



The Impact of Small-Scale Mining Operations on Economies and Livelihoods in Low- to Middle-Income Countries

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About Pact and ARM:

International not-for-profit organisations Pact and ARM are jointly responsible for this report's contents. Both organisations are independent yet partner on a project by project basis to promote and achieve excellence in natural resource management, improve social and environmental responsibility within artisanal and small-scale mining, and assist communities to gain lasting benefit from the more sustainable use of the natural resources around them.

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Abbreviations and Acronyms

3T	tin, tantalum, and tungsten
AM	artisanal mining
ASGM	artisanal and small-scale gold mining
ASM	artisanal and small-scale mining
CAR	Central African Republic
CBO	community-based organisation
COMIKAGI	Coopérative Minière of Kababaru-Gikingo
CSO	civil society organisation
DFID	U.K. Department for International Development
DRC	Democratic Republic of Congo
EARF	East Africa Research Fund
ESIA	Environmental and Social Impact Assessment
FDI	foreign direct investment
FECOMIRWA	Fédération des Coopératives Minières au Rwanda (Rwandan Federation of Mining Cooperatives)
FY	fiscal year
g	gram(s)
GDP	gross domestic product
GLR	Great Lakes Region
GNI	gross national income
GOR	Government of Rwanda
ha	hectare(s)
HSE	health, safety, and environment
ICGLR	International Conference on the Great Lakes Region
ICMM	International Council on Mining and Metals
IIED	International Institute for Environment and Development
IISD	International Institute for Sustainable Development
ILO	International Labour Organisation
ITRI	International Tin Research Initiative
iTSCi	ITRI Tin Supply Chain Initiative
KES	Kenyan shilling
kg	kilogramme(s)
KILM	ILO's Key Indicators of the Labour Market database
km	kilometre(s)
LBMA	London Bullion Market Association
LSM	large-scale mining
m	metre(s)
M	million(s)
MEM	Tanzanian Ministry of Energy and Minerals
MEMD	Ugandan Ministry of Energy and Mineral Development
MINIRENA	Rwandan Ministry of Natural Resources
MMSD	Mining, Minerals, and Sustainable Development Project
MOM	Kenyan Ministry of Mining
n/a	not applicable
OECD	Organisation for Economic Co-operation and Development
oz	Troy ounce(s)

PMMC	Precious Minerals Marketing Corporation
PRSP	Poverty Reduction Strategy Paper
PSSMA	People's Small-Scale Mining Area
RP	rural population
RWF	Rwandan franc
SAM	Sustainable Artisanal Mining Project
SDC	Swiss Agency for Development and Cooperation
SSM	small-scale mining
U.K.	United Kingdom
U.S.	United States
UBC	University of British Columbia
UBOS	Uganda Bureau of Statistics
UGX	Ugandan shilling
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
USD	United States dollar
VAT	value added tax
WBH	Wolfram Bergbau und Hütten AG
WMP	Wolfram Mining and Processing Ltd.

Executive Summary

This report of the East Africa Research Fund (EARF) project '**Understanding the Economic Contribution of Small-scale Mining in East Africa**' addresses the first of three main objectives of the Terms of Reference, namely to conduct an **overarching synthesis to understand the impact of small-scale mining operations on economies and livelihoods in low to middle income countries**, and explore the implications for three case study countries Kenya, Rwanda and Uganda in East Africa.

For that purpose, the paper not only draws on findings from the study countries, but also on relevant international experiences from other African countries as well as from other continents. Extensive literature research and drafts of this report informed the country studies, while the final version of this report incorporates the findings from field research assessing two representative supply chains per country. The findings are followed by a synthesis of the conclusions and recommendations from the three country studies.

Kenya: ASM gold mining at the assessed mining village Osiri injects USD 1.9 million per year into the local economy. At the Migori district level, ASM gold mining generates USD 37 million per year and at the national level USD 225 million per year. Gemstone mining in Taita Taveta generates a production value of USD 120 million per year, of which roughly USD 50 million per year is spent locally. It is estimated that ASM gold and gemstone mining nationwide together generate a foreign exchange influx into the country in the range of USD 500 million per year.

Rwanda: Responding to the challenge of international conflict minerals legislation, Rwanda has made significant progress towards formalising its ASM sector. One cassiterite/tantalite mine (run by a cooperative) and one wolframite mine (under the umbrella of a company) were assessed. In both cases, the major part of the generated production value remained in the communities as income for miners and subcontractors. Government revenues from the formalised ASM sector are significant and the sector contributes to almost 20% of the country's exports.

Uganda: In one of Uganda's poorest region, Karamoja, artisanal gold mining provides 22,500 miners with an annual income that is significantly above the gross national income (GNI). In the wider Kampala area, more than 90,000 informal clay miners and brick-makers produce about 8 billion bricks, generating a production value in the range of USD 500 million per year. If ASM would be included in the formal sector, Uganda's gross domestic product (GDP) would increase by 5%.

This excerpt of impressive numbers demonstrates the economic potential of ASM for low to middle income countries. ASM is globally on the rise and is about to surpass 40 million people choosing this activity as a livelihood strategy. ASM is an opportunity to escape poverty and it is almost ubiquitous in low to middle income countries. Eighty to ninety percent of low income countries can be considered 'ASM countries', while the number decreases to 40–60% for middle income countries and less than 10% for high income countries.

Findings show that ASM has **positive as well as negative impacts** on economies and livelihoods of low to middle income countries. Economic impacts of ASM generally are positive, but social and environmental impacts on livelihoods are considerable. ASM may even involve a political cost, as seen particularly in the context of armed conflicts in the Great Lakes Region (GLR), where militias have attempted to reap the micro- and macro-economic benefits of the sector. The resulting political discussion about 'illicit mining' partly misses the point insofar as the root problem is not the activity itself (the predominantly manual extraction of minerals) but its placement in the informal sector and the mineral flows outside official trade routes. Rather than a mostly informal sector of the economy, ASM is an economic sector in mostly informal national business and employment contexts.

In order to maximise the **net economic contribution of ASM** to poverty reduction and economic growth, social, environmental, and political costs of informality need to be minimised and barriers to entry into formal processes must be removed. For sustainable livelihoods, this requires 'transforming structures and processes'. The underlying core process is formalisation. Most countries, including the three case study countries, are still in the early phases of this process, focussing on the central issue of access to mineral rights. What directly affects the lives of the miners is informal employment, with related issues of gender inequality and child labour. Labour formalisation still remains a large gap in

ASM formalisation approaches The political will to formalise the sector is a ‘necessary but not sufficient’ condition. ASM formalisation needs to be accompanied by programmes mitigating the activity’s negative impacts, incentivising its transition to formal business routes, and improving its social and environmental performance and return.

Recommendations for improving the economic contribution of ASM can be subdivided into a set of success factors for sovereign policy-making related to ASM formalisation and a portfolio of targeted interventions (as national projects or jointly with cooperation partners) to improve ASM’s social and environmental performance.

Success Factors for ASM Formalisation Policy and Strategy

ASM formalisation requires a clear understanding of the mining sector’s county-specific segmentation that allows for distinguishing ASM from other mining activities. Policies need to start out from a robust baseline. However, national ASM definitions need to be based on a development perspective, expressing what the sector should be in the long term. Countries that delimit ASM as a subsistence activity will get ‘exactly what they asked for’: highly migrant, short-term subsistence mining plagued by serious safety and environmental problems. Countries with wider ASM definitions can expect the sector to develop towards organised associations, cooperatives, or even companies, progressively improving technical and environmental performance.

Formalisation of mining rights needs a focus on ASM organisations. Any ASM formalisation effort attempting to attend individual miners (e.g., by ID cards) has failed so far. Formalisation and organisation of the ASM sector are indivisible and mutually reinforcing. For such ASM organisations, legislation needs to incorporate the core elements of mineral rights. These rights are as important for ASM as for LSM and include exclusivity rights, rights of transfer and upgrade, successive permit renewals, right to process minerals and the right to commercialise products at market price.

ASM formalisation must be understood as a permanent role of the state. The ASM sector is in constant evolution; for example, successful miners outgrow their segment, new persons start to seek a livelihood in mining, rushes attract new groups, and disasters push people into digging. All these people need to be accommodated in the formal economy. For that to happen, entry barriers to formalisation need to be low and ideally eliminated. Applying for and being granted the right to perform ASM activities needs to be a simple, expeditious, and straightforward administrative process, guided by win-win options.

Informality has a cost and bears a risk. Artisanal miners will formalise if the cost of being formal is lower than the monetarised risks of being informal. Considering the elimination of taxes that cause higher administration costs than revenues could be one of the win-win options.

The authority in charge of ASM must have adequate institutional capacity to oversee the ASM sector. ASM administrations need to address new challenges at a similarly fast pace as they occur. Local or regional authorities are best positioned for this task. The closer the ASM administration is to the mines, the better the officials know the miners and the fewer barriers exist for miners to approach a local officer. This reduces entry barriers for miners and access barriers for the administration. Decentralisation, de-concentration, or devolution of ASM administration is a must.

Targeted Interventions to Enhance ASM’s Economic, Social, and Environmental Performance

ASM formalisation needs to be accompanied by targeted interventions to improve the sector’s economic, social, and environmental performance. This usually requires inter-institutional coordination between government, development agencies, civil society organisations (CSOs), and the private sector.

Addressing technical training needs and improving business skills of miners is of pivotal importance. Miners learned their craft by replicating existing local practices and the majority is not aware of existing alternatives. Knowledge transfer, capacity building, and training are needed to improve mineral extraction, mineral processing, workplace health and safety, and productivity and to reduce environmental impacts and, in particular, mercury emissions from gold mining. Like with technology, miners repeat locally common business practices and errors, making them vulnerable to deceitful,

unfavourable, or obscure practices, often ending up in debt bondage. Improvement of miners' business skills is crucial to reduce poverty and convert locally mined minerals into locally generated wealth and development.

Strengthening of local and national ASM organisations has a high development impact. Local ASM organisations can play a key role as multiplier of training efforts and awareness building campaigns, translators of national law into local customary rules and even catalysts for local economic development. National ASM organisations can play an important role of interlocutor, facilitator, and mediator between the ASM sector and the government.

Targeted policies and programmes in benefit of vulnerable groups can contribute to mitigate inequalities at ASM sites. Prioritising women's participation and training, including within formalisation efforts, and promoting cultural shifts in terms of their roles will empower women to have access to better quality jobs and a fairer share of benefits. Child labour needs to be addressed by awareness raising in combination with an offer of adequate and accessible educational opportunities. Improving labour relations between employers and miners enables workers to enjoy the rights they have and deserve.

Another vast area for programmes is to improve miners' access to markets, finance and the formal banking system. Extending access of legitimate buyers to mine sites and access of miners to legal markets will not only contribute to transparency of minerals supply chains but also help to better capture, disseminate and distribute the local economic contributions from ASM. Some commodities, such as gemstones or non-metallic minerals, offer to create additional added value. With many ASM miners lacking access to the banking system, the sector is an easy target for the informal finance sector. Programmes to encourage engagement of the banking sector with ASM or strengthening savings and credit cooperatives are only a few of the possible options.

Due diligence of minerals supply chains has become imperative and downstream operators increasingly demand compliance with standards and traceability requirements. This implies costs for miners (e.g., traceability) that need to be balanced with the benefits of standard compliance to avoid formalised minerals becoming non-competitive against informal production. Options to reduce the cost burden on producers need to be explored.

1. Introduction

1.1. Background

In 1995, Richard Noetstaller opened the World Bank's International Roundtable on Artisanal Mining with a keynote speech pointing out:

Ever since man learned to exploit the wealth of inanimate nature, artisanal mining has been one of the essential human economic activities, providing materials for adornment, tools and shelter. From the dawn of civilization through the beginnings of the industrial revolution, it was the exclusive form of mining. At the end of the 20th century, it still plays a significant role in many parts of the developing world. Today, artisanal mining is a highly controversial activity, meaning different things to different people. To some it is dirty and dangerous, disturbing and destructive, and frequently on the wrong side of the law. To others it is profitable and productive, and the only means of survival in an environment with few alternatives¹.

Norman Jennings' 1999 seminal report² for the International Labour Organisation (ILO) seconded Noetstaller and strongly influenced vast subsequent research and development work.

While competent, high-level institutions recognised³ the positive socio-economic impacts of artisanal and small-scale mining (ASM), particularly income generation and employment creation in rural areas, concern arose in 2002 that 'the bulk of research has been devoted to analysing the negative aspects of the industry'⁴. As a result, the field had a poor understanding of ASM's economic role and gathered unfounded ideas and generalisations about the sector's activities to the extent that the ASM sector continues to occupy a marginal position in the economic development agenda⁵. This appeared to change when the 53 member states of the African Union adopted the Africa Mining Vision in 2009 and expressed the vision of "a mining sector that harness the potential of artisanal and small-scale mining to stimulate local/national entrepreneurship, improve livelihoods and advance integrated rural social and economic development".⁶

Despite some progress addressing these challenges⁷, in 2014, Hilson concluded that 'a burgeoning body of research has emerged over the past two decades which points to ASM being an indispensable – and potentially, the most important – economic activity in rural sub-Saharan Africa but has failed to change donor and policymakers' perceptions of the sector completely'⁸. In response, Beatrice Labonne speculated that in many instances, governments are comfortable with the status quo⁹.

1.2. Purpose of this Study

This research project of the East Africa Research Fund (EARF) provides an opportunity contribute to **Understanding the Economic Contribution of Small-scale Mining in East Africa**. This report addresses the first of 'three main objectives, namely to conduct an overarching synthesis to understand the impact of small-scale mining operations on economies and livelihoods in low to middle income countries, and explore the implications for three case study countries [Kenya, Rwanda, and Uganda] in East Africa'¹⁰.

The scope of the overarching synthesis report is to 'review the following parameters:

- the definitions of small-scale mining operations in low to middle income countries; and consistency in definitions of operations across countries;

¹ Noetstaller 1995.

² ILO 1999.

³ E.g., the United Nations Economic Commission for Africa (UNECA; Pedro 2004).

⁴ Hilson 2002

⁵ Conclusion of Hilson & McQuilken (2014), critically reviewing 'four decades of support for artisanal and small-scale mining in sub-Saharan Africa' that can be extended by analogy to most low and middle income countries.

⁶ African Union 2009

⁷ UNECA 2011, pp. 75–79

⁸ Hilson & McQuilken 2014.

⁹ Labonne 2014

¹⁰ Terms of Reference EARF/ITT/007, DFID, 29 Jan 2016.

- the economic contribution of small-scale mining operations in low to middle income countries, including where possible the size of minerals extracted compared to overall outputs and any largescale mining operations; productivity of the sector; public revenues; export routes and earnings and foreign capital flows including aid;
- the definitions of formalisation of small-scale mining in low to middle income countries and identify examples from where formalisation has taken place; the processes undertaken to achieve this; the extent of formalisation or coordination of the sector that led to increased or reduced productivity; and positive or negative economic impacts on the poor with particular emphasis on youth, women and children;
- overview of all other options implemented (e.g., forms of commercialisation) to increase the economic potential of small-scale mining with lessons (where available);
- extent to which options implemented depend on the type and scale of mineral deposits;
- draw together any lessons learned and set-out options to effectively promote sustainable economic development for poor and vulnerable small-scale mining workers in the case study countries in East Africa; and;
- identify evidence and data gaps in the literature on the impact of small-scale mining on poverty reduction and possible research questions to address gaps identified for the case study countries in East Africa¹¹.

The objectives and scope frame the primary **research questions**¹²:

- What actual economic benefits (at macro and micro levels) does ASM bring to low-to-middle-income countries, including Kenya, Uganda, and Rwanda?
- In which context(s) have policy approaches (e.g., formalisation, commercialisation, a mixed approach, other approaches) led to relative maximisation of ASM's benefits in terms of national macro-economic prosperity and of improving the livelihoods for the poor at the micro level?
- What do the ASM sectors in Kenya, Rwanda, and Uganda need to promote further, inclusive and sustained growth?

