Transforming matters: sustaining gold lifeways in artisanal and small-scale mining

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Growth strategies in mining regions promote gold extraction based on industrial mining, associating Artisanal and Small-scale Gold Mining (ASGM) with persistent informality. Against this background, we consider how to approach transformations to sustainability in ASGM. Acknowledging how problematic this topic is for sustainability debates, given how ASGM is associated with a host of environmental and social problems, we argue that a justice lens demands we confront such challenges within the global politics of sustainability. This leads us to review advances in the study of ASGM, linked to debates on extractivism, resource materialities, and informality. We use the notion of gold lifeways to capture how the matter of mining shapes different worlds of extraction. We argue that consideration of the potential for transformations to sustainability needs to be grounded within the realities of ASGM. This necessitates giving value to miners’ knowledge(s), perspectives and interests, while recognising the plurality of mining futures. Nevertheless, we conclude that between the immediacy of precarious work and the structural barriers to change in ASGM, the challenges for transformation cannot be underestimated.

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Introduction
Critiques of the notion of progress based on continuous economic growth situate ecological destruction as a defining feature of modern society [1]. In this line, it is argued that to address environmental crisis there is an imperative to fundamentally change the way people live on earth, transforming human relations to nature [2]. Hence, sustainability debates give attention to the need for change of a scale, speed, and extent that is transformative for sustainable societies. Both the climate crisis and the Covid-19 pandemic have fuelled these calls for transformative change, including through identification of how the social sciences and humanities may contribute to a more egalitarian knowledge and politics of transformation [3,*4**]. In this line, attention to global environmental change has led an expanding body of literature to explore
the characteristics of transformation, how it can arise, and whether it can be just and equitable [5,6,7,8,9] (see Fisher et al., Introduction, this special issue). Beyond academia, growing weight is given to transformation within international policy, including through the United Nations’ (UN) 2030 Agenda on Sustainable Development ‘Transforming our World’ [10].

Mineral extraction contributes to global environmental change, with Artisanal and Small-scale Gold Mining (ASGM) playing a role within larger extractive processes. The term ASGM commonly refers to the extraction and processing of gold through manual or partially mechanised techniques, although its scale and intensity (capital and technology used, volumes mined) is increasing. ASGM occurs in at least eighteen countries in the Global South. Data are notoriously weak [11,12], but approximately 90% of all employment in gold mining and 20% of global gold production is based on small-scale extraction [12,13]. Put another way, estimates suggest 44.75 million people are directly and 134 million indirectly dependent on Artisanal and Small-scale Mining (ASM); around half are involved in ASGM [12].

In countries across the Global South, national growth strategies endorse extractives-led development that privileges industrial large-scale gold mining. Worldwide, the gold industry is witnessing rapid change, incorporating new actors, technology and sources of capital [14**]. Such processes redefine temporal and spatial dynamics [15**,16] and contribute to the flows, movements and obstacles that disrupt and re-make worlds of extraction [17*]. We use the term ‘gold lifeways’ to focus on the ‘unruly edges’ [18**] of gold extraction, where informality is useful for the global supply chains that incorporate up to 20% of gold production from ASGM [12,19]. Gold lifeways gives expression to the situated, heterogeneous character of ASGM. Lifeways can be both precarious and a source of (temporary) stability, providing footholds towards futures constructed in the present using available symbolic and material capital. The notion of gold lifeways extends analysis of ASGM beyond either a resource logic or characterizations of informality; instead, lifeways capture the character of an occupation where people seek freedom and agency to create their own futures, with the matter of mining giving shape to diverse worlds of extraction. Our premise is that this can open a window for engaging with and unpacking the idea of ‘transformations to sustainability’ in ASGM.

In such complex, dynamic contexts, the value of (imported) models of change based on a single, objective view of ‘the problem’ is questionable [20]. Leach, Scoones and Stirling [20] stress the need to pay attention to plural perspectives and to the narratives framing sustainability. Such narratives incorporate judgements about the temporalities of change, about which issues are important; about the prioritisation of some solutions over others; and about whose interests should be included in, or excluded from, decision-making processes. Sustainability narratives pertinent to ASGM reflect stark asymmetries of knowledge and power. All too often, these narratives reinforce negative, homogenising and dehumanising stereotypes that situate miners as environmental pariahs and social deviants [21**,22]. Within policy, expert-led knowledge and technical solutions gain credence at the expense of opportunities for gold miners’ voices and interests to inform debate. This contributes, unsurprisingly, to a highly contested knowledge arena.

