



Environmental and social impacts of gold dredging in the Niger River bed: The case of Banco Coura Village in the commune of Sanankoroba

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Abstract

Within about ten years, gold dredging has replaced traditional artisanal gold panning in the bed of the Niger River upstream of Bamako. In Banco Coura, in the rural commune of Sanankoroba, artisanal and mechanised dredges suck up river sediments every day, even though the 2019 and 2023 mining codes prohibit the practice. We sought to understand what this activity changes for the environment and for riverside communities. The study combines a literature review, direct observations of the river and its banks, and a survey conducted in August–September 2025 among thirty purposively selected people: housewives, farmers, fishers, artisanal gold miners and dredge operators, supplemented by key informants (town hall, National Directorate of Geology and Mines, an ecologist). Quantitative data were processed in Excel and interviews through content analysis. Four out of five respondents (80%) note that the river has changed: murkier water, collapsing banks, scarcer fish. Six out of ten say they have been personally affected, through the loss of farmland or difficulties in accessing drinking water, and 70% report waterborne diseases. Conflicts between gold miners, farmers, fishers and herders are reported by 73% of respondents. Yet 40% oppose a halt to dredging, for lack of any other source of income, and all call for job creation. Dredging thus appears as a paradox: it provides a living for part of the village while destroying the very resources on which that village depends. Rather than yet another ban, the way forward lies in the economic reconversion of young people, regular environmental monitoring of the sites, and genuine enforcement of mining regulations.

Keywords: Gold dredging, Niger River, environmental impacts, land-use conflicts, Sanankoroba

Introduction

In West Africa, artisanal gold mining is no longer a side activity. For millions of rural people, it has become a way of coping with poverty (Hilson, 2009) ^[5]. In Mali, Hilson and Garforth (2012) ^[6] showed that its expansion closely tracks the difficulties of smallholder farming: when the harvest is no longer enough, people turn to gold. The Malian artisanal sector is estimated to produce between 6 and more than 20 tonnes of gold per year and to employ around 500,000 people at some 350 sites (Sidibé and Camara, 2020) ^[17].

Over the past decade, part of this activity has moved from land-based placers to the beds of watercourses themselves. Dredging consists of sucking up bottom sediments with pumps mounted on boats, then washing them to extract the gold. On the Baoulé, a tributary of the Niger, Maïga *et al.* (2022) ^[12] describe dredges fitted with old vehicle engines, consuming 40 to 50 litres of diesel a day, and operators handling mercury and cyanide without knowing the doses. Riverside residents there report the near-disappearance of 78% of fish species.

The effects of this type of extraction on a watercourse are well known. Deprived of its sediments, the river takes them back from its banks and bed: the channel deepens and the banks collapse (Kondolf, 1997) ^[11]. The review by Koehnken *et al.* (2020) ^[10] adds increased turbidity and the destruction of spawning grounds. In the case of gold,

mercury comes on top of this, artisanal mining being the world's largest source of mercury emissions (Esdaile and Chalker, 2018) ^[3]. In neighbouring Burkina Faso, Bohbot (2017) ^[2] speaks of an “economic windfall” whose social and environmental consequences remain “poorly controlled”.

The Malian State responded with a ban. Ordinance No. 2019-022 of 27 September 2019, followed by Law No. 2023-040 of 29 August 2023 ^[14, 15] on the Mining Code, prohibit gold dredging in watercourse beds (Republic of Mali, 2019; 2023) ^[14, 15]. On the ground, however, dredges continue to operate upstream of Bamako (Traoré, 2023; Sanogo, 2025) ^[16, 19].

Scientific studies on gold dredging in the Niger River itself remain scarce. Available work focuses on land-based gold mining, on tributaries or on sand extraction; regarding the latter, Hemmler *et al.* (2025) ^[4] describe a rather peaceful coexistence with farming and fishing around Bamako. Does gold dredging have the same effects? We set out to examine this at the scale of a single village, Banco Coura, by looking at what riverside residents observe in the river, what this changes in their daily lives and relationships, and the solutions they themselves envisage. Our hypothesis is that dredging provides a living for some of the village's young people while degrading the resources on which other activities depend, thereby fuelling land-use conflicts.