1.3. Methodology

A four-pronged approach was applied to identify and collect the relevant literature:

- A systematic search in scientific databases available at the *Montanuniversitaet Leoben*
- Internet searches
- A personal collection of offline documents from national stakeholders during the inception phase
- The extensive personal archives of the authors

The authors used a snowballing technique¹³ while reading these sources to find further sources. The roughly 500 items of the evidence body were categorised and systematised with support of reference and knowledge management software.

Findings from the literature review were complemented by findings and primary data from the three country case studies¹⁴. Based on available resources, the scope of case studies is constrained to representative supply chains of two different minerals per country (each starting from one upstream ASM producer). Minerals and study sites were selected using diverse criteria, including economic contribution expressed in sales, export value, employment generation, potential negative externalities relevant to social development, long-term resilience, readily available data, and relevance to programming of the U.K. Department for International Development (DFID).

1.3.1 Limitations

The research design precluded a country-wide, multi-commodity assessment. Instead, in consultation with DFID, two supply chains and regions were selected for each country for more intensive research. In Kenya, focus materials were gold and gemstones in Migori and Taita Taveta Counties (respectively). In Rwanda, research focused on cassiterite/tantalum (tantalite) in the Gakenke district and wolframite in the Burera district. In Uganda, the focus was on gold in the Karamoja Region and clay and brick production in and around the capital city, Kampala. As such, the country case studies

¹¹ Terms of Reference, op.cit.

¹² Taken from Barreto & Pact 2016 (inception report).

¹³ Wherein one source provides further references that the authors then consulted.

¹⁴ ARM 2017a, ARM 2017b, ARM 2017c

make no claim of reflecting a comprehensive, countrywide ASM analysis, nor supply chain analyses for all commodities. However, through describing six different ASM contexts in East Africa and synthesising the information, the case studies provide valuable primary evidence to respond to the research questions. Specific research limitations in each country are listed as appropriate in each case study. In addition, Section 5.2 of this report ('Identified Gaps and Limitations of this Study') discusses issues of data availability in a sector that is largely informal.

2. Definition of ASM

2.1. Evolution of International Understanding of ASM

The often-quoted expression 'Artisanal mining is meaning different things to different people'¹⁵ reflects the vast diversity of a sector for which, in the 1980s and 90s, it appeared impossible to agree on a common definition. The aspiration at that time was to agree on a single universal (absolute) ASM definition. Different proposed definitions tended to mix characteristics with symptoms or with implications of the informal situation. Commonly, concepts such as illegality and the use of rudimentary technology were part of these definitions¹⁶.

Often, there was a lack of clarity about the reasons and objectives for adopting a particular definition, but, in general, having a clear ASM definition serves two different purposes¹⁷.

- **From a development perspective**, the objective of having a working definition is to ensure a common understanding and an aspirational long-term vision for the sector.
- **From a public policy perspective**, and especially for regulatory purposes, a definition fundamentally provides a practical distinction between ASM and other mining activities.

Annex 2 presents a selection of development-oriented ASM definitions formulated between 2003 and 2013¹⁸; some definitions are highlighted as follows.

Barreto took a new approach by attempting to incorporate geological and mining concepts without creating obstacles to the future evolution of ASM operations in terms of growth, innovation, and efficiency. Her definition says:

Artisanal mining and small-scale mining are those activities that exploit mineral deposits [with the combination of geologic, physical and chemical characteristics] that allow for simplified forms of exploration, extraction, processing, and transportation. It is a form of mining in which the exploration and exploitation phases can occur simultaneously and in which all phases of the mining cycle can involve low capital intensive and high labour intensive technology. 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 enterprises¹⁹.

To distinguish between ASM and other mining activities and to identify supply chain risks, the Organisation for Economic Co-operation and Development (OECD) formulated an ASM definition that closely follows a development approach, but that also intends to serve as the framework for an increasing number of national legislations adhering to the OECD guidance.²⁰

Artisanal and Small-scale Mining (ASM) – formal or informal mining operations with predominantly simplified forms of exploration, extraction, processing, and transportation. ASM is normally low capital intensive and uses high labour intensive technology. 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 or even thousands of miners. For example, it is common for work groups of 4-10 individuals,

¹⁵ Expression crafted by Noetstaller 1995 and widely disseminated by N. Jennings in ILO 1999

¹⁶ Barreto 2011

¹⁷ Ibid

¹⁸ Hilson & McQuilken 2014

¹⁹ Barreto 2011

²⁰ OECD 2016

sometimes in family units, to share tasks at one single point of mineral extraction (e.g., excavating one tunnel). At the organisational level, groups of 30-300 miners are common, extracting jointly one mineral deposit (e.g., working in different tunnels), and sometimes sharing processing facilities.

Purely public policy-oriented definitions, and especially those intended for regulatory purposes, still largely draw on easily quantifiable 'traditional' parameters²¹, such as production or sales volume, number of people per productive unit, capital employed, labour productivity, quantity of reserves, operational continuity and reliability, size and type of mine claim, or duration of the mining cycle. Most problematic are 'recursive' definitions, where, for example, ASM can be *granted* up to x-hectare (ha) mining area, while ASM is defined as having no more than x ha mining area, or where ASM is defined as a manual activity and ASM miners consequently are prohibited from using mechanised technology. Such 'self-fulfilling prophecies' carry a high risk of curtailing the development potential of the sector.

2.2. ASM Definitions in East Africa: Kenya, Rwanda, and Uganda

2.2.1. Kenya

The Mining Act No. 12 of 2016²² uses the definitions that 'artisanal mining means traditional and customary mining operations using traditional or customary ways and means' and 'small scale operation means a prospecting or mining operation as described by the Second Schedule to this Act'. The Mining Act defines four permits for the ASM sector, and Table 1 identifies the criteria used to determine the size of the operation for each permit.

Table 1: Classification of ASM operations in Kenya

Type of operations	Estimated annual extraction of minerals or material bearing minerals	Investment and expenditure	Technology
Artisanal	Not defined	No	Traditional and customary mining operations using traditional or customary ways and means
Small-scale reconnaissance	Not applicable	Not defined	Not defined
Small-scale prospecting	Not applicable	To be defined in the regulation	Does not employ specialised prospecting
Small-scale mining	Not exceeding 25,000 m ³ per year	To be defined in regulations	Does not use mechanised mining technologies, chemicals including mercury and cyanide, or explosives

Source: *The Mining Act 2016 (Kenya 2016)*

2.2.2. Rwanda

The Law on Mining and Quarry Operations²³ and Ministerial Orders 002/ 2015²⁴ and 003/2015²⁵ define the criteria for ASM mining operations according to the mining licences system of Rwanda. The regulations use four criteria for all mining licenses, except for commercial small-scale quarry, which follows only two criteria and does not define a time period for its duration of capital investment (Table 2).

²¹ These parameters were already identified a decade ago by Hentschel et al. 2003.

²² Kenya 2016

²³ Rwanda 2014

²⁴ MINIRENA 2015a

²⁵ MINIRENA 2015b

Table 2: ASM mine size criteria in Rwanda

Mine size	Criterion			
	Quantity of reserves (est. minimum)	Capital investment (minimum during five years) ²⁶	Production of minerals (estimated)	Depth of the mine and/or technologic criteria
Artisanal mining	30 tonnes	RWF 70 million (~USD 84,000)	Half tonne to 3 tonnes a month	40 m calculated between the surface of the site and the bottom of the pit. The distance shall be calculated vertically Uses mining equipment and techniques which preserve health, security of people and environment
Small-scale mining	200 tonnes	RWF 700 million (~USD 840,000)	3 tonnes a month (minimum)	Uses mining equipment (extracting and processing machines) Skilled personnel with technical know-how
Commercial small-scale quarrying		RWF 5 million (~USD 6,000)		Uses equipment and techniques that comply with environmental, health and safety standards

Source: MINIRENA 2015a, 2015b

2.2.3. Uganda

Ugandan legislation does not distinguish between 'artisanal' and 'small-scale' mining. In the policy context of the Mineral Policy for Uganda 2001, 'artisanal' and 'small-scale' mining refer to mining operations run by individuals, families, groups of local communities or migrant workers, or local enterprises, most whom have no formal technical training and depend on rudimentary tools. The Ugandan mining legislation does not provide a direct definition of 'artisanal' mining; only 'small-scale' mining has been defined in the Mining Act 2003²⁷, with its operations characterised by small capital investment, low levels of technological sophistication, and at least 51% ownership by Ugandan citizens²⁸. The Mining Act 2003 defines ASM as 'small-scale operations means prospecting or mining operations, which do not involve expenditure in excess of five hundred currency points [approximately USD 3,000] or the use of specialised technology' to bring the mine into production. The maximum area that can be attributed by a 'location licence' depends on the type of deposit and the minerals extracted (see Table 3).

2.2.4. Comparison of East African ASM Definitions

ASM definitions in all three East African countries do not focus on the sector's development perspective (what the sector should be in the long term), but serve practical regulatory purposes differentiating between different segments of the mining sector. Table 3 summarises the definition parameters used in the three study countries²⁹.

Table 3: ASM definition parameters in use in the study countries

Criteria used	Kenya	Rwanda	Uganda
Ownership	ASM: traditional and customary Citizen of Kenya or 60% Kenyan shareholder	n/a	Citizen of Uganda or minimum 51% Ugandan shareholder
Reserves	n/a	AM: minimum 30 tonnes SSM: minimum 200 tonnes	n/a
Mining area	AM: Designated and non-designated areas Size of the area is not defined SSM: maximum 25 blocks (~506 ha) for prospection, maximum 2 blocks (~40.5 ha)	AM: maximum 49 ha SSM: maximum 100 ha	Location licence sizes for: • Precious metals: 500 m x 300 m along the supposed strike • Precious stone other than alluvial, alluvial for precious

²⁶ Exchange rate of RWF to USD 01.09.2016 (oanda.com)²⁷ Uganda 2003²⁸ MEMD 2016²⁹ Segregated by artisanal mining (AM) and small-scale mining (SM), where applicable.

Criteria used	Kenya	Rwanda	Uganda
	for extraction; Designated and non-designated areas for extraction		metals or precious stones, and non-precious minerals: 16 ha <ul style="list-style-type: none"> • Within a river or a swamp and land adjoining such river or swamp: 1500m along the course of the river or swamp and not more than 100m on each side • Limestone and chalk: 8 ha • Brine and salt: 35 m in length and 10 m in width
Production	SSM: maximum 25,000 m ³ per year	AM: minimum 0.5 tonnes to maximum 3 tonnes per month SSM: minimum 3 tonnes per month	n/a
Technology	AM: traditional and customary means SSM: not employ specialised prospecting, mechanised mining technologies, chemicals including mercury and cyanide or explosives	AM: techniques that preserve health, safety, and environment (HSE), maximum 40 m SSM: skilled personnel with technical know-how	No use of specialised technology
Investment	SSM: maximum amount prescribed by the Cabinet Secretary	AM: minimum RWF 70 million in 5 years [approximately USD 85,000] SSM: minimum RWF 700 million in 5 years [approximately USD 850,000]	Maximum 500 currency points (1 pt. = UGX 20,000) [approximately USD 3,000] to bring the mine into production
Duration	AM: 3 years SSM: 5 years	AM: 5 years SSM: 15 years	2 years
Transferability	Not clear	Yes	Yes

An important difference can be observed between Kenya and Uganda's parameters and those of Rwanda. While Kenya and Uganda, like many other countries, use maximum thresholds (for, e.g., production capacity or investment), Rwanda introduces minimum thresholds for reserves, production capacity, and investment. This might be a response to the country's high population density in the sense that land should only be used for mining where benefits from mining clearly outperform agriculture. Regardless of this possible rationale, the Rwandan approach can be seen as an interesting pilot experience promoting upscaling of ASM. Rwanda is also different in that participation of non-national (minority) shareholders in ASM operations is not an option³⁰.

The legal frameworks in all three countries acknowledge the ASM sector, an important first step toward the sector's formalisation. However, the specific criteria for characterising artisanal mining (AM) and small-scale mining (SSM) are quite varied in terms of their potential impacts on the feasibility and potential growth of operations in the respective countries. Some of the key issues worth noting include:

- **Differentiation between AM and SSM.** Rwanda describes the two different kinds of operations. Uganda only recognises SSM. In Kenya, there is no objective and measurable criterion to distinguish AM from SSM.
- **Allowable amounts of investment.** Rwanda applies a positive degree of latitude for investment, whereas Uganda places significant limitations on investment. This criterion is not defined in Kenya's Mining Act, but will be articulated in the regulations that are currently being drafted.

³⁰ However, this does not limit possibilities for foreign investment. We assess the company Wolfram Mining and Processing Ltd. (WMP) for the Rwanda case study. Although WMP has close economic linkages to its refiner Wolfram Bergbau und Hütten AG (WBH) in Austria, a subsidiary of the Swedish group SANDVIK, WMP is constituted as a Rwandese company headquartered in Kigali.

- **Duration of licence.** Rwanda's licence duration is appropriate and consistent with best practice. In Kenya, it is shorter but still operable. In Uganda, it is too short to be reasonable in promoting the stability of operations.
- **Transferability of licence.** Both Rwanda and Uganda have clear and positive rules for transferability. In Kenya, this criterion is not clearly stated.
- **Size of license area.** In all three countries, the license areas tend to be too small for the feasibility, growth and stability of ASM operations. At the low end is Uganda with 16 ha. Such small areas are often mined out in less time than a formalisation process requires and consequently promote informality. The largest size is allowed in Rwanda, but even here the permitted license area could be enlarged.
- **Restrictions on technology use.** The imposition of restriction on the use of explosives, processing chemicals including cyanide and mercury can create significant limitations on feasibility and growth. In Kenya, these technologies are specifically disallowed, and Uganda has a prohibition on the use of 'specialised technologies', but it is less clear in the scope of the intended restrictions.
- **Restrictions on maximum allowable production.** The annual production allowance for Kenya (25,000 m³) is too small to promote the stability and growth of small-scale operations³¹. The monthly allowable rates of production are not defined in Uganda, but the investment restrictions will impose severe limitations on mineral production.

3. Economic Contributions of ASM

Mining has long been heralded as a key economic sector for development. However, in sub-Saharan Africa, the focus has traditionally been on large-scale mining (LSM) and oil and gas extraction, which have tended to benefit the elite, providing limited added value to the sustainable growth of economies³². World Bank's 'Strategy for African Mining' of 1992, which shaped the economic development of the sector for decades opened with the statement, 'Mining can provide important benefits in terms of exports, foreign exchange earnings and tax receipts to support economic recovery and growth in Africa'³³. This raises the question of whether the same terms and metrics also apply for assessing the economic contribution of ASM.

The general profile of what modern mining (i.e., LSM) contributes to the macro-economy is summarised schematically in Figure 1 (on the next page)³⁴. Some similarities and significant differences to ASM can be noted.

- As an economic activity that is normally low capital intensive and uses high labour-intensive technology³⁵, ASM contributes primarily to **employment** and to **national income**, created at the **local level**.
- **Export** of ASM commodities (e.g., gold; diamonds; coloured gemstones; certain metal- and non-metal minerals, such as tin, tantalum, copper, cobalt, fluorspar, baryte) is an important source of foreign exchange for many countries.
- ASM is poverty-related; either 'poverty driven' or an opportunity to escape poverty, i.e., 'opportunity driven.' Consequently, direct **government revenues** from 'taxing the poor' should be low. Notwithstanding, findings from the country studies of research demonstrate that ASM's tax contributions (both direct and indirect) are substantial.
- Legitimate **foreign direct investment** (FDI) in the ASM sector is usually quite limited³⁶.