In this article, we take the basic starting point that one cannot expect to transform the world without understanding it. Hence, we situate gold mining within a broader field of study on mining and extractivism to consider what theoretical and methodological approach is relevant for addressing transformations to sustainability in ASGM. Intending to pay attention to plural perspectives, we address how to understand better what futures miners anticipate and wish for, acknowledging the spatially and historically situated character of such anticipation. Disregarding miners’ perspectives reinforces critical barriers to sustainability and limits scope for fostering deliberative sustainability transformations. Motivated by a three-year transdisciplinary project for which co-authors are team members, ‘Gold Matters — Transformations to Sustainability in Artisanal and Small-scale Gold Mining, Transregional and Multi-Actor Perspectives’ [2], this overview will lead us to reiterate the value of transdisciplinarity, drawing from our own experience as a team.

In seeking to mobilise anthropology and allied disciplines for politically relevant modes of engagement [23*], we recognise that addressing ‘transformations to sustainability’ in ASGM is complex, perhaps even an oxymoron [24]. Moreover, as Kirsch [25*] argues, ‘sustainable mining’ can be a corporate strategy used to conceal harm and neutralise critique [also 26]. When considering ASGM, what constitutes gold as a resource and how it can be sustained is not a given. According to a techno-scientific logic, gold is a finite, non-renewable resource whose reserves are being depleted [27,28]. However, ethnographically, anthropologists problematize this view of gold as an inert, fixed resource by demonstrating how cosmology mediates people’s relationships to gold [29,30,31*,32**]. Beyond this, and in the context of

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1 For data on ASM see DELVE, a global online data platform supported by the World Bank Group and Partnership for Capacity Building in Africa (PACT). https://delvedatabase.org/about (accessed 2021-04-12).

2 Co-authors of this publication are members of the Gold Matters project, which explores whether a transformative approach towards sustainability can arise in ASGM. See: http://gold-matters.org.
governance arrangements and industry dynamics that reinforce informality, ASGM is often characterised as the epitome of unsustainable production. It is widely associated with environmental destruction, deplorable working conditions, and negative socio-economic and health impacts; it also contributes 38% to global mercury emissions [33]. We do not shy away from these issues and acknowledge just how problematic they can be when addressing questions of sustainability.

Our orientation, and why we consider ASGM an important issue for debates on transformations to sustainability, is pragmatic. Many millions of people in the Global South depend on gold mining, and with high global demand for gold, coupled with miners’ capacity to exploit marginal reserves, ASGM will continue for years to come. Whether addressing critical barriers to sustainability involves transition to more sustainable mining practices or to non-mining livelihoods, a justice lens demands that we debate such problematic challenges within the global politics of sustainability.

To develop this line of argument, we turn in Section ‘Mining, extractivism, and materiality’ to consider how literature relevant to transformations to sustainability addresses mining and extraction. Then, in Section ‘ASGM, informality, and formalization’, we capture debates on informality in ASGM, outlining a dominant approach to sectoral development known as ‘formalization’. Section ‘Gold lifeways, transformation, and sustainability’ gives attention to how the notion of gold lifeways can be used to address transformations to sustainability in ways that embrace resource materialities. Finally, ‘Conclusions’ are followed by ‘References and recommended reading’, incorporating an annotated bibliography that highlights literature of value to our main line of argument.

**Mining, extractivism, and materiality**

We start with the observation that work on mining or mineral resource extraction characterised by a ‘transformative turn’ is limited. This may reflect how studies have focused on transitions in systems deemed fundamental to societal functions and contributing significantly to carbon emissions (energy, transport, housing, and agro-food) [7,34]. Of course, human societies are profoundly dependent on metals, minerals and mining [35**], but this gap in research is only recently changing, notably through attention to energy transition and an expanding demand for minerals and metals in low-carbon technologies [36,37]. Bearing this shortcoming in mind, we choose to delimit three broad areas of scholarship that we consider relevant to advancing the discussion.

The first area relates to work on sustainable mineral use and mining industry development. In the context of debates over mineral resource scarcity and exhaustion, sustainability scholars have emphasised the need for international governance mechanisms to ensure the availability of minerals and the equitable distribution of mineral wealth [38–40]. This tallies with science-policy on climate change that addresses transformation pathways in mining [41,42], although the tone is of a depoliticised ‘voice of industry’, with weak attention to the social and political drivers of transformation. From a development perspective, where these drivers are more apparent, studies consider mining and change necessary to meet the Sustainable Development Goals (SDGs) but do not address transformation per se [43,44]. Casting the net wider, research shows how mining heritage cities can transition in (uns)ustainable ways [45,46]. Transitions literature also addresses the implications of a boom in demand for minerals and metals due to a new renewables’ infrastructure [47]. Studies identify a ‘decarbonisation divide’ between the Global North and South, encompassing issues of exploitation and injustice [37,48,49].

