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# The Impact of Mining on Forests: Information Needs for Effective Policy Responses

3 June 2015

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### Introduction

On 3 June 2015 Chatham House hosted a workshop in London on ‘The Impact of Mining on Forests: Information Needs for Effective Policy Responses’. The workshop brought together 40 experts from around the world, including representatives of the private sector, multilateral agencies, civil society and academia.<sup>1</sup> It explored which data are currently available to policymakers, which initiatives are under way to assess and monitor forest impacts and where there are knowledge and data gaps. The aim of the workshop was to understand the data needs for improved monitoring, regulation and control of the sector in order to reduce impacts on forests. The workshop had a broad focus: case studies ranged from the impacts of large-scale formal coal mining in Indonesia to artisanal gold mining in Peru.

Since demand for mineral resources is set to continue to grow, it is vital to identify and monitor the environmental and social impacts of mining. While there is much anecdotal information about the direct and indirect impact of mining on forests, no comprehensive review has been undertaken to date. Given the important role forests play in sustainable development and climate regulation, this lack of information and analysis is worrying. A sound understanding of the impacts of mining on forests is needed to identify policy measures that can mitigate any negative impacts and help ensure that the mining sector makes a positive contribution towards sustainable development.

The complexity of the issue, highlighted at the beginning of the workshop, is that mining activities and their impacts vary by country and by commodity. But perhaps the main differences are between production methods: in particular, there is a distinction between artisanal and small-scale mining (ASM) and large-scale mining. ASM refers to mining by individuals and small groups and is generally informal in nature. It can be defined as formal or informal and involves relatively simple forms of exploration, extraction, processing and transportation. For this reason, it generally has low capital and high labour requirements.<sup>2</sup> In some countries and in the case of some metals and minerals, it is the dominant mode of production. While formal, large-scale mining varies from country to country in terms of scale and sophistication, it can involve large mine footprints owing to extensive infrastructure, heavy machinery and a sizable workforce.

### Key points

- There is a gap in understanding and awareness of the impact of mining on forests. Assessing the scale of the problem is complex and varies according to commodity type, mode of production and country context. In particular, the direct impacts of artisanal and small-scale mining on forests are very different from those of large-scale mining; and quantifying indirect impacts is challenging.
- Monitoring the impact of mining on forests requires a landscape-level approach so that not only impacts beyond those of individual projects are taken into account but also interactions with other land uses.
- An understanding of likely mineral demand trends in the future can help identify potential mining hotspots and thus priority areas for policy action.
- Satellite and digital technology provides policymakers with a range of data on forest impacts, but practical and analytical challenges need to be overcome in order for those data to be used effectively.

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<sup>1</sup> Speaker presentations can be found at <http://www.illegal-logging.info/content/impact-mining-forests-information-needs-effective-policy-responses>.

<sup>2</sup> ‘ASM can include men and women working on an individual basis as well as those working in family groups, in partnership, or as members of cooperatives or other types of legal associations and enterprises involving hundreds of thousands of miners.’ Source: OECD (2013), *OECD Due Diligence Guidance for Minerals from Conflict-Affected and High-Risk Areas*, p. 65.

- Governments, the private sector and civil society all have a role to play in monitoring and regulating forest impacts. Capacity-building should be a priority in many producer countries, not least to strengthen the regulatory framework and its enforcement and to support local civil society.
- A better understanding of the business case for why companies should be concerned about the impact of their activities on forests is required.
- As part of their efforts to promote sustainable supply chains for metals and minerals, consumer countries should draw lessons from existing regulatory initiatives – in both the mining and the forestry sectors.

## Session 1: Current state of knowledge

### Global picture

A discussion of the state of knowledge about the impact of mining on forests was launched through presentations by Chatham House and the World Bank. Felix Preston of Chatham House presented the findings of a literature review on the global impact of mining on forests. The research found that mining is having a significant impact on forests in a number of countries and regions. Those countries and commodities for which the literature has documented a link between mining and deforestation are listed in Table 1. Most of the commodities in question are produced for export – an observation that is relevant for considering which potential policy measures could be used to influence those supply chains.