³¹ The ASM definition of OECD (2016) is to the point, indicating that an ASM site may involve 'hundreds or even thousands of miners'. 25,000 m³ per year can be extracted manually by a few dozen miners.

³² Collier 2010

³³ World Bank 1992

³⁴ Roe & Essex 2009

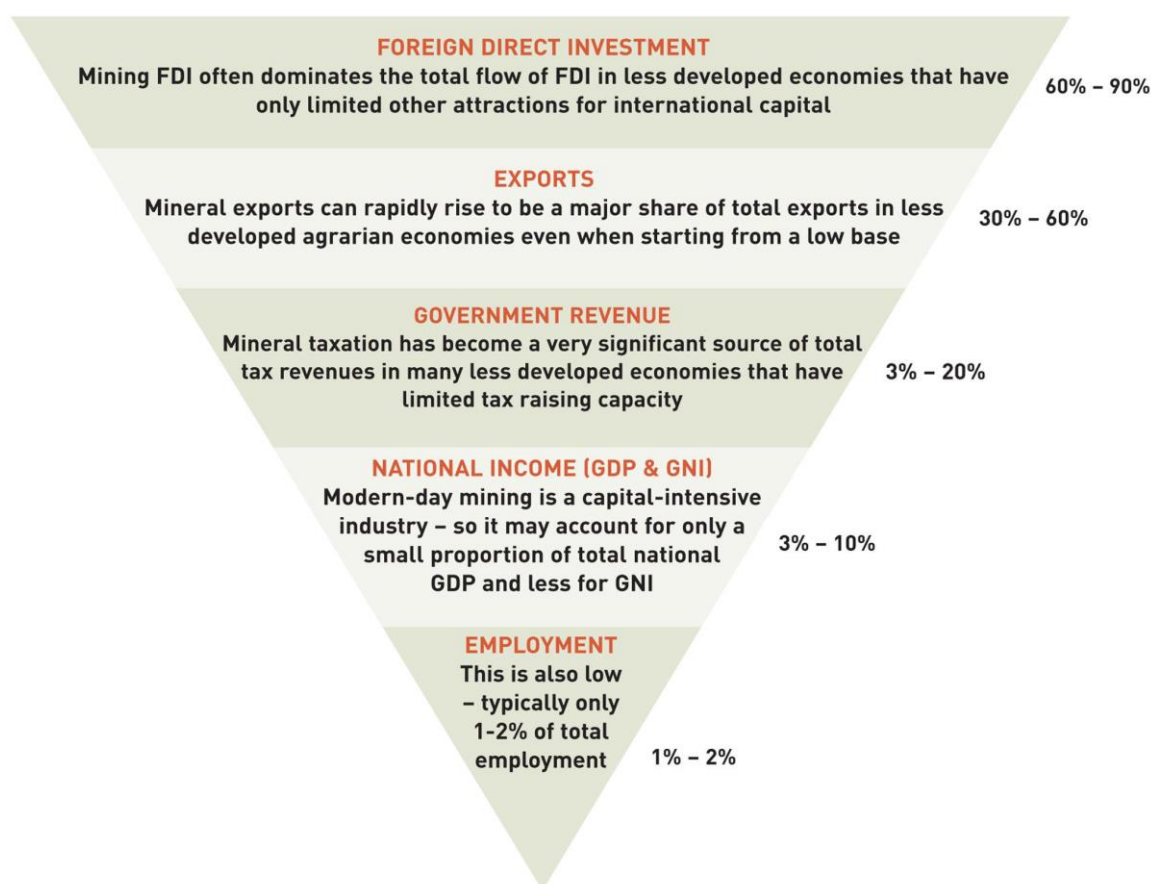
³⁵ OECD 2016

³⁶ Kenya and Uganda allow foreign investors to hold minority shares in ASM operations (Table 3). In the Kenya country case study (section 0), Tanzanian investors transferred gold leaching know-how to Migori. It is however crucial to carefully distinguish legitimate FDI in the ASM sector (as per OECD definition) from foreign actors

In a similar analysis to Figure 1 for ASM, employment would likely rank highest in contribution, followed by local and national income generation. Exports and government revenues would rank next, and FDI would rank last. This suggests a high complementarity of the ASM sector with the LSM sector and an excellent opportunity for low- and middle-income countries to draw on 'the best from both worlds'. In fact, synergies often can be observed, where either ASM or LSM consider the deposit depleted, but the other sub-sector continues operating.

However, the interaction between LSM companies and ASM operations is not always positive, and confrontations between the two sectors are common. The analysis of this conflict through the lens of competition for non-renewable resources, traditional land rights clashing with mineral licensing policies, lack of community engagement by LSM³⁷, and divergent elite interests³⁸ exceeds the scope of this report³⁹.

Figure 1: Stylised view of (large-scale) mining's macro-economic contribution⁴⁰



In a more holistic view, the above economic contributions of ASM (and LSM) must be set against social and environmental costs. Gathering the required information is a complex endeavour due to an overwhelming number of uncertainties and data gaps. LSM projects must now typically conduct Environmental and Social Impact Assessments (ESIAs)⁴¹, which also have been conducted at the

camouflaging as ASM, as in the case of Chinese involvement in small-scale gold mining in Ghana (Crawford et al. 2016).

³⁷ World Bank 2009, ICMM & IFC 2010

³⁸ Collier 2010

³⁹ E.g., the rationale behind considering the continued extraction of non-renewable natural resources from abandoned mines and waste rock dumps as 'criminal' in South Africa (Crowley 2014), with the related question whether the 'criminality' is cause or effect of such prohibition. In any case, it is a clear example where the alleged 'inefficiency of ASM' in the political economy analysis of Collier (2010) is mirrored by the LSM sector.

⁴⁰ Roe & Essex 2009, also published by WGC 2009

⁴¹ IFC n.d.

national level for some countries. An example in the ASM sector is the extensive 'Integrated assessment of artisanal and small-scale gold mining' recently concluded in Ghana⁴². This research project, conducted over six years (2009–2015) and involving more than 30 researchers, identified impacts on human health, ecosystems, and livelihoods and produced proposals for mitigation strategies and policy recommendations for Ghana. Such holistic exercises provide valuable input for designing required mitigation measures and allow, to some degree, for an estimation of their cost. However, it is important to note that these mitigation costs do not reflect the true social and environmental costs, which in some cases becomes known only after decades or centuries⁴³.

The debatable issue in determining environmental costs is whether it is actually possible to put a monetary value on natural resources and the environment. Even rough approximations require the combination of several methods and extensive baseline data⁴⁴, and they still may lead to results that lack robustness⁴⁵. Given this complexity, this report refrains from attempting to quantify social or environmental costs in monetary terms.

In the following sections of this paper, ASM's economic contribution will be assessed in terms of employment and income generation, macro-economic value generation, and micro-economic entrepreneurial and/or livelihoods aspects.

3.1. Employment and Income Generation

The number of ASM miners globally is usually reported in the range of 20–30 million, with three to five times that number indirectly supported through their activities and approximately half of them engaged in artisanal and small-scale gold mining (ASGM)⁴⁶. ASM is carried out in more than 80 countries (see Annex 3) and produces some 15% of the world's mined gold, 20% of mined diamonds, 60% of mined tin, 50% of tantalum, and 80% of coloured gemstones⁴⁷. Furthermore, aside from the above 'high value/low volume' commodities destined to be exported, ASM production is significant for a range of industrial minerals, coal, and particularly construction materials for local use⁴⁸. Often in ASM literature, the size and importance of this 'low value/high volume' mineral production is overlooked or underestimated.

Annex 3, which brings together data on ASM population from the major comprehensive studies on this topic as well as selected updates, suggests that the overall number of artisanal miners is rather close to **40 million people**. This would coincide with the fact that the published numbers for many gold-producing ASM countries have not been updated since 1999 and consequently do not reflect the increase of the gold price that happened between 2003 and 2012 or the increase of population in mostly all ASM countries. Particularly the latter is a factor widely ignored in sector analyses. Between 1999 and 2016, the population in the three study countries increased as follows (Table 4).

⁴² Basu et al. 2015, Rajaei et al. 2015, Wilson et al. 2015; see also <http://asgmresearch.weebly.com/>

⁴³ E.g., ASM-specific: US EPA superfund sites rehabilitating mining sites of the American gold rush (Carson River, Sacramento, etc.) from the 1850s; or, more generic: the environmental and social cost of climate change resulting from industrialization.

⁴⁴ Bolt et al. 2005

⁴⁵ E.g., Gulley 2017 uses a 'calibrated benefit transfer approach' to extrapolate environmental costs of ASM gold mines in developing countries from environmental costs of industrial coal-fired power plants in the USA. Beyond doubt, the results are mathematically correct, but whether they reflect the reality remains highly questionable. Further discussion of this topic goes beyond the scope of this report.

⁴⁶ Buxton 2013, Hruschka & Echavarria 2011, Veiga, Bernaudat 2003.

⁴⁷ Villegas et al. 2012, with update of recent tin and tantalum figures.

⁴⁸ Buxton 2013, Villegas et al. 2012, Hentschel et al. 2003, Hinton 2006. See also <http://developmentminerals.org>.

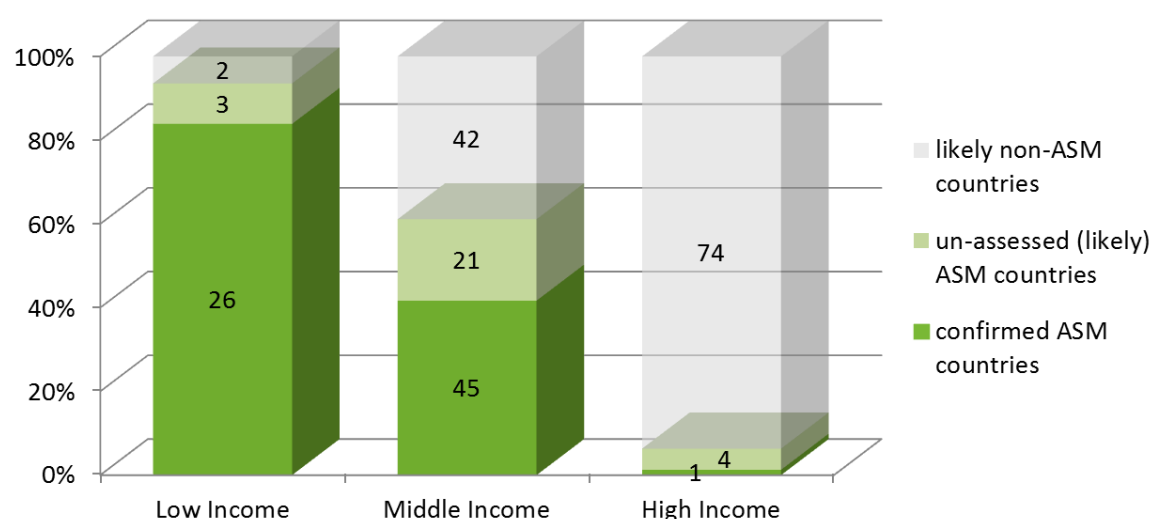
Table 4: Changes in population in the three study countries

Country	Population (millions) in 1999	Population (millions) in 2016
Kenya	30	46
Rwanda	7.3	11.7
Uganda	22	28

Another aspect resulting from the data in Annex 3 is the differing prevalence of ASM in countries with different income levels. For the 2017 fiscal year (FY), the World Bank defines economies based on 2015 gross national income (GNI) per capita as follows⁴⁹:

- Low income: USD 1,025 or less
- Lower middle income: between USD 1,026 and USD 4,035
- Upper middle income: between USD 4,036 and USD 12,475
- High income: USD 12,476 or more

As a result, based on Annex 3, 80–90% of low income countries can be considered ‘ASM host countries’, while the number decreases to 40–60% for middle income countries and less than 10% for high income countries (Figure 2).

Figure 2: Prevalence of ASM in countries at different income levels

This data allows for several important findings.

- ASM is an important economic sector in low income countries, where income opportunities generated by ASM mineral extraction by far outperform income levels of alternative rural livelihoods⁵⁰.
- While ASM is ‘poverty driven’ in the sense that it is highly attractive to (poor) people who earn below average, it is foremost an opportunity to escape poverty by providing opportunities to earn above-average incomes.
- Every citizen earning above average contributes to elevate the GNI and, therefore (through his/her earnings and spending), to advance the national economy to a next-higher level.

These findings are aligned with Labonne’s conclusions that, ‘Ultimately, ASM formalisation will result not from direct assistance but on the contrary, from the success of governments in combating poverty in the non-mining rural communities’⁵¹. ASM has a very low prevalence in high income countries because at such GNI levels most ASM is outperformed by non-mining employment sectors.

⁴⁹ World Bank Website. Oct. 2016. <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

⁵⁰ At a 2016, average gold price of 1,250 USD/oz (40 USD/gr), an ASM productivity of 0.82 oz/year (i.e., 26 gr/year or a little more than 2 grams per month) is equivalent to an average annual income in the range of the low-income threshold GNI per capita. A common estimation for gold is 1oz/miner/year, which is even above this threshold.

⁵¹ Labonne 2014

Notwithstanding, to achieve a formalised ASM sector, a process of developing enabling policies (including assistance programmes) is required.

3.2. Macro-Economic Value Generation

3.2.1. Gross Domestic Product

The extent to which quantitative data on ASM's macro-economic contribution is available depends largely on the extent to which such data is collected at the national level. In many developing countries, informal sector activities are the source of the majority of jobs and make a large contribution to national gross domestic product (GDP). This is particularly significant for ASM, which, despite its significance as an employment engine in sub-Saharan Africa and elsewhere, comprises un-officialised activities, the output from which is rarely included in national statistics⁵². As pointed out by Banchirigah and Hilson⁵³, GDP was never intended to measure well-being and statistics on GDP rarely provide accurate data on the economic impacts of the informal sector. In fact, as discussed in the EARF country report on Uganda, where ASM wealth creation was estimated to be 5% of the GDP, this figure does not indicate that ASM contributes 5% to the actual reported GDP, but that the real GDP would be 5% higher if ASM were included in the formal economy⁵⁴.

3.2.2. Export Figures

The situation is similar with export figures. Particularly in the case of ASGM, which accounts for approximately half of all global ASM activity, frequently only a fraction of cross-border sales are registered as official exports and thus are reflected in trade statistics. Blore⁵⁵ demonstrates the questionable reliability of gold export figures from the International Conference of the Great Lakes Region (ICGLR) (3.2.2.). Import figures into Dubai appear to be more reliable, as they reflect the widely perceived increase of ASGM activity proportional to the last decade's rise of the gold price. Total ASGM production worldwide is estimated at 380 to 450 metric tonnes per year⁵⁶. Local consumption of raw gold in producer countries is negligible in terms of volumes; most of that newly mined gold is sold in cross-border trades, resulting in foreign currency entering the country in exchange. The (registered or unregistered) export value⁵⁷ of this ASGM production is in the range of USD 16 billion per year, which for gold alone comes close to the total accumulated GNI of the world's five poorest low income countries⁵⁸.