A second area of scholarship relates to extractivism and transformation. As regards mining, extractivism refers to an acceleration of extraction to fulfil global demand for metals, minerals and energy in ways imbued with a specific resource logic (endowing natural resources with a dominant rationale for framing human relations to the non-human environment that excludes other kinds of relations or value [50**]). Neo-extractivism distinguishes post-2000 extractivism in Latin America from an earlier neoliberal form where the export of raw materials was exclusively in the hands of transnational corporations [51]. Neo-extractivism incorporates a welfare model of development in which progressive governments invest revenues in social programmes and infrastructure to benefit populations. It is nonetheless argued that neo-extractivism remains premised on the same extractivist relationships to natural resources, with continuing negative environmental and social impacts [52]. While extraction-led development holds many promises [53] the negative impacts of extraction provoke conflict and formidable struggles between people, state and transnational corporations [e.g. Ref. 54]. This stimulates the search for alternatives, especially in Latin America, as documented in work on social movements as agents of transformation. Examples include Escobar’s ‘designs for a pluriverse’ [55] and Gomez-Barris’ decolonial exploration of ‘terrains of potential’ [56]. Of note, too, is Temper et al.’s [57,58] work on resistance and transformations to sustainability.

Gold mining and gold are bound to the development of capitalism, transforming nature through technological innovation [59], and the creation of racialized regimes of labour exploitation and gender inequality in the conversion of surplus value [60,61**]. This legacy reminds us that ‘transformations to sustainability’ are not an innocent endeavour disconnected from colonial and imperial pasts,
or indeed ideas of modernity and visions of progress. It is therefore worth dwelling on the notion of extractivism to inform our continuing discussion. Szeman and Wenzel [50**] argue that the term extractivism is either used narrowly, referring to a physical process of extracting natural resources, or is expanded to include ideological rationales that motivate either extraction or its consequences and which reference a wide range of areas encompassed by capitalism and the erasures (human and non-human/other-than-human) generated by extraction [60*].

Used well in an expanded sense, Yusoff [61**], creates a history of minerals and bodies rendered extractable through racialized regimes of colonialism and slavery. She comments on the universal human agent of ecological destruction signalled by the term ‘Anthropocene’ and indicates geology as constitutive of the environmental crisis. Likewise, to provide a contrasting example, Povinelli [62**] re-theorizes questions of power by focusing on late liberal governance and the extractive economies of settler colonialism in Australia. Through the concept ‘geontologies’ and a mode of power conceptualised as ‘geontopower’, Povinelli shows how settlers’ categorization of extractive landscapes as ‘Nonlife’ served to ignore and belittle the different categorizations of ‘Life’ and ‘Nonlife’ applied in Aboriginal societies.

Szeman and Wenzel [50**] argue the notion of extractivism requires careful use — as demonstrated by the work of both Yusoff and Povinelli — because it can loosely connote everything through which value is generated for capitalism. In this blanket sense, without teasing out aspects of capitalism or relations described as extractivist, it becomes analytically unhelpful. Thus, better to focus extractivism on naming a human instrumentalism of non-human nature, the use of which is only a means towards human ends (and not all humans). In so doing, keeping both materiality in view, and the social relations constellated around specific resources, helps to capture the ‘itineraries of material flows . . . [and] rifts, geographic, social, metabolic/ecological . . . that create disjunctions in the value extracted from, produced by, and returned to, sites of extraction and the lifeworlds in which they are embedded’ [20, p. 510]. As Richardson and Weszkalyns [63] propose, giving attention to the character of matter and of infrastructures of extraction facilitates interrogation of the logics that perpetuate natural resource exploitation [64].

This leads to a third area of scholarship within literature on the anthropology of ASGM.1 Consistent with our argument, we zoom in on studies that convey the strength of ethnography for understanding resource materialities. They bring into view the material conditions of social and cultural life by rethinking received dichotomies between the human and non-human, society and nature, including what has agency or is acted upon. We note here Ingold’s [65] plea to ‘take materials seriously’ (p. 31) as processual and relational, rather than having fixed attributes. Ferry does this well for gold [66*].

