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The lifeways of small-scale gold miners: Addressing sustainability transformations

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ABSTRACT

Small-scale gold mining sustains millions of people's lives and yet it stimulates environmental harms and social conflicts. Global environmental crises drive calls for fundamental change to how people live on the planet. For small-scale gold mining, this raises questions about whether current dynamics can provide a basis for sustainability transformations. Proposing the notion of gold lifeways to focus on the lived experience of mining and gold resources as relational phenomena, we ask what sustainability looks like from different miners' perspectives and probe the practice dynamics of current transformation. Our methodology is social science-led and transdisciplinary. From multi-sited and trans-regional research between South America and Africa, we draw cases from Suriname, Guinea Conakry, and Uganda. Our study finds that gold lifeways give expression to different strands of sustainability: sustaining everyday life in mining; discourses framing mining practices; and government repression of mining. Hence, as our empirical data demonstrates, miner perspectives on sustainability gain content not in isolation, but as part of gold lifeways embedded within different contexts and shaped by societal dynamics. Ultimately, the transformative potency of small-scale gold mining is located in personal lives and precarious dynamics rather than glittering promises of a sustainable future.

1. Introduction

In Suriname in South America, miner Pretinha Nascimento has no plan to return to her home country, Brazil. To our camera,[1] she confides that she loves the independence of mining. Although most mine owners are male, she is not the only female entrepreneur in the gold business. The income is higher than she could earn in Brazil, although she has had bad luck for a long time. For more than a year, she and her husband with some loyal crew have been moving from one potential mining site to the next, but they have been unable to set up a proper operation. At the time of filming, the plan to restart an old mine was at a standstill because the excavator was broken and Pretinha had exhausted her savings. Nevertheless, she continues, the men pan some gold from old tailings for pocket money, and she negotiates with moneylenders and investors to rig up a working mine again. As Pretinha explained, being a mining entrepreneur gives freedom, comradery, being able to make your plans;

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[1] *Ouro Surpreende a Gente (Gold Surprises Us),* by Júlia Morim de Melo and Marjo de Theije (2022) https://filmfreeway.com/GoldSurprisesUs.

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after all, there is always the chance that luck will come to your side, and you can make good gold.

In Ghana in West Africa, miner Zakari Imrana searches for gold in the Upper East Region. Here, there is a history of gold mining, although a Chinese company now threatens the prospects of small-scale miners. Speaking to our camera,[2] Zakari explained that he quit school in southern Ghana to follow an uncle who mines. In his words, gold mining is very hard; you need enough money to invest before you get it … [gold] …out. When you are working in mining and you do not have enough money, you find it so difficult. Your boys need food from you; your machines take fuel from you. Your boys, your machines, even the pit itself. If you don't have the money, you can't, because the work is very hard …[but]…in this life when you are determined to do something you have to be bold…[and]… if you keep trying you may achieve what you want.

Pretinha and Zakari's narratives hint at the mining contexts in which they are working and how they negotiate experiences of precariousness. These are personal stories and those of other miners differ, of course, shaped by different experiences, knowledge and skills, work roles, gender identities and forms of intersectionality. Nonetheless, what such narratives point towards, and as our cases will explore, is the need to understand peoples' lived experiences of mining and the contexts that shape these experiences. By so doing, we can gain insight into how gold miners engage with and transform their relationships to the natural, social, political, and economic worlds, enabling us to probe issues of sustainability and transformation.

To address transformations to sustainability with respect to small-scale gold mining, our starting premise is that anthropologists can shed light on situated notions of mining (un)sustainability. Hence, in this article, we ask what sustainability looks like from different miners' perspectives, and question what the characteristics of current transformation are.

We turn to describe the project that provides our empirical data and in Section 2 present background on small-scale gold mining and the concept of lifeways, then we will outline the structure of the article and capture our argument.

We draw the narratives of Pretinha and Zakari from films[3] made for a transdisciplinary research project 'Sustainability Transformations in Artisanal and Small-scale Gold Mining: Trans-Regional and Multi-Actor Perspectives' (2018–2022) or 'Gold Matters'. The project examined whether and how societal transformations towards sustainable mining futures are possible in small-scale gold mining. It combined anthropology, industrial ecology, mining engineering, and remote sensing with non-academic collaboration through art and video (Fisher et al., 2021; Fisher et al., 2022).[4] We refer to our collaborations as co-labouring to convey how it is possible to work together and gain mutual understanding, while recognising differences and inequalities (de la Cadena, 2015; Pijpers and Luning, 2020). Photographer Nii Obodai, painter Christophe Sawadogo, and filmmakers Júlia Morim and Gideon Vink co-laboured with miners and researchers, with the intention of enhancing understandings of small-scale gold mining by publics and specialist audiences.

2. Gold Matters

Turning to small-scale mining, statistical data is notoriously weak (World Bank, 2019). Nonetheless, as an indication, it provides employment for an estimated 44.75 million people worldwide (70 percent men, 30 percent women) (World Bank, 2020: 1). Approximately half are gold miners who generate 20–30 percent of global gold production (IGF, 2017). A further 134 million people work in related industries (World Bank, 2019: 71). Small-scale gold mining refers to extraction and processing through manual or partially mechanised techniques, although the scope of extraction, capital invested, and degree of mechanisation is intensifying. With potential for income-generation, mining creates employment and can drive rural transformation. This form of mining has a long history, bound to global processes of world-making (Luning, 2013).

Gold is a high value mineral and rising prices attract people either to start mining or to rework sites; declining prices are a deterrence, but some people will continue. Since abolishment of the gold standard in the 1970s, gold markets became volatile. This coincided with growth in industrial gold mining (Verbrugge and Geenen, 2020: 53-65). As indicated in Fig. 1 with project period highlighted, since 1970 there have been peaks in gold prices. Since 2000, prices have risen dramatically despite volatility, with an almost sevenfold increase to 2022.

Although economically significant, small-scale gold mining is associated with an economic resource logic that drives environmental harms and social ills. These include the consequences to humans and animals of toxic mercury intake; physical injury and death; damage or destruction of forests, farmlands and wetlands; the pollution of soils and waterbodies; social conflict; and associations with armed groups and violence. In short, addressing the future of small-scale gold mining and questions of sustainability is hugely problematic.

Government approaches to gold sector development can reinforce these environmental and social challenges. How informality is used to stigmatize and criminalize miners is at the heart of this issue (e.g. D'Avignon, 2022; Kaufmann and Cote, 2021). Consistent with a negative view of small-scale gold mining, government strategies for mineral sector development typically privilege large-scale industrial gold mining, with laws and regulations being often inapplicable to small-scale gold mining.

Eighty to ninety percent of small-scale gold mining characterised as unlicensed and informal (Hinton, 2006; World Bank, 2020). Hence, 'formalisation' – private mineral rights within a regulatory framework to govern these rights - has been a dominant paradigm framing policy approaches to small-scale mining for at least two decades (Hilson et al., 2022; Hilson and Maconachie, 2017; Mathis, et al., 2018; Spiegel, 2012; World Bank, 2020). Formalisation initiatives are a conduit for environmental sustainability-related actions, such as mercury elimination in gold processing (Hilson et al., 2017; World Bank, 2020).

There is extensive literature on the successes and failures of formalisation initiatives and there isn't space to repeat these debates (e.g. see Damonte, 2021; Hilson and Maconachie, 2017; Hilson et al., 2022; Hook, 2019; Jonkman, 2019; Munkherdene and Sneath, 2018; Spiegel, 2015; Verbrugge, 2015). Worth noting, however, is how studies problematize formalisation as being desirable for small-scale miners, given how it is based on a legal dualism that is both political and normative (Geenen, 2016; de Theije et al., 2014). In this vein, Luning (2013) argues that in mining localities, distinctions between legality and illegality become blurred, and what is relevant is how 'legal fictions' are put to work in the making of inequalities and territories.