⁵² Banchirigah & Hilson 2010, Gajigo et al. 2012

⁵³ Banchirigah & Hilson 2010

⁵⁴ ARM 2017c

⁵⁵ Blore 2015

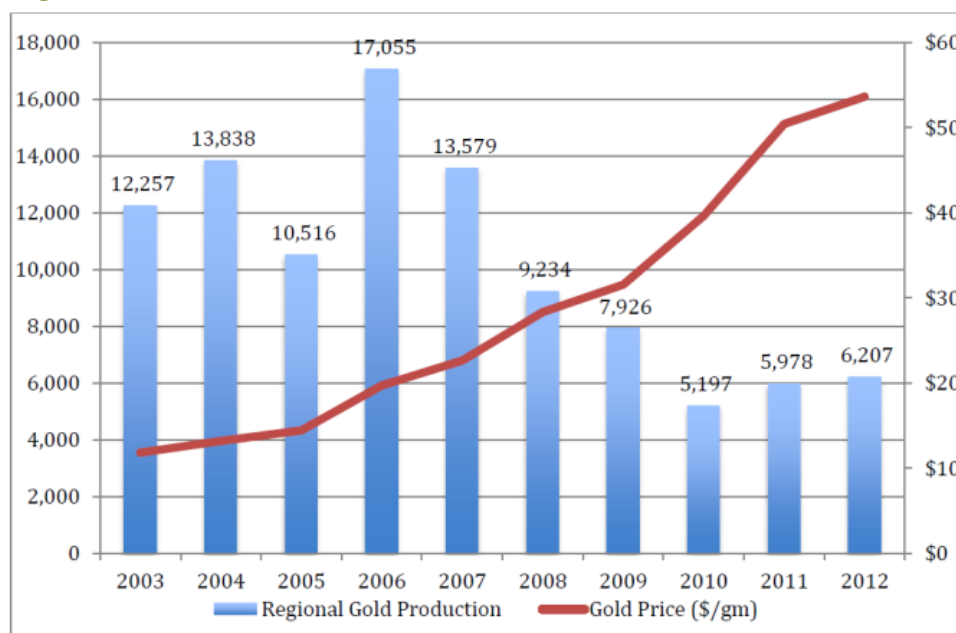
⁵⁶ Marin et al. 2016

⁵⁷ At a conservative estimation of 400 t/a ASGM production and a current gold current gold price level of USD 1,250 per oz (USD 40,000 per kg)

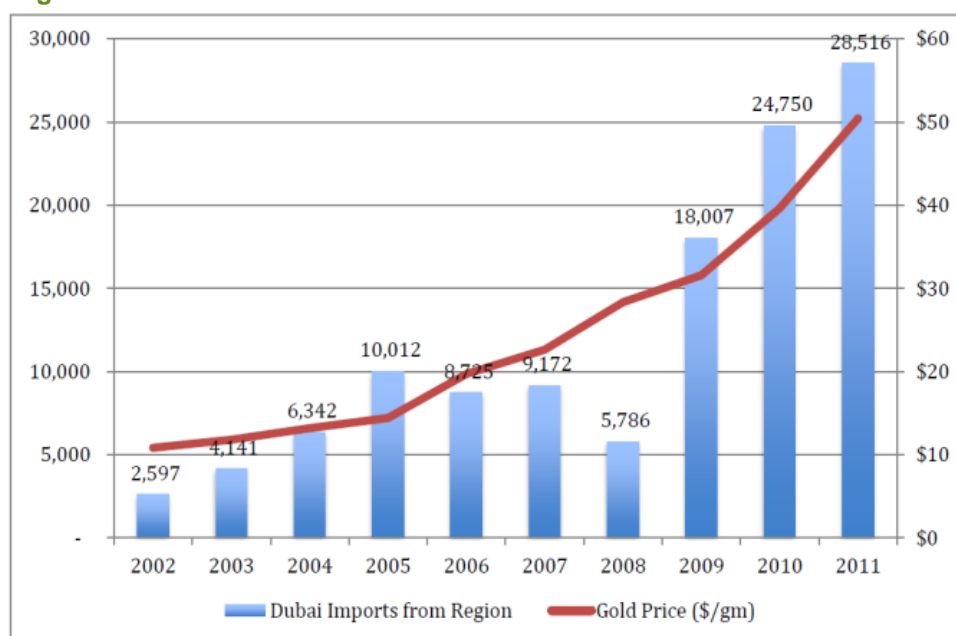
⁵⁸ Burundi, CAR, Malawi, Liberia, and Niger (Data source: <http://databank.worldbank.org>)

Figure 3: Cross-border gold trade between ICGLR member countries and the United Arab Emirates⁵⁹

3a: Export figures



3b: Import figures



Additionally, that figure can serve as a rough proxy for estimating ASGM miners' global average income. With an estimated number of 30–40 million ASM miners (Annex 3) and half of them (i.e., 15+ million) engaged in gold mining, global average revenues generated per capita are in the range of USD 1,000 per year—in the range of the threshold value that makes the difference between a low and middle income country⁶⁰.

⁵⁹ Blore 2015

⁶⁰ Notably, this is a very rough estimation and needs to consider that income is revenue less cost. Furthermore, an income disparity can be expected between low and middle income countries.

Similar distortions of trade statistics can be expected for export figures of other high value/low volume ASM commodities, such as diamonds or coloured gemstones⁶¹. The contribution to export only becomes visible where ASM commodities are systematically accounted for. In the EARF country reports, this is the case only for the tin, tantalum, and tungsten (3T) sector in Rwanda, where the country's exports totalled USD 600 million in 2015, with 3T constituting USD 110 million or 19% of all annual exports, making them key contributors to the country's export and foreign exchange earnings⁶².

Independently of the registered or unregistered status of exports (i.e., 'legal' or 'illegal' trade, according to contemporary mainstream language terms), cross-border sales result in foreign currency entering the country in exchange. **Foreign exchange contribution** of exported ASM products is significant for many countries. Assessed production figures (which only cover the commodities assessed in the country studies) and export statistics indicate that the ASM sector represents an annual foreign exchange source of well over USD 500 million for Kenya, USD 110 million for Rwanda, and USD 200 million for Uganda. Jointly for the three countries, ASM generates a foreign exchange influx of almost USD 1 billion per year.

While gold accounts for approximately half of the ASM sector, the remaining half comprises a wide range of minerals. Apart from other minerals destined mainly for export, such as diamonds, gemstones, cassiterite (tin), and tantalite (tantalum), the remaining half consists of mined **ASM products for domestic and local supply**, such as salt, coal, agro-minerals, or construction materials such as clay, sand, gravel, and dimension stones. By being much more deeply embedded in traditional livelihoods, ASM of these materials attracts much less attention than the emblematic artisanal gold mining activities. However, research on this sector demonstrates its relevance for people's livelihoods and the economic potential of invigorating other local industries along its downstream value chain⁶³. For example, in Uganda, the case study demonstrates that ASM value generation from the clay/brick sector exceeds the importance of ASGM mining by almost seven times⁶⁴.

3.2.3. Government Revenues

Because most ASM worldwide operates predominantly in the informal economy, the initial assumption is that government revenue from mining (focusing on direct taxes and fees) may be lost through avoidance of paying taxes, fees, and royalties; under-reporting of production; loss of miners' income tax from illegal trading and other activities; and the state's limited enforcement capacity⁶⁵. Some of the leading specialists on mining taxation, such as James Otto, even consider exempting ASM from royalty payments and mining taxes to be a pragmatic option because the cost of collecting these payments may exceed the revenue generated and ASM revenue may not meet a minimum threshold for paying taxes on the income⁶⁶.

However, the ASM sector is an important tax payer, even though, due to its predominantly informal condition, royalties or direct tax payments often are negligible. Whenever miners, as organised entities or as individuals, purchase value added tax (VAT)-affected goods, they generate government revenues. Particularly when informal miners purchase machinery or supplies, they are considered 'end consumers' without the ability to carry-on and recover VAT the way formal businesses do⁶⁷. The usual counter-argument that such government revenues from VAT cannot be attributed to the ASM sector is inaccurate because without the extractive activity of the ASM miners, spending (on which VAT is paid) would be lower or would not occur at all.

⁶¹ E.g., According to the EARF case study on Kenya, the Kenya Revenue Authority reported for 2015 USD 2.6 million on gems exports, whereas the national market value of gemstone production from 10,000 miners in Taita Taveta alone is estimated in USD 120 million per year. (ARM 2017a)

⁶² ARM 2017b

⁶³ Birabwa 2006, K'Akumu 2010, Hinton 2011, K'Akumu et al. 2013, Wanjiku 2015, Ming'ate & Mohamed 2016, Hruschka unpublished etc.

⁶⁴ ARM 2017c; ASM gold production is estimated at 2 t/a, whereas the value generated by ASM clay mining and brick production is approximately USD 500 million, equivalent of 13.7 tonnes of gold

⁶⁵ Hentschel et al. 2003, Cook & Mitchell 2014

⁶⁶ Otto et al. 2006

⁶⁷ When the Peruvian Ministry of Finance evaluated the Law on ASM formalisation in 2001, it concluded that losses in 'end-consumer VAT' from informal miners might be higher than expected tax income from formalised ASM operations. (Unpublished meeting notes).

The amount of government revenues collected from ASM is related directly to ASM formalisation policies in place. Informality bears a cost for artisanal miners. They are more likely to formalise if the cost of being formal is lower than the cost of being informal. Hinton and Levin (2010) provide an illustrative case of how total government revenues from artisanal diamond mining in the Central African Republic (CAR) can be significantly increased by adjusting licence fees to an 'affordable' level for ASM miners.

3.3. Micro-Economic Entrepreneurial and/or Livelihoods Aspects of the ASM Sector

As the understanding of the ASM sector evolved over the past decades, some important paradigm shifts took place. In the early days of ASM research, the activity was seen mostly from a technical point of view, reflecting the development approaches of the 1980s, portraying the sector in a very entrepreneurial light⁶⁸. As Hilson states, 'in contrast with many other rural development schemes, small-scale miners generally are self-motivated and start their enterprise without government encouragement and assistance'. But, this focus on entrepreneurship was accurately criticised for completely ignoring the poverty and livelihoods dimension of ASM, paving the way for development approaches such as the Sustainable Livelihoods Approach that became mainstream much later.

3.3.1. Effects of Shifts in Livelihoods Activities on ASM

In another series of papers, Hilson⁶⁹ analysed the effect of de-agrarianisation, resulting in unsustainably small farm sizes (e.g., in East Africa in the range of 1–2.5 ha.) that:

... led hundreds of thousands of the region's households to diversify their livelihood portfolios in an attempt to avert risk and generate the disposable incomes needed to improve quality-of-life. Many have turned to the nonfarm economy and ASM in particular, a main reason why, in many areas of sub-Saharan Africa, the sector has experienced such meteoric growth over the past decade. ... Whilst estimates vary, the consensus ... is that today [at the time of this writing], at least 35–45% of household income generated in rural sub-Saharan Africa is derived from the nonfarm economy⁷⁰.

His findings are aligned with Labonne's earlier view that ASM has become more widespread mainly because of the deterioration in agriculture-based livelihoods⁷¹, thereby concluding that the growth of informal gold mining in rural sub-Saharan Africa is, in fact, a product of wider lifestyle changes that had engulfed the region⁷².

However, another aspect, perhaps overlooked in the previous sub-section's analysis, is that rising gold prices from 2000 to 2015⁷³ contributed to ASGM progressively outperforming agricultural income opportunities and simultaneously to attracting exactly the 'entrepreneurs' already identified as key stakeholders in the 1980s. The truth is probably somewhere in the middle. ASM is on one side a poverty-driven issue of subsistence, livelihoods diversification, and even lifestyle, but on the other side and simultaneously an opportunity-driven business. For many miners it is both, becoming an opportunity to escape poverty.

3.3.2. Positive versus Negative Economic Impacts of ASM

Because most of the world's ASM sectors tend to operate in the informal economy, their contributions to local and national development are typically invisible to most decision-makers, government, and the public. While the negative impacts of ASM are well covered by awareness-raising campaigns and receive deserved uptake in media, the much more 'silent' positive impacts in many low-to-middle income countries can be significant in mining villages and regions. At the household and community levels, ASM provides rural employment options and results in reduced rural-urban migration.

⁶⁸ E.g., views of the issues as identified by Noetstaller 1987; reviewed by Hilson & McQuilken 2014 and Hilson & Gatsinzi 2014

⁶⁹ Banchirigah & Hilson 2010, Hilson & Garforth 2012

⁷⁰ Hilson & Garforth 2012, p. 439

⁷¹ Labonne 2002

⁷² Hilson 2013

⁷³ Average LBMA PM fix: 2000: 279.10 USD/oz., 2015: 1,160.06 USD per oz (x 4.2)

Furthermore, miners' incomes often are reinvested in agriculture or used to stimulate other small businesses, while revenues from ASM and spinoff ventures often play an important role in helping local families meet their health and development needs⁷⁴. Table 5 presents some convincing examples of this positive impact, compiled mainly by Eftimie et al. (2012).

Table 5: Examples of economic contributions of ASM

Country	Example
Central African Republic	Using conservative multiplier effects, as much as USD 144.7 million may be injected into the economy from informal artisanal diamond mining revenues and spin-off economic enterprises. When indirect labour, induced employment, and fertility rates (4.6%) are considered, about two-thirds of the women, men, and children in the CAR may directly or indirectly rely on artisanal diamond mining ⁷⁵ .
Liberia	There are an estimated 50,000–75,000 artisanal miners in Liberia, of whom 10–20% are women, most of whom pan for gold at diamond sites. If half of their combined income is spent on local goods and services, more than USD 13.5 million may be injected into local economies, creating markets for locally grown or supplied products and increasing the cash component of household incomes. This ASM-injected capital may further stimulate local formal and informal enterprises to contribute an additional USD 33.75 million to local economies ⁷⁶ .
Mongolia	More than 60,000 artisanal miners (about 30% of whom are women) of gold, coal, fluorspar, and other minerals are estimated to contribute more USD 811 million per year to the country's GDP. An additional estimated USD 505 million is spent each year in local economies near mining activities. About 600,000 Mongolians (almost 20% of the population) may rely to some extent on ASM. These estimates are based on direct employment (mine workers, etc.), people who provide goods and services to the mines, and induced employment (owners and workers in local shops, restaurants, and other small businesses in communities where mining revenues are spent) ⁷⁷ . These findings deserve an amendment related to ASM formalisation (covered below, in section 0): In the past, most gold production from ASM disappeared on the black market. Formalisation of ASM and the formerly illegal gold supply chain achieved that in 2014, after which approximately 25% of the gold officially purchased by the Bank of Mongolia originated from ASM. In 2014, 3.5 tonnes of gold bought from ASM contributed USD 140 million in properly accounted foreign exchange and generated USD 3.5 million in royalties for the state ⁷⁸ . In 2015, official gold purchases from ASM further increased toward 7 tonnes, at par with LSM gold production.
Uganda	Almost 200,000 women (45%) and men (55%) are engaged in AM of gold, tin, coltan, wolfram, and a range of industrial minerals. The average miner is estimated to contribute almost 20 times more to GDP than those employed in farming, fishing, and forestry ⁷⁹ . Eftimie et al. postulated that in 2008, ASM was the country's third-highest foreign exchange earner, which was confirmed in 2016 ⁸⁰ .

Despite its positive economic contribution at the local level, the overall impact on livelihoods in ASM regions does not always result in a positive balance⁸¹. The mostly favourable endowment with the livelihoods assets financial capital (ASM as a source of income, as a 'last resort' in case of poverty-driven subsistence mining, or as an opportunity to escape poverty) and physical capital (e.g., infrastructure, spin-off opportunities created through ASM, sustaining subsistence agriculture) need to be weighed against social and environmental costs. The human capital is frequently severely impacted by child labour, a lack of education opportunities, public and occupational health issues, workplace health and safety issues, and sexual and gender-based violence, among other issues. The social capital deficit is particularly concerning in contexts of conflict minerals with related crime, violence, and forced labour or in remote temporary settlements whose sole purpose is mining. On the other hand, ASM can also play a vital role as a social safety net.

