

Making the Commodity Sector Work for Developing Countries Local Impacts, Global Links, and Knowledge Gaps

Switzerland occupies an important position in the global trade of hard and soft commodities. Companies headquartered within its borders directly or indirectly shape commodity extraction practices around the world, some of which carry considerable negative environmental and social risks on the ground, particularly in fragile contexts. Minimizing these risks and maximizing shared economic gains could enable mutually beneficial development and counteract persistent social and political inequality. This factsheet examines these issues locally in developing countries – complementing a previous factsheet^A that focused on Switzerland's role as a trading hub. It further highlights promising approaches for research and policy change with regard to developing country governments, involved companies, trading hubs, and the international community.

The commodity sector: Risks, and opportunities at the global and local levels

The production, processing, and trading of commodities through complex global and regional value chains connect actors from developed, developing, and emerging countries. While companies in developed countries can draw on substantial legal, political, and financial resources to pursue their interests within global commodity chains, many developing countries involved have great difficulty mobilizing the necessary resources required to assert their own interests and rights. A lot of attention is paid to the economic outcomes of global commodity markets, but the actors involved also share a responsibility for balancing the environmental and social benefits and costs of commodities along the value chain. Local communities in developing countries are usually vulnerable participants in such equations, often

facing food insecurity, environmental degradation, and negative health impacts, while receiving few of the economic benefits of commodity production. Notably, negative environmental impacts in developing countries can have regional and even global impacts, such as population displacement or widespread pollution. A recent study commissioned by the Swiss Federal Office for the Environment,¹ for instance, describes how Swiss financial practices affect global carbon emissions, including investments in the commodity sector linked to extractive activities in developing countries. These activities are associated with major carbon emissions, contributing to a possible 4 – 6° Celsius increase in global temperatures. Meanwhile, experts call for limiting the global temperature increase to 2° Celsius.

^A "Switzerland and the commodities trade: Taking stock and looking ahead" (2016). Swiss Academies of Arts and Sciences Factsheets 11 (1).

Some key terms

- **Commodities** are raw materials or primary agricultural products that can be bought or sold.^B These include soft commodities such as timber, soy, and cotton, and hard commodities such as copper, gold, and crude oil.
- The **resource curse**, according to Sachs and Warner (1995), refers to “one of the surprising features of economic life (whereby) resource-poor economies often vastly outperform resource-rich economies in economic growth”.^C
- **Indigenous and local communities** have been described as those communities that have a long association with the lands and waters that they have traditionally used.^D
- **Participatory governance (PG)** is a regulatory framework in which the task of running public affairs is not only entrusted to government and public officials, but also allows for people who would otherwise remain voiceless to contribute to decision-making processes. It involves cooperation between state institutions and civil society groups, in an effort to democratize the formulation and implementation of public policy from local to national/international levels. Notably, PG means more than just allowing stakeholders or local communities to participate. Its greater purpose is to deepen democracy, not merely to facilitate implementable agreements.^E
- **Hard law** refers to binding legislation (e.g. enshrined in national constitutions, global trade rules, and ratified international treaties). **Soft law** refers to voluntary international or national standards that, while not legally binding, help to build consensus and establish legitimacy (e.g. declarations, guidelines, guiding principles, and codes of conduct). The latter are, however, not enforceable.^F

^B Oxford Dictionaries. Oxford University Press. <http://www.oxforddictionaries.com/definition/english/commodity> (accessed 18 January 2016).

^C Sachs J.D., Warner A.M. 1995. Natural Resource Abundance and Economic Growth. NBER Working Paper Nr. 5398.

^D Convention on Biological Diversity. Additional information received on use of the term “Indigenous Peoples and Local Communities”. Montreal, Canada 2014. <https://www.cbd.int/doc/meetings/cop/cop12/information/cop-12-inf-01-add1-en.pdf>.

^E Friedman S. 2006. Participatory governance and citizen action in postapartheid South Africa. International Institute for Labour Studies, Geneva.

^F Abbott K.W. and Snidal D. 2000. Hard and Soft Law in International Governance. International Organization 54(3): 421.

Developing hard and soft law instruments to promote more equitable sharing of risks and benefits associated with commodity production and trading is a considerable challenge. For one thing, little progress has been made towards identifying evidence-based connections between policies or actions by international players like Switzerland and specific local outcomes in developing countries. Among other reasons, this is due to the opacity of commodity trading activities and multi-actor relationships along commodity chains. As a result, assessing the effectiveness of individual hard and soft law instruments globally has been largely unsuccessful. More attention should be given to interventions and participatory governance processes that can improve conditions at the local level in the countries where commodities are extracted and produced.

A growing body of literature describes how commodity production in developing countries – so-called host countries – reshapes local socio-economic conditions. Our empirical review of this literature (see Box) highlights how the production of hard and soft commodities affects local livelihoods and environmental conditions in distinct ways. Promising approaches to reduce vulnerability and address inherent inequalities in the system are common to both commodity types, yet many research gaps remain. The remainder of this factsheet first introduces insights from past research on hard and soft commodity production, before discussing existing knowledge gaps and potential policy implications and solutions.

Soft commodities

Grains, sugar, soy, rubber, palm oil, timber, coffee, cocoa, and cotton are among the most important soft commodities produced by developing and emerging countries. As the “home” country for several major transnational companies involved in commodity trading and extraction, Switzerland plays a key role in the corresponding value chains. Half of the entire global trade in sugar, for instance, is handled in Switzerland, and 60 % of the world’s coffee trade. The production of soft commodities extends across vast geographical areas, but our review of some 150 papers on local impacts associated with these production activities yielded common threads related to impacts on people’s livelihoods and the environment.