**Table 1: Country overview: Key mineral exports, contribution of forest and mining sector to GDP and tree cover loss 2001–13**

Country	Key mineral export commodities (those linked to significant deforestation are in bold) <sup>a</sup>	Forestry, % of GDP, 2011 <sup>b</sup>	Mining, % of GDP, 2012 <sup>c</sup>	Tree cover loss, million ha (and % of total national tree cover) 2001–13 <sup>d</sup>
Indonesia	<b>Tin, nickel, gold, copper, aluminium (bauxite)</b>	1.7	1.7	17 (10%)
Brazil	Iron ore	1.1	2.9	36 (7%)
DRC	<b>Copper, gold, tin, tantalum, tungsten, cobalt</b>	0.6	18	7 (3%)
Cameroon	Aluminium (bauxite), <b>gold</b>	2.8	0.2	0.5 (2%)
Ghana	<b>Gold</b> , manganese	3.5	13	0.5 (7%)
Guyana	Aluminium (bauxite), <b>gold</b>	4.1	22	0.1 (0.5%)
Liberia	Iron ore, <b>gold</b>	15.2	29	0.6 (7%)
Peru	<b>Gold, tin, copper</b> , zinc, lead, silver	0.8	13	2 (2%)

<sup>a</sup> Chatham House Resource Trade Database, 2015.

<sup>b</sup> Global Forest Watch (GFW) data.

<sup>c</sup> Exports of metallic minerals, metals and coal (UNCTADstat data) as share of total merchandise exports.

<sup>d</sup> GFW data. Note that tree cover loss is not necessarily the same as deforestation. There are multiple drivers of tree cover loss, which may include mining, forestry and other activities.

### Direct and indirect forest impacts

Kirsten Hund of the Energy and Extractives Global Practice of the World Bank gave a presentation on mining in Central and West Africa, where ASM is widespread. Hund highlighted that the direct and indirect impacts of mining on forests of ASM are very different from those of large-scale mining. The direct impacts include deforestation and removal of topsoil for open-cast mining, cumulative forest loss

caused by ASM and the pollution of soil and water sources. Both the scale and the impacts of the ASM sector are difficult to quantify because of the high level of informality and the associated lack of data. The direct impacts of large-scale mining tend to be easier to quantify because they are relatively well regulated. Mining companies are generally required to undertake environmental impact assessments (EIAs) and draw up detailed rehabilitation plans under the laws of the countries in which they are operating. Moreover, those measures are required in order to meet the standards of international financiers in cases where there is reliance on such funding.

The indirect impacts of infrastructure development for large-scale mines, particularly in previously unexplored forest areas, pose a significant threat to forests: the construction of transport infrastructure may open up remote forests to other activities, such as logging, hunting and agriculture. The development of settlements near mine sites for workers has local impacts, too, including attracting those who are looking for associated economic opportunities.

Besides extracting resources, artisanal miners use the forest and its resources for food, construction materials and energy. In so-called ‘rush situations’, where large numbers of miners suddenly descend on a previously untouched area to extract its minerals, particularly significant damage can be caused to forests.

A number of challenges associated with data collection to monitor impacts were outlined at the workshop. First, impact assessments are highly site-specific and use various methodologies. The ecological, social and technical context will determine which data are needed and how they are collected. For example, if infrastructure development is required for a project but is not the responsibility of the mining company, the impacts will not necessarily be included in the mining project’s EIA. The presence of several mining companies in the same landscape can encourage a population influx and subsequent impacts, but in most cases this will not be the subject of a landscape-level impact assessment. Moreover, identifying and isolating drivers and responsibilities is difficult – for example, in cases where mining and agriculture projects share infrastructure. Methodological challenges include integrating data sets and scaling these up to form an aggregated picture of the impacts of mining on forests at the local, national and global level.

Finally, the complexity of products and their mineral supply chains means that consumers are often unaware of the production impacts of products. Furthermore, much of the debate on minerals has focused on ‘conflict minerals’ and human rights rather than environmental impacts. Consequently, it has proved difficult to engage companies on the issue of environmental impacts.