While ASM relies on natural capital in the form of the mineral deposit, its impacts on natural capital in the form of environmental degradation can be severe. This relates to aspects like the use of chemical

⁷⁴ Eftimie et al. 2012

⁷⁵ Ibid

⁷⁶ Ibid

⁷⁷ Ibid

⁷⁸ Singo & Hruschka 2016

⁷⁹ Eftimie et al. 2012

⁸⁰ BOU 2016a, analysed in ARM (2017c)

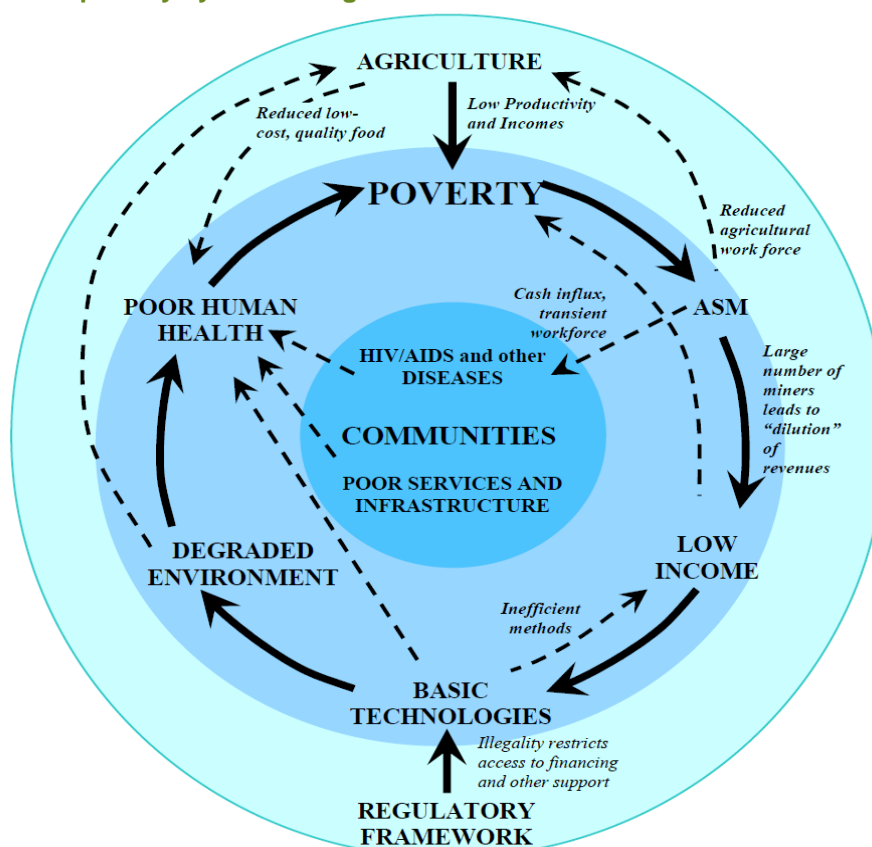
⁸¹ Banchirigah & Hilson 2010, Maconachie & Hilson 2011, Hilson et al. 2013, Arthur et al. 2016, Obiri et al. 2016

substances such as mercury or cyanide in gold mining, impacts on water bodies and siltation of rivers, forest degradation and deforestation, bush-meat hunting, and invasion of protected areas, to name a few, which draw the attention of policy-makers, media, researchers, and the public.

These accumulations of adverse conditions create a vulnerability context in which many ASM miners and their families are trapped in a poverty cycle (see Figure 4, on the next page)⁸². Importantly, though, despite these vulnerabilities, the global number of artisanal miners is at constant increase (see section 0). This can be explained by miners' widespread perception that, despite all hardships, ASM is a more promising livelihood strategy to escape poverty than alternative occupations⁸³.

The transformational structures and processes in the sustainable livelihoods framework⁸⁴, such as laws and policies, are linked to the vulnerability context, which, in turn, affects the available livelihood assets. Their influence, which enhances or hinders people's access to livelihoods assets, particularly on legitimate and legal access to the mineral deposit (i.e., the natural capital) as main a livelihoods asset of ASM, is crucial and will be discussed in section 0.

Figure 4: The ASM poverty cycle in an agricultural context⁸⁵



3.4. Examples of Economic Impact of ASM in East Africa

The following sub-sections summarise the three country case studies, conducted as part of this assignment to assess the current and potential national and sub-national economic contributions of the ASM sector and policy approaches to maximise benefits for the poor.

⁸² Hinton 2006, Hilson 2012

⁸³ This statement is supported by the authors' experience from many countries, underpinned by statistically significant figures from the quantitative surveys conducted in Kenya (ARM 2017a) that in Migori '78% of miners surveyed did not wish to abandon their jobs in the mines' and in Taita Taveta '69% did not wish to abandon their jobs in the mines'. See also section 0.

⁸⁴ DFID 1999

⁸⁵ Hinton 2006

According to available resources for the investigation⁸⁶, the country reports do not cover a comprehensive, country-wide ASM analysis beyond a literature review, nor supply chain analyses for all ASM commodities. Instead, two representative supply chains per country (each starting out from one upstream ASM producer community) were selected and analysed under the methodologic aspects outlined in section 0 and in the corresponding country reports.

The sub-sections contain the findings from the study sites and the extrapolation of those national economic key indicators of ASM, for which data is believed to be sufficiently conclusive. Further policy-related aspects are discussed in the section 4, on ASM formalisation.

3.4.1. EARF Case Study: Kenya

Kenya is considered a lower-middle income country. It possesses a wide range of minerals, both metallic and industrial, and to increase the mining sector's contribution to the GDP. The EARF case study on Kenya⁸⁷ investigated the economic contribution of ASM at two sites—Migori and Taita Taveta—selected in consultation with DFID because of their representative nature for gold and gemstones mining nationwide.

ASGM in Migori⁸⁸

The Osiri village and mine site were founded between 2011 and 2013, after an artisanally mineable gold deposit had been discovered, and have since evolved into a flourishing local economy. With an estimated population of 2,000–3,000 people, the village committee manages more than 50 shops, five hotels, and 37 restaurants. A quantitative household survey in 307 households⁸⁹ showed that mining (although often practiced alongside agriculture) is the primary income-generating activity in the area and that 78% of miners surveyed did not wish to abandon their activity. Six main groups of supply chain actors related to gold production were identified: the Community Development Committee, mine owners, extraction workers, artisanal mineral processors, on-site traders, and cyanide leaching plants. Men constitute 92% of the extraction workforce and women 62% of the mineral processing workforce (crushing, milling, sluicing, amalgamation). Many female miners stated that the ability to pay school fees was one of the most important benefits of their work in ASM.



Environmental and occupational health and safety issues

The most significant environmental and occupational safety and health issues in the Migori gold mines relates to extensive misuse of mercury in the production process. Mercury losses are estimated to amount to more than 70 kg per year in Osiri, and more than 1.2 tonnes of mercury are emitted annually from all sites in Migori County. Approximately half of the mercury is lost during amalgam burning at homes and in gold shops, creating serious immediate health risks. Women, comprising 59% of traders and 62% of mineral processors, are likely to be less aware of mercury exposure risks than men, but may be more subject to exposure. Other substantial environmental concerns relate to deforestation. Child labour does occur, but to a lesser degree than anticipated.



Economic impacts

Gold production at Osiri is estimated in the order of 230 g per day. Around half of the gold's value directly benefits those working in ore extraction, processing, and mineral trading. The household survey found that women in this ASM workforce yield only 11% of the revenue share despite

⁸⁶ For each country: One week in-country for a team of three.

⁸⁷ ARM 2017a

⁸⁸ The case study on Migori is based on own observations (ARM 2017a), but also draws on earlier work, such as Ogola et al. 2002, Mitullah et al. 2003, Mutagwaba 2011, and Sivi-Njonjo 2015.

⁸⁹ Ensuring 95% confidence interval and 5% margin of error based on the extrapolated 2009 population census (KNBS 2010).

comprising 38% of the workforce. Based on the estimation that two thirds of the income from gold mining in Osiri is spent locally, USD 1.9 million per year are injected into the local economy. The treatment of tailings, recently in expansion through 10 processing plants using Tanzanian technology, adds an estimated additional 32 kg of gold per year from the Osiri mine with a local value of USD 1.2 million and employing a significant number of people.

At the Migori district level, local spending from ASM gold production is significant. The number of miners and processors are reported in the range of 10,000 people. The district's annual gold production is 1–1.2 tonnes. Extrapolating the findings from Osiri, the impact of ASGM in the district in terms of local spending is likely in the order of USD 35–40 million per year. This amounts to an important percentage of the total economy of the district. Extrapolated from Osiri Village, an economic multiplier of 3.8 spin-off jobs for every job in mineral production is estimated.

Gemstone Mining in Taita Taveta⁹⁰

In Taita Taveta County, tsavorite (a rare green garnet) is the most mined gemstone, generating the highest accumulated value at the county level, followed by tourmaline and ruby. As the main global source of tsavorite (named after the Tsavo region), Taita Taveta County is uniquely positioned to establish a signature gemstone market with significant development potential through support to ASM. Approximately 10,000 people are involved in gemstone mining and processing, often practiced alongside agriculture. The current direct employment across Taita Taveta County is estimated at approximately 5,000, of which, according to the quantitative household survey in 381 households⁹¹, 85% of the total workforce is comprised of men and 15% are women. In the most gemstone-reliant sub-counties, Mwatate and Voi, ASM provides the main source of employment for 57% of women and men of economically active age. Half of those miners are employed by small-scale companies, community-based organisations (CBOs), or associations and are paid on a production share. The other half of the workers extract independently. Miners' net income is presumed to average USD 140 per month⁹². Based on their 30% share in the production, the annual local value of extracted gems per miner can be estimated at USD 5,700. Both men and women believe that someone employed in a mining activity earns more money than an agriculture worker. Furthermore, among those engaged in mining, 69% did not wish to abandon their jobs in the mines.

Environmental and occupational health and safety issues

Local conditions in the arid plains suggest that environmental impacts are limited. Environmental and occupational risks are closely tied to water scarcity. Chronic dust exposure during rock breaking can lead to silicosis and other respiratory diseases. Conversely, water scarcity can reduce risks associated with underground instability and resulting tunnel collapses. Risks to biodiversity through bushmeat hunting and poaching are high. Modest levels of child labour (under age 15 years) were observed, but hundreds of vulnerable young men (below age 18 years) seem to dominate work at many sites.

Economic impacts

Trading dynamics of gemstones is complex, mainly because there is no international daily fixed price or simple way to determine value without some form of training. Valuation of rough gemstone requires special skills, tools, and practice, resulting in a knowledge differential between gem miners and traders. Further, gemstones buyers are not as numerous as gold buyers, where potentially every jeweller can make an offer on gold using the touchstone evaluation method; therefore, there are not as many potential sales opportunities. The gemstone market's complexity allows traders to have more commercial power, especially in an informal market where transactions take place in secret.

⁹⁰ The case study on Taita Taveta is based on own observations (ARM 2017a), but also draws on earlier work, such as Pohl & Horkel 1980, Mghanga 2011, Rop 2014, Anyona & Rop 2015a, and Anyona & Rop 2015b.

⁹¹ Ensuring 95% confidence interval and 5% margin of error based on the extrapolated 2009 population census (KNBS 2010).

⁹² It is important to notice, that different to most ASGM, income of gemstone miners is not continuous but highly erratic over time. Gemstone miners may find 'nothing' during months and occasionally 'millions' in a single day.

Consequently, traders' margins can be as high as 100% of the buying price⁹³ (also due to the high risks assumed by the buyer on the final quality).

The national market value of gems was approximated at USD 120 million per year. This amount is roughly distributed as follows:

- USD 20 million for the 10,000 miners
- USD 20 million for the landowners and cooperatives
- USD 20 million for investors/sponsors
- USD 60 million for traders

The miners' and landowners' shares likely are spent locally on food and locally sold consumer goods. Half of investors' share is likely local direct investment. Half of traders' share also can be considered locally spent. Thus, the local economic contribution can be estimated as USD 80 million per year.

Only a small part of the Kenyan gemstone production is locally cut and exported. The cutting industry in Kenya is small, and cutting skills have been low for a long time. Cut gems represent 66% of the official exports (for a value of USD 3.1 million in 2015). However, the research team has reason to believe that official exports represent only a small fraction of total exports, occurring mostly in the form of rough stones. Considering half of the miners' revenue is spent on VAT-taxed goods, Taita Taveta's gemstone sector contributes an estimated USD 1.6 million to the annual Kenyan national budget. This amount far exceeds royalty revenues (estimated at USD 96,000, based on the export permits granted in 2015) and confirms the findings of Otto et al.⁹⁴. By optimizing the miners' revenues, the VAT generated will contribute much more to government revenues than tightening the control of exports.

Estimation of National Economic Key Indicators of ASM

Employment

The non-metallic and construction minerals sector employs 90,000 people (quarries: 40,000, sand: 30,000, other: 25,000), of which approximately 70,000 (75%) are artisanal miners. The gold mining sector, including other counties such as Siaya and Turkana and the seasonality of work, employs some 40,000 Kenyan citizens, while the gemstone sector nationwide employs some 30,000 miners. This confirms the importance of the ASM sector because it provides employment for at least 140,000 people. With an average of six persons per household, according to the 2009 population and household census⁹⁵, this results in more than 800,000 Kenyan citizens dependent on ASM.

GDP

Extrapolating the micro-economic findings from the Migori case study to the country level and based on the estimation of 40,000 ASGM miners, gold production would amount to 5.2 tonnes or USD 225 million per year, equivalent to 0.35% of the country's GDP. Insufficient data is available to extrapolate the contribution of the entire ASM sector to GDP.

Foreign exchange balance

The main ASM commodities for export are gold and gemstones. Regardless of registration of exports, these commodities generate a foreign exchange influx into the country. Adding the USD 225 million gold production to the estimated USD 120 million production value of Taita Taveta gemstones and considering that Taita Taveta employs only one third of Kenya's gemstone miners, it is believed that the ASM sector represents a foreign exchange source of well over USD 500 million per year.



Government revenues

The ASM sector is an important taxpayer, even though royalties and direct tax payments from ASM are negligible, mainly due to its informal nature. The authors' estimations indicate that spending of

⁹³ Anyona & Rop (2015c) estimate that the price of tsavorite increases from miner to international rough stone trader by six times and by 15 times to the final market for cut stones. Following the logic of this exponential downstream price increase, it is reasonable to assume that prices double from miners to national traders and triple from national to international traders.

⁹⁴ Otto et al. 2006

⁹⁵ KNBS 2010

miners in VAT-affected goods generates a minimum of 6% of the mineral value as government tax revenue.

3.4.2. EARF Case Study: Rwanda

Rwanda is a low-income country, globally recognised as a prominent source of 3T minerals. In 2010, the situation became critically complicated for Rwanda, when United States conflict minerals legislation under the Dodd-Frank Act required publicly traded companies to report on whether 3T minerals and gold coming from the Democratic Republic of Congo (DRC) and adjoining countries are conflict free. Rwanda was the first country in the Great Lakes Region (GLR) to implement a due diligence and traceability system via the International Tin Research Initiative (ITRI) Tin Supply Chain Initiative (iTSCi) implemented by Pact⁹⁶. The case study on Rwanda⁹⁷ investigated ASM's economic contribution at two sites—Gakenke and Burera Districts—chosen in consultation with DFID due to their representative nature of ASM conditions nationwide.

COMIKAGI Cassiterite-Columbite-Tantalite Mines⁹⁸

Located in Ruli Sector of the Gakenke District in Rwanda's Northern Province, the Coopérative Minière of Kababaru-Gikingo (COMIKAGI) is one of the district's most significant cassiterite-tantalite producers. The cooperative consists of 39 members and 70 active sub-contractors (10 of whom are women) working under its umbrella that employ 5–20 workers each. In 2015, the cooperative produced 108 tonnes of mixed cassiterite-tantalite pre-concentrate.