Livelihood impacts and environmental risks of soft commodity production

Soft commodity production depends on access to arable land, water resources, and human labour. Most of the crops are grown as monocultures on a massive scale, such as vast rubber and oil palm plantations. This often results in **increased vulnerability** among local communities. While locals may experience economic benefits, mainly as production activities begin, they often become dependent on unfamiliar crops.^{2,3} In addition, they face an increased risk of elite capture (see below) and vulnerability to market prices that fluctuate based on global rather than local dynamics. They must also contend with depressed commodity prices resulting from agricultural subsidies in developed countries. Small-scale farmers producing crops like soy and cotton often shift from local to genetically modified seeds and related technologies.⁴ While some evidence suggests that vulnerable social groups such as indigenous communities or women can



Storage of coal waste on the lands of the El Hatillo community in Colombia has had devastating impacts. Although resettlement talks began six years ago, the matter is unresolved.

benefit from the introduction of such technologies, the lasting impacts of such shifts are unclear due to the lack of comprehensive sustainability assessments.⁵ Moreover, modern technologies have been linked to deskilling at the farm level, and resulting dependency on external inputs like seeds, fertilizers, and pesticides likewise increases exposure to market volatility.^{6–9}

The push to transform diverse landscapes into large-scale monocultures for soft commodity production can also result in increased *concentration of wealth and power* in the hands of local or regional elites. Landowner rights and access to land are frequently reshaped by unequal partnerships and private land deals between national or transnational commodity companies and states. Related pressures often lead to conflict, illegal seizure of land and water resources, and subsequent displacement and migration of communities or small-scale farmers.^{7, 10, 11} These dynamics contribute to “elite capture”, in which a small group receives the consolidated benefits of soft commodity production, while the majority of the community experiences increased vulnerability and dependency.¹²

Land use change for soft commodity production is frequently associated with significant or even irreversible environmental damage.^{13–15} Conversion of primary forests or peatlands into rubber

or oil palm plantations, for example, can severely harm biodiversity and soil fertility.^{16, 17} Large-scale deforestation for timber production or the cultivation of cash crops like soy can also fundamentally change watersheds, potentially constraining water availability over time.^{18, 19} Short-term overexploitation of soils and primary forests can also reduce the long-term productive capacity of land. Finally, changes in land use also frequently cause growing carbon emissions that further accelerate climate change.^{14, 15}

Hard commodities

Whereas soft commodities are largely agricultural, hard commodities are overwhelmingly mined and extracted. The following section outlines some of the local impacts associated with production of hard commodities in developing countries, in particular gold, copper, iron, aluminium, coal, gas, and oil.

Livelihood impacts and environmental risks of hard commodity production

Extractive activities often initially have a *positive impact on local economic development*, with affected communities generally

experiencing income increases, in terms of both labour and compensation.^{20–22} Farming households, for example, can benefit from artisanal and small-scale mining work in their off-season.^{23–25} But the benefits may be short-lived, as mine operators tend to favour increased mechanization over time, potentially pushing labourers back into severe poverty. In some cases, the increasing importance of mining over traditional agriculture causes social structures to change, undermining the economic and social status of women, in particular, who face further (or renewed) marginalization and impoverishment.^{26, 27}

Extractive activities also frequently cause *health risks* and conflict, sometimes in contravention of national laws and global commitments.^{28–30} Mercury used in artisanal gold mining, for instance, harms water quality and has been linked to adverse health effects among local people.^{31, 32} Since rural subsistence farmers, many ethnic minorities, indigenous groups, and forest communities depend directly on the natural environment for their livelihoods, mining-related health and environmental harms can contribute to local conflicts. This, in turn, can exacerbate the political marginalization of certain groups and compromise livelihood systems. Similar to soft commodities, positive short-term impacts on incomes often go hand in hand with long-term negative impacts on human and natural capital.^{33–35}

Increased pollution is one of the primary environmental risks of copper,^{36–39} iron,^{37, 40} coal,^{33, 41} and gold mining,^{30, 42, 43} as water sources become contaminated with mining waste. But water is only one pathway through which surface contaminants spread; wind can also pick up dangerous sediments and disperse them over wide areas.^{44, 45} Metal concentrations in nearby soils and watersheds often reach elevated levels, damaging aquatic ecosystems and soil quality.^{46–49} Surface mining,³⁷ coal extraction,^{33, 50} and gas drilling⁵¹ can likewise generate unsafe levels of air pollution, often contributing also to negative impacts on biodiversity and ecosystems.^{52, 53}

Mining activities can *negatively impact indigenous and local communities*, who rely on sustainable use of local ecosystems and biological diversity. Studies of mining in Africa have found evidence of extensive clearing of rainforests near mines. Likewise, water, soil, and air pollution combine to degrade or cause irreversible harm to agricultural lands and forests.^{43, 54} Local communities often face major power asymmetries due to endemic corruption and repression by local elites, whose favoured tools are formal top-down governance mechanisms designed to their benefit.^{55–57} The remoteness of national policymakers and elites from the directly affected natural systems and communities can also contribute to clashes between local and national interests.