### **Past and future trends**

Besides examining the current situation, it is important to look at past and future trends. Past trends highlight how production and trade patterns can shift dramatically and have implications for the impact of mining on forests. For example, the rapid increase in gold prices since the global financial crisis is thought to have been a significant driver in the expansion of both ASM and formal gold mining. Forecasting patterns of production and consumption are important for prioritizing action and identifying potential policy levers for intervention. It was highlighted at the workshop that the current slump in prices on the commodities market and the resulting reduction in exploration activity provide an opportunity for policymakers to take stock and think about how to achieve better planning in order to improve the sustainability of mineral development.

## Mining and hotspots of forest impacts

At the global level, metal and mineral production volumes have risen dramatically over the past 10 years, although large-scale production has been confined to a handful of countries.<sup>3</sup> These include states that have extensive forest resources, in some of which mining – directly and/or indirectly – is thought to have contributed to significant deforestation.<sup>4</sup> Again, it is important to distinguish between formal, large-scale mining and ASM. Case studies from Indonesia and Peru and a regional study of South America were presented at the workshop. These cases are notable as Brazil, Indonesia and Peru, for example, are home to some of the world's largest industrial mines, including areas where ASM predominates.

A sharp increase in mineral prices can result in a surge in mining activity, which contributes to deforestation in some locations. High gold prices since 2007–08 have led to an artisanal gold mining boom in Brazil and Peru, as previously uneconomical low-grade deposits could be extracted. A study by the University of Puerto Rico found that tree cover loss in the Madre de Dios region of Peru has increased significantly since 2007 as a result of artisanal gold mining.<sup>5</sup> Whether the current period of lower commodity prices will lead to a corresponding reduction in such mining activity – and thus the associated negative impacts – remains to be seen. At the same time, the short-term prospects for new 'greenfield' projects in emerging producer countries, which could pave the way for negative impacts on forests in new areas, would appear dim, given the recent falls in prices for most mineral commodities.

## Future demand

Although the commodity boom of the past decade may be at an end, global demand for mineral resources is set to increase in the medium term owing to infrastructure expansion and urbanization in emerging economies. China's surging demand growth has slowed, but it is still importing and processing huge volumes of minerals both for its own consumption and, increasingly, for export production. India and other emerging economies will increase their demand for minerals in coming years. Meanwhile, Europe remains a large consumer of metals products as well as of some raw materials, including ore for gold refining in Switzerland.

Meeting this growing demand will present both opportunities and risks for producer countries. As the one of the main drivers of this demand, consumer countries have an important role to play in ensuring the sustainability of production, especially if institutions are weak in the producer countries. It was noted that consumer countries could draw lessons from the regulation of supply chains in other sectors – for example, under the EU Timber Regulation and the US Lacey Act, both of which prohibit the import of illegal timber, as well as the Dodd-Frank Act and the EU Directive on Conflict Minerals, which seek to exclude conflict minerals from supply chains.

## Policy tools

There followed discussions on what policy tools are available – at both the international and the national levels – to address forest impacts linked to mining. The need to build on existing policy processes in order

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<sup>3</sup> See Kooroshy, J. et al. (2014), 'Cartels and Competition in Minerals Markets: Challenges for Global Governance', Chatham House research paper.

<sup>4</sup> Swenson, J. J., Carter, C. E., Domec, J. C. and Delgado, C. I. (2011), Gold mining in the Peruvian Amazon: Global prices, deforestation, and mercury imports. *PloS one*, 6(4); and Asner, G. P., Llahtayo, W., Tupayachi, R. and Luna, E. R. (2013), 'Elevated rates of gold mining in the Amazon revealed through high-resolution monitoring', *Proceedings of the National Academy of Sciences*, 110(46), 18454–59.

<sup>5</sup> Alvarez-Berrios, N. L. and Aide, T. M. (2015), 'Global demand for gold is another threat for tropical forests', *Environmental Research Letters*, 10(1).

to monitor and regulate forest impacts was highlighted, with particular reference to the areas discussed immediately below.