Concentrate export revenues are distributed as follows (at the time of assessment):

- 477 workers retain 41.3% of production value as their wages. The average worker's net monthly salary (after deductions) is USD 86.
- 70 sub-contractors retain 21.2% as gross profit and 14.1% after major operating expenses.
- COMIKAGI (39 members) retains 7.8% as gross profit (i.e., 10% on sales).
- Processors/exporters, including Fédération des Coopératives Minières au Rwanda (FECOMIRWA; the Rwandan Federation of Mining Cooperatives), retains 14.6% as gross profit.
- Traceability services constitute approximately 3% in total as levies.
- The Government of Rwanda (GOR) retains 12% as taxes, i.e., 4% royalties, 3.9% social insurance, and 4.1% personal income tax on workers.

Environmental issues

Environmental concerns relate to inadequate management of tailings, potentially creating downstream siltation issues and minor impacts on water *quantity*. An important environmental concern relates to land degradation associated with operating and abandoned extraction sites.

Economic impacts

The economic impact of the AM sector becomes visible in mining areas such as Ruli or Mududu Village, where the COMIKAGI headquarters is located. The village has a remarkably diversified economy of small shops, canteens, and restaurants, with a significant number (given the population) of relatively new *boda boda* taxis (motorcycles). Individual sub-contractors report that mining has enabled them to significantly improve their socio-economic status. Notwithstanding, gender imbalances seem to extend beyond the quantity of jobs, the quality of work, and its resulting economic benefits. Women comprise a calculated 19% of the overall workforce as sub-contractors and workers, yet they receive only 14% of the revenue share accrued to the local economy.

Based on 2015 production statistics and the local share of production value (workers, sub-contractors, and COMIKAGI), more than USD 1.5 million was injected into the local economy in 2015. The cumulative effect of multiple 3T mines in Gakenke District is significant. The town is a hub of bustling shops and restaurants and boasts many impressive modern houses, as well as a new health centre

⁹⁶ ITRI 2016, Pact 2015

⁹⁷ ARM 2017b

⁹⁸ The case study on COMIKAGI is based on own observations (ARM 2017b), but also draws on earlier work, such as Rwanda 2013, NISR 2012, Bobolo 2016, and Rulinda 2016.

and several schools. Assuming that revenue distributions found in COMIKAGI are representative of Gakenke District, more than USD 3.2 million was injected into the local economy in 2015.

Gifurwe Tungsten Mines⁹⁹

Located in Rwengabale Sector of Burera District in Northwestern Province, the Gifurwe Mine commenced operations in 1937. Following sporadic operations by a series of companies and nationalisation in 1989, the 20 concessions were acquired in 2007 by Wolfram Mining and Processing Ltd. (WMP). The company, with 40 employees, integrates local artisanal miners into the traditional setup, resulting in 660 artisanal miners working under 15 sub-contractors (four of whom are women). The company provides the technical, administrative, and legal management for the mining operations.

Concentrate export revenues are distributed as follows (at the time of assessment):

- 660 workers obtain 55.3% of the total export value before deductions (social insurance, personal income tax).
- 15 sub-contractors obtain 7.3% of the total export value before deductions (social insurance, personal income tax).
- WMP obtains 21.3% of the concentrate export value as margin after payment of royalties, due diligences fees, and mine workers' costs, but before corporate income tax (and excluding capital and operating expenditures).
- Traceability costs constitute 5.4%.
- The GOR retains 10.7% of the concentrate export value as royalties (4%), social insurance (5.5%), and personal income tax (1.2%) on workers.

Environmental issues

Overall, mine waste management leaves room for improvement. Siltation poses risks to downstream watercourses, and impacts on water quality are assumed. To offset the environmental footprint and to provide a source of timber, WMP has allocated 90 ha for forestry.

Economic impacts

Anecdotal appraisal of the economic impact by interviewed mine workers and sub-contractors was consistently positive¹⁰⁰. Gifurwe workers and sub-contractors, who reside in and mainly originate from nearby communities, yield approximately 73% after deductions. An estimated USD 370,000 is injected annually into the local economy. Based on these ratios and Burera District's wolframite statistics, more than USD 1.8 million was injected into the local economy from miner and sub-contractor incomes in 2015.

Multiplier effects were not quantitatively determined from Burera District, but based on factors employed in other ASM countries (and similar production systems in adjacent mines), direct and induced employment may amount to 2,500 and 6,200 jobs, respectively, with the economic contributions totalling USD 6.3 million per year.

⁹⁹ The case study on Gifurwe is based on own observations (ARM 2017b), but also draws on earlier work, such as Frisch 1975, Clercq et al. 2008, RCS 2013, and PAC 2015.

¹⁰⁰ A number of senior workers reported that conditions have improved substantially since WMP has taken over Gifurwe. The most commonly cited improvement relates to changes in occupational safety and health, including widespread use of personal protection equipment, frequent and ongoing inspection, supervision and timbering activities, availability of first aid treatment, and a vehicle to transport injured workers, among others. WMP's efforts to employ women have impressively challenged prevailing beliefs in Rwanda that women cannot work underground. In efforts to challenge gender discrimination, WMP has recently supported a team of seven women and three men to develop an 800 m shaft into un-exploited vein sets. Women miners conveyed how their work in the mines enabled them to buy livestock, provide financial support to their parents and other benefits that they saw as an improvement from their previous work in farming. One sub-contractor, a miner at Gifurwe since 1974, now owns 16 plots of land for which he employs others to work, built a house and owns a motorcycle and livestock while putting three children through school.

Estimation of National Economic Key Indicators of ASM

Employment

Depending on the definition of ‘who is a miner?’ and methods to calculate employment in the mining sector, figures between 20,000 to 34,000 (full-time) workplaces are officially reported. Because most miners are casual workers (combining mining with other rural livelihoods strategies), the actual number of individuals directly involved in 3T mining on a seasonal basis may well have ascended to 65,000 in 2014 and eventually as high as 77,000 in 2015. There was a major slump in employment levels in 2015–2016 due to a price drop of tin (and, to a lesser degree, of tantalum) and closure of mines that were operating on exploration licences without exploitation licences, but employment had reportedly recovered by the end of 2016. If common multiplier effects are applied¹⁰¹, spin-off employment in mining areas may amount to an additional 190,000 induced jobs and, accounting for both direct and induced employment, suggests that about 1.1 million Rwandans may rely on the mining sector.¹⁰²

Foreign exchange and export earnings

In 2015, Rwanda’s exports totalled USD 600 million, with 3Ts constituting USD 110 million, or 19% of all exports, making them key contributors to export and foreign exchange earnings in the country, considering that exporters are required to repatriate export earnings.

Economic stimulus into local economies

As a finding of the case study, artisanal and small-scale miners were estimated to contribute more than USD 39.5 million to local economies in 2015. At the district, sector, and village levels, this can make a significant impact in terms of buttressing the cash component of household incomes by providing markets for agricultural and other goods, stimulating small enterprise development, and improving the health, educational status, and overall well-being of those benefiting directly or indirectly from the sector.

Government revenues

For 2015, taxes from AM workers (income tax and VAT on spending) and royalties were assessed in the range of USD 6 million, contribution to the Social Security Fund in the range of USD 3.7 million. Even without corporate income tax (which was not assessed in the country study), these numbers demonstrate that the 3T sector makes significant contributions to state coffers.

3.4.3. EARF Case Study: Uganda

Uganda is a low-income country with relatively solid economic growth and ambitions to achieve middle income status by 2020. The minerals sector is expected to play a critical role in the nation’s economic transformation, along with the government’s desire to host large-scale, industrial mines and increase investment in downstream value addition. The case study on Uganda¹⁰³ investigated the economic contribution of ASM at two sites—Karamoja and Kampala—chosen in consultation with DFID due to their representative nature of ASM conditions.



Gold Mining in Karamoja¹⁰⁴

Two ASGM sites were assessed in Karamoja. The Rupa gold mine is located approximately 10 km north of Moroto. Mining is scattered and qualifies as alluvial, subsistence mining usually performed in family units. Rupa has a thriving ASM sector with approximately 10,000 miners extracting gold. The Morita mine is located south of Moroto in the Nakapiripirit district and is a hard-rock mine that characterises

¹⁰¹ In the absence of a calculated multiplier in Rwanda, a multiplier of 2.5 has been applied as in Liberia, CAR, and Uganda (Hinton et al. 2008, Hinton 2011, Hinton & Levin 2010).

¹⁰² Based on average household size of four (4) family members (World Bank 2014).

¹⁰³ ARM 2017c

¹⁰⁴ The case study on Karamoja is based on own observations (ARM 2017c), but also draws on earlier work, such as Hinton et al. 2011, Delany 2011, Ngabiirwe et al. 2012, Burnett & Evans 2014, Houdet et al. 2014, ECO 2014, and Alayebu et al. 2015.

the currently waning gold rushes that have occurred in the region over the past five years. The mine has very low activity from April to October because of flooding in the mine shafts.

Environmental and occupational health and safety issues

The main environmental concern relates to large numbers of abandoned pits. Miners work in unsupported tunnels and the risks of tunnel collapse are high, particularly in Rupa. In Morita, timbering is used only to stabilise tunnels at the shaft opening, and, given that the deposit is in hard rock, inhalation of silica-rich dust poses great risk for development of silicosis. Rates of child labour are high across Karamoja (an estimated 20–30% of the workforce), particularly in alluvial, subsistence ASM areas. This appears to be even more pronounced for girls than for boys.

Economic impacts

The gold production of Karamoja, conservatively estimated in 845 kg per year, represents a London Bullion Market Association (LBMA) market value¹⁰⁵ of USD 36 million, but individual productivity is exceptionally low (averaging 0.12 g of gold per day per miner, 0.1–0.3 g per person per day in dry and wet seasons). Although women and girls constitute 30–80% of the ASM workforce (depending on the site), they seem to have marginal access to and control of the benefits.

On-site buyers often mislead sellers by adulterating the scales to weigh the gold¹⁰⁶, leaving only 55% of the LBMA gold value to the miners or, at the Karamoja level, USD 17 million per year (based on 2015 gold price average) for a population of 22,500 miners, i.e., an annual income of USD 770 per miner. Notwithstanding, the low income associated with ASM activities should be seen in light of the fact that it is a seasonal activity and in the local context of Karamoja, which is one of the poorest and most marginalised parts of the country.

The next-largest revenue share is that of local gold buyers, which is estimated at USD 10 million per year. Together with miners' income, that leaves USD 27 million per year in the region.

Kampala Clay Area¹⁰⁷

Clays occur widely in many parts of Uganda, but its extraction is most prolific in the wider Kampala/Entebbe area. The artisanal brick supply chain is direct and short. Bricks usually are fabricated and sold directly on the clay extraction site.

Environmental issues

Environmental impacts on wetland and forest resources are significant. On an annual basis, up to 9 km² of land is degraded and 40,000 tonnes of firewood are consumed, impacting approximately 14 km² per year of forests.

Economic impacts

In 2009, the National Strategy for ASM identified that 45,556 clay miners produced 4.05 billion bricks per year.¹⁰⁸ Extrapolated by the Uganda Bureau of Statistics (UBOS) Construction Index and growth in the construction sector, it is reasonable to estimate that the brick sector today employs 92,500 miners, producing 8.2 billion bricks and generating a current production value in the range of USD 500 million per year, equivalent to 1.9% of the 2015 GDP.

Firewood and other costs are estimated to amount to 23% of production cost. That leaves 77% for income of involved actors (48% 'team leader', 21% salaries of workers, and 8% to land owners). Based on this distribution and given that women are engaged in production at lower rates than men



¹⁰⁵ International gold price set at the LBMA

¹⁰⁶ The scales were set to weight in pennyweights when the reported weights to the sellers were in grams. This means that the weight was discounted by 36% (1 pennyweight = 1.5552 gram).

¹⁰⁷ The case study on Kampala clay is based on own observations (ARM 2017c), but also draws on earlier work, such as World Bank & UNDP 1989, Nyakairu et al. 2002, Birabwa 2006, and Hashemi & Cruickshank 2015.

¹⁰⁸ MEMD 2009

(10–15%) and are less likely to hold roles as team leaders, land owners, and firewood vendors, they are estimated to obtain approximately 8% of the value.

As artisanal brick production belongs entirely to the informal sector, the central government does not levy any direct tax. However, indirect government revenues through spending and VAT generation might be significant. If only one third of salaries and 20% of the owner's income was to be spent in VAT-taxed goods, this would imply that 3% of these sales end in the state budget of VAT collected. Based on the estimated sector sales, it represents USD 15 million per year.

Estimation of National Economic Key Indicators of ASM

Employment

In the ASM sector, employment was assessed in 2008 as part of the National ASM Strategy. As of this writing, the total number of ASM miners was estimated at 200,000¹⁰⁹. Updated numbers of the gold miners' population to date, considering significant gold rushes in Mubende, Mayuge, Namayingo, Bugiri, and Karamoja, as well as significant increase of ASM on construction materials (clay and other), estimate that ASM employs 300,000 miners.

Using indirect employment multipliers of 2.5 previously applied in Uganda and elsewhere¹¹⁰, an estimated 750,000 Ugandans would benefit from additional jobs created by the sector. Together with direct work in ASM, this amounts to 1,050,000 jobs produced by the ASM sector. Based on an average household size of 4.7¹¹¹, more than 4.9 million Ugandans, equating to 12.8% of the population, are directly or indirectly, wholly or partially economically reliant on ASM.

Foreign exchange earnings and trade deficit

The main mineral commodity produced for export is gold. Official export figures dropped from 6.9 tonnes in 2006 to 161 kg in 2013 and to about 15 kg in 2014 and 2015. This decline started in 2007 when the UN Security Council imposed sanctions on Ugandan gold traders for buying gold from the DRC's ASM sector, which was believed to be tightly linked to militias¹¹². However, official import and export statistics virtually are unrelated to in-country production figures.

Kampala traders estimate the total national ASGM production at 2 tonnes per year; other estimates tend toward 2.8 tonnes in 2016¹¹³. Therefore, the foreign exchange earning potential is high, with 2 tonnes corresponding to a value of USD 85 million per year¹¹⁴. Without ASGM production, for FY 2015/16, Uganda's trade deficit would have been 5% higher and the overall balance deficit would have been almost twice as high¹¹⁵.

GDP

Under the plausible assumption that industrial minerals such as sand, stone aggregate, limestone, and marble experienced the same growth as clay; in line with construction sector demands; and conservatively assuming other ASM commodities (salt, tin, tantalum, tungsten) are unchanged since 2008, then the ASM sector would be comprised of approximately 300,000 active miners and generate USD 1.3 billion per year. This corresponds to 5.3% of the USD 25 billion GDP of FY 2015/16.¹¹⁶ If ASM would be included in the formal sector, Uganda's GDP would increase by 5%. As industrial, large-scale mining still accounts for a small portion (0.5%) of Uganda's GDP,¹¹⁷ ASM's mineral production is 10 times higher than LSM and contributes 10 times more to GDP.

¹⁰⁹ Ibid

¹¹⁰ Drechsler 2001, MEMD 2009, Hinton & Levin 2010

¹¹¹ UBOS 2014

¹¹² GOE 2006; GOE 2014, p. 24; Schipper et al. 2016

¹¹³ Interviews with Kampala's traders and Schipper et al. 2016

¹¹⁴ Based on LBMA price Sept. 2016

¹¹⁵ BOU 2016b

¹¹⁶ Ibid

¹¹⁷ Crawford et al. 2015

3.4.4. Summary of Economic Key Indicators

The Table 6 below attempts to summarise the estimated national economic key indicators of the three study countries. Estimations reflect the extrapolation of field study findings triangulated with secondary sources believed reliable. Not all indicators could be assessed for all countries.