Sustainable development calls for more participatory governance

At the local level, participatory governance has proven to be one of the most effective ways of addressing economic and social needs, while fostering sustainable use of natural resources. Commodity value chains that lack regulations in line with basic principles of sustainable development tend to externalize environmental costs, destabilize local social structures, and exacerbate existing inequalities between winners

Literature review on commodity sector shows need for studies on “home” and “host” countries, cross-border connections, and policy measures

The challenges and research needs summarized here stem from a detailed commodity-sector literature review, from the perspective of sustainable development, conducted by researchers at the Centre for Development and Environment (CDE), the World Trade Institute (WTI) of the University of Bern, and the Institute for Business Ethics (IWE) of the University of St. Gallen. The review calls for additional studies on the role of “home” countries like Switzerland, where commodity traders and extractive companies are headquartered, and “host” countries in the developing world, where fossil fuels and minerals are extracted and food, feed, and fibres are grown. Studies are especially needed on the impacts in both home and host countries, on the relations between them, and on the policy measures available in either group of countries. This factsheet focuses on key issues facing host countries in regard to resource extraction, environmental impacts, and pathways to participatory governance and equitable benefit sharing. A previous factsheet based on this review emphasized the pressing knowledge gaps and policy issues for Switzerland and other home countries (available at www.swiss-academies.ch/en/factsheets).

The original full-length review (CDE/WTI/IWE 2015) is available at: www.kfpe.ch/WorkingPaper-commodity

and losers. In the case of rubber and oil palm plantations, for instance, participatory approaches to avoiding conversion of primary forests and managing agricultural areas have been shown to be effective at balancing social needs and development needs, while ensuring long-term conservation of local agro-biodiversity.^{58–60}

To enable a more equitable distribution of benefits and costs of commodity production and trade, processes should be made more transparent and participatory. This entails both the use of impact assessments and the empowerment of indigenous and local communities to ensure fairer baseline conditions for entering into negotiations with mining / agricultural companies and the state.^{54, 61} Projects should be organized in a way that empowers local communities and gives them a sense of self-determination.⁶² Private companies involved in commodity extraction, for instance, sometimes improve local infrastructure, or directly provide health, education, and security services for local communities. While such actions may initially appear to be beneficial, research shows that local actors often feel this makes them overly dependent on private interests. Participatory processes can be used to better allocate responsibilities to state authorities, civil society actors, and private businesses in local commodity-related investment settings.



Artisanal gold mining with excavation waste in the background (Kankan Region, Republic of Guinea).

Closing knowledge gaps

Focus on local socio-economic impacts

Most research and related policy recommendations on the economic effects of commodity extraction rely on cross-country analyses. However, there is little research that helps to explain why the socio-economic impacts of commodity production, in particular, vary so greatly from one subnational setting to another.⁶³ More and greater subnational, local-level studies are needed. Initial research suggests that diverse, fluctuating impacts on local welfare and economic development can be usefully understood according to the “boom” and “bust” (e.g. mine closing) cycles associated with extractive activities. Fledgling research also highlights the potential for local governments to do more to counteract growing inequality between those who tend to benefit from economic boom cycles and those who do not, including women, youth, and the elderly. Finally, initial studies highlight the promise of research on the environmental and sociopolitical effects of “no-go” zones for commodity production, enabling local communities to access international courts or courts in the home countries of commodity firms for the enforcement of the principle of “free, prior and informed consent”.⁶⁴

Unknown effectiveness of hard and soft law instruments

Research is urgently needed on the extent to which states, international bodies, and commodity producers / traders can be compelled to contribute to more participatory negotiation of resource use through soft and hard law standards and regulations. Many policy instruments have been designed to promote sustainability and best practices in the commodity sector.

But their local impacts remain largely unknown. This can be partly attributed to lack of transparency in the production and trading of commodities as well as to lack of coordinated oversight across different sectors of public administration, civil society, and the scientific community. It is critical to assess the degree to which existing commodity-related hard and soft law instruments are capable of safeguarding human rights, socio-economic equity, and environmental sustainability at subnational levels. The Swiss National Science Foundation has taken initial steps towards closing this research gap,⁶⁵ but much work remains to be done.

While soft law can make certain aspects of individual value chains more sustainable, it often fails to address other issues that are just as relevant to sustainability, i.e. paying of applicable taxes and levies.⁶⁶ Soft law instruments' non-binding nature also means that not all companies will apply them, making it difficult to evaluate their broader contribution according to key sustainable development indicators.⁶⁷

Nevertheless, one systematic assessment of the effectiveness of 67 voluntary schemes in six European countries concluded that 55 of them performed poorly according to one or more of the following measures: target achievement (the extent to which voluntary targets are realized); target ambition (the stringency of the targets relative to the policy objective); and level of uptake (participation rate).⁶⁸ Indeed, development researchers increasingly agree that voluntary approaches alone are insufficient. Future research must focus on how to incorporate them most effectively into a broader set of coherent policies that include meaningful standards against which to regulate the commodity sector.

Future of agroforestry and agrotechnology

Traditional agroforestry practices are attracting increasing attention as a promising way of avoiding many risks associated with large-scale monocultures. To a limited extent, agroforestry can be used to produce soft commodities such as cocoa, rubber, and coffee.⁶⁹⁻⁷² Besides fostering biodiversity, agroforestry methods can reduce the vulnerability of coffee and cocoa farmers to volatile markets and climatological risks.^{73, 74} However, concerns exist that agroforestry systems are an intermediary step towards monocultures, enabled in some cases by the availability of newly developed hybrid varieties.^{71, 75, 76} In addition, genetically modified organisms and hybrid seeds are opening up new ways of producing soft commodities, but little is known about their long-term environmental and social impacts. Comprehensive, independent sustainability assessments are needed on the potential costs and benefits of new forms of agrotechnology in comparison with traditional production systems.