Ethnographic case studies address materiality and the embodied dimensions of mining [22,67*,68]. Examples are illustrative (including studies by this article’s co-authors). Luning and Pipers [69] explore the ‘in-depth geopolitics’ of pit mining in Ghana, in which ‘a socio-political field of relations anchored into an underground of geological structures’ (p. 762) echoes the governance arrangements that frame access to gold in mining concessions. Luning [70] expands the material dimensions, focusing on the politics of knowing the underground and valuing subterranean extraction. Focusing on river dredging for gold in Bolivia, Salman [71**] locates materiality within human action and describes ‘how local techniques, materiality, infrastructure, and operation modes, together with histories and memories thereof, influence the way alluvial mining in Bolivia materializes’ (p. 1125). Also in the Amazon basin, the research of scholars led by de Theije [72–75] pays close attention to materials within a ‘socio-tech’ approach to mining.

Through ethnography, De Theije [76,77] and De Theije and Luning [78] portray the transnational character of mining, and the geographical movement of matter through the mobility of people, gold and goods. Attention to how mobility and technological innovation stimulates wider transformation also brings social and material arrangements to the fore, as described by Lanzano and Arnaldi di Balme [79,80**] and by Robertson and Farrelly [81]. Finally, a wealth of cosmological understanding points to the power and capricious agency of gold and spirits of the underground, requiring rest, care, protective charms, or libation [29,30,31*,32**,79,82]. In these ethnographic studies, ‘the material’ is not simply a condition for social organisation but integral to the analysis, with the matter of mining given shape through miners’ skill, knowledge, practices, bodies and mobilities within lifeways that lend nuance to an understanding of the heterogeneous and historically situated character of ASGM.

In our view, different aspects of the above literature provide entry points into constructing the relationship between ASGM and transformation. Consideration of what is to be sustained, how transformation can occur, and whom will benefit are political and justice issues, as attention to extractivism underlines. Bringing materiality to the fore can help to reveal how mining and sustainability dynamics are socially and materially shaped, as well as being historically situated and contextually rooted.

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1 Broader review of the anthropological literature on ASM and ASGM is beyond this article’s scope [see Refs. 35**,120*,121*].
Attention to ASGM dynamics leads us to turn to issues of informality.

**ASGM, informality, and formalization**

When considering transformations to sustainability in ASGM, the issue of informality, and how governments address this through ‘formalization’ (integration into the formal legislative, regulatory, and economic system), needs explaining.

Broadly, across the Global South, ASGM is entrenched with limited government recognition or regulation [83]. Indeed, informality and illegality maybe the only possibilities for miners because national mining laws are inappropriate for ASM or, more commonly, suitable laws remain unimplemented.

Analysing why ASM has been overlooked by African governments over four decades, Hilson and McQuilken [84] argue that environmental, social and related problems are expressions of persistent informality, underpinned by sector-specific interventions that are disconnected from wider development planning. Coming into play — in Africa and other continents — are national growth strategies promoting industrial mining. This generates mineral rents but negates ASGM’s value for employment and local economies [19,85,86].

While many studies focus on the role of the state in relation to informality, Geenen and Verbrugge [19,83,87] draw attention to how informalization is inherent in the way international mining capital seeks cheap and flexible labour to overcome persistent crises of accumulation. As they underline, the ubiquity of outsourcing and subcontracting in industrial gold mining challenges a dualistic perspective (i.e. treating industrial gold mining as ‘formal’ and ASGM as ‘informal’). This leads them to argue that informalization is a systemic response to sector challenges with respect to mineral scarcity, labour costs, and local resistance. In effect, capitalism today perpetuates the structural characteristics of informality by not requiring the rationalisation of labour and extraction [c.f. 18**]

From a different perspective, what is referred to as ‘informality’ exposes the situated and expansive character of ASGM in mining regions. In this vein, De Theije [88] argues that seeing informalization in Brazil as merely a systemic response to the growing scarcity of gold ore and the reduced activity of industrial mining misses how ‘informal mining is the oldest and most flexible form of gold mining that was meaningful and workable under different political winds and economic waves’ (p. 119).

Tubb [89**] makes a related observation on rebusque (‘shifting’)[4] in Colombian ASGM: ‘seen from below, [it] encompasses and surrounds the formal sector . . . becomes the dominant economy, and the formal economy is merely a normative project’ (p. 108). Jonkman [90] adds for Colombia that informality stimulates ‘bottom-up’ state making, appropriating the paraphernalia of officialdom, including within the cultural politics of the underground [91**].