To explore an occupation where people seek freedom and agency to create their own futures, and what this implies for consideration of transformations to sustainability, we move beyond a preoccupation with informality and the challenges of formalisation. Instead, inspired by work on materiality in mining we build on perspectives that treat mineral resources as relational phenomena, hence being more than 'already there' materials named as resources (e.g. Ferry and Limbert, 2008;

[2] *Gold Matters in Kejetia (Gbane, Ghana): Future Makers,* by Gideon Vink, Sabine Luning, and Nii Obodai (2022) https://vimeo.com/778468702?embedded=true%26source=vimeo_logo%26owner=147435576.

[3] See also: *Gold Matters in Tarkwa (Ghana): Taking Small-scale Mining to the Next Level*, by Gideon Vink and Sabine Luning (2022) https://vimeo.com/778457447?embedded=true&source=vimeo_logo&owner=147435576 *and Gold Matters in Burkina Faso: The Art of Bonding in Precarious Times*, by Gideon Vink and Christophe Sawadogo (2021), https://www.youtube.com/watch?v=lZF64dNPyRQ,

[4] For publications see: https://gold-matters.org/.

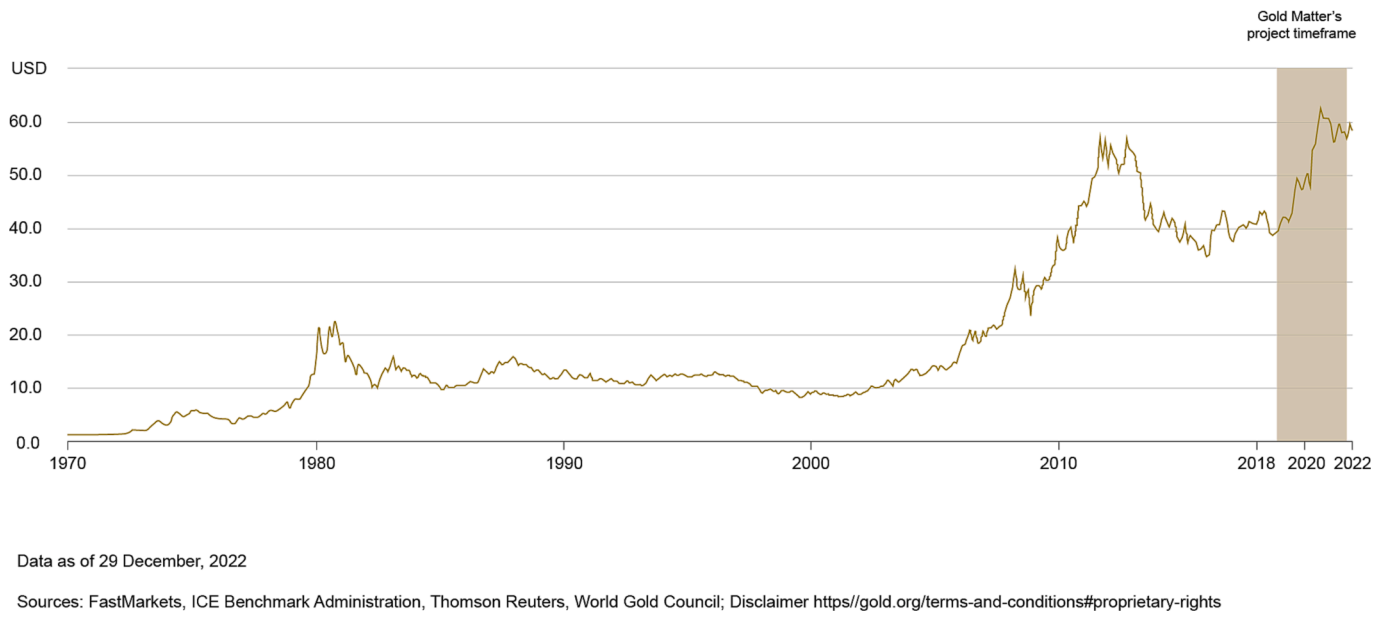

Fig. 1. International gold prices 1970–2022.

Ferry, 2021; Jaramillo, 2020; Luning, 2021; Richardson and Weszkalnys, 2014). Richardson and Weszkalnys (2014: 16-22) describe these relational phenomena as "resource materialities". They suggest that resource materialities encompass four dimensions. First, resource ontologies (i.e. assumptions about what resources are, what sustains them, shaping how they are engaged with); second, the way specific resources are known; third, infrastructures to extract resources and to refine, transform and transport them; and fourth, resource exploitation as a process and how it is experienced and embodied by people, in interaction with technologies, infrastructures and substances.

Pursuing this line of analysis, we deploy the term 'gold lifeways', taking our cues for 'lifeway' from 'life' (*lif*) – existence, lifetime, to continue, body – and 'way' (*weg*) – road, path, course of travel, freedom of movement, encompassing moral, ethical or religious and spiritual choices (*cf*. Fisher et al., 2017; Fisher et al., 2021; Tsing, 2015).[5] A gold lifeway encompasses how gold and its extraction are embodied in lived experience while paying attention to gold as a resource, a relational phenomenon that draws together matter, social organisation, land & mineral rights, technology, capital, and infrastructures, in processes of extraction across different spatial and temporal scales (See Fig. 2). Drawing on Ingold (2011) and Tsing (2015), who both link processes of becoming to expressions of being in the world, we contend that without an understanding of mining 'from within', actions stimulating sustainability transformations – whatever they are – will be neither successful nor appropriate. Gold lifeways provides a prism to engage with miner perspectives on sustainability.

Tsing (2015: 62) observes that capitalism accumulates wealth without rationalising labour and raw materials, relying on translation across social and political 'patches', which draw different world-making practices into one another. Understanding small-scale gold mining's relational model of extraction will benefit from thinking on sustainability transformations through exploring ethnographically how gold, people, and things – including ideas, opinions and beliefs - come together within different lifeways, as miners seek to make a living by extracting gold for world markets, while steering a course through interactions with different actors. Tsing (2015) and colleagues Gan et al. (2017) provide the insight that life in the ruins of capitalism is growing at varying permutations and intensities in a polyphony of life. Inclusion of human and non-human actions and meanings broadens our comprehension of precarity and survival, and of small-scale gold miners motivations (Jaramillo, 2020).

We turn to situate mining in relation to thinking on transformation, life ways and sustainability. Then, with grounding in theory, Section 4 explains our methodology. In Section 5, we present cases from Suriname, Uganda and Guinea Conakry (Guinea). Based on this empirical data, we argue that a focus on miners' lifeways enables us to identify empirically how miners' and related actors give local meaning to sustainability via interconnected 'strands' of understanding and practice. We conclude in Section 6 by arguing that the transformative potential of gold lies within individual lives and find little evidence for sustainability transformations emerging from the existing dynamics of gold lifeways.

3. Literature review

3.1. Mining, minerals, and transformation

Minerals have a part to play in the transformational change addressing global crisis but international policy has a blind spot regarding humankind's profound dependence on metals, minerals and earth materials (Jacka, 2018). All Sustainable Development Goals (SDGs) have a connection with small-scale gold mining, in potential positive and negative ways (Hirons, 2020). Nonetheless, Agenda 2030 largely omits reference to minerals or earth materials, although attention has grown regarding the mineral security needed to achieve the goals (Franks et al., 2022). The Intergovernmental Panel on Climate Change (IPCC) identifies the importance of critical minerals for mitigation, however where focus is on adaptation, "informal small-scale mining" is negatively portrayed as a "high risk income alternative that the world's poorest commonly take to finance adaptation" (IPCC, 2022c: 1248).