Identifying interdependency of host and home countries

Tracing environmental and livelihood impacts in host countries to specific policies or business activities in home countries such as Switzerland remains very challenging. Lack of transparency of trade and transit data plays a major role. Moreover, commodity producers seldom operate alone in any specific area; hence local impacts reflect the cumulative effects of multiple operators. This often makes it impossible to establish the links between affected actors in local sites of exploitation or production of commodities and the national and global actors that are causing these local activities. In addition, host countries often lack the capacity and (scientific) expertise to properly assess the sustainability of local commodity production activities and related value chains, including environmental and health impacts at the local level. More research is needed on how to best support local authorities in effectively monitoring these ground-level impacts and feeding the results into decision-making. Connecting business decisions or policies in home countries with local impacts in host countries could help to identify ways of ensuring maximum sustainability benefits from foreign investments.

Among other things, this might mean expanding corporate social responsibility (CSR) schemes to include maximization of shared benefits, not just minimization of local harms.⁷⁷

International action by host countries

Developing and emerging countries are frequently called upon to promote transparency and participatory processes within their own borders, while industrialized countries largely dominate international policymaking processes. More research, knowledge transfer, and training are needed to identify ways for host countries to better protect their interests in the realm of international policy and commodity value chains. There is significant scope for them to negotiate better commodity-related investment and tax agreements, shape trade rules, and otherwise assert their position. Certain commodity-producing countries have, for instance, explored the (highly contentious) policy of keeping their own black lists or grey lists of countries⁷⁸ in which multinationals are headquartered that pay relatively little taxes or act in a non-transparent manner. These and similar measures by host country governments may be seen as attempts to increase their say in managing and profiting from their own natural resources. Progress in these areas could enable them to better fund their own development.

Effectiveness of participatory governance

Although there is a broad consensus that participatory governance is required, little scientific evidence is available about the optimal conditions under which it can effectively improve negotiation processes or related socio-economic, political, and environmental outcomes. Further research is needed to clarify the mechanisms that must be established to balance objectives and mitigate conflict via participatory governance in these settings, and to explore innovative new approaches capable of adapting to dynamic environmental, economic, and social contexts. The broader potential for participatory governance to promote a democratic transition to sustainability likewise remains unknown.

FURTHER READING

Bucher D, Bürgi Bonanomi E, Dey P, Elsig M, Espa I, Franz S, Gelb SR, Giger M, Holzgang M, Rist S, Wehrli J, Wettstein F. 2015. The Commodity Sector and Related Governance Challenges from a Sustainable Development Perspective: The Example of Switzerland – Current Research Gaps. CDE WTI IWE Joint Working Paper No. 1. Bern and St. Gallen, Switzerland: Centre for Development and Environment (CDE), World Trade Institute (WTI), and the Institute for Business Ethics (IWE).

www.kfpe.ch/WorkingPaper-commodity

IMPRINT

FACTSHEET AUTHORS: Robert Blasiak (The University of Tokyo), Stephan Rist (CDE), Elisabeth Bürgi Bonanomi (CDE/WTI), and Anu Lannen (CDE). **PROJECT MANAGERS:** Jon-Andri Lys (KFPE), Stephan Rist (CDE), and Christoph Ritz (ProClim). **EDITORS:** Robert Blasiak (The University of Tokyo) and Anu Lannen (CDE). **LAYOUT:** Gregorio Caruso (Basel). **PHOTOS:** Mirko S. Winkler (photos Africa), Swiss Tropical and Public Health Institute (Basel); Rafael Figueroa, Pensamiento y Acción Social (PAS) (photo p. 3)

THE FOLLOWING EXPERTS CONTRIBUTED TO THIS FACTSHEET

Daniela Bucher (CDE), Thomas Cottier (WTI), Pascal Dey (IWE), Manfred Elsig (WTI), Ilaria Espa (WTI), Simone Franz S (WTI), Stephen Gelb (WTI), Markus Giger (CDE), Milena Holzgang (IWE), Judith Wehrli (CDE/WTI), Florian Wettstein (IWE)

This factsheet of the Swiss Academies of Arts and Sciences draws on findings in the working paper specified under "Further reading". It also incorporates insights from attendees at a workshop held to discuss the working paper. Workshop attendees included representatives of Swiss federal agencies, NGOs, the private sector, and other research groups.

The factsheet was written in the context of the project "Global change and developing countries: why should we care?" managed by the Commission for Research Partnerships with Developing Countries (KFPE) and the Forum for Climate and Global Change (ProClim), two working groups of the Swiss Academy of Sciences (SCNAT).

A project of the Swiss Academy of Sciences

sc | nat 

A PDF version of this factsheet featuring extensive references and notes may be downloaded for free at:

www.swiss-academies.ch/en/factsheets

Making the Commodity Sector Work for Developing Countries Local Impacts, Global Links, and Knowledge Gaps

References and notes (All internet links last verified on 9 April 2016)