Table 6: Summary estimation of economic key indicators for ASM

Estimation of key indicator	Kenya	Rwanda	Uganda
Direct employment	>140,000 miners >800,000 dependents	65,000 miners	300,000 miners
Spin-off employment	(Multiplier of 3.8 in Migori) Insufficient data to extrapolate	190,000 induced jobs	750,000 induced jobs
Total population directly or indirectly involved including dependents	Insufficient data to extrapolate (RP 34.3M) ^a	1.1 million = 13% of RP 8.3M ^a	4.9 million = 15% of RP 32.7M ^a
Annual local economic stimulus	Migori: USD 35–40 million Taita T.: USD 80 million Insufficient data to extrapolate	USD 40 million <i>Gakenke: USD 3.2 million</i> <i>Burera: USD 1.8 million</i>	>USD 690 million <i>Karamoja: USD 17 million</i> <i>Brickmaking: USD 500 million</i>
Contribution to GDP	ASM gold: 0.35% of GDP Gemstones: 0.20% of GDP Insufficient data to extrapolate	Insufficient data to extrapolate	5% of GDP USD 1.3 billion
Annual contribution to foreign exchange earnings	> USD 500 million Gold: USD 225 million Gems TT: USD 120 million	> USD 110 million from 3T =19% of exports Insufficient data for other minerals	> USD 86 million =reducing trade deficit by 5% Gold: USD 85 million 3T: > USD 1.1 million
Effective contribution to government revenues	Tax & royalty: negligible VAT ^b : 6% of mineral value	Tax & royalty: >10% of export value VAT ^b : 2.5% of mineral value	Tax & royalty: Insufficient data to extrapolate VAT ^b : 3% of sales value in case of clay/bricks
^a Percentage of rural population (RP) 2015 (Data source: World Bank Database) in millions (M) ^b Government revenues from spending of artisanal miners in VAT taxed goods Cells with light grey background: only partial data available, insufficient for extrapolation at national level			

4. ASM Formalisation

4.1. Background On and Complexities Surrounding Formalisation of the ASM Sector

Formalisation of the ASM sector (i.e., the inclusion of marginalised miners in the formal economy) has been identified as key to the sector's development. In 1993, participants of the UN ASM Conference Harare endorsed the need for all mining (large and small-scale) to be incorporated into one legal system¹¹⁸.

Two years later, at the World Bank Roundtable on Artisanal Mining, speakers called for actions to transform informal AM into formal mining operations by enabling miners to gain legal and transferable rights to mineral titles. The challenge then became how to integrate artisanal miners within mainstream

¹¹⁸ Labonne 1994, Fisher 2007

economic, fiscal, regulatory, managerial, and legal regimes¹¹⁹. It was further argued, this integration will lead to benefits being channelled to miners at the bottom of the production chain and, in the process, impoverished, mineral-rich communities will become more prosperous¹²⁰. By the end of 1995, some 36 African countries had legalised artisanal operations or were in the process of doing so and had established specific administrative and technical institutions with a view to assisting artisanal and small-scale miners¹²¹. But, two decades later, most ASM is still trapped in the informal sector.

In 2002, while still active as UN senior advisor, Labonne¹²² highlighted that it is often the vibrancy of the informal sector that protects countries and regions from further hardship. Rural or urban subsistence activities are the only means of livelihood for a large section of the population, particularly in countries where the formal private and public sectors have either shrunk or disappeared¹²³. Therefore, ASM formalisation is 'straightforward task' it was initially considered to be.

It took almost two decades from the UN ASM Conference Harare to realise that formalisation is a (lengthy and almost permanent) process.

Formalization is a process, not a product, and even the most elaborate policies to formalize mining activities fail if a government lacks the will to implement these plans, if miners perceive licensing as a threat, or if miners cannot afford the costs of joining the legal economy¹²⁴.

Formalization is a process that seeks to integrate [ASM] into the formal economy. The process of formalization includes the development or adaptation of mining (and other) laws or policies to address the challenges of [ASM]. A well-designed formalization process generates the enabling conditions for accountability within the sector so that it can ultimately be integrated into the formal economy. Formalization can only be successfully achieved if programmes and public policy deal with the different dimensions of [ASM] activities simultaneously and in an integrated way. Legalization is just one dimension of the process of formalization¹²⁵.

The ASM sector still faces a number of challenges on its way to formalisation. For example:

- The OECD (2016) intentionally describes the ASM sector as comprised by 'formal or informal mining operations' it can be both, but a formal AM sector is the outspoken aspirational goal. Nevertheless, the reality often is an ASM sector deeply informal.
- Aside from its undisputable macro- and micro-economic importance, the ASM sector is plagued by a long list of social and environmental problems, such as precarious working conditions, adverse impact on human health, child labour, environmental degradation, mercury contamination, criminal activities in gold rush areas, and even links to civil wars, creating a perpetuating poverty trap.

The challenges are exacerbated in remote regions where the state is weak and regulations are virtually non-existent¹²⁶.

The complexity of ASM formalisation needs to be understood in the legal-economic context of those low and middle income countries where it takes place. ASM's predominating informality is not a singularity. A World Bank review of household enterprises in sub-Saharan Africa¹²⁷ confirms that the informal non-farm sector is an important contributor to economic development in low-income sub-Saharan Africa as a source of employment, earnings, and household livelihoods. Nearly 70% of employment outside farming is in the informal sector¹²⁸. Triangulating the list of ASM countries in

¹¹⁹ Fisher 2007

¹²⁰ Maconachie & Hilson 2011

¹²¹ Cited in Fisher 2007: Traore, P. A. (1998) 'Strategies for Development of Small/Medium Scale Mines in Africa', in L. Landner (ed.) *Small-Scale Mining in African Countries: Prospects, Policy and Environmental Impacts*, pp. 17–24. Dar es Salaam: University of Dar es Salaam.

¹²² Labonne 2002

¹²³ Ibid

¹²⁴ Siegel & Veiga 2009

¹²⁵ UNEP 2012. In the quote, the abbreviation ASGM is replaced by ASM, in brackets.

¹²⁶ Fisher 2007, Maconachie & Hilson 2011, Buxton 2013

¹²⁷ Fox & Sohnesen 2012

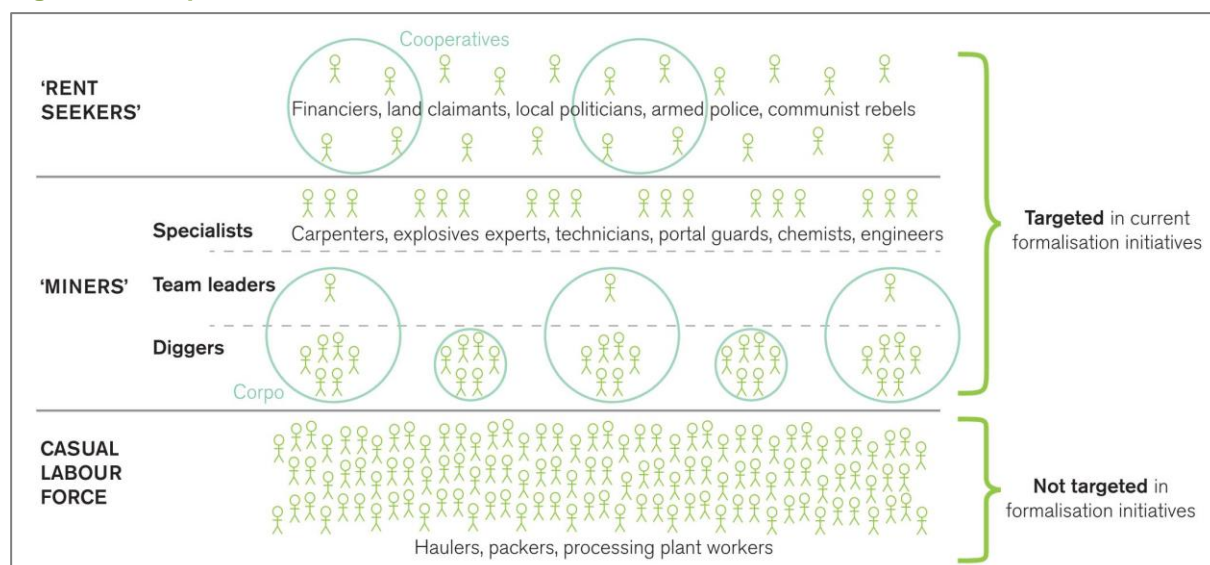
¹²⁸ World Bank 2016b

Annex 3 with ILO statistics on informality¹²⁹ confirms that informal employment is the norm rather than an exception in most ASM countries, affecting 40–80% of the labour workforce.

This situation is further exacerbated by the fact that, with few exceptions, most ASM countries rank in the third and last quartiles with regards to an enabling business environment¹³⁰ (see Figure 7 in Annex 4). The World Bank's Doing Business Indicator also reflects bureaucratic hurdles against establishing formal businesses. Thus, rather than a mostly informal sector of the economy, ASM should be viewed as **an economic sector in mostly informal national business and employment contexts**. What is today framed as global policy discussion on 'illegal mining'¹³¹ is only one of the symptoms of the extensive and much deeper-rooted problem of informal economies, gaining visibility in a context of competition for limited, non-renewable resources and increasing pressure for transparency of financial flows on the downstream supply chain.

In many countries, subsistence mining persists alongside more capitalised ASM operations that have a complex and multi-tiered labour structure. Verbrugge et al. (2014) suggest that, in such cases, ASM formalisation needs to take a more inclusive approach, one that protects not merely ASM entrepreneurs, but also their labour force. This requires a better understanding of the sector's employment arrangements, like those illustrated in 4.2 from a case study in the Philippines.

Figure 5: Complex and multi-tiered labour structure of the ASM sector¹³²



4.2. Examples of Formalisation Experiences

4.2.1. Ghana

Ghana¹³³ was one of the first African countries to address ASM formalisation. The initial 'flaw' of the 1980s—addressing ASM in a separate legal framework—was ameliorated by integrating ASM in the Minerals and Mining Act 2006. However, the legal framework only addressed the higher-end small-scale segment of ASM, while the lower-end, poverty-driven *galamsey* miners received limited attention¹³⁴. With the exception of the Poverty Reduction Strategy Paper 2003–2005 (PRSP I)¹³⁵, inspired by the Yaoundé Vision Statement, national development frameworks fail to identify ASM as a

¹²⁹ ILO 2016

¹³⁰ Doing Business Indicator of The World Bank, World Bank 2016a

¹³¹ Expressed in nuanced terms between *informal*, *illicit*, *illegal*, and *criminal*, according to affected interests of non-ASM stakeholders

¹³² Verbrugge et al. 2014

¹³³ Summarised from Hruschka 2015

¹³⁴ Hilson 2001

¹³⁵ IMF 2003

development opportunity¹³⁶. The state's lack of attention to a *galamsey* sector, which was seen as an annoyance and was marginalised as illegal mining amid crackdowns in the mid-2000s, made the ASM sector an easy prey for stakeholders with malicious intentions¹³⁷. Also, the public discourse fails to distinguish between Ghanaian *galamsey*, who theoretically can legalise or formalise their operations by obtaining SSM licences, and immigrants camouflaged as *galamsey* who cannot¹³⁸.

Still, with an official policy adamantly against illegal mining, including legitimate traditional mining, the Government pursues a second pragmatic policy, buying gold from *galamsey* miners through the government-owned Precious Minerals Marketing Corporation (PMMC), in benefit of the national monetary policy and central bank reserves¹³⁹.

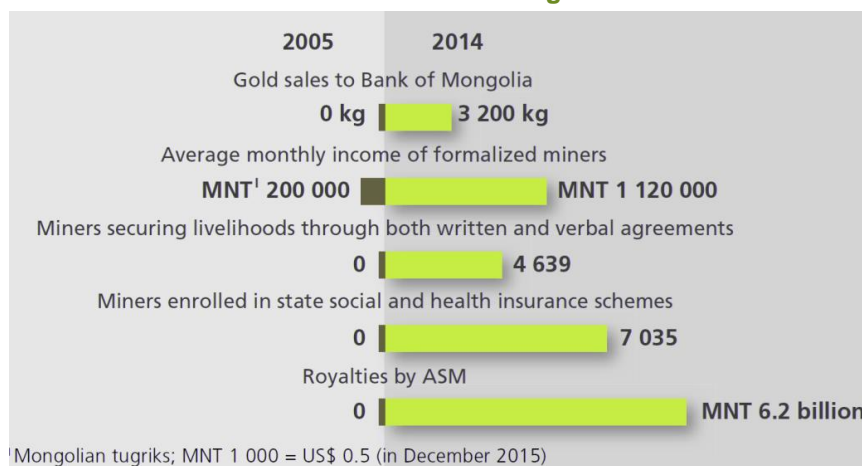
4.2.2. Mongolia

From the early 1990s to 2003, the number of artisanal miners rose from zero to 100,000, creating a serious challenge to both policy-makers and the public, neither of whom had previous experience with ASM. Although a few policy-makers pushed proposals for the regulation and legalisation of the sector as early as 2002, it took until 2010 for the Mongolian Parliament to approve amendments to the Law on Minerals, Law on Land, and Law on Taxation of Personal Income to include provisions for ASM¹⁴⁰. Nevertheless, the law has several shortcomings, such as access to land rights instead of mineral rights, short durations of ASM permits, and prescription of extremely low levels of mechanisation. A process to further amend the law is ongoing.

A survey from the Sustainable Artisanal Mining Project (SAM), funded by the Swiss Agency for Development and Cooperation (SDC), indicates that miners earn an average of USD 176 per month, about 57% more than the Mongolian minimum wage. Miners from formalised hard-rock gold mining sites can earn up to USD 360 per month¹⁴¹.

In 2014, the Bank of Mongolia started to officially buy gold from ASM. In the first-year, the bank collected 3.2 tonnes¹⁴²; in 2015 the purchased volume increased to 7 tonnes. Key economic indicators for the success of (incipient) formalisation efforts are summarised in Figure 6.

Figure 6: Economic results of ASM formalisation in Mongolia¹⁴³



¹³⁶ Ghana 2010

¹³⁷ E.g., illegal immigrants of Chinese origin seeking to circumvent legal requirements intentionally by camouflaging as *galamsey*

¹³⁸ Adjei et al. 2012, Hilson & Osei 2014,

¹³⁹ Hilson et al. 2007, Collins & Lawson 2014

¹⁴⁰ Singo 2012

¹⁴¹ NSO 2012, Odgere et al. 2013

¹⁴² Singo & Hruschka 2016

¹⁴³ Ibid

4.2.3. Peru

The 2001–2002 legislative process for enacting Law 27651 Formalisation and Promotion of Small Scale and Artisanal Mining was seen as a good example of constructive consultation and stakeholder engagement¹⁴⁴. It has been used to gradually formalise ASM, with more than 6,000 concession titles existing as of March 2011, many of which involve large numbers of individual miners organised as legal entities¹⁴⁵.

Successful formalisation experiences have occurred precisely in situations in which miners were able to organise into companies, production cooperatives, mining associations, or any other form of productive organisation. Miners' organisations have played a pivotal role in facilitating ASM formalisation through peer-to-peer training.

Another success factor was the (in comparison to the global figures) large maximum concession areas for AM (up to 1,000 ha). This promoted the creation of community-based entrepreneurial organisations, where, in some cases, entire villages organised into one single mining company or cooperative¹⁴⁶.

Unfortunately, after this very promising start, the Government lacked the capacity or political will to address formalisation as a process and, in the period of 2005–2010, lost interest in the sector for different reasons¹⁴⁷. Particularly in regions where miners' organisations were weak and good practice examples to follow were scarce, the mining operations grew in an uncontrolled manner toward illegal medium-scale mining with high environmental impacts, while still claiming to be artisanal¹⁴⁸. The government's response in 2012 of heavy-handed policing of the entire ASM sector proved an inadequate solution to these issues by criminalising ASM miners instead of giving them adequate opportunity to formalise and make a more positive economic and social contribution to the country¹⁴⁹.