Methodology

1. Study area

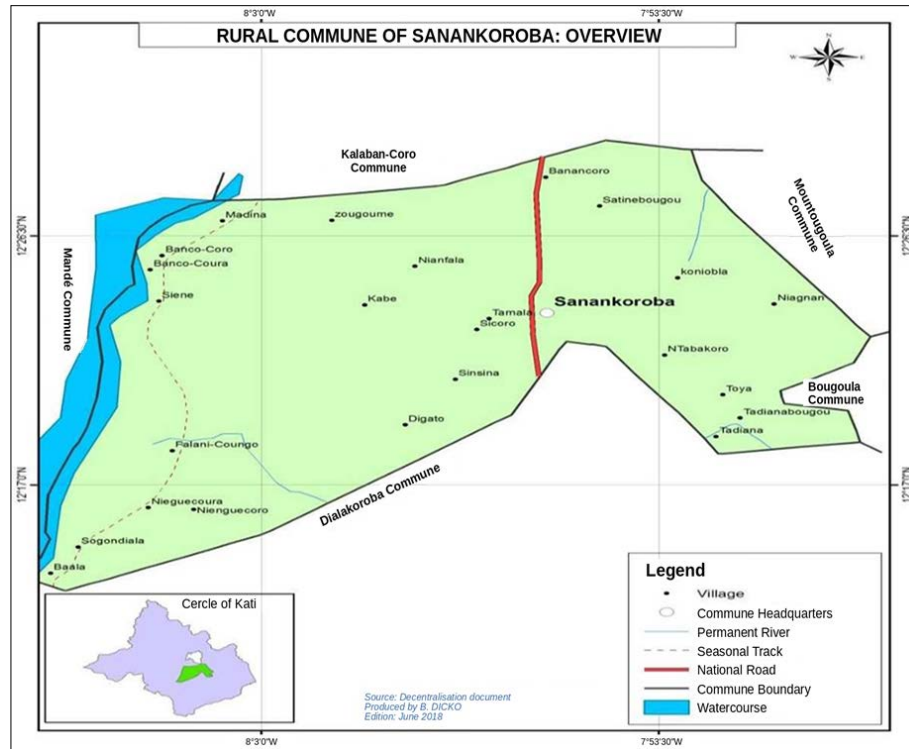


Fig 1: location map of the rural commune of Sanankoroba

Banco Coura is a riverside village on the Niger River, part of the rural commune of Sanankoroba in the Cercle of Kati (Koulikoro Region). Sanankoroba lies about thirty kilometres south of Bamako, on National Road 7 leading to Bougouni. The climate is Sudanian, with a rainy season from June to October that sets the pace of both farming activities and the river's flow regime. The village has traditionally lived from farming, fishing, livestock rearing and riverbank market gardening. Over the past decade, gold dredging has taken hold to the point of turning the riverbank into a veritable work site: artisanal and mechanised dredges, shelters, tents and equipment depots follow one another along the shore.

2. Data collection

We combined three sources of information.

The literature review covered work on artisanal gold mining and in-river sediment extraction, the Malian mining codes of 2019 and 2023 [14, 15], and grey literature (reports, investigative journalism).

Direct observations were made on the river and its banks in September 2025 [4]. We recorded the types of dredges, how sediments are washed, the condition of the banks, the colour of the water and the occupation of the riverbank, photographing each situation.

The field survey took place in August–September 2025 among thirty people, purposively selected to represent the different users of the river: housewives, farmers, fishers, artisanal gold miners and dredge operators. We also conducted interviews with three key informants: a representative of the Sanankoroba town hall, an officer of the National Directorate of Geology and Mines (DNGM) and an ecologist. Table 1 summarises this set-up.

Table 1: data collection set-up

Tool	People or places concerned	Information sought
Questionnaire	30 riverside residents (housewives, farmers, fishers, artisanal gold miners, dredge operators)	Changes observed in the river, effects on living environment, access to drinking water, waterborne diseases, conflicts, wishes and recommendations
Interview guide	Town hall, DNGM, ecologist	Regulations, control of the activity, perception of impacts, possible solutions
Observation grid	River bed, banks, dredging sites	Types of dredges, condition of banks, appearance of the water, occupation of riverbanks
Literature review	Articles, reports, legal texts	Analytical framework, state of knowledge, regulations

Source: Personal surveys, 2025

3. Data processing and analysis

The questionnaire was entered and processed in Microsoft Excel. For each closed question, we calculated percentages based on a sample of thirty people. Interviews were transcribed