Thinking on sustainability transformations offers critical social

[5] https://www.etymonline.com/word/lifeway.

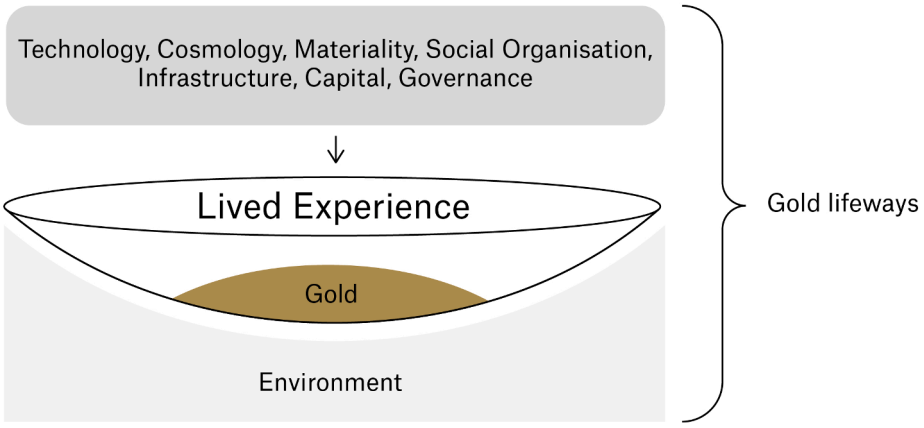

Fig. 2. Gold lifeways.

science perspectives relevant to the lives and livelihoods of those in the Global South (Blythe et al., 2018; Feola, 2015; Köhler et al., 2019; Patterson et al., 2017, 2015). What constitutes sustainability transformations is controversial, but it is recognised that transformation is non-linear and non-teleological (Fisher et al., 2022). Judgement on what is to be transformed, who instigates transformation, and whether emphasis should be placed on transformative as opposed to incremental change, are political issues; all made complex by competing visions of sustainability (Scoones et al., 2015; Scoones et al., 2020).

A danger is that sustainability policies fail to recognise the relevance of diverse contexts and knowledges, or depoliticise contestations, overemphasising 'top-down' solutions (Huff and Naess, 2022). A fruitful line of analysis is provided by those giving attention to practices of transformation, as opposed to ideal-typical models, as an entry point for analysis that anchors understanding in the situated and specific (Domínguez-Guzmán et al., 2023; Mehta et al., 2021; Rutting et al., 2022). In turning to practice, terms such as transformation and sustainability become more fluid.

These challenges confront researchers working on transformations in small-scale gold mining. To have a vision of what transformation in gold mining could look like and to know how to achieve this vision (O'Brien, 2018), requires delineating what is to be transformed, by whom, and how. To do this, we first need to be able to explain how gold miners and related actors think about and perceive their roles and relate to the societal context within which they are working. In the next section, we go deeper into the gold lifeways. How different actors understand 'sustainability' is part of this picture and will be considered in the subsequent section.

3.2. Gold wealth, materiality, and morality

Keeping the practice of transformation in view, we return to gold lifeways. Space does not permit us to do justice to a wealth of studies tracing the contours of resource materialities in small-scale gold mining, but we can highlight selected points.

In Amazonian contexts of resource competition, not only in Brazil but also in the Guianas, Peru, Bolivia and Colombia, small-scale mining remains a livelihood opportunity in the margins of national territories, even though the forest is also seen as the lungs of the earth (Cremers and de Theije, 2013). Significantly, gold booms have stimulated new mining activities by migrant miners in pristine rainforest and the extension of informal mining infrastructure (Jonkman and de Theije, 2022b), with profound effect on local society and environment (Jébrak et al., 2021; Laing, 2019; Tamboli, 2019). Gold mining in indigenous territories and biodiversity conservation areas stimulates pressure over land (Villén-Pérez et al., 2022), coupled with intense local conflict and polarised national debate. Conflict over gold mining in Yanomami territory uncovered early 2023, made it the subject of international outrage too.[6]

Mobility flows from seasonal livelihood patterns, social and political factors incentivising mobility, including individual rewards from flexibility of movement (de Theije and Bal, 2010) and plays an important role in the diffusion, adaption, and re-invention of mining technology (i.e. tools, knowledge, body skills, and methods; D'Angelo, 2021). With technology (and capital) comes miners' changing capacities to exploit gold deposits. In this line, the notion of the frontier is deployed to focus on the economic and cultural transformations associated with mining mobility (Dummet, 1998). The frontier acts as a space where novel social, cultural and technological features can emerge – including norms of conflict resolution and risk sharing - and where migrant and local miners negotiate relationships, including over access to land (Jonkman and de Theije, 2022b). In West Africa especially, access to gold reserves intersects with cleavages between *autochthone* and *allochthone* (first-comer versus latecomer) groups that characterise many agrarian societies in the region (D'Avignon, 2022; Luning, 2010; Werthmann, 2006).

Research on gold mining livelihoods highlight issues connecting the materiality of gold to social processes, culture and morality. For instance, Tubb's (2020) ethnography on shifting livelihoods in the Chocó, Colombia, brings to the fore agency by using the notion of '*rubusque*', or 'shifting', to characterise the creative strategies men and women use to make a living. Likewise High's (2017) ethnography of a gold rush in Mongolia, draws attention to the materiality of gold mining livelihoods in a context of economic change.

In many countries, small-scale gold mining is a terrain for heightened conflict, be it material or spiritual. Rosen (2020) shows how in Ghana state military personnel clash with small-scale miners who claim ancestral and national rights to gold in the face of a large-scale gold mining industry they feel impoverishes, displaces and disinherits them. Exploring the ritual relations that animate conflict, Rosen shows how sources of power outside formal legal systems feed into these conflicts, and that spiritual powers fuel contests and collaborations in the gold fields. Such studies demonstrate the necessity of understanding how particular social, spatial, temporal, and cosmological contexts shape the manner the socio-natures of orebodies and the subterrain are drawn into the mining experience (Luning, 2021). They also challenge assumptions about gold as an inert or finite resource by demonstrating how cosmology mediates relationships to gold, allocating agency to this gold

[6] Illegal gold miners stand accused of attacking people and raping women and girls, poisoning rivers, and contributing to children dying of malaria, malnutrition and pneumonia. Federal police opened an investigation into genocide.

and the wealth it stimulates (de Theije, 2008; Luning, 2012). Hence non-human beings become capricious agents granting or withholding riches (c.f. D'Angelo, 2019, on diamonds), with the power and agency conferred by gold extending into political and social arenas (High, 2017; Werthmann, 2003).

Dreaming of abundance and good relations with fickle agents is definitely part of gold lifeways, but more mundane and material aspects of living in bush or forest, the sense of freedom, peace in relation with nature, and autonomy are too. All are elements of gold lifeways as defined in Section 2, as a conceptual device to explore the lived experience and moralities and materialities of mining worlds.

3.3. Sustainability and small-scale mining

For several decades, scholars have framed mining in terms of non-renewable stocks and the depletion of resources (Godoy, 1985) and whether small-scale gold mining can be sustained. Studies examine technology needed to make the activity efficient and less damaging to the natural environment (e.g. Hinton et al., 2003; Spiegel and Veiga, 2005; Veiga, 1997), or ways in which the sector can be formalised (see Section 2).

Such technological and policy-focussed studies assume that there is a unified understanding of sustainability that is significant and comprehensible to all participants in the field. Moreover, that everyone agrees that the negative impact of this mining on the natural environment, animals and plants, waterways, and air quality, is obvious to all and a consequence to be combated. Studies also seem to assume that policies are neutral.