- Qehri O, Horster M, Dreher C, Fogde F, Frank A, Jochum C, Lutz V. 2015. Kohlenstoffrisiken für den Finanzplatz Schweiz. Zurich, Switzerland and Vaduz, Liechtenstein: South Pole Group and Center for Social and Sustainable Products AG. https://yoursr.com/media-new/download/def_schlussbericht_okt2015_schlussredaktion-bafu3908_spg.pdf.
- Obidzinski K, Andriani R, Komarudin H, Andrianto A. 2012. Environmental and social impacts of oil palm plantations and their implications for biofuel production in Indonesia. *Ecology and Society* 17(1):25. <http://dx.doi.org/10.5751/ES-04775-170125>.
- Mullins M, Flaherty M. 1995. Customary landowner involvement in the Kumil timber project, Papua New Guinea. *Geoforum* 26(1):89–105. <http://www.sciencedirect.com/science/article/pii/S0016718595000138>.
- Chen R, Huang J, Qiao F. 2013. Farmers' knowledge on pest management and pesticide use in Bt cotton production in China. *China Economic Review* 27(0):15–24. <http://www.ccap.org.cn/uploadfile/2014/0207/20140207041019821.pdf>.
- Subramanian A, Qaim M. 2010. The impact of Bt cotton on poor households in rural India. *Journal of Development Studies* 46(2):295–311. <http://www.tandfonline.com/doi/abs/10.1080/00220380903002954#vwrKWT8qW1A>.
- Ruggie JG. 2013. *Just Business: Multinational Corporations and Human Rights*. New York and London: W. Norton & Co.
- Cooke FM. 2012. In the name of poverty alleviation: Experiments with oil palm smallholders and customary land in Sabah, Malaysia. *Asia Pacific Viewpoint* 53(3):240–253. <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-8373.2012.01490.x/abstract>.
- Koczberski G, Curry GN. 2005. Making a living: Land pressures and changing livelihood strategies among oil palm settlers in Papua New Guinea. *Agricultural Systems* 85(3):324–339. http://espace.library.curtin.edu.au/R?func=dbin-jump-full&local_base=gen01-era02&object_id=19792.
- McCarthy JF, Gillespie P, Zen Z. 2012. Swimming upstream: Local Indonesian production networks in "globalized" palm oil production. *World Development* 40(3):555–569. <http://www.sciencedirect.com/science/article/pii/S0305750X11001872>.
- Kenney-Lazar M. 2012. Plantation rubber, land grabbing and social-property transformation in southern Laos. *Journal of Peasant Studies* 39(3–4):1017–1037. <http://www.tandfonline.com/doi/abs/10.1080/03066150.2012.674942>.
- Larsen RK, Jiwan N, Rompas A, Jenito J, Osbeck M, Tarigan A. 2014. Towards 'hybrid accountability' in EU biofuels policy? Community grievances and competing water claims in the Central Kalimantan oil palm sector. *Geoforum* 54:295–305. <http://www.sciencedirect.com/science/article/pii/S0016718513001929>.
- Platteau JP. 2004. Monitoring elite capture in community-driven development. *Development and Change* 35(2):223–246. <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-7660.2004.00350.x/abstract>.
- Verchot LV, Hutabarat L, Hairiah K, van Noordwijk M. 2006. Nitrogen availability and soil N₂O emissions following conversion of forests to coffee in southern Sumatra. *Global Biogeochemical Cycles* 20(4). <http://onlinelibrary.wiley.com/doi/10.1029/2005GB002469/abstract>.
- Smiley GL, Kroschel J. 2008. Temporal change in carbon stocks of cocoa – gliricidia agroforests in Central Sulawesi, Indonesia. *Agroforestry Systems* 73(3):219–231. <http://link.springer.com/article/10.1007%2Fs10457-008-9144-3>.
- Chiti T, Grieco E, Perugini L, Rey A, Valentini R. 2014. Effect of the replacement of tropical forests with tree plantations on soil organic carbon levels in the Jomoro district, Ghana. *Plant and Soil* 375(1–2):47–59. <http://link.springer.com/article/10.1007%2Fs11104-013-1928-1>.
- Fu Y, Chen J, Guo H, Hu H, Chen A, Cui J. 2010. Agrobiodiversity loss and livelihood vulnerability as a consequence of converting from subsistence farming systems to commercial plantation-dominated systems in Xishuangbanna, Yunnan, China: A household level analysis. *Land Degradation & Development* 21(3):274–284. <http://onlinelibrary.wiley.com/doi/10.1002/ldr.974/abstract>.
- Turner EC, Foster WA. 2009. The impact of forest conversion to oil palm on arthropod abundance and biomass in Sabah, Malaysia. *Journal of Tropical Ecology* 25(1):23–30. <http://journals.cambridge.org/action/displayFulltext?type=1&fid=2955160&jid=TRO&volumeId=25&issueId=01&aid=2955152>.