### Land-use planning

The importance of promoting integrated land-use planning for mining and associated infrastructure was noted. Improved inter-ministry coordination of land-use planning and the sharing of land-use data would help provide a more coherent picture of how the impact of mining on forests compares with that of other sectors and forms of economic activity. In addition, such cooperation could help support the development and implementation of coherent cross-sector legislation, where appropriate.

It was highlighted that inclusive planning can help reduce land-use conflict and minimize indirect and cumulative environmental impacts. However, participants noted that while integrated maps play an important role in such planning, policymakers and stakeholders need to be able to interpret and use them effectively.

Another aspect of land-use planning is consultation with local communities. It was stressed that often communities are unhappy about mining projects, one of the main reasons being inadequate consultation or communication processes, as a result of which expectations of the potential benefits are too high and awareness of some of the negative impacts too low.

### REDD+ strategies

A number of countries acknowledge in Reducing Emissions from Deforestation and Forest Degradation (REDD+) readiness documents that mining is a driver of deforestation; they include Ghana, Indonesia, Cameroon, Colombia, the DRC, the Republic of the Congo and Papua New Guinea. Integrating the extractives industry in REDD+ strategies could make an effective contribution to emission reductions, while at the same time contributing to forest carbon-stock monitoring and reporting processes. It was suggested that leveraging REDD+ capacity could reduce the burden on those collecting and processing information as well as harness existing information on land use and rights.

### Biodiversity offsetting

Offsetting the negative impact of a mining project on biodiversity in order to achieve 'zero net loss' should be considered the last resort in the mitigation hierarchy. It was noted that while offsets are a measurable conservation outcome, there are a number of practical challenges, including high transaction costs, significant competition for land and long-term protection of offset sites. Effective implementation needs a strong policy framework, long-term commitment from the private sector and buy-in from all relevant stakeholders, including local communities.

### Corporate reporting

There is a growing body of legislation requiring companies to report on their environmental policies and the impacts of their activities, including carbon emissions and deforestation – for example, new laws in the EU on non-financial reporting. At the same time, an increasing number of companies have made commitments to reduce or eliminate deforestation in their supply chains and are developing systems to monitor and report on their progress. The mining sector could learn lessons from these efforts in order to improve data collection and transparency in mineral supply chains and monitor the sector's forest impacts.

## Session 2: National and international monitoring: State of the art and analytical challenges

There have been significant advances in monitoring and communications technology over the past decade. A number of initiatives were presented at the workshop as part of the discussions devoted to the state of knowledge and challenges that are being faced in monitoring. Rachael Petersen of GFW presented her organization's online mapping tool, which allows users to track forest change over time. The availability of improved satellite and cloud computing technology means that previously dispersed information can be easily collated and shared and thus used to inform decision-making on forest issues and improve enforcement. GFW has compiled data on mining activities in Canada, Colombia, DRC, Gabon and the Republic of Congo; other countries will be added to this list in the near future.

Nora Alvarez-Berrios of the University of Puerto Rico presented the findings of a study that triangulated government, private-sector and Google Earth data as well as the results of a literature review in order to measure the impact of the gold-mining boom on forests in South America. GIS mapping tools were used to layer this information onto forest cover maps; in this way, gold mining activities and impacts not reported in national statistics were revealed.

A recent ETH Zurich study, presented by Janice Lee of Princeton University, demonstrated how ultra-high resolution satellite imagery is being used to monitor forest change in Indonesia. The study drew on 250-metre spatial resolution maps based on satellite data to monitor how various land uses impact on deforestation. The study found that coal mining contributed to 2 per cent of forest loss in Indonesia. It also found that a large proportion of forest loss occurred in mixed concessions, making it difficult to identify the cause of forest loss and highlighting the importance of clarifying-spatial maps for mining concessions.