To address issues of sustainability with respect to small-scale gold mining necessitates uncovering the localised and personalised conceptualisations of the social and political-economic dimensions of sustainability. Proceeding thus may enable us to pay attention to how plural perspectives frame sustainability in mining (Lanzano, 2021). We must address judgements about which issues are important; about the prioritisation of some actions over others; and about whose interests are included in, or excluded from, decision-making processes (Scoones et al., 2015). And, as Ingold (2022: 324-326) reflects, notions of sustainability are not necessarily predicated on assumptions of future depletion and resource limits and may instead be concerned with how life carries on, renewing itself.

With such understandings of sustainability, we may have a better appreciation of why miners continue working in the sector, persevering despite precarity, stigmatisation and opposition. On this basis, the scope for transformative action to tackle the many social and environmental harms of small-scale gold mining, and to do this in ways that enable miners to have dignified and secure lives, may become clearer. Placing emphasis on the lived experience of producing gold for world markets, recognising social differentiation within mining groups and heterogeneity between different localities, opens potential to analyse in what circumstances and with what means gold miners have the capacity to sustain different futures, inside or outside of mining contexts.

4. Methodology

We present empirical case studies produced by the Gold Matter's project, focusing on the social scientific data. The research was multi-sited and trans-regional between South America and Africa (Fig. 3). Our rationale for a multi-sited approach was that understanding the temporal and spatial dynamics of change in mining areas, and the scope for transformation, benefits from comparison of how gold lifeways develop within different contexts.

Emphasis on ethnography has implications for how we frame comparison. To elaborate, the common comparative strategy, a variable-oriented approach, typically seeks to compare set variables by excluding features that situate phenomena in wider context (Schnegg, 2020). For anthropologists, this presents difficulties. A strength of ethnography is how "context" frames the subject under investigation. This requires processual methods with scope to respond flexibly to emerging data. These strengths make comparison, in the sense implied by systematically comparing common variables across sites based on standardised sampling criteria, problematic (Moore, 2005; Hirsch et al., 2020). Therefore, to retain case study analysis, we based our approach to comparison on shared research questions aligned to a shared conceptual framework and the identification of common themes. Data analysis followed themes but deliberately avoided formal codification so case studies could be developed.

To select case studies, we delineated (Table 1): (i) at least two sites/administrative areas for in-country comparison; (ii) gold within alluvial or near surface deposits appropriate for small-scale gold mining; and (iii) areas where gold mining has taken place over extended periods

Fig. 3. Study sites.

Table 1
Case study countries, administrative location, and type of small-scale mining.

	Gold deposit/administrative location	Type of small-scale gold mining
Brazil	1. Peixoto de Azevedo region (northern Mato Grosso state). Alta Floresta Gold Province, southern Amazon Craton. Peixoto de Azevedo, Matupá, Guarantã do Norte.	Open pit colluvial/eluvial mining of secondary deposits using hydraulic monitors; alluvial ore mining in waterbodies using suction dredges; manual underground reef mining.
	2. Tapajós river region (southern Pará state) Tapajós Mineral Province. Altamira, Novo Progresso, Itaituba, Jacareacanga, Santarém.	Mechanized open-pit mining; manual underground mining; tailings reprocessing; alluvial ore mining in waterbodies using suction dredges.
	3. District of Lourenço (Amapá state) Salamangone "Au-deposit" Guiana Shield Precambrian deposits. Calçoene.	Mechanized pen-pit mining, manual underground reef mining (primary deposit); retreatment of tailings.
Suriname	4. Lawa river, border with French Guiana Guiana Shield Precambrian deposits. Sipaliwini.	Alluvial/eluvial mining with hydraulic monitors and suction dredges; manual underground reef mining.
	5. Brokopondo reservoir region Guiana Shield Precambrian deposits. Brokopondo, Sipaliwini	Alluvial/eluvial mining with hydraulic monitors and suction dredges; manual underground reef mining. Recently retreatment of tailings with cyanide leaching.
Ghana	6. Tallensi Nabdam, Upper East Region	Small-scale: Manual alluvial mining; manual underground reef mining.
	7. Tarkwa, South West Region	Large-scale: reef-mining (primary deposit). Small-scale: Alluvial underground reef mining; river dredging broader Tarkwa region.
Burkina Faso	8. Gaoua, Diébougou, Dano, and Kampti in Southwest Region	Small-scale (semi-mechanized sites): Alluvial and eluvial techniques with rudimentary materials; hard rock mining: deep shafts for primary deposits; re-treatment of tailings.
Guinea	9. Bouré, sous-préfecture of Kintinian	Panning (manual and mechanized with "*laveries*", underground alluvial and (more recently) reef mining of primary deposits; reprocessing of tailings; recent open-pit mining.
	10. Siéké, sous-préfecture of Doko	Panning, manual and mechanized with "*laveries*", underground pits and tunnels targeting both alluvial and (recently) primary deposits.
Uganda	11. Sikuda, Buteba and Busitema sub-counties, Tiira Town Council, Busia district.	Combination of shaft, open pit, and panning.
	12. Bihanga, Buhunga, Bisya, Engaju, Kajani, Nyakishana, Nsika Town Council, Rwenge sub-counties, Buhuweju district.	Combination of manual alluvial mining, limited reef mining.

(>70 years) to capture change. In terms of why we selected specific countries, the research design identified geographical foci in East and West Africa, and in South America. Then, we wanted to capitalise on knowledge from our past research, and to explore the dynamics of cross-border mobilities, so chose neighbouring countries where members of the team had conducted research.

Two factors affected plans: First, escalating violence in Burkina Faso, which led to a focus on only one site (case study 8) and attention to Burkinabe miners in northern Ghana. Second, the Covid-19 pandemic and restrictions on travel (March 2020 +). This led us to omit a second East African country and profoundly disrupted data collection. To structure cross-case comparison, we had designed shared periods of fieldwork and analysis. In reality, timing of fieldwork was ad hoc, and stays were shorter than intended. Positively, the pandemic facilitated insight into miners' capacities for resilience (Calvimontes et al., 2020; Pijpers & Luning, 2021).

From the wide variety of fieldwork results, we have chosen three cases, Suriname, Guinea and Uganda, from data collected between 2019 and 2022, each from one of the regions where we worked, for the analysis in this article. We selected them based on a combination of criteria. Firstly, we want to show the richness of how people mine gold and organise the activity, collectively, in villages or temporary communities, but also in family and individual lives, in the material encounters at the heart of gold lifeways. Methodologically speaking, at the cradle of Gold Matters was the idea that we would learn from comparing lifeways between the three major regions. This included regional research "traditions" of interpretation and theorisation. We saw it confirmed that each region employs an analytical framework linked to historical, cultural and social existences, but also to the way anthropologists and others frame them. For instance, analyses in terms of host–guest relations are fundamental to understanding human mobility around mining in West Africa. In the Amazon, this analytical framework is not used. Still, in Suriname, for example, relationships between traditional inhabitants and migrants can also be understood with the help of the same terminology. Finally, although we present them here as regionally bounded case studies, researchers engaged in co-labouring across regions, and the case studies are not isolated because of the sharing and co-constructing of knowledge in research, art, and writing.

Regarding our research methods, there are significant similarities. As highlighted in Table 2 for Suriname, Guinea and Uganda, the "core methods" used by all the case studies are open or semi-structured interviews and observation. We include information on additional

Table 2
Data collection periods, methods, and data.