The notion of frontier has been used to elaborate on the worlds of extraction that are labelled ‘informal’. It helps interrogate how, where the state is weak, as Werthmann and Grätz [92] explain, ‘artisanal mining springs up and creates new communities, new forms of bonding and alliance, and new divisions and hostilities, or new forms of integration and conflict.’ (p. i). Attention to these issues leads Pelluso [82*] to explore resource frontiers in which labour practices, property relations and secret knowledge create resource territories. In contrast, Luning and de Theije [93*] conjoin the notions of frontier and border to understand the dynamic between governance practices and people’s action, exposing identity politics and transnational mobilities. Taking a different tack, Bryceson and Geenen [94**] examine an occupational frontier to demonstrate how collective occupational identity and professional rule-making create scope for self-governance. Elsewhere [95,96], Bryceson and colleagues argue the mining frontier encourages egalitarian democracy. A thread running through all these studies is attention to what happens within a frontier where people seek freedom and agency to create their own futures [16].

Returning to a governance view of informality, while remember this larger picture on worlds of extraction within mining frontiers, the paradigm of ‘formalization’ goes to the heart of policy reforms across Asia, Latin America and sub-Saharan Africa. Reforms have sought to regularize ASM by bringing it into the legal sphere, with emphasis placed on securing mineral titles and permits. Being formalized acts as a catalyst for enterprise development, finance, environmental protection, gender empowerment, and improvements in pay, health, and well-being [e.g. Ref. 97**]. Over three decades, multilateral institutions, non-governmental organisations, industry bodies, and miners’ associations have generated practical action aligning with this orientation.

Formalization contributes to sectoral development and enables some miners to secure benefits. However, evidence points to unevenness of impact. Here we loop back to ASGM being a way of organising worlds of extraction. Studies identify formalization successes [11,97*,98], but a

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[4] Tubb [89**, p. xvi]: ‘shifting’ ‘aims to capture the temporary, contingent, creative, and mobile world of informal work represented by rebusque.’
wealth of research also documents limitations. For example, through continued informality in labour practices [17, 62**, 68, 69*, 72, 99, 100], gender exclusions [101], state weakness [102, 103], and complex exclusions [104**] including as a result of environmental policies [105–107]. Studies connect ASM to the SDG agenda [12, 43*], identifying barriers due to informality [108**], although this may relate to the inappropriateness of a target-driven SDG approach for ASM [109*].

The many issues identified in research on formalization, point to how ASGM has its own embedded dynamics and rationalities that are masked by sweeping reference to ‘informality’. The drive to formalize ASGM demonstrates benefits for some groups of people in certain contexts. Nevertheless, its shortcomings are apparent. Typically formalisation is based on a short-term development logic and reinforced by project-oriented development finance, in contrast to approaches to change that encompass a wider vision for sectoral reform, and public policies and finance that facilitate the sustainable development of ASGM in ways that are of genuine benefit to the people whose lives depend on it. As well as bringing into view the need to address structural barriers to sustainability, this underlines how important it is to draw the perspectives of miners to the fore.

**Gold lifeways, transformation, and sustainability**

We bring together our review on gold mining, extractivism, and informality to consider how conceptualisation of ‘gold lifeways’ permits us theoretically to approach transformations to sustainability in ASGM.

Used here, ‘lifeways’5 are neither a synonym for livelihoods nor a way of connecting to sustainable livelihoods debates. The term owes a debt to Tsing’s [18**] analysis of international commodity chains based on Matsutake mushrooms following a ‘white gold’ rush in 1980s Oregon. As for Matsutake, salvage accumulation incorporates sites within and outside capitalism, those involved may associated their work with freedom. Tsing’s [18**] call to ‘watch the unruly edges’ (p. 20), focusing on precarity to understand capitalist destruction and collaborative survival, strikes a chord for reflecting on transformations at the ‘unruly edges’ of gold extractivism, where informality is useful for gold supply chains [14**]. As Tsing observes, it is possible to amass wealth within capitalism today without rationalising labour and raw materials. Important instead, she argues, are acts of translation across varied social and political spaces (‘patches’) that draw one world-making project into another to make accumulation possible (p. 62). This applies par excellence to gold lifeways in ASGM.

Latour et al. [110] discuss avoiding ‘grand narratives’ when approaching capitalist enterprise and the (un)making of human — non-human ecologies. Likewise, we reject a view of capitalism and mining based on a singular global history [111]; we see value for thinking on transformations to sustainability in exploring ethnographically how the extraction and mobility of gold, people, and things emerges through different constellations around the world.