These examples showcased the state of the art in the monitoring of the impact of mining on forests as well as the huge potential of satellite and digital technology. However, a number of analytical and practical challenges were highlighted:

- While very fine-resolution maps are increasingly available, the data require both a significant amount of time to process and ample storage space.
- Mapping methodologies can vary according to vegetation type, making comparison of data difficult.
- With the exception of large mine scars, it is difficult to map dispersed mining impacts, while the integration of data on small-scale impacts is another challenge.
- Data alone cannot improve forest governance; they must be made easily accessible to policymakers and other key stakeholders.
- While new monitoring technology can assist enforcement and compliance, officials need to be sufficiently resourced to use this technology.

It was suggested that international standards should include criteria on spatial data disclosure – for example, requiring companies to publish maps of their concessions – in order to improve transparency in the sector and enable monitoring by stakeholders. The Roundtable for Sustainable Palm Oil (RSPO) has recently amended its principles and criteria to require all member companies to disclose maps of their concessions.

The discussion also highlighted the potential value of real-time forest monitoring: drones and mobile phones are being used in several tropical forest countries to collect data on forest change. However, the challenges of processing real-time data were highlighted, as well as the need to scale up implementation.

The One Map Initiative, which is being developed in Indonesia to provide a comprehensive map of existing land uses and rights, was cited as an example of a large-scale mapping project. It is raising awareness of the importance of robust data on land use and rights and highlighting the need for integrated land-use mapping.

### Session 3: Supporting best practice in producer countries

As mentioned above, mining operations are highly diverse and context-specific – there are no ‘one-size fits all’ solutions to resolve the environmental and social challenges that producer countries face. Nor will data alone be sufficient to meet those challenges. The third session of the workshop explored the data needs for government officials and industry to support best practice. It sought to answer the question of what could be done to enhance accountability and transparency and build institutional capacity in producer countries.

#### Government role

Governments have a large role to play in monitoring and regulating mining activities so as to minimize their impacts on forests. Robust regulation and its strict enforcement are required, but many forest- and mineral-rich countries lack the capacity and resources to implement such regulation. Accurate and recent data and baselines are essential tools for monitoring; however, these are virtually non-existent in many producer countries, particularly for remote regions.

Tunde Morakinyo and Tracey Draper of Environmental Resources Management (ERM) highlighted these challenges. They presented the case study of a mining project in Cameroon that faced difficulties in meeting free, prior and informed consent (FPIC) requirements because of weak government capacity and the unavailability of data on the location of communities, their livelihoods and the ecosystem. They noted that governments are often keen for mining projects to begin as soon as possible and for this reason often do not support implementing international requirements, including FPIC, since they could slow down the licensing process.

The challenge of limited capacity and lack of coordination was highlighted in the case of Peru by Marco Zeisser of Cooperacion. A number of policies have been designed with the aim of improving legal compliance amongst small-scale miners in Peru. However, implementation of these policies is challenging because there is a lack of coordination between the multiple authorities involved, limited resources and widespread corruption.

#### Private-sector role

The private sector plays a key role in reducing negative impacts not least because it manages most operations on the ground. However, it was highlighted that for many junior and mid-tier mining companies, securing the financial and human capacity to meet environmental and social ‘best practice’ (e.g., the IFC Performance Standards<sup>6</sup>) is particularly challenging. Those companies often have limited

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<sup>6</sup> See

[http://www.ifc.org/wps/wcm/connect/topics\\_ext\\_content/ifc\\_external\\_corporate\\_site/ifc+sustainability/our+approach/risk+management/performance+standards/environmental+and+social+performance+standards+and+guidance+notes](http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/performance+standards/environmental+and+social+performance+standards+and+guidance+notes).



understanding of such standards, and so many are reluctant or unable to use their limited resources to try to meet them.

Furthermore, in countries in which government enforcement of regulations is lax, there is little incentive for those companies to reduce the environmental impact of their mining activities. Moreover, the complexity of gathering data on baselines in remote areas means that meeting international standards can be both expensive and time consuming, although this is an area that could be partly addressed through the application of new technologies.