	Location	Data collection period(s)	Methods	Data
Suriname	Sipaliwini	Feb 2020 (extensive prior fieldwork periods from 2006, totalling almost two years in the field)	Ethnographic fieldwork, observation, open and semi-structured interviews, surveys about technology (2009), photography	Fieldnotes, reports, published articles, drawings, and photos. Qualitative, manual analysis.
	Brokopondo	Feb 2020, July 2022 (occasional prior fieldwork since 2006, between 2 and 3 days visits and twice a more extensive data collection)	Field visits, observation, open and semi-structured interviews, surveys about technology (2016), team research, focus group discussions, photography, filming	Fieldnotes, reports, published articles, drawings, photos, and film. Qualitative, manual analysis.
Guinea	Bouré	February 2019 (prior fieldwork June 2014)	Ethnographic fieldwork, observation, open and semi-structured interviews, photography	Fieldnotes, reports, published articles, drawings, and photos. Qualitative, manual analysis.
	Siéké	February 2019 (prior fieldwork June 2014)	Ethnographic fieldwork, observation, open and semi-structured interviews, photography	Fieldnotes, reports, published articles, drawings, and photos. Qualitative, manual analysis.
Uganda	Busia	July – Oct 2019, Jan-March 2020, Feb – April 2022 (prior fieldwork in August 2015 and November 2018)	Ethnographic fieldwork, observation, semi-structured interviews, life cycle assessment, scenario planning, institutional analysis, photography, remote sensing	Fieldnotes, reports, published articles, drawings, and photos. Qualitative, manual analysis.

methods researchers applied in each case, depending on the local needs and possibilities. In addition, we chose examples where team members could contextualise the Gold Matters data drawing on previous fieldwork. Finally, in all three countries, more than one researcher conducted the fieldwork to achieve a thicker analysis.

5. Gold lifeways

We turn to focus on miners' experiences of gold lifeways in the three selected cases, considering how resource making of gold contributes to miners' perspectives on sustainability and the transformations underway. To facilitate understanding, Table 3 estimates miner numbers, provides historical facts on study locations, and identifies our published studies that enrich the empirical data presented here. Also relevant is Fig. 1 (Section 2), highlighting high international gold prices over the study period (2018–2022). This is significant to our description of gold lifeways transformed by technological and capital intensification.

5.1. Sustaining gold lifeways through mining mobilities in Suriname

Small-scale mining in Suriname is built on mining mobilities. Since the 19th century, investors and miners from Europe and the Caribbean worked in the first mines (also de Theije, 2017). After around 1990, the protagonists were migrants from Brazil, bringing mining experience and innovative technology (also de Theije and Bal, 2010; de Theije and Heemskerk, 2009). Of an estimated 30,000 active miners, roughly half are Brazilian while the other half are Surinamese, mostly Maroons, whose traditional territory is where mining occurs. Migrants are highly mobile, between different locations in the gold fields, to and from Paramaribo, and between neighbouring countries. Those who can afford it also travel between Suriname and Brazil to visit family and invest earnings. Moreover, miners move around Suriname and across borders into neighbouring French Guiana and Guyana in search of better work conditions or abundant gold finds. Miners' mobility is fuelled by the aspiration to continue to mine, making access to gold deposits perpetuated, and infinite.

The mobility of Brazilian miners is encouraged by how they find it easier to mine in Suriname than Brazil. Their considerations provide insight into perceptions of security and stability and, eventually, sustainability issues and transformative change. It is simpler to gain access to the gold fields. No environmental licences and mining permits are required, making it easier to set up an operation without incurring document costs, often a time-consuming and expensive affair in Brazil. Most Brazilians have no licenses to mine in Suriname, but they perceive *de facto* agreements with locals as lawful permission to mine. The absence of formalised documents also creates insecurity; one is not bothered by the government, but an undocumented miner also finds no legal security, e.g. in a dispute about access. Nevertheless, uncertainty is at the core of lifeways because lacking extensive geological knowledge, miners consider it is always, to some extent, a gamble whether there is enough gold in a deposit to justify investment and mining. "Small-scale gold miners are very religious people," a crew of Pretinha explains half laughing half serious in the film.[7] "After all, you need to have faith because a miner never knows for sure if he will find the gold."[8].

The statement about the miners' faith hints at beliefs and morals about gold and how humans should relate to it. The view that a good man finds more gold or is more entitled to it is widespread. Gold has agency in this worldview; it hides from the immoral prospector or runs away from him. Such imaginaries are often attached to Christian teachings. The god-fearing miner can find gold in the place where it ran away for a sinful miner. The adulterous miner loses his possessions until he repents before god (also de Theije, 2008). Such convictions are a fundamental part of gold lifeways.

A threat to the continuation of the mining activities lies in the organisation of access to land and gold, which must be negotiated with concession holders or Maroon or Amerindian groups who claim customary ownership of land. Agreements are verbal and can be revoked. Miners narrated many occasions of losing approval to work

Table 3
Gold mining in case study contexts.

Estimated no. small-scale gold miners+	Case study	Gold mining background
Suriname 30,000 (World Bank, 2021).	Lawa river (Sipaliwini)	1880s: gold discovered; area mined with varied intensity. Late 1990s+: intense small-scale mining by Surinamese maroons and Brazilian migrants. Suriname side of border river is also hub to illegal mining in French Parc Amazonien.
	Brokopondo lake region (Brokopondo and Sipaliwini)	First discoveries and mine 1718. From 1880s, many discoveries and local gold rush (de Vletter and Hakstege, 1998) Late 1990s+: intense small-scale gold mining, mostly by Surinamese maroons and Brazilian migrants. 2004+: 1 large-scale mine, large/small-scale competition over deposits.
*de Theije, 2021; de Theije and Heemskerk, 2009; Jonkman and de Theije, 2022a,b; Luning et al., 2014; de Theije, 2017		
Guinea Estimate: 300,000 small-scale miners (gold and diamond) in the whole country (UNECA, 2011)	Bouré	Early to mid-19c: gold placers of Bouré-Siéké documented from early colonial times (but possibly known and mined much earlier). Mid-19c+: colonial government attempted to control gold production and trade. Since Guinean independence (1958): various explorations 1990s+: Renewed large-scale exploitation; Société Aurifère de Guinée (SAG) (currently owned by AngloGold Ashanti) dominates extractive activities.
	Siéké	As above. SAG activities are more recent (concessions in the Siéké from the 2010s+).
* Lanzano, 2018, 2020; Lanzano and Arnaldi di Balme, 2021; Pijpers et al., 2021.		
Uganda Estimate: 40,000 small-scale gold miners (2017) (Barreto et. al., 2017)	Sikuda, Buteba & Busitema sub-counties, Tiira Town Council, Busia district	1930s+: colonial shaft mining (exploration/limited extraction). 1930s+: SSGM, artisanal alluvial panning; artisanal open pit. 2000s+: mining company (medium-scale) 2000s+: national mineral sector development planning
* van de Camp, forthcoming; Fisher, 2018; Pijpers et al., 2021; Fisher et al., 2022a; Fisher, 2015.		

+ Comparable statistical data is unavailable.
* Published data covering location/country by co-authors & their collaborators; data produced for Gold Matter highlighted in bold.

[7] Footnote 1.
[8] Interview, July 2022.

after the gold discovery appeared significant. In this case, the owner would instead mine himself than settle for the agreed percentage of the gold production. We also encountered Surinamese citizens invoking authorisation from the government or prominent politicians, with or without presentation of documents, to expel Brazilian miners. Such events show that it is ultimately a precarious existence because the small-scale miners have no titles and never know how long they will be allowed to work in a specific location.

Surinamese miners also operate in this informal environment and deal with uncertainties. However, they can claim multiple rights, such as tribal land claims and Surinamese citizenship, and have the advantage of being acquainted with the culture and embedded in family relationships and local histories. Consequently, they are less vulnerable to the whims of authorities and local power holders than their Brazilian counterparts. Nevertheless, they are bound by the constraints of tribal habitats and relationships, which can limit their freedom. Above all, Brazilian and Surinamese miners work side-by-side on the same claims and sometimes together in one operation, each with relative skills, advantages, strengths, and limitations characterising gold lifeways (also Jonkman and de Theije, 2022a).