Gold lifeways bring together all the elements within gold’s transformation from geological matter to ‘pure’ gold; from mine sites to markets and beyond. Global gold prices create a dynamic: in boom times, new mining areas are opened and old areas are reworked; as prices fall, miners either remain or abandon sites [32**, 72, 112]. Entwined with the booms and busts of gold markets are other temporalities (e.g. cycles of production; seasonality), and their construction, manipulation and dissonances [15**]. Nevertheless, ASGM can appear in the moment, as people seek to create and imagine their own (unpredictable) futures [16]. In such processes, cosmologies are revealed in notions of luck, time, danger, secrets, and gold’s agency [30, 32**].

People may enter mining with little experience, but this is gained as occupational transformation occurs [95]. Whether through ore drilled from a rock face or placer deposits panned in a wetland, miners become experts at extracting, processing and trading gold, holding embodied knowledge of underground and overground matters [70, 113*]. Forms of organisation establish norms and rules, tenure rights and access arrangements, enabling miners to work together and negotiate conflict [69*, 72]. Regional mobilities generate multi-ethnic, transnational arrangements and prompt identity politics [78, 93*, 114]. Mobility also stimulates technological innovation and professionalization, with experts, knowledge, skills, and materials moving between mine sites [77, 78, 94**, 115]. Investment in equipment and innovation changes production levels and environmental impacts, for better or worse. Extraction, processing, human provisioning, and the sale of gold requires fuel, electricity and transport infrastructures. As references throughout this review highlight, ASGM takes varied forms in mining regions. Hence, ‘translation’ enables gold to be traded on distant markets as a capitalist commodity (that may end life as a gift).

Put abstractly, what we are describing is an assemblage of elements that influence one another in a manner that is open-ended, not fixed or bound [116, 117]. This assemblage includes human and non-human entities (‘real’ and otherwise; human and non-human/other-than-human), entangling the social and material together in encounters that stimulate transformation. This is dynamic, ‘assemblages don’t just gather lifeways, they make them’

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5 Archaeological, anthropological and sociological research in North America has used the concept of lifeways.
An important issue is how an assemblage becomes greater than the sum of its parts, as we seek to encapsulate by exploring gold lifeways.

We come to the question of whether and how, within a highly dynamic occupation, gold lifeways can be transformed, or transform themselves, to generate sustainable futures. Materiality associated with the making and imagining of resources conditions understandings of past, present and future [118]. Hence for us, addressing issues of transformation lies in paying attention to gold lifeways as the locus where miners’ seek the freedom to imagine their own futures. To transform worlds of gold extraction, necessitates gold miners’ knowledge(s), perspectives and interests being valued in addressing sustainability. This may appear self-evident, but it is far from the case within the political realities of ASGM.

Transformative action also requires attention to structural dimensions that play out within gold lifeways. Here one cannot be naïve. When considering ‘transformations to sustainability’ in ASGM, a lesson from formalization experiences is just how entrenched are structural barriers to progressive visions of an inclusive mining sector, recognising its significance for those whose lives and livelihoods depend upon it, and how weak are public policies to address ASGM’s many sustainability challenges. The best we can suggest is that a rounded understanding of sustainability dynamics in local contexts may permit windows of opportunity for transformative change to be grasped when they open up.

On a final note, to know the world making of miners and to understand ASGM dynamics in mining settings is challenging. In this respect, we find value in transdisciplinarity, bringing together interdisciplinary perspectives and incorporating non-academic knowledge and ways of framing transformations to sustainability. For us, methodologically, the need to co-labour [119] with miners to understand their worlds of extraction and the challenges and opportunities for sustainability transformations becomes critical. Co-labouring foregrounds multiple perspectives, since different people look with different eyes based on expertise, sensitivities and interests. A strength of a transdisciplinary approach is it enables researchers to engage with ASGM and sustainability issues in diverse and holistic ways. This requires reflexivity and acknowledged positionality on the part of researchers, including over the risks taken by miners in the conduct of research and the uses of knowledge.

Conclusions
This review has examined recent advances in the study of small-scale gold mining to ask what theoretical and methodological approach is relevant for addressing transformations to sustainability in ASGM. Theoretically, we have intersected the notion of transformations to sustainability with that of gold lifeways, giving expression to mining matters, while methodologically we have emphasised the value of a transdisciplinary approach. For meaningful transformation to arise and to change practices within the underground, addressing transformations to sustainability must necessarily foreground miners’ perspectives and acknowledge the plurality of mining futures in different worlds of extraction.

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References and recommended reading
Papers of particular interest, published within the period of review, have been highlighted as:
- of special interest
- **of outstanding interest**


Introduces a special issue whose articles critically address what the Environmental Humanities can contribute to understanding the challenges facing humanity.