- Ali J, Benjaminsen TA. 2004. Fuelwood, timber and deforestation in the Himalayas: The case of Basho Valley, Baltistan Region, Pakistan. *Mountain Research and Development* 24(4):312–318. <http://www.bioone.org/doi/abs/10.1659/0276-4741%282004%29024%29032%3AFTADIT%20C0%3B2>.
- Base F, Elsenbeer H, Neill C, Krusche AV. 2012. Differences in throughfall and net precipitation between soybean and transitional tropical forest in the southern Amazon, Brazil. *Agriculture, Ecosystems & Environment* 159(0):19–28. <https://darchiv.mblwholibrary.org/handle/1912/5545>.
- Bloch R, Owusu G. 2012. Linkages in Ghana's gold mining industry: Challenging the enclave thesis. *Resources Policy* 37(4):434–442. <http://www.sciencedirect.com/science/article/pii/S0301420712000402>.
- Bryceson DF, Jönsson JB. 2010. Gold digging careers in rural East Africa: Small-scale miners' livelihood choices. *World Development* 38(3):379–392. DOI: 10.1016/j.worlddev.2009.09.003.
- Heemskerk M. 2003. Self-employment and poverty alleviation: Women's work in artisanal gold mines. *Human Organization* 62(1):62–73. <http://sfaajournals.net/doi/10.17730/humo.62.1.5pv7nj41xldexd8>.
- Hilson G. 2010. 'Once a miner, always a miner': Poverty and livelihood diversification in Akwatia, Ghana. *Journal of Rural Studies* 26(3):296–307. <http://www.sciencedirect.com/science/article/pii/S0743016710000124>.
- Hilson G, Amankwah R, Ofori-Sarpong G. 2013. Going for gold: Transitional livelihoods in Northern Ghana. *Journal of Modern African Studies* 51(1):109–137. <http://dx.doi.org/10.1017/S0022278X12000560>.
- Okoh G, Hilson G. 2011. Poverty and livelihood diversification: Exploring the linkages between smallholder farming and artisanal mining in rural Ghana. *Journal of International Development* 23(8):1100–1114. <http://onlinelibrary.wiley.com/doi/10.1002/jid.1834/abstract>.
- Yakovleva N. 2007. Perspectives on female participation in artisanal and small-scale mining: A case study of Birim North District of Ghana. *Resources Policy* 32(1–2):29–41. <http://tinyurl.com/hf35zgj>.
- D'Souza MS, Karkada SN, Somayaji G, Venkatesaperumal R. 2013. Women's well-being and reproductive health in Indian mining community: Need for empowerment. *Reproductive Health*. <http://www.ncbi.nlm.nih.gov/pubmed/23602071>.
- Fisher E. 2007. Occupying the margins: Labour integration and social exclusion in artisanal mining in Tanzania. *Development and Change* 38(4):735–760. <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-7660.2007.00431.x/abstract>.
- Hilson G, Yakovleva N. 2007. Strained relations: A critical analysis of the mining conflict in Prestea, Ghana. *Political Geography* 26(1):98–119. <http://centaur.reading.ac.uk/8666>.
- Tschakert P, Singha K. 2007. Contaminated identities: Mercury and marginalization in Ghana's artisanal mining sector. *Geoforum* 38(6):1304–1321. http://inside.mines.edu/~ksingha/web_files/tschakert&singha.2007.pdf.
- Cortes-Maramba N, Reyes JP, Francisco-Rivera AT, Akagi H, Sunio R, Panganiban LC. 2006. Health and environmental assessment of mercury exposure in a gold mining community in Western Mindanao, Philippines. *Journal of Environmental Management* 81(2):126–134. <http://www.ncbi.nlm.nih.gov/pubmed/16905240>.
- Ogola JS, Mitullah WV, Omulo MA. 2002. Impact of gold mining on the environment and human health: A case study in the Migori Gold Belt, Kenya. *Environmental Geochemistry and Health* 24(2):141–158. <http://link.springer.com/article/10.1023%2FA%3A1014207832471>.
- Mishra PP. 2009. Coal mining and rural livelihoods: Case of the Ib Valley coalfield, Orissa. *Economic and Political Weekly* 44(44):117–123. <http://www.epw.in/journal/2009/44/special-articles/coal-mining-and-rural-livelihoods-case-ib-valley-coalfield-orissa>.
- Bury J. 2004. Livelihoods in transition: Transnational gold mining operations and local change in Cajamarca, Peru. *Geographical Journal* 170:78–91. http://www.jstor.org/stable/3451330?seq=1#page_scan_tab_contents.
- Bury J. 2005. Mining mountains: Neoliberalism, land tenure, livelihoods, and the new