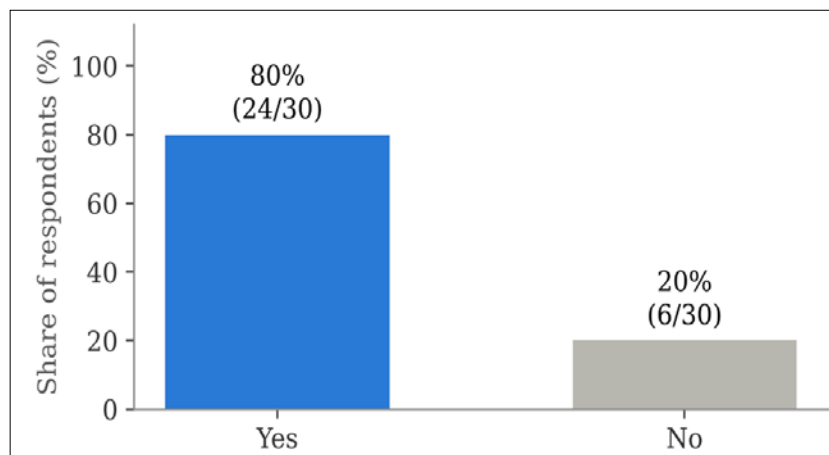
Then analysed by theme (Bardin, 2013) [1]: environmental degradation, effects on livelihoods, relations between users, proposed solutions. Photographs were treated as observations in their own right and compared with the statements collected.

Results

1. Changes observed in the river

When asked “Have you noticed any changes in the river

bed?”, twenty-four out of thirty respondents answered yes, i.e. 80%. The other six believe that dredging has no effect on the river (figure 2).



Source: field survey, 2025

Fig 2: Respondents’ views on changes in the river bed

Three changes come up in almost every interview: the water has become murky, the banks are receding and fish are becoming scarce. Our observations of the river point in the

same direction. Table 2 sets respondents’ statements side by side with what we observed on site.

Table 2: changes in the river environment reported by respondents and observed in the field

Change	What respondents say	What observation shows
Murky water	River water can no longer be used for domestic needs	Yellow-ochre water, wash water discharged directly into the river (figure 4a)
Bank erosion	Riverside fields are falling into the river	Gullied banks, collapsed blocks of soil, trees with exposed roots (figure 3)
Fewer fish	Catches are declining year after year	River bottom constantly stirred up in dredged areas
Clogging of the river bed	Ever more numerous and more powerful dredges	Artisanal and industrial dredges, machinery abandoned on site (figures 1 and 4b)

Source: field survey and observations, 2025.

Along several stretches of the riverbank, the ground has collapsed in whole sections. Near one tree, the bank has receded so far that the roots are laid bare (figure 3a). Further

on, cattle rest on a cracked bank, where they usually go down to drink (figure 3b).



(a)



(b)

Source: Personal photographs, 2025

Fig 3: (a) Eroded bank and tree with exposed roots; (b) cattle on a weakened bank, a watering and grazing area.

The water has a yellow-ochre tint everywhere (figure 4a). Around the dredges, wash water is discharged directly back into the river. Two types of machines operate side by side. Artisanal dredges are assembled from pipes, jerrycans and salvaged engines; young people from the village, both men

and women, work on them. Industrial bucket dredges are much larger; according to our observations and the respondents, they are often owned by foreign operators, notably Chinese (figure 1b). Some, no longer in working order, have been left on the riverbank (figure 4b).



Source: personal photographs, 2025.

Fig 4: (a) River water laden with fine particles; (b) bucket chain of an abandoned industrial dredge.

2. Effects on living conditions and health

Table 3 groups the responses on daily life and health.

Table 3: effects of dredging on respondents' living conditions and health (n = 30)

Question	Yes (n)	Yes (%)	No (n)	No (%)
Does dredging harm your living environment?	18	60.0	12	40.0
Have you been personally affected?	18	60.0	12	40.0
Do you have difficulty accessing drinking water?	18	60.0	12	40.0
Have you observed or experienced waterborne diseases?	21	70.0	9	30.0

Source: field survey, 2025.

Eighteen out of thirty people believe that dredging degrades their living environment, and the same number say they have suffered from it directly. They speak of fields swept away by collapsing banks, falling harvests and water that can no longer be used. The other twelve, by contrast, say they make their living from this activity.

Access to drinking water is a problem for 60% of respondents. Those who have no difficulty have a well or a borehole. Twenty-one people, or 70%, say they have observed or experienced water-related diseases, which they attribute to dredging.

On the dredges, no one wears gloves, boots or a mask. They work right next to the petrol engines, in the exhaust fumes (figure 5).



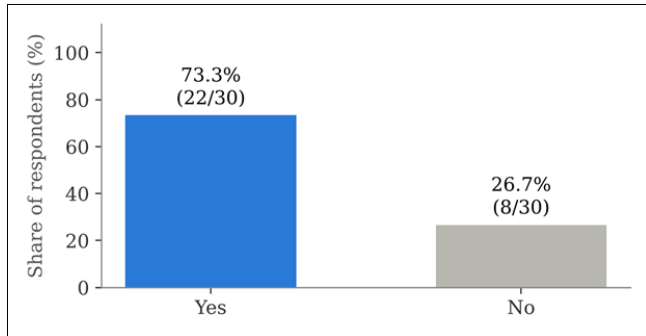
Source: personal photographs, 2025.