The mobility of migrant miners is a critical component of gold lifeways in Suriname and a capacity that embodies miners' resilience. When a mine depletes, or land claimants withdraw access rights, the migrant miners move to different places, whereas local miners are more tied to specific tribal or family locations (also de Theije and Bal, 2010). Depleting the "easy" gold deposits, close to the surface and geographically accessible, stimulates several processes. First, prospectors go further in search of new deposits, with miners building more infrastructure, increasingly opening up the interior (also Jonkman and de Theije, 2022b). Second, technology is adapted so previously exploited deposits can be mined again or hitherto inaccessible gold-bearing land becomes mineable. The introduction of excavator machines, allowing for processing ore-containing soil at a much larger speed, has created significant impact. Third, underground mining, with tunnels sometimes tens of meters deep, has become increasingly common. Miners' mobility, in this way, spreads technological mining knowledge across the Amazon region. Thus it multiplies the forms of exploitation of the territories being mined, allowing new 'readings' (Jonkman, 2022) of the landscape and resources so material opportunities to live the gold lifeway increases.

In Suriname, gold is the primary source of income for the government, much produced through small-scale mining.[9] There have been attempts – in 2008 and during Operatie Ordening Goudsector in the early 2010s to register miners and their equipment to increase revenues, by taxing profits. To this day, there is no functioning regulation integrating gold miners into the formal economy. The absence of a national framework for small-scale gold mining, also applies to environmental legislation and its enforcement. The government is largely absent in the gold fields, and there is no government policy to steer towards environmental conservation, cleaner methods (e.g. mercury free mining) or switching to other livelihoods (also Seccatore and de Theije, 2017). For years, international organisations and local non-governmental organisations have been spokespersons for a sustainability discourses on environmental damage. However, projects have not led to substantial transformation of the gold mining practices. For most miners, talk about the negative environmental consequences is the talk of city people having no realistic knowledge of jungle resilience. Moreover, the major damage is not caused by small-scale gold mining but by the big industrial mines, they feel. Miners display profound distrust about government action (Heemskerk et al., 2014), but since no environmental regulations are implemented, fear for punitive action for violation is not something they worry about as a threat for the sustainability of their livelihood. In day-to-day conditions, the only repression to deal with stems from petty corruption and abuse of power by lower-level police and army officials as a part of the gold lifeways.

For migrants, transformation takes place partly elsewhere. Gold can change their lives, however, this is always precarious. "I don't like this life when the mine idles like now. But I love it very much when we are producing, when I have paid off my debts, when we earn enough to send money to my family and I can help friends," said Pretinha.[10] For months, she was unable to "make" gold, and attempting to start up again she became heavily indebted, but still, she preferred this situation to surrender all together. "What are my chances to achieve something in a salaried job after all these years as an independent worker?" she added rhetorically.[11] For Pretinha, her business is sustainable if she can continue it. Autonomy is essential in the lifeways of self-employed migrant gold miners. Their future dream is a better life in Brazil, investing in houses and shops, farms, and livestock. With this prospect, miners imagine and situate the transformative potency of gold mining in their personal lives and communities.

5.2. *Anticipating depletion in the Bouré-Siéké of Guinea*

In eastern Guinea, in Bouré-Siéké, intensification is transforming small-scale gold mining. Technological change shapes the opportunities that local communities have to continue to mine gold, an activity they have relied on for generations. Given this history, gold lifeways are embedded within social institutions and traditional norms. At face value, this contrasts with the case of Suriname, where migrants introduced new mining technology more recently, but in Guinea too, mining is associated with mobility, and we will describe how most recent waves of migration have generated change in technology and infrastructures.

In Bouré-Siéké, customary authorities, such as elders and lineage chiefs, are involved in the designation of mining fields and the timing of the mining season. They are responsible for attributing mining pits – traditionally organised along orderly rows at regular distance from each other (*bè*) – to the different personalities of the village, and for deciding the use of informal taxes collected on the mines (also Lanzano, 2018). In Mande societies, blacksmiths constitute a hereditary professional group. Besides providing and preparing tools for miners, they (and the potter women) have a specific relation to the earth, which is part of wider cosmological perspectives that inform gold mining. Traditional hunters help enforcing security and surveillance. In each mining field, the *tomboloma* - a committee (or "mine police") composed by representatives of the different professional categories involved in mining - oversees extractive activities, collects informal taxes and mediates conflict.

There have been attempts – from the state, from miners' associations and from multilateral aid projects – to push miners to register formally, but these interventions are too limited to deploy perceptible effects on the ground (see Arnould, 2019; Choquet, 2018). Work, exchange and production continues to rely on a combination of customary norms regulating access to land and natural resources, and emerging patterns and informal arrangements that guarantee the functioning of complex value chains.

Since independence, official legislation and public policies have concentrated on large-scale industrial mineral extraction (bauxite, iron ore and diamonds aside from gold), which is the main source of export revenues for Guinea. In the Bouré-Siéké, the Société Aurifère de Guinée (SAG), which took over in the 1990s from previous explorations in the region, and went through several changes in ownership, dominates large-scale gold extraction. Today, it is a subsidiary of the AngloGold-Ashanti mining conglomerate, with a minority capital share from the Guinean state. Since the 2000s, industrial gold extraction has boomed and large-scale concessions in favour of SAG have multiplied,

[9] Two industrial mines are operating in the country: the Merian mine (Newmont) and the Rosebel mine (Zijin Mining Group, until 2022 Iamgold).

[10] Interview, July 2022.

[11] *Ibid.*

progressively saturating the mining space, and creating tensions and negotiations with local residents, and waves of expulsion of artisanal miners from the land allocated to SAG.

Multiple connections link industrial and small-scale mining, shaping how lifeways incorporate gold. Incomes from large-scale mining are occasionally reinvested in small-scale mining activities; small-scale miners can be evicted and repressed, or conversely compensated and included in corporate social responsibility schemes; and miners often share the same spaces, with artisanal miners reworking residues on abandoned industrial sites (also Pijpers et al., 2021). The increased presence of industrial mining has incentivised a similar tendency towards intensification of small-scale methods of gold extraction and processing, for example, through the diffusion of metal detectors (Dessertine, 2016) or mercury-based processing associated with deeper shafts targeting primary deposits (also Lanzano, 2020; Lanzano and Arnaldi di Balme, 2021). New mobilities add layers of complexity to pre-existing mobility patterns (Bolay, 2021). These processes show a demand for socio-technical innovation that reinforces itself. Pushed by increased pressure, miners seek new technological means to intensify and accelerate extraction in land still accessible to them. In so doing, they contribute to the same logic of 'exclusionary territorialisation' that Dessertine and Noûs (2021) ascribe to a spatial reconfiguration occurring in Bouré-Siéké. This is generated by large-scale extractive concessions and industrial mining, with their tendency to fix borders in ways that impact on the mobility of small-scale miners and place pressure on resources that stimulated innovation initially.

The socio-technical system of *bè* has been impacted by intensification. Some norms and mechanisms that limit individual decisions tend to disappear today. The cyclical character of mining reflected pre-existing alternation patterns between the agricultural and the mining season. Mining was practiced during the dry season and relied on an intrinsically mobile system, where people were free to migrate in search of gold, and norms and institutions related to hospitality (*jatigiya*) guaranteed the integration of non-natives, outsiders (*allochthones*) in mining fields (Luning et al., 2014; D'Avignon, 2022) - that used to limit individual decisions tend to dissappear today. Currently it is the growing presence of industrial mining, and the acceleration pursued in a parallel way by artisanal miners, that produce scarcity, and the perception of scarcity. The prospects of future gold depletion haunt imaginaries and shape anticipation and coping strategies.

