for smaller infrastructure, while contractors should load larger trucks that they were then supposed to own as well for large scale (public) infrastructure. But as the contractors not only did not own their own trucks, but also did not always have contracts for infrastructural works, they mostly supplied to trucks coming to the extraction site, often in direct competition with *chepe*. As one *chepe* leader argued⁸:

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.

Truck drivers, whose income depended on making as many sand trips in a day, indeed would often prefer to take sand from excavators, which while more expensive, were much faster to fill their trucks allowing for many more trips. Lack of enforcement, maybe combined with the lack of opportunities to derive a stable income from contractor work if only focusing on the supplying large-scale infrastructure, created conflicts between the two, officially separate forms of extraction.

⁸ Interview with sand labourer, site C, 29 September 2021.

While the absence of true LSM activities makes some of the hindrances for ASM formalization, not applicable to the case discussed here., the conflicts between contractors and *chepe* are reminiscent of ASM-LSM conflicts. Also in this case, the government's policy imperative to have larger sand suppliers for large-scale infrastructure seems to have come into conflict with the other policy imperative to create employment opportunities, mainly for unemployed youth with limited education. In most cases, informal agreements had been reached between *chepe* and contractors, for instance marking contractor trucks more clearly (regardless of size) or dividing up the smaller trucks to allow for both *chepe* and contractor opportunities.

4.3. Formalization effects

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. This was not only the case for the artisanal miners themselves, but also for the truck drivers who used to transport sand illegally.

After the formalization, drivers would carry the tax receipts as legal proof that they were transporting legally mined sand and this had greatly decreased harassment.

However, the registration of groups of artisanal miners also had a number of exclusionary effects. First of all, while women sand miners were active in the illegal sand mine in our sample, no women were working as miners in the legal extraction points. While this is no conclusive evidence of the absence of women in all formal mining sites, it is a point of concern (for more details see Shitima et al., forthcoming). Secondly, as only members of the registered groups were part of the official permits, this made it harder for new sand miners to become active in these sites. While earlier the *Wakurungwa* would have enabled new recruitment, this now was more static. New miners would enter as helpers or assistants (*ngara*) whose payment was up to the registered member they worked as *ngara* for.

New entrants could however become part of new groups. Indeed, the research team heard frequently about 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 can go hand in hand with environmental protection and anti-flood measures defined at the onset of the formalization process.

Members of the village communities where sand mining took place were divided on the benefits of sand formalization. Some argued that sand mining was not really the source of the river erosion which was taking place; For others the more limited illegal extraction had now been replaced with more intensive sand extraction causing damage to river-banks and houses alongside it.

These would also stress the lack of oversight by the relevant authorities. They would e.g. argue that⁹

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.

While *chepe* miners would deny this allegation, one key element seems to be the lack of community benefits out of sand mining. While the local government would collect taxes, these taxes not only were far lower than those collected by municipal or national government bodies, this also seems not to have been directly associated with community benefits. Some *chepe* miners were sensitive to the issue and had contributed voluntarily, giving donations of construction material (including sand obviously) to the local government offices or to local

schools. Contractors were requested to repair roads and bridges—which were of course sometimes damaged by heavy sand truck traffic—which both served their own, but also community interests.

While complaints were thus voiced by local communities, the wider environmental concerns were hard to ascertain beyond perception and warrant more research. The mentioned increase in sand labourers and sand labourer groups might point to overextraction. The careful balancing of policy concerns: sand for infrastructure, taxation, employment, and river cleaning, flood prevention and the environmental protection of the river system, is possibly made more challenging given the presence of many government institutions all having their own interests. Strong oversight to connect these issues is necessary. More research into the environmental effects of (formalized) river sand mining, both by government and independent research bodies, a must. Again the broader body of literature on the relation between ASM and the environment (see e.g. Hook, 2019; Zvarivadza and Nhleko, 2018) could provide a starting point. However there is also a (growing) body of literature, mainly by geologists and environmental scientists relating specifically to the impacts of sand and gravel mining on river beds and banks, and on aquatic flora and fauna (Hackney et al., 2020; Kondolf, 1997; Padmalal et al., 2008), although in this case it remains important to distinguish between artisanal and small-scale mechanised extraction and large-scale dredging operating in some of these contexts (Padmalal et al., 2008).

5. Conclusion

This article aimed to unpack the formalization of river sand mining in the Dar es Salaam region. Given the lack of both literature on legal river sand mining and on formalization in the sector itself, this case study can provide key lessons in thinking about such formalization efforts or continued bans in other countries. The case study shows that infrastructural development was the key driver of sand mining and formalization a way not only to better control the existing sector and the employment opportunities entailed, but also to be able to tax the sector better. Moreover, river cleaning and the prevention of floods by the taking away solid waste and sand was the official starting point of the formalization exercise. The formalization effort created two types of ASSM: one fully manual (*chepe*) and one using excavators (contractors), but still at a relatively small scale as compared e.g. to dredging operations. Formalization entailed foremost legalization, with limited extension activities present. Of key importance was the task force with representatives of a host of government agencies having an interest in regulating, but also in taxing the trade with most of them having a local agent at the sand mining sites.

Miners were largely content with the formalization efforts as it stopped long-term harassment by government agents. This was supported by sand truck drivers who faced similar harassment and corruption while the trade was still illegal. While many young men have joined the business after formalization, it seems to have had some exclusionary effects as well, mainly on women. Members of riverine communities were very divided on the impacts of sand mining in and near their villages citing further erosion as a key problem, but also stating the lack of impact on village development. Others saw the employment opportunities as a key benefit.

While government agents were present, there also seems to be a potential lack of oversight as soon as the mining site has been established and approved. While environmental protection was one of the key drivers of the *river cleaning* operation, the impact of sand mining and formalization on the environment warrants research. Beyond the case study, more research is necessary on the governance of sand mining, looking at the functioning of both a formal and informal governance mechanisms operating in the sector, in line with other research focusing on ASM in Tanzania (see in particular: Jønssen and Fold, 2014). Given the boom of sand mining for infrastructural development, it remains necessary to also look into alternatives for sand in other to sustainably

⁹ Interview with community member, site A, 24 September 2021.

govern sand mining, in Tanzania and beyond.

Credit author statement

Bert Suykens: Conceptualization, Methodology, Writing- Reviewing and Editing, **Christina Shitima.:** Data curation (Data collection, management and analysis); Writing- Original draft preparation.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Bert Suykens reports financial support was provided by VLIR-UOS. Bert Suykens reports financial support was provided by Norges Forskningsrad.

Acknowledgments

This work was supported by the Policy Supporting Research (PSR) programme of Ghent University under the Belgian development cooperation (DGD). (Author's) Research on sand is also supported by a Research Council of Norway. We want to thank Jeroen Cuvelier for comments on an earlier version of this article.

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