- Peruvian mining industry in Cajamarca. *Environment and Planning A* 37(2):221–239. <http://epn.sagepub.com/content/37/2/221.abstract>.
- 36 Mees F, Masalehdani MNN, De Putter T, D'Hollander C, Van Biezen E, Mujinya BB, Potdevin JL, Van Ranst E. 2013. Concentrations and forms of heavy metals around two ore processing sites in Katanga, Democratic Republic of Congo. *Journal of African Earth Sciences* 77(1):22–30. <http://www.sciencedirect.com/science/article/pii/S1464343X12001719>.
- 37 Monjezi M, Shahriar K, Dehghani H, Samimi Namin F. 2009. Environmental impact assessment of open pit mining in Iran. *Environmental Geology* 58(1):205–216. <http://link.springer.com/article/10.1007%2Fs00254-008-1509-4>.
- 38 Sracek O, Křibek B, Mihaljevič M, Majer V, Veselovský F, Vencelides Z, Nyambe I. 2012. Mining-related contamination of surface water and sediments of the Kafue River drainage system in the Copperbelt district, Zambia: An example of a high neutralization capacity system. *Journal of Geochemical Exploration* 112:174–188. <http://www.sciencedirect.com/science/article/pii/S0375674211001737>.
- 39 Hettler J, Irion G, Lehmann B. 1997. Environmental impact of mining waste disposal on a tropical lowland river system: A case study on the Ok Tedi Mine, Papua New Guinea. *Mineralium Deposita* 32(3):280–291. <http://link.springer.com/article/10.1007%2Fs001260050093>.
- 40 Ghose MK, Sen PK. 1999. Impact on surface water quality due to the disposal of tailings from iron ore mines in India. *Journal of Scientific & Industrial Research* 58(9):699–704.
- 41 Wei X, Wang R. 2014. Influences of coal mining on safe water supply: A case study in Jizhong City. Paper at 2014 International Conference on GIS and Resource Management (ICGRM). Conference proceedings, pp. 3. <http://tinyurl.com/zh7bsa2>.
- 42 Da Silva Brabo E, de Oliveira Santos E, de Jesus IM, Mascarenhas AF, de Freitas Faial K. 2000. Mercury contamination of fish and exposures of an indigenous community in Para State, Brazil. *Environmental Research* 84(3):197–203. <http://www.ncbi.nlm.nih.gov/pubmed/11097792>.
- 43 Schueler V, Kuemmerle T, Schröder H. 2011. Impacts of surface gold mining on land use systems in western Ghana. *Ambio* 40(5):528–539. <http://www.ncbi.nlm.nih.gov/pubmed/11097792>.
- 44 Faanu A, Kpeglo DO, Sackey M, Darko EO, Emi-Reynolds G, Lawlusi H, Awudu R, Adukpo OK, Kansaana C, Ali ID, Agyeman B, Agyeman L, Kpodzro R. 2013. Natural and artificial radioactivity distribution in soil, rock and water of the Central Ashanti Gold Mine, Ghana. *Environmental Earth Sciences* 70(4):1593–1604. <http://link.springer.com/article/10.1007%2Fs12665-013-2244-z>.
- 45 Boamponsem LK, Adam JJ, Dampare SB, Nyarko BJB, Essumang DK. 2010. Assessment of atmospheric heavy metal deposition in the Tarkwa gold mining area of Ghana using epiphytic lichens. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms* 268(9):1492–1501. <http://www.sciencedirect.com/science/article/pii/S0168583X10000303>.
- 46 Kambey JL, Farrell AP, Bendell-Young LI. 2001. Influence of illegal gold mining on mercury levels in fish of North Sulawesi's Minahasa Peninsula (Indonesia). *Environmental Pollution* 114(3):299–302. <http://www.ncbi.nlm.nih.gov/pubmed/11584628>.
- 47 Durand JF. 2012. The impact of gold mining on the Witwatersrand on the rivers and karst system of Gauteng and North West Province, South Africa. *Journal of African Earth Sciences* 68:24–43. <http://www.sciencedirect.com/science/article/pii/S1464343X12000593>.
- 48 Almas AR, Manoko MLK. 2012. Trace element concentrations in soil, sediments, and waters in the vicinity of Geita gold mines and north Mara gold mines in northwest Tanzania. *Soil & Sediment Contamination* 21(2):135–159. <http://www.tandfonline.com/doi/abs/10.1080/15320383.2012.649372>.
- 49 Binega Y. 2002. Monitoring of soil, air, water, and noise at the Lega Dembi Gold Mine. *Tailings and Mine Waste*:39–44. <https://www.tib.eu/de/suchen/id/BLCp%3ACN042439113>.
- 50 Pandey B, Agrawal M, Singh S. 2014. Coal mining activities change plant community structure due to air pollution and soil degradation. *Ecotoxicology* 23(8):1474–1483. <http://www.ncbi.nlm.nih.gov/pubmed/25017960>.
- 51 Riddiford FA et al. 2003. A cleaner development: The In Salah Gas Project, Algeria. In: Gale J, Kaya Y, eds. *Greenhouse Gas Control Technologies, Vols I and II, Proceedings*, pp. 595–600.
- 52 Chima UD, Vure G. 2014. Implications of crude oil pollution on natural regeneration of plant species in an oil-producing community in the Niger Delta Region of Nigeria. *Journal of Forestry Research* 25(4):915–921. <http://link.springer.com/article/10.1007%2Fs11676-014-0538-y>.
- 53 Donggan G, Zhongke B, Tieliang S, Hongbo S, Wen Q. 2011. Impacts of coal mining on the aboveground vegetation and soil quality: A case study of Qinxin coal mine in Shanxi Province, China. *Clean – Soil Air Water* 39(3):219–225. <http://onlinelibrary.wiley.com/doi/10.1002/clen.201000236/abstract>.
- 54 Mwitwa J, German L, Muimba-Kankolongo A, Puntodewo A. 2012. Governance and sustainability challenges in landscapes shaped by mining: Mining–forestry linkages and impacts in the Copper Belt of Zambia and the DR Congo. *Forest Policy and Economics* 25: 19–30. <http://tinyurl.com/zl94sq>.
- 55 Andrews-Speed P, Ma G, Shao B, Liao C. 2005. Economic responses to the closure of small-scale coal mines in Chongqing, China. *Resources Policy* 30(1):39–54. <http://www.sciencedirect.com/science/article/pii/S0301420705000036>.
- 56 Nel E, Binns T, Gibb M. 2014. Community development at the coal face: Networks and sustainability among artisanal mining communities in Indwe, Eastern Cape Province, South Africa. *Geographical Journal* 180(2):175–184. <http://onlinelibrary.wiley.com/doi/10.1111/geoj.12022/abstract>.