During ethnographic work in Bouré in 2019, we witnessed how mechanisation had radically affected the visual and productive landscape around Kintinian. For example, one informal 'open pit' mining area appeared in the vicinity of inhabited neighbourhoods. Instead of organising work through the orderly patterns that characterise the *bè* system or gathering in teams to dig underground tunnels targeting hard-rock deposits, miners worked with pickaxes across what resembled a canyon-shaped quarry, digging out large quantities of rock. Trucks collected the rock and carried it away for processing in the so-called laundries. These machines, functioning through fuel engines and combining the operations of grinding and 'washing' the ore on sluice boxes, allowed the testing and processing of large quantities of rock in relatively short periods of time. In this new system, village personalities, and most notably the landowners holding customary rights on the land occupied by excavation and processing plants, were guaranteed rents or managed to impose informal taxes on the different actors and transactions involved in the production chain. However, the *tomboloma* and customary authorities, previously central roles in the organisation of small-scale gold mining operations, seemed significantly reduced.

Interviews with elders involved in mining highlighted contradictory perceptions of recent developments. Many interlocutors evoked technological innovations less as an expanded potential for extraction, than as a demonstration of the gradual depletion of gold reserves, to which the 'new' machines and techniques represented an adaptation. The perspective of running out of gold created uncertainty and represented an existential threat for communities with livelihood and existence based on gold extraction. An elder in one of the most ancient mining sites, belonging to a lineage that established the first operations in the current site, four generations earlier, claims to use traditional methods and is sceptic with respect to the new quarry: "if we wanted to transform our mine into a quarry, the landowners here would refuse. What is happening there is not good for the village, because it deteriorates the environment. What would have become of us if our ancestors who started digging here had done that? What would become of our grandsons if we decided to do it?"[12] He worried about the declining content of gold: "the ore extracted by our grandparents was so rich that they would fill a goat skin with gold nuggets, while we haven't witnessed similar earnings during our lifetime here in the mine. We are digging these pits for the fourth time already, and we find less and less gold. (…) Artisanal mining may not bring any more wealth here, and in the future we may need new sources of development".[13]

Another elder from a village located a few kilometres away, admits resorting to *laundries* and other machines to process gold ore: "initially we welcomed the new machines with enthusiasm, but everyone is disappointed now. New technologies are very expensive and have made us very indebted".[14] Commenting on the destructive impact of some new technologies, expressed awareness of how his ancestors preserved resources for later generation by choosing to dig tunnels in one single direction: "we are today in a different logic, we scrape everything. A prophecy had been made in the past, predicting that a new generation would come: a generation characterised by great desire and little force, and incapable of thinking for future generations. That moment has come".[15]

In this case, it is precisely the sustainability – or lack thereof – of past and current modes of gold extraction in the Bouré-Siéké that is at stake. The notion of sustainability is rarely evoked in an explicit way, and like in Suriname, the mainstream language of sustainable development and environmental impact has had relatively limited influence among small-scale miners. However, emerging concerns about inter-generational justice, the questioning of the appropriateness and moral legitimacy of new techniques of extraction, and the anxieties generated by the declining resource availability and the related challenges for gold lifeways, represent an emic articulation of broader debates on sustainability, overconsumption, and adaptation to environmental change.

5.3. Sustainability discourses and lifeways in Uganda

In Busia District, gold lifeways are witnessing processes of transformation. Change has stimulated the emergence of discourses that are explicitly about sustainability, and which miners articulate, with some changing their practices. In this changing context, miners connect ideas about sustainability to moralities about responsible or irresponsible mining. Many different mining actors have an interest in or collaborate with the mining companies, officials, and non-governmental organisations. How they influence gold lifeways provides a good example to describe these aspects of sustainability.

In contrast to Suriname and Guinea, where the state either does not formalise the sector or has had little perceptible effect, promotion of formalisation by the Ugandan state is witnessed in the growth of "Artisanal and Small-scale Miners Organizations" and registration of mining claims. Hence, in Busia, the number of licensed operations has expanded with support from non-governmental organisations as a way to hinder mining companies appropriating small-scale mines and to introduce 'cleaner' technologies and improved working practices, including reduction in child labour (also Fisher, 2018; Fisher et al., 2021).

[12] Interview, February 2019.
[13] *Ibid.*
[14] Interview, February 2019.
[15] *Ibid.*

Gold has long accelerated transformation in Busia. In the 1930s, colonial geologists discovered gold deposits, with a mine starting in 1934 (in Tiira). Present-day inhabitants' recount how at this time gold resource making began when local people became aware of gold and small-scale mining started, attracting both local inhabitants and Kenyan migrants (who came with a European mining company). In the last two decades, both company geologists and small-scale miners have identified further deposits and there has been a scramble to register formal claims, invoking for some a sense of uncertainty for the future.

In the 2000s, the Ugandan government promoted industrial mining and secondary value addition as an engine of the economy. In 2022, government granted a Chinese mining company a licence for industrial gold mining and refining in Busia. Small-scale miners now fear land expropriation, "a big storm is coming, because little do we know that we are sitting on the richest gold belt of East Africa and nothing can stop them from evicting us."[16]

Against this background, two illustrations show how miners draw ideas about sustainability into their gold lifeways, including how these ideas reflect engagement with external actors. The first relates to the timbering of mineshafts and the second to an attempt to upscale/support mining operations by seeking investment.

A soft soil and high-water table make open-pit mining the method of choice. However, after a non-governmental organisation took some miners to visit counterparts in Tanzania around 2013-14 (see Fisher, 2018), where timbering is common, they experimented with timbered shafts. Nowadays, Tanzanian mining engineers have visited Busia with shaft-building skills and the practice has spread, with Busian miners, with varying degrees of success, constructing timbered shafts in the soft soil. Miners perceive these timbered shafts to be sustainable in the way that it can save space for farming or homesteads - or can enable land reclamation – it is therefore seen as reducing impact on the environment/landscape. This has a moral dimension because they perceive that building timbered shafts signifies to government officers that they are 'responsible' miners who take action to be more sustainable. This is as opposed to – as they perceive it – officials delegitimising them according to negative stereotypes, in which "organised" small-scale miners are encouraged while miners held by officials to be "disorganised" are not (also Fisher et al., 2020). Reminiscent of how 'legal fictions' are put to work (Luning, 2013), as highlighted in Section 2, these fears have risen in a context of increasing external interests in the Busian mining deposits. As one miner stated: "if an environmental government official is green (=new) in mining, he might see an opencast and mistake it for a poorly maintained mine, while in fact it might be just temporarily out of use due to the rainy season."[17]

While some miners consider timbered mine shafts to be a sustainable practice, for the majority managing to develop a viable mine, with sufficient capital and equipment to make mining profitable, is a primary form of sustainability in the sense it is about how to sustain a livelihood (including school fees and food) and maintain small-scale gold lifeways in the locality. Our second illustration conveys these dynamics in relation to a mining group called Tiira Small-scale Miners Association (TIISMA). TIISMA formed as part of a Fairtrade project and, unusually, a majority of members were women. They faced challenges to extract gold as their mine deepened because they need to find partners for equipment and pre-finance, especially for water pumping fuel and to prevent low-value sale of unprocessed stones to pay workers (also Fisher, 2015). The need for finance led TIISMA to give a Turkish investor a stake in their mine. The Investor formed a company with two local landowners and gained protection from the army (Uganda People's Defence Force, UPDF). Unfortunately, relations broke down, with stories of internal conflict, fights, cheating and arrests. The Investor took the miners to court to gain control of the mine – which he saw as rightfully his, as company-owner - but lost, partly because the location licence was registered to TIISMA. When the soldiers protecting the site finally left, one miner reflected, "today we are free, we will celebrate and dance, and as we defeated a disturber through the juridical system, this day is history"; another declared "we chased him through the papers".[18] However, while they were able to continue the mining, they had yet to resolve internal conflict and they again needed capital and equipment. For these miners, like those in Suriname, of primary importance is being able to sustain their mine, and to do this in ways that give access to capital and reduce conflict.

