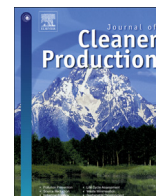




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## Mining in a changing climate: what scope for forestry-based legacies?

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## ABSTRACT

This paper provides an interdisciplinary perspective on mine reclamation in forested areas of Ghana, a country characterised by conflicts between mining and forest conservation. A comparison was made between above ground biomass (AGB) and soil organic carbon (SOC) content from two reclaimed mine sites and adjacent undisturbed forest. Findings suggest that on decadal timescales, reclaimed mine sites contain approximately 40% of the total carbon and 10% the AGB carbon of undisturbed forest. This raises questions regarding the potential for decommissioning mine sites to provide forestry-based legacies. Such a move could deliver a host of benefits, including improving the longevity and success of reclamation, mitigating climate change and delivering corollary enumeration for local communities under carbon trading schemes. A discussion of the antecedents and challenges associated with establishing forest-legacies highlights the risk of neglecting the participation and heterogeneity of legitimate local representatives, which threatens the equity of potential benefits and sustainability of projects. Despite these risks, implementing pilot projects could help to address the lack of transparency and data which currently characterises mine reclamation.

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## 1. Introduction

Prompted by criticisms regarding poor environmental and social performance, the global mining industry has implemented a comprehensive sustainable development agenda. This agenda is becoming increasingly dominated by concerns over climate change, widely recognised as one of the most important challenges of the 21st century (Stern, 2006). Mining corporate sustainability strategies, therefore, have increasingly engaged with the issues of carbon emissions mitigation and carbon accounting (Pellegrino and Lodhia, 2012). The emergence of strategies to manage carbon emissions from land-use change presents an opportunity for mining companies to augment their sustainability credentials by using carbon finance to support reclamation of mined land to forests,<sup>1</sup> and the economic development of local host communities. Although some companies have started to engage with payment for ecosystem services (PES) schemes (Olsen et al., 2011), the potential for forestry-based legacies has received limited attention

(Gilberthorpe and Banks, 2012). It is timely, therefore, to critically review the basis for, and implications of, such schemes.

Drawing on interdisciplinary research conducted in Ghana, this paper aims to gauge the potential for forest-based legacies by providing an initial quantification of the carbon stocks associated with reclamation in forest areas, exploring how key stakeholders understand and influence the reclamation of mine sites, and reflecting on the potential implications of mining companies harnessing carbon finance as part of their sustainability strategies. The findings suggest that forestry-based legacies could go a long way towards mitigating the adverse socio-ecological impacts associated with unplanned and poorly executed mine closures (Laurence, 2007). The discussion also highlights how the global focus on climate change risks marginalising the concerns of local communities and exacerbating the already-inequitable sharing of natural resource-derived benefits. Nonetheless, pursuing pilot projects would help to address the lack of data and transparency that currently characterises mine reclamation in countries such as Ghana.

## 2. Sustainable mining: the growing importance of climate change

From one perspective, sustainable mining is an oxymoron: exploiting a finite resource is inherently unsustainable. But the

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E-mail address: [m.a.hirons@pgr.reading.ac.uk](mailto:m.a.hirons@pgr.reading.ac.uk) (M. Hirons).<sup>1</sup> Mine reclamation refers to the process of returning mined land to a useful state, which in the context of this paper is a forest for the purpose of sequestering and storing carbon.

mining industry provides a range of materials essential for societal wellbeing. Accordingly, most accusations that the mining industry is unsustainable are directed not at the industry *per se*, but at the corollary impacts which contradict key sustainability principles, especially environmental protection and the equity of economic growth.

The economic benefits of mining are well noted, but are rarely realised in local 'host' communities which, instead, bear the brunt of the problems associated with mineral extraction and processing. The academic and popular literature is replete with examples of unsustainable practices in the mining industry, including unmitigated land degradation and deforestation, chemical leakages, water pollution and human rights abuses (Ballard and Banks, 1997; Ruggie, 2007; Bebbington and Bury, 2009). These issues are particularly prevalent in developing countries, which have competed for investment by, *inter alia*, creating favourable tax incentives and minimising regulatory oversight (Akabzaa, 2004). Although the general applicability of the 'race to the bottom' theory in the context of a globalising mining sector is open to debate (Konisky, 2007), there is widespread agreement that resource-rich countries have consistently underperformed economically and environmentally. This 'resource curse' is evidenced by several mineral-rich countries' perpetual occupation of the lowest tier of the UN Human Development Index, and topping Transparency International's Corruption Perceptions Index.