- 57 Sinha S, Bhattacharya RN, Banerjee R. 2007. Surface iron ore mining in eastern India and local level sustainability. *Resources Policy* 32(1–2):57–68. <http://www.sciencedirect.com/science/article/pii/S0301420707000360>.
- 58 Gomes CVA, Vadjunec JM, Perz SG. 2012. Rubber tapper identities: Political–economic dynamics, livelihood shifts, and environmental implications in a changing Amazon. *Geoforum* 43(2):260–271. <http://www.sciencedirect.com/science/article/pii/S001671811001771>.
- 59 Manivong V, Cramb RA. 2008. Economics of smallholder rubber expansion in Northern Laos. *Agroforestry Systems* 74(2):113–125. <http://link.springer.com/article/10.1007%2Fs10457-008-9136-3>.
- 60 Zhang L, Kono Y, Kobayashi S, Hu H, Zhou R, Qin Y. 2015. The expansion of smallholder rubber farming in Xishuangbanna, China: A case study of two Dai villages. *Land Use Policy* 42(10):628–634. <http://www.sciencedirect.com/science/article/pii/S0264837714002105>.
- 61 Camacho FM. 2012. Competing rationalities in water conflict: Mining and the indigenous community in Chiu Chiu, El Loa Province, northern Chile. *Singapore Journal of Tropical Geography* 33(1):93–107. <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9493.2012.00451.x/abstract>.
- 62 Pacheco P. 2012. Smallholders and communities in timber markets: Conditions shaping diverse forms of engagement in tropical Latin America. *Conservation & Society* 10(2):114–123. <http://tinyurl.com/jmo67xf>.
- 63 Cust J, Poelhekke S. 2015. The local economic impacts of natural resource extraction. *Annual Review of Resource Economics* 7(1):251–268. <http://www.annualreviews.org/doi/abs/10.1146/annurev-resource-100814-125106>.
- 64 Pegg S. 2006. Mining and poverty reduction: Transforming rhetoric into reality. *Journal of Cleaner Production* 14(3–4):376–387. <http://www.sciencedirect.com/science/article/pii/S0959652605000697>.
- 65 See 2016 R4D-SNSF call on Natural resource governance for sustainable development: http://www.r4d.ch/SiteCollectionDocuments/r4d_Call_AddThematicCall.pdf.
- 66 Bürgi Bonanomi E. 2015. Sustainable investment in land in the Global South: What would it require from a coherence perspective? The case of Sierra Leone. *Questions of International Law QIL* 21:17–37. http://www.qil-qdi.org/wp-content/uploads/2015/11/03_Sustainable-Investment_BURGI-BONANOMI_FIN-2.pdf.
- 67 Locke RM. 2013. *The Promise and Limits of Private Power: Promoting Labor Standards in a Global Economy*. Cambridge, UK: University Press. <http://tinyurl.com/hnsk7cz>.
- 68 McCarthy D, Morling P. 2015. *Using Regulation as a Last Resort: Assessing the Performance of Voluntary Approaches*. Sandy, Bedfordshire, UK: Royal Society for the Protection of Birds. http://www.rspb.org.uk/Images/usingregulation_tcm9-408677.pdf.
- 69 Ruf FO. 2011. The myth of complex cocoa agroforests: The case of Ghana. *Human Ecology* 39(3):373–388. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3109247>.
- 70 Van Noordwijk M, Tata HL, Xu J, Dewi S, Minang P. 2012. Segregate or integrate for multifunctionality and sustained change through rubber-based agroforestry in Indonesia and China. In: Nair KPP, Garrity D, eds. *Agroforestry: The Future of Global Land Use*. Dordrecht, The Netherlands: Springer, pp. 69–104. http://link.springer.com/chapter/10.1007%2F978-94-007-4676-3_8.
- 71 Ekadinata A, Vincent G. 2011. Rubber agroforests in a changing landscape: Analysis of land use/cover trajectories in Bungo district, Indonesia. *Forests, Trees and Livelihoods* 20(1): 3–14. <http://www.tandfonline.com/doi/abs/10.1080/14728028.2011.9756694>.
- 72 Ketterings QM, van Noordwijk M, Bigham JM. 2002. Soil phosphorus availability after slash-and-burn fires of different intensities in rubber agroforests in Sumatra, Indonesia. *Agriculture Ecosystems & Environment* 92(1):37–48. <http://www.asb.cgiar.org/publication/soil-phosphorus-availability-after-slash-and-burn-fires-different-intensities-rubber>.
- 73 Oyekale AS. 2012. Vulnerability of peasant cocoa farmers to climate change in south-west Nigeria. *Journal of Human Ecology* 40(1):33–41. <http://www.krepublishers.com/02-Journals/JHE/JHE-40-0-000-12-Web/JHE-40-0-000-12-Contents/JHE-40-0-000-12-Contents.htm>.
- 74 Lin BB. 2010. The role of agroforestry in reducing water loss through soil evaporation and crop transpiration in coffee agroecosystems. *Agricultural and Forest Meteorology* 150(4): 510–518. <http://www.sciencedirect.com/science/article/pii/S0168192309002755>.
- 75 Bright GA, McDonald MA, Anglaaere LCN, Cobbina J. 2007. Financial analysis of shaded cocoa in Ghana. *Agroforestry Systems* 71(2):139–149. <http://link.springer.com/article/10.1007%2Fs10457-007-9058-5>.
- 76 Anglaaere LCN, Cobbina J, Sinclair FL, McDonald MA. 2011. The effect of land use systems on tree diversity: Farmer preference and species composition of cocoa-based agroecosystems in Ghana. *Agroforestry Systems* 81(3):249–265. <http://link.springer.com/article/10.1007%2Fs10457-010-9366-z>.
- 77 Byiers B, Bessems J. 2015. Costs if you do, costs if you don't: Promoting responsible business & reporting – challenges for policy makers. Discussion Paper No. 176. Maastricht, The Netherlands: ECDPM. <http://www.ecdpm.org/dp176>.
- 78 Falcao T. 2011. *The Brazilian Transfer Pricing Rules: A New Approach to Transfer Pricing?* Machado Associados e Consultores. <http://taxjustice.blogspot.ch/2011/06/brazilian-transfer-pricing-rules-new.html>; Mehta K. 2014. *How Developing Countries Can Take Control of Their Own Tax Destinies*. Chesham, Buckinghamshire, UK: Tax Justice Network. <http://www.taxjustice.net/2014/07/09/developing-countries-can-take-control-tax-destinies>.