Transformation in gold lifeways has been taking place in Busia, driven by new actors and dynamics. These lifeways have expanded to incorporate different organisational and licensing arrangements. Moreover, technological innovation stimulated by the influence of non-governmental organisations is changing the materialities of extraction; with it come discourses of sustainability, articulating the value of new practices for reclaiming space for habitation and farming. Miners look towards the state for legitimacy and conjure moralities of 'responsibility'. A group of miners are in the exceptional position of having won a court case against a foreign investor and within the miners' association, responses to events implied navigating internal dynamics, conflicts, and inequalities. For all there is a concern over the need for capital investment to sustain their mining livelihoods and many express fears regarding the precariousness of their continued ability to rely on gold lifeways.

5.4. Discussion

If we compare gold lifeways in the cases from Suriname, Guinea, and Uganda, the contexts are different but at a metalevel, there are shared characteristics. Over a period of high gold prices (Fig. 1), intensification in the use of technology is driving transformation. Within this, mobilities are a feature of livelihood dynamics, and with them the negotiation of relationships, linked to different skills and identities. This alters abilities to make claims to gold-bearing land, changes people's relationships to the matter of mining (deeper ore-bodies, new chemicals, etc.), and feeds into cosmologies about the nature of gold and mining moralities. This all contributes to how miners' experience degrees of precariousness and insecurity, permanence and impermanence as they shape gold lifeways.

Socialities are at play in how miners come together. In Suriname, miners are highly mobile, and insecurity of access makes attachment to the location of gold deposits and mines temporary and transient. As a result, the Brazilian migrant miners do not entwine personal and family futures with their localised mines. In Guinea, social institutions and traditional norms have dictated gold lifeways for generations, but a radical new mining procedure has caused significant reconfiguration of social dynamics and the local political-economic arena. In Uganda, miners who might have dug for gold on family landholdings in the past, are organised into miners organisations and navigate different mining scales with regard to institutions and governance that secure access to mineral claims, but also technical scales in depths of the mine and the technology used. As in Suriname and Guinea, there is a push towards intensification of mining techniques and more extensive extraction, but this is constrained by access to capital and equipment, hence the attraction of a foreign investor. To an extent in contrast to Suriname, in the Ugandan case there is a push towards cleaner mining techniques, facilitated by non-governmental organisations and by state legitimacy.

What do these cases, which centre on the lived experiences of small-scale gold mining and consider gold resources as relational phenomena as the essence of gold lifeways, bring to an understanding of sustainability from different miners' perspectives? Here we can distinguish different 'strands' in articulations about sustainability and mining.

[16] Interview, February 2021.
[17] Interview, April 2021.
[18] Interviews, February 2020.

First, and the dominant 'strand' within our cases, the notion of 'sustainability' has little meaning for the miners concerned, or has individual meanings in terms of sustaining personal activity. In this sense, echoing Ingold (2022), sustainability is about how gold lifeways carry on. For the miners, sustainability lies in the ability to continue mining, finding new ore-bearing grounds available for exploitation or reworking old, negotiating existential concerns over gold depletion, and being able to maintain their lifestyle and *sustain* crew, families and friends with the profits from mining.

Concern for the ecological context of mining activities may not be evident. In Suriname, miners may burn mercury amalgam in the open air, abandon workplaces as ruins and mining pits as holes in the forest or leave the natural course of diverted creeks unrestored. In Guinea, a new socio-technical system of extraction leans toward the same logic that characterises industrial open-pit mines, i.e., the cyclical concentration of accelerated extractive operations on limited areas, with the goal of maximising the quantities of ore extracted, with greater environmental harm in the process. Within gold lifeways, while 'old methods' did not make gold mining sustainable *per se* in Guinea, they paced the rhythm and temporalities of extraction according to a shared notion of intergenerational and redistributive justice. In Uganda, new techniques are perceived to contribute to more sustainable mining practices, but here too, emphasis is on *sustaining* everyday life and livelihoods, through saving space for farms and homesteads. Overall, across the cases, uncertainty about access and rights to the mines stands in the way of transformation towards environmental conservation and cleaner mining techniques.

Second, sustainability maybe articulated in *discourses* related to the mining category ('we miners'), especially when there is a miners' organisation and there has been a project in the locality seeking to introduce 'cleaner' techniques, as exemplified by discourses on responsible mining and claims to legitimacy in Uganda. Counter-narratives are also apparent, drawing from local cosmologies. Hence, we see how narratives about traditional authority in Guinea articulate concerns about mining intensification and resources depletion, and perceptions about the ignorance of city people and the bad intentions of public policies underline jungle resilience in Suriname.

Third, sustainability maybe associated with government *policy* and/or *action* in terms of repression of mining activities, especially in relation to environmental regulations, licencing, and the promotion of industrial mining interests. Our data here shows how miners are concerned about such repression in Uganda (and our wider data e.g. Massaro et al., 2022 [Brazil]; Pijpers, 2020 [Ghana]) but government ineffectiveness makes this a distant concern in Guinea and Suriname.

Gold lifeways reflect processes of transformation, but different sustainability strands problematize situating sustainability at the heart of change.

6. Conclusions

To approach sustainability transformations, we have underlined the importance of understanding the lived experience of small-scale gold mining and foregrounding the resource materialities that shape the gold lifeways within which this experience is embedded. We started this article by asking what sustainability looks like from different miners' perspectives. Our empirical data has demonstrated that these perspectives on sustainability gain content and impact not in isolation but as part of gold lifeways embedded within particular contexts and shaped by societal dynamics.

The three illustrative cases, and the wider range of country studies we draw them from, all highlight how miners negotiate precariousness in small-scale gold mining, including through recourse to mobility. This can relate variously to disputed claims over mineral-rich land, inability to generate or maintain capital for the necessary investment, lack of access to technology, or a deposit declining. At times, opportunities open up for sustainability actions, for example flowing from investment in new technologies. Nevertheless, there are also wider features that either support or undermine miners' endeavours, shaped for example by their own abilities or shortcomings, or by the political context including gaining legitimacy through mineral licences or, conversely, punitive government action.

All these dimensions contribute to how ideas and practices relevant to (un)sustainability are given meaning in mining contexts. Ultimately, for the majority of small-scale gold miners getting by within inherently precarious circumstances, gold's transformative potential is situated in personal lives and aspirations. It perpetuates a status quo that enables gold lifeways to carry on and those dependent on gold mining to continue. However, this is in ways far removed from ideals of a fundamental – transformative – change towards a sustainable future.

CRediT authorship contribution statement

Eleanor Fisher: Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Marjo de Theije:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Carlos H.X. Araujo:** Conceptualization. **Jorge Calvimontes:** Conceptualization. **Esther van de Camp:** Conceptualization, Writing – original draft, Writing – review & editing. **Lorenzo D'Angelo:** Conceptualization. **Cristiano Lanzano:** Conceptualization, Writing – original draft, Writing – review & editing. **Sabine Luning:** Conceptualization, Methodology, Writing – review & editing. **Luciana Massaro:** Conceptualization. **Januária Mello:** Conceptualization. **Alizèta Ouédraogo:** Conceptualization. **Robert J. Pijpers:** Conceptualization. **Raíssa Resende de Moraes:** Conceptualization. **Christophe Sawadogo:** Conceptualization. **Margaret Tuhumwire:** Conceptualization. **Ronald Twongyirwe:** Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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