Fig 5: Artisanal dredge operated without protective equipment

Interviews and our observations also point to the arrival of many migrants from other regions of Mali and from abroad. The village population is growing quickly, the cost of living is rising, and problems previously little known are emerging: insecurity, prostitution, child labour.

3. Land-use conflicts

Nearly three quarters of respondents (73.3%) have witnessed conflicts related to dredging, i.e. twenty-two out of thirty people (figure 6).



Source: field survey, 2025.

Fig 6: respondents' observations on conflicts related to dredging

Tensions pit dredgers against three groups of river users. Table 4 specifies, for each group, the contested resource and what triggers disputes.

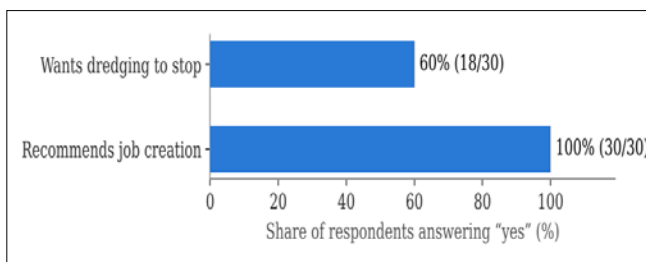
Table 4: actors in conflict with dredgers and sources of tension

Group	Resource at stake	What causes the tension
Farmers	Riverside land	Bank collapse and loss of fields
Fishers	Fish, fishing grounds	Dwindling fish stocks, occupation of the river bed by dredges
Herders	Watering points, riverbank pastures	Dangerous banks, poor-quality water for livestock

Source: survey and interviews, 2025.

4. Respondents' views on the future of dredging

Eighteen respondents (60%) would like dredging to stop. Twelve (40%) are opposed (figure 7). The arguments of both sides are summarised in Table 5.



Source: field survey, 2025.

Fig 7: Wish to stop dredging and recommendation for job creation.

Table 5: arguments put forward for and against stopping dredging

Position	Number (%)	Arguments put forward
For stopping	18 (60%)	Destruction of farmland, water pollution, degradation of the living environment
Against stopping	12 (40%)	Source of income, reduced unemployment, keeping young people away from delinquency

Source: field survey, 2025.

Those who oppose stopping mainly talk about income and unemployment. One respondent put it bluntly: "If you ever ask them to stop this activity, I say it loud and clear, they will all end up delinquents and they will spread terror in the village." A young operator adds: "Don't think I didn't study; I just didn't find work. The village is full of educated people without jobs. I would a thousand times rather die trying to feed my family with dignity than do nothing and watch them starve. Asking us to stop this activity is like asking us to watch our mothers, our fathers, our children and our wives starve to death."

One demand, however, unites everyone. All thirty respondents, whether for or against dredging, want jobs to be created so that young people can leave the activity (100%).

Discussion

1. A river weakened by dredging

What riverside residents describe, and what we saw, closely resembles what the literature predicts for watercourses subjected to sediment extraction. Kondolf (1997) ^[11] explains that a river deprived of its sediment load seeks it elsewhere, in its bed and banks. This is what is happening in Banco Coura: the banks give way, riverside fields disappear, trees are uprooted. Padmalal *et al.* (2008) and Koehnken *et al.* (2020) ^[10, 13] add that this bank retreat eventually feeds siltation downstream, which reduces flow capacity and can worsen flooding. The phenomenon observed here is therefore by no means a local peculiarity.

Water turbidity and declining catches point in the same direction. By clogging spawning grounds and reducing light, resuspended fine particles weigh on fish reproduction. On the Baoulé, Maïga *et al.* (2022) ^[12] report that riverside residents have seen 78% of the species they knew disappear; around Bamako, Sanogo (2025) ^[16] describes the same concern among fishers.

We must nevertheless remain cautious on this point. Hemmler *et al.* (2025) ^[4], who measured the turbidity of the Niger around Bamako, found no link between sand extraction and water colour: turbidity mainly follows rainfall, from 13.2 NTU in May to 56.5 NTU in July. Gold dredging differs from sand extraction, since it stirs up fine sediments and returns wash water to the river. Still, our observations were made during the rainy season, when the water is naturally laden with sediment. Without measurements upstream and downstream of the sites, and across several seasons, we cannot isolate the share attributable to dredging.