The financial sector has a crucial role to play, too, in reducing the impact of mining on forests, as investors often require compliance with such standards as part of their risk-management process. For example, most commercial banks apply the Equator Principles, which are based on the IFC Performance Standards, as part of the lending approval process. Nonetheless, there remain question marks over the scope and effectiveness of such standards and the extent to which they can be used to directly monitor and address the impact of mining on forests.

### **Civil-society role**

Civil society organizations play a key role in supporting best practice. While monitoring against international standards is often done by international consultants, national organizations are usually best placed to implement long-term monitoring and to hold companies and governments to account; however, capacity for such monitoring is often very limited. The need for much more investment in developing local skills and resources was highlighted at the workshop.

Because the need to tackle poverty is prioritized over addressing the environment, civil society frequently faces a huge challenge in lobbying governments to implement and enforce regulation in the sector. The development of mapping and digital technologies is improving the knowledge base, which will help civil society to fulfil its lobbying role. For example, GFW has been working with the RSPO to carry out risk assessments and monitor the extent to which members are respecting their commitments. A similar approach could be used to monitor the mining sector.

### **Session 4: Promoting sustainable supply chains**

There are a number of initiatives aimed at promoting sustainable supply chains, including through voluntary approaches and legislation. Participants agreed that both mining companies and the governments of producer and consumer countries can tap into those initiatives to improve monitoring of the impacts of mining on forests.

Company reporting was highlighted as an important policy lever to promote data collection and transparency in the mining sector. Shivani Rajpal of the Global Reporting Initiative (GRI) outlined the role of her organization in ensuring that sustainability is part of business strategy and encouraging companies to consider sustainability along their supply chains. The GRI framework requires reporting of the impacts of the activities of companies and their suppliers.

The legislation of consumer countries has a role to play, too, in promoting sustainable supply chains. As noted above, existing legislation on conflict minerals and illegal timber in the EU and US could inform any reporting or disclosure requirements aimed at improving transparency in the metal and mineral supply chains.

In addition, the provision of alternative livelihoods in producer countries needs to be considered as part of any strategies to regulate ASM. Juan Carlos of Althelia Ecosphere described how the REDD+ mechanism is being used to provide such livelihoods in the Madre de Dios region in Peru as a means of reducing unsustainable gold mining.

### **What are the data and capacity needs for stakeholders?**

The workshop ended with an evaluation of what data and capacity needs are required to overcome the challenges discussed. Participants concluded that there is a gap in understanding and awareness of the impact of mining on forests and the ways in which this issue can be effectively addressed.

It was suggested that information specific to particular modes of production should be explored and that the increased study of the indirect impacts of mining should be a priority. In particular, the relationship between various land uses and their relative impacts on forests needs to be investigated – for example, artisanal loggers and miners often switch practices, while mining companies can open up land for agriculture through roads built by them or vice versa.

The development of new technology for mapping and satellite monitoring presents a huge opportunity. Coordination between the many initiatives currently being undertaken is required. Linking geospatial data with policy tools is another important means of ensuring that data are used effectively. And communication platforms are needed for the dissemination of information to companies, governments and consumers.

A number of steps can be taken to improve data availability and capacity. In the case of producer countries, governments need to improve the enforcement of existing land-use requirements, strengthen legal frameworks and establish systems for integrated land-use planning. It was emphasized at the workshop that as most mitigation requirements apply at the project level, governments should take a look at the bigger picture – that is, assess regional and national level impacts through a landscape-level approach. Moreover, it was suggested that legal reform should be a priority for funders, while local civil-society actors should be supported in their efforts to monitor the impacts of mining activities.

Currently, companies have relatively few incentives to address these issues, and so there is a need to communicate the business case for why firms should be concerned about the impacts of their activities on forests. The potential to increase incentives needs to be explored, too – for example, through price premiums or improved market access for sustainable products. The sharing of best practice on monitoring and reporting should be improved, while the increased uniformity of standards and reporting processes would not only facilitate compliance by companies but allow information to be shared more easily. Finally, there is a need to improve the understanding and awareness of all these issues among the end-consumers, which have an important role to play in driving change within companies and governments. Indeed, consumer campaigns can be a useful tool in raising such awareness and moving issues up the political agenda.