In response to widespread criticism, the mining industry has pursued a series of legitimising strategies in order to operationalise a rhetorical shift towards 'sustainable mining' (Whitmore, 2006). Corporate Social Responsibility (CSR) agendas are at the forefront of these strategies. As Gilberthorpe and Banks (2012) point out, the underlying justification for the adoption of CSR is that it provides a framework for delivering sustainable development. Reflecting the growing importance of climate change in the sustainable development discourse (Grist, 2008), the mining industry has, rather sluggishly, begun to engage with the issue. The production of a suite of documents on climate and mining by the International Council on Mining and Minerals (ICMM) which aims to demonstrate the willingness of the industry to play 'a constructive and pragmatic role in climate change policy discussions' (ICMM, 2013) is symptomatic of this shift.

The most recent ICMM climate reports, released in May 2013, focus, understandably, on articulating the physical and financial risks associated with climate change and carbon pricing. This focus reflects the increasingly neoliberal approach to sustainable development encapsulated by the commodification of carbon and the promotion at the Rio+20 conference of the 'green economy'. Under this paradigm, payment for ecosystem services (PES) schemes rooted in the carbon market have proliferated. Such schemes enable individuals, government, non-governmental organisations and private companies to pay for carbon storage and sequestration (Kinzig et al., 2011). Several variants of carbon-based PES schemes exist, including the poorly-regulated voluntary carbon market (Gillenwater et al., 2007), the Clean Development Mechanism (CDM) created under the Kyoto Protocol, and Reducing Emissions from Deforestation and Degradation (REDD+).<sup>2</sup> Policy-makers have embraced carbon finance schemes because they ostensibly deliver both environmental benefits in the form of increased carbon storage, and financial benefits to poor communities and countries. It has been estimated that carbon markets could be potentially worth more than US\$30billion/year (Corbera et al., 2010).

<sup>2</sup> The 'plus' component of REDD+ refers to the enhancement of carbon stocks, sustainable forest management with respect to forest communities and biodiversity conservation.

There is considerable concern, however, that carbon market initiatives are being pursued in spite of the considerable risks associated with introducing policies which are not sufficiently grounded in the realities of the contexts in which they are being implemented. Boyd (2009) argues that while proven scientific methods exist for quantifying carbon dynamics associated with land-use change, scientists and resource managers simplify complex forest ecosystems and their social context in order to facilitate universal management strategies, including the trading of carbon credits. Furthermore, the commodification of carbon risks reversing advances in decentralised and community-based natural resource management (Sandbrook et al., 2010). This resurgent protectionism (Beymer-Farris and Bassett, 2012) threatens to undermine local institutions, complicate resource tenure and marginalise community control over resource management and decision-making, factors which have been found to be necessary components of PES projects that contribute to poverty alleviation and environmental protection (Dougill et al., 2012).

The relatively low-spatial extent of mining activities means the sector has received less attention than agriculture and logging in carbon-market and PES discussions. But, by virtue of their extensive concessions and dramatic impact on ecosystems, mining companies represent a significant land holder and a key stakeholder in land-use governance. Although the ICMM document 'The role of Mining and Metals in Land-Use and Adaptation' (ICMM, 2013) moots involvement of the mining industry with REDD+, there has been little discussion regarding how and why mining companies might engage with land-use based carbon finance initiatives.<sup>3</sup> Principally, schemes are viewed as a carbon offset option, with companies providing the finance for projects (ICMM, 2013). Schemes of this kind have begun to emerge. In Madagascar, for example, Rio Tinto is collaborating with the International Union for Conservation of Nature (IUCN) on a project aiming to utilise PES schemes to support conservation in order to offset their activities (Olsen et al., 2011).

A more direct link between mining activities and carbon markets could be established through forest-based legacies. Under such schemes, mined land could be reclaimed to forest and then returned to communities which could derive benefits through payments for carbon sequestration under the voluntary carbon market, the CDM, or, if negotiations allow, under the plus-component of REDD+ schemes. In theory, these schemes could augment CSR agendas by contributing to the mitigation of climate change and local development. Sperow (2006), for example, highlights the potential of carbon sequestration on mine sites by estimating that in the United States, rehabilitating mined areas could contribute up to 12.5% of a 7% target reduction in total emissions. The potential for carbon-based PES schemes at mine sites in a development context, however, has not received any explicit attention.

This paper contributes to debates by examining the potential for, and potential pitfalls of, forest-based legacies. A balanced analysis requires a holistic approach which develops an understanding of the carbon dynamics of reclaimed mine sites as well as accounting for the complex social realities and contested nature of resource governance which typifies mining-forestry contexts. The following section outlines the interdisciplinary methods used in this study to provide an initial estimate of the progress of reclamation in restoring forest carbon stocks and investigate how reclamation is conceptualised by a variety of stakeholders.

<sup>3</sup> Mining companies have, however, been involved with energy related carbon market schemes, notably the European Union Emissions Trading Scheme.

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