2. Health and water access unevenly threatened

The waterborne diseases cited by seven out of ten respondents are a matter of perception. Our survey does not allow us to link them to dredging with certainty, especially as sanitation and the rainy season also play a role. This concern nonetheless has good grounds. The mercury used in artisanal gold mining reaches workers through vapours and fish consumers through accumulation in the food chain (Esdaile and Chalker, 2018) ^[3]. In Mali, Human Rights Watch (2011) ^[9] showed that children are particularly exposed. The working conditions we observed, without any protection, add more immediate risks: poisoning from fumes, accidents, drowning.

The drinking water issue also reveals an inequality. Households with a well or borehole manage; those who

depended on the river bear the full brunt of its degradation. Dredging therefore does not affect everyone in the same way, and those who pay the price are not always those who earn an income from it. Finally, the influx of migrants and the rising cost of living recall what Sidibé and Camara (2020) ^[17] described around the gold-mining sites of Kadiolo: gold transforms local society far beyond the river.

3. Conflicts born of competition over the river

Homer-Dixon (1999) ^[8] showed that the degradation of a renewable resource, when access to it is unequal, fuels local conflicts. The tensions recorded in Banco Coura fit squarely within this framework. Farmers, fishers and herders depend on the same river as the dredgers, and each loses something to their activity: land, fish, a watering point for livestock.

Inequality in fact operates at two levels. It separates those who extract from those who farm, fish or herd. It also runs through the world of dredgers, where young villagers on their makeshift boats have little in common with the operators of large industrial dredges, who are often foreigners. The presence of women on artisanal dredges further shows that, under the pressure of need, the activity recruits well beyond young men.

Our results qualify those of other studies. Hilson and Garforth (2012) ^[6] showed that artisanal gold mining can complement farming, and Hemmler *et al.* (2025) ^[4] describe a “symbiotic” relationship between sand extraction, cropping and fishing around Bamako, with sand income being used to buy inputs and equipment. In Banco Coura, gold dredging appears to have the opposite effect. By destroying riverbank land and spawning grounds, it deprives other activities of their base instead of financing them.

4. Between economic survival and prohibition

The split between supporters and opponents of dredging recurs almost identically from one question to the next: 60% versus 40% for living environment, for having been affected and for wishing it to stop. The sample probably divides into two fairly stable groups: those who suffer from the activity and those who live from it. A cross-tabulation by occupation would make it possible to verify this.

The operators’ statements are unambiguous. They see the damage, but they see no other way to feed their families. Hilson (2009) ^[5] sees artisanal gold mining first and foremost as a response to poverty; Bohbot (2017) ^[2] sees it as an economic windfall with poorly controlled consequences. The young people of Banco Coura illustrate both readings.

This also explains why the ban has had little effect. In force since 2019, it offers no solution to those who live from dredging, and the dredges keep running (Traoré, 2023; Sanogo, 2025). Teschner (2012) ^[16, 18, 19] made the same observation in Ghana, where repression mainly drove artisanal mining underground. Hilson and Maconachie (2020) ^[7] propose another path: recognising the place of artisanal mining in rural economies and integrating it into development policies.

The respondents’ unanimity on job creation points in this direction. It suggests that young people do not defend dredging for its own sake, but because it is their only source of income. It is from this point of agreement that public action has the best chance of succeeding.

Conclusion

We wanted to find out what gold dredging is changing in Banco Coura. The answer is clear: it has transformed the river. Four out of five riverside residents note this, and our observations confirm bank erosion and the murky colour of the water. These changes weigh on daily life: six out of ten respondents say they are affected, as many struggle to find drinking water, and seven out of ten mention water-related diseases. They also fuel tensions between dredgers, farmers, fishers and herders, reported by nearly three quarters of respondents.

Yet for part of the village, dredging remains a matter of survival. Four out of ten respondents oppose stopping it for lack of an alternative. Therein lies the paradox: the activity supports families while destroying the resources on which the whole community depends. As long as this paradox is not addressed, the ban will remain largely a dead letter.

Our results first call for offering young people other prospects, as respondents unanimously request: vocational training, support for irrigated agriculture, market gardening and fish farming, and access to microcredit. They also argue for regular monitoring of the sites, involving technical services, the commune and users, with measurements of water quality and bank condition, and for the restoration of the most degraded banks. Finally, regulations must be enforced in earnest, targeting first the industrial dredges, whose impact is heaviest, and involving communal and customary authorities.

Much remains to be measured. Water and sediment analyses, particularly for mercury, upstream and downstream of the sites and across several seasons, would make it possible to move beyond perceptions. Monitoring of the banks using satellite imagery and a broader survey, cross-tabulating responses by stakeholder category, would usefully complement this initial study.

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