Considers the need for analysis that combines theoretical capacity to address structural political-economy conditions with unry processes reflecting complexity, uncertainty, contingency, and context specificity reflecting on implications for international development.

Examines the notion of transformation in relation to contemporary sustainability debates. Identifies latent risks with discourse that frames transformation as apolitical and inevitable. Suggests transformation needs to be considered in plural and political ways.

Reviews three approaches to transformations — ‘structural’, ‘systemic’ and ‘enabling’ — and argues all three approaches may hold value for addressing effective transformations to sustainability, in ways that recognize diverse knowledges, plural pathways and the essentially political nature of transformation.


8. McPherson T, Raymond CM, Gulsrud N, Albert C, Coles N, Fagerholm N, Nagatsu M, Olafsson AS, Soininen N, Viarikkö K: Radical changes are needed for transformations to a good Anthropocene. npj Urban Sustain 2021, 1
Addresses how human activity on the planet needs to radical depart from the status quo to remain within planetary boundaries and achieve sustainability. With an urban focus, it is argued this requires rethinking growth, efficiency, the state, the commons, and justice.

Focusing on climate change, addresses the question of how do deliberate social transformations happen? Presents three spheres of transformation: the practical, political, and personal spheres, exploring how they can be used as leverage for transformation.


Examines how industrial gold mining and artisanal and small-scale mining are globally integrated within a gold production system. Structural trends in gold production are analysed and country case studies presented, highlighting how production and trade in gold is embedded within local structures and ecologies.

Introduces a special issue advancing recent scholarship on temporal dynamics in the extractive industries. Attention is drawn to the multiplicity of temporalities associated with extraction and how they diverge and conflict within representations, discourses and politics.


Draws on concepts from Human Geography, Rural Territorial Development and Development Studies to frame relationships between mining and sustainable development while paying attention to movement.

Examines the relation between capitalist destruction and collaborative survival within multi-species landscapes, presenting a reflection on environmental history and global commodity production.


Demonstrates how miners challenge dominant discourses that represent them as immoral, anti-social agents. By examining the vocabulary of contingency used by miners to make sense of their successes and failures and guide their daily decision-making, the article argues that miners’ vocabulary reflects the social reality in and around diamond mines.


Examines why anthropology matters, making a case for political engagement.


Challenges mining companies’ claims to practice sustainable mining, arguing that progressive redefinition of the term sustainability has emptied out the concept with reference to the environment. Instead used to refer to corporate profits and economic development that will outlast the life of a mining project, becoming corporate oxymoron that corporations use to conceal harm and neutralize critique.


Draws on ethnography from the Peruvian Amazon, the article demonstrates how Andean miners adapt their cosmologies to encompass shifting political situations and divergent ways of experiencing the world. It is argued that ASM in western Amazonia requires consideration of material and religio-spiritual relationships that transcend the Andes-Amazonia divide.

32. High M: Fear and Fortune: Spirit Worlds and Emerging Economies in the Mongolian Gold Rush. Cornell University Press; 2017 Provides a rich ethnographic account of ASM in Mongolia. While focusing on gold mining as an emerging economy, the book traces continuities and disjunctions between human and non-human participants in a gold rush, following the paths of gold from the point of extraction to some of its destinations.


Transformations to sustainability: critical social science perspectives


Reviews literature on the anthropology of ASM, with a focus on livelihood transformations and corporate practices, coupled with consideration of the environmental impacts and social conflicts wrought by mining.


Argues that focusing on ASM would help governments in sub-Saharan Africa realise the Sustainable Development Goals, providing justification for featuring ASM more prominently in development planning.


Considers the relationship between resource extraction as a moment and process and extractivism as an ideology and cultural logic that permeates social imaginaries. Argues that keeping materiality of relations and processes coined ‘extractive’ helps ensure analytical precision in use of the term ‘extractivism’.


Describes the Latin American social movements that seek to defend their territories from large-scale extractivism. Escobar demonstrates how these social movements engage in an ontological politics, which he argues is central to creating world-making stories of different possible futures that may enable the profound social transformations that are needed to address planetary crisis.


Draws on decolonial theory, to make a case for the persistence of colonial logics, highlighting how indigenous intellectuals, artists and activists in Latin America create spaces within ‘extractive zones’ — modes of living beyond extractive capital.


Focuses on transformations to sustainability, to propose that a resistance-centred perspective offers potential to reframe the agency of those engaged in the creation and recuperation of ways of being in the world.


A conversation between Donna Haraway and Anna Tsing reflecting on legacies of the plantation, including species extinction and land dispossession, linked to discussion over the limits and possibilities of the Anthropocene as a geological epoch.

61. Yusoff K: A Billion Black Anthropocenes or None. The University of Minnesota Press; 2018

An examination of the relationship between geology and subjectivity, making the argument that the notion of the Anthropocene incorporates racial blindness that disregards histories of slavery creating a ‘double dispossession’ of spaces and peoples, including those categorised as non-beings.


A further contribution to Povinelli’s work characterizing the conditions of late liberalism, in which power and governance are rerecontextualised.


This essay explores the semiotic properties of gold, exploring how gold is particularly appropriate for meaning making and contestation.

Focuses on subterranean ethnography, examining access to gold in the context of governance modalities, socio-political context, and geological structures. It contributes to debates on subterranean sovereignty and the socio-spatial characteristics of mining concessions.


71. Salman T: The intricacies of “being able to work undisturbed”: the organization of alluvial gold mining in Bolivia. Soc Nat Resour 2016, 29:1124–1138

Examines small-scale alluvial gold mining in Bolivia to show how cultural practices, social patterns, and institutions, policies and politics are connected to technologies, physical environments, infrastructure, and landscapes. It argues for an analytical approach that acknowledges the interlinking of sociocultural and physical dimensions.


This article presents ethnography from Burkina Faso to bring attention to new scenarios opened by the shift to cyanide for processing gold — a transformative factor in many gold mining areas across the world. The research contributes to a broader reflection on the nexus between the trajectories of socio-technical innovation and the ongoing power struggles in the informal economies of resource extraction.


Focuses on small-scale gold mining in Indonesian Borneo to argue that gold’s presence, discovery, and informal extraction creates resource frontiers, and that within these frontiers, mining labour practices, property relations, and gold-mining-related secret knowledge converges to generate resource territories. The article challenges views of territory and territorialisation as an imposition of government on people and resources within spatial boundaries.


Focuses on why the economic importance of ASM has been overlooked in sub-Saharan Africa over a period of four decades. It argues that initiatives to support the ASM sector have been introduced in an ad hoc fashion, dissociated from wider national and regional development planning.


89. Tubb D: Shifting Livelihoods: Gold Mining and Subsistence in the Choco, Colombia. University of Washington Press; 2020

An ethnographic account of gold extraction in Colombia. The notion of rebusque (shifting) is used as a metaphor for the fluid livelihood strategies employed by gold miners, amongst others, carving a niche within processes of resource extraction that shape lives and localities.


Exposes underground cultural politics amongst Afro-descendent communities involved in gold mining. It critiques state-centric understandings of neoliberal multiculturalism, underlining the role miners play as agents in the enacting of multicultural governance regimes.


Conjoins the notions of frontier and border to understand the dynamics between governance practices and people’s action, exposing identity politics and transnational mobilities.


Comparing mining experiences between the Democratic Republic of Congo and Tanzania, this article examines labour transformation within an occupational frontier. It argues that shared occupational identity and collective professional norms generate potential for self-governance.


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Argues there is a gulf between academic research on informality and policy/donor objectives. It takes the view that bringing these perspectives together will help strengthen the case for formalizing ASM, permitting policy to more accurately reflect the sector's dimensions.


Draws on feminist political ecology and political economy to analyse the gendered meanings of gold and women’s inclusion in sub-Saharan Africa. It presents two examples of the consequences of enforcing gender-blind environmental initiatives on gold miners in Ghana and Mozambique.


Critically examines debates over formalization drawing on empirical evidence from Guyana, linked to an understanding of the interaction between social and ecological phenomena. The country has had a formalized gold mining sector for a long time, which is considered well established and egalitarian. Shows how exclusionary dynamics play out in formalized mine sites, due to state-led restrictions, landlord-tenant relations, and the availability of gold deposits.


Focuses on Liberia to examine why formalization of the ASM sector continues to be undermined. It argues that persistent informality needs to be understood as a rational strategy for those employed within the sector. Doing so provides a basis for sustainable mining reforms to be linked to broader national and international extractive sector policy frameworks.


Argues that a target-driven SDG approach to ASM risks exacerbating the large-scale mining bias, entrenching inequalities that are bound to formalization, and privileging techno-scientific knowledge at the expense of critically probing the impact of global sustainability governance on the lives of the poor.


Presents an overview of how historically anthropologists working on resource extraction have addressed materiality in their research, then considers how attention to materials has come to the fore in recent research. Identifies emergent and new areas for inquiry.


An annual review of anthropological perspectives on mining, as apparent in the mid-1980s.


An annual review of anthropological perspectives on mining in the early 2000s, giving emphasis to resource conflicts.