4.2.4. Philippines

The foundations of the Philippine legal framework for ASM were established 1984 and 1991. Both legislations, though partly overlapping and lacking clarification of applicability until 2007, were rather favourable for ASM, but were never implemented in their entirety. Declaration of People's Small-Scale Mining Areas (PSSMAs) lagged behind, and the People's Small-scale Mining Protection Fund never received the envisaged funding. Despite a lack of progress in formalisation, the ASM sector succeeded to grow into producing close to 80% of the country's annual gold supply¹⁵⁰.

In 2012, an executive order was issued to strengthen the protection of the environment, promote responsible mining, and provide a more equitable revenue-sharing scheme between government and the private sector. The order aimed to restrict ASM in several ways, including limiting ASM to PSSMAs, requiring an Environmental Impact Statement, strictly prohibiting mercury use, and extensive administrative requirements. The regulations published in 2015 appear to tighten the grip even more. But, it remains to be seen whether the current Government will be able to provide continuity on promises (capacity building and training) and duties (massive declaration of PSSMAs). The current situation (ASM only allowed in PSSMAs, but only very few PSSMAs declared) renders most ASM in the Philippines practically illegal. In principle, this could represent the ideal starting point for an auto-destructive crackdown approach, like the Peruvian case. In the Philippines, which does not have major LSM gold mines like Peru, this approach would put 80% of the country's gold production at risk¹⁵¹.

¹⁴⁴ Hruschka 2003, Gamarra & Reinoso 2009

¹⁴⁵ Orozco & Gamarra 2012

¹⁴⁶ Ibid

¹⁴⁷ Arguedas et al. 2011

¹⁴⁸ Brack et al. 2011

¹⁴⁹ Orozco & Gamarra 2012, Low 2012, Hruschka 2015

¹⁵⁰ Bugnosen 2001, Ban Toxics 2010, Raymundo 2014

¹⁵¹ Hruschka 2015

4.2.5. Tanzania

Tanzania has a long history on ASM formalisation alongside LSM development. ASM has been addressed in national PRSPs since 2005 and is, based on recommendations of a comprehensive baseline survey¹⁵², reflected in the country's Mining Policy 2009¹⁵³. Formalisation strategies focus on higher-end ASM stakeholders, but provide little instruments and incentives for lower-end subsistence miners. Although the Government emphasises the importance of licensing individuals, the reality is that landlords and licence holders often lease out land to unlicensed groups¹⁵⁴.

Experiences to date show that it is vital to ensure that administrative policies and institutional roles are designed in ways that improve the accessibility of licences in marginalised ASM communities. It appears that decentralisation of the process for issuing primary mining licenses (to the Zonal Mines Office level rather than the Dar es Salaam office) has been an important step in developing a more regionally situated management system that can respond to local contextual needs¹⁵⁵.

4.3. Formalisation of ASM in the EARF Case Study Countries

4.3.1. Kenya

Kenya's mining industry has for decades been guided by a 1940 Act that criminalised AM and totally disregarded artisanal miners, thereby implicitly ignoring their contribution to the extractive industry and the entire economy¹⁵⁶.

But, Kenya passed the new Mining and Minerals Policy¹⁵⁷ and Mining Act¹⁵⁸ in 2016. The policy explicitly recognises ASM as:

... an activity that takes place in many areas of the country, mainly in panning for gold, gemstone mining, winning of sand, gravel, clay and quarrying, ... [and] an income generating activity benefiting low income and vulnerable groups ... [and concludes that] mainstreaming ASM has immense potential to contribute to the development of the country's mining industry by generating employment and income; widening the tax base; adoption of safer, healthier and more environmentally compliant standards; and creation of synergies with the formal large scale mining sector.¹⁵⁹

New mining regulations are in an advanced phase of drafting and public consultation. These legal instruments lay out the new legal framework for the country's mining sector, including the ASM sector. However, other laws and regulations will need to be promulgated to fully develop and refine this framework.

The draft mining regulations propose royalties at a level of 8% for precious stones and metals, higher than in neighbouring countries. Royalty or tax differentials between countries carry an inherent risk of increasing the attractiveness of smuggling. This is especially important to Kenya, whose traceability in the gold supply chain is a concern given that Kenyan gold is subject to the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict Affected and High Risk Areas. For ASM products, such as gold and gemstones, only a fraction of cross-border sales are registered as official exports and reflected in trade statistics.

It is too early to assess the impact of the Mining Act on the legalisation and formalisation of the ASM sector. But, during the fieldwork interviews, the general perception was that the Mining Act is an advance from the previous Mining Act of 2014 regarding the recognition of the ASM sector as part of the Kenyan mining sector. This recognition is an important first step for the success of any formalisation process of the sector.

¹⁵² Bomani Committee 2008

¹⁵³ MEM 2009

¹⁵⁴ Spiegel 2012

¹⁵⁵ Spiegel 2012, Hruschka 2015

¹⁵⁶ Wang'ombe 2016

¹⁵⁷ MOM 2016

¹⁵⁸ Kenya 2016

¹⁵⁹ MOM 2016, p. 9

4.3.2. Rwanda

In Rwanda, minerals have long played an important role in armed conflicts and wars. Since the end of the civil war in 1994, the country slowly has gained political stability. Rwanda's involvement in the Second Congo War (1998–2001) and in the resumption of hostilities in the Eastern DRC in 2012 caused further disruptions.

As a major producer of 3T minerals, the promulgation of the U.S. Dodd-Frank Act in 2010 was a serious issue for Rwanda. The threat of a de facto embargo, which would have put the livelihoods of tens of thousands of artisanal, mostly informal, and poorly organised miners at risk¹⁶⁰, was mitigated by the rapid implementation of the iTSCI traceability programme at the end of 2010. Since then, iTSCI has been integrated into Rwanda's national mining regulatory system and has been implemented jointly by the Geology and Mines Department and ITRI/Pact across the whole 3T mining and trading sector¹⁶¹. Somewhat in parallel, the ICGLR Regional Certification Mechanism was developed and became mandatory by Ministerial Order from 2012. These processes resulted in significant progress in organising and formalising the mines. Also, the mining sector recently has been re-privatised, with ongoing efforts by the Government to establish and refine the associated policy and regulatory framework (e.g., through the new Mining Code of 2014).

By early 2014, Rwanda had issued 548 mining permits to 213 registered mining companies or cooperatives. In 2016, with the adoption of instruments specifying the classification of mines and procedures for licencing (Ministerial Orders 002 and 003), 570 concessions were listed in the mining cadastre of the Ministry of Natural Resources (MINIRENA)¹⁶². As a result, the 3T supply chain is highly formalised. All three minerals can be exported legally, miners are paid through the banking system (high rate of use of the banking system in the sector), and taxes or social security on their revenue are collected.

In 2016/2017, the Rwandan mining administration has undergone significant changes. A key legacy issue to be addressed remains the suspension of mines operating on exploration permits, which had pushed many operations back into illegal status. Another challenge is the potential repeal of the U.S. Dodd-Frank Act. The future will determine if the formalisation that has emerged from traceability will be sustainable in the absence of a legislative driver of market requirements.

It is important to recognise that, while attribution of ASM titles is a critical precursor for improving the sector's economic performance, it marks only one step in the sector formalisation process.

Formalisation of ASM involves a sustained process of integrating rather than simply controlling extra-legal enterprises by recognising existing arrangements in legislation, reducing legal barriers beyond those related to the licencing regime, and creating clear benefits from participation in the formal system, including by addressing the needs of miners¹⁶³. Professionalization of the ASM sector (in Rwanda and elsewhere) requires even more extensive commitments to¹⁶⁴:

- Support access to finance and appropriate, intermediate technologies
- Increase productivity and income
- Strengthen capacity
- Employ more responsible, safe, and efficient methods
- Improve environmental performance
- Ensure ASM cooperatives, companies, or other entities are structured and operating in a sustainable and profitable manner

In all cases, formalisation of ASM and of institutional obligations and responsibilities to support this process is crucial to success¹⁶⁵.

¹⁶⁰ Pact 2015

¹⁶¹ Cook & Mitchell 2014

¹⁶² MINIRENA Mining Cadastre. (Interview Sept. 10, 2016): These included 49 artisanal mining licences, 21 small scale mining licences and 7 large scale mining licences with an additional 47 'mining licences' continuing to operate under the old licencing system and the remainder attributed to mineral exploration (211) and quarrying.

¹⁶³ Pelon & Martel-Jantin 2006

¹⁶⁴ Hinton & Levin 2010

¹⁶⁵ ARM 2017b

4.3.3. Uganda

Several colonial gold and tin mines started to introduce small-scale mining in the 1920s. Until the 1970s, many semi-mechanised lead, tin, wolfram, and coltan mines operated in the southwest, contributing up to 35% of the country's foreign export earnings. Mining of gold and diamonds became illegal under the 1964 constitution, yet gold continued to be extracted within the region, particularly around sites of pre-independence gold mines, until widespread political and civil unrest under the regime of Idi Amin led to the collapse of the formal mining sector in the late 1970s and retrenchment of over 10,000 trained miners. With the relative stability experienced since the mid-1980s, mining resumed with a series of gold discoveries by artisanal miners and subsequent rushes¹⁶⁶.

The Mining Act of 1964 substantially hindered mineral sector development by many policy, legal, regulatory, and enforcement constraints, but lasted until policy and legal reforms beginning with a Mineral Policy in 2001, followed by promulgation of the Mining Act (2003) and Mining Regulations (2004)¹⁶⁷. The Act introduced location licences for AM operations. These ASM licenses were designed for family operations or very small extraction sites, with limited investment. Operations that require a higher investment to bring the mine into production must apply for a mining lease under the same requirements as LSM. Limitations related to location licences in combination with bureaucratic hurdles limited uptake so that to date fewer than 5% of ASM miners are formalised¹⁶⁸.

The Government now gives more political prominence to the sector as an important part of its national development strategy expressed in the Vision 2040. As part of this process, the Government also is revising its mining policy and legislation, with the new National Mining and Minerals Policy of Uganda in its last phase of consultation and drafting¹⁶⁹.

4.4. ASM Commercialisation as an Alternative to ASM Formalisation

A common denominator of ASM formalisation experiences analysed in sections 0 and 4.3 is **limited uptake**. The percentage of formalised ASM operations is, in most countries, far behind the expectations of policy-makers and authorities. While this clearly can be attributed to the perpetuation of early and simplistic concepts of ASM formalisation¹⁷⁰ and the lack of understanding of formalisation as a process¹⁷¹, it leads to a certain 'formalisation fatigue'.

One response to this formalisation fatigue can be seen in the current trend to outcast and criminalise ASM as illegal or illicit mining. A ban on ASM, as proposed by populist politicians, is an unrealistic option in view of a global workforce of some 40 million artisanal miners. In view of ASM's economic contribution, particularly for low income countries (see Figure 2) criminalising ASM also can be seen as a quite self-destructive option.

The other response increasingly discussed is a kind of null option of commercialisation, re-assessing the role of the informal sector. ASM has grown well in the informal sector and contributes, although unrecorded, to economic prosperity and growth. It is aligned with Aryeetey's (2015) findings:

It is suggested here that under conditions of high unemployment and growing poverty, as is the case in Sub-Saharan Africa (SSA), the informal economy is likely to expand and should be viewed more positively with a view to enhancing its productivity by removing institutional obstacles to the achievement of higher productivity. ... The informal economy has a role to play in generating incomes and wealth and the formal private market mechanism alone cannot be relied upon to solve the poverty and unemployment problems in SSA. If SSA is to make any significant progress towards

¹⁶⁶ Hinton 2012

¹⁶⁷ Ibid

¹⁶⁸ Crawford et al. 2015, ARM 2017c.

¹⁶⁹ MEMD 2016

¹⁷⁰ E.g., Harare Conference 1993, Washington Roundtable 1995; see section 0.1

¹⁷¹ E.g., Bernd Klein's statement 'Trying to formalize artisanal mining hasn't worked well. You just give someone a piece of paper to do what they've always done'. (Penner 2014)

achieving poverty reduction goals, policy must focus on informal economy strategies that encourage its participants to engage in the wider economy.

The main drawback in the eyes of policy-makers is that ASM in the informal sector does not contribute directly or transparently to government revenues.

In its essence, commercialisation policies for ASM consist in pragmatically ignoring the informal status of the sector and generating government revenues at some downstream chokepoint¹⁷². Such pragmatic solutions have been practiced for decades by Ghana's PMMC (see section 0), were recently introduced in Mongolia (see section 0), and are applied in many other countries implementing state-sponsored gold-buying programmes¹⁷³. Commercialisation policies also can be seen as aligned with the recommendations of Otto et al. (2006) to waive royalty collection for artisanal operations due to limited efficiency and effectiveness¹⁷⁴.

The response is given in Aryeetey's (2015) conclusion to the above quote:

The quest to formalisation of enterprises needs to be addressed from various different angles; by reducing entry and operating formal costs, increasing the incentives for MSEs [micro- and small enterprises] to operate formally, reducing obstacles to their growth, and searching for inexpensive approaches through which to enforce compliance with government regulations.

If a commercialisation policy contributes to lowering the costs of formalisation for artisanal miners, it is well applied. However, commercialisation of ASM is not a substitute for formalisation.

5. Discussion and Lessons Learned

5.1. Key Points for Understanding the ASM Sector

The ASM sector is constantly growing globally, in sub-Saharan Africa, and in the East African study countries. ASM is almost ubiquitous in low and lower-middle income countries, to the extent that some experts even see it as a product of wider lifestyle changes. Artisanal miners are poor, but they choose permanent, seasonal, or complementary ASM as an alternative livelihood strategy and an opportunity to escape poverty because ASM provides employment and income. As miners' income is spent and injected into the local economy, it 'trickles up' into the national economy and contributes to GDP, foreign exchange earnings, and, not insignificantly, even to government revenues.

This comes at a social and environment cost, not easily quantifiable in monetary terms, but tangible in the short, medium, and long term¹⁷⁵. It may even involve a political cost, as seen particularly in the context of armed conflicts in the GLR, where militias attempted to reap the micro- and macro-economic benefits of the sector. The resulting political discussion about 'illicit mining', sometimes accompanied with crack-downs on ASM, partly misses the point, insofar as the root problem is not the activity itself (the predominantly manual extraction of minerals), but its setting in the informal sector. Rather than a mostly informal sector of the economy, ASM is an economic sector in mostly informal national business and employment contexts¹⁷⁶.

To maximise the net economic contribution of ASM to poverty reduction and economic growth, benefits need to be increased, particularly ensuring that all legitimate stakeholders receive a fair share of the value generated by the activity, and social, environmental, and political costs need to be minimised by enabling the sector to escape the poverty trap of informality. To achieve this, the political will to formalise the sector is a 'necessary but not sufficient' condition. ASM formalisation needs to be accompanied by programmes to mitigate the activity's negative impacts and to improve its social and environmental performance.

¹⁷² <http://projects.worldbank.org/procurement/noticeoverview?id=OP00014423&lang=en>

¹⁷³ RCS 2016

¹⁷⁴ Otto et al. 2006

¹⁷⁵ See introduction of section 0.

¹⁷⁶ E.g., In all three study countries, the percentage on informal employment, according to ILO (2016), is fairly above 75% (see Annex).

5.2. Identified Gaps and Limitations of this Study

The main gap for understanding the economic importance of ASM is related to **uncertainties regarding global ASM data**. The global ASM population is a good example for this: How many people's income and livelihoods depend on ASM? As seen in Annex 3, so far no systematic assessment has been carried out to screen all countries for the existence of ASM. Any of the major compilation exercises missed some ASM countries. Besides, data on some countries are seen as considerably outdated.

Another major gap is **knowledge about the informal sector** in general. As emphasised in section 4, rather than a mostly informal sector of the economy, ASM is an economic sector in mostly informal national business and employment contexts. Data on the informal sector is difficult to assess and, therefore, only partially available. ILO, through its Key Indicators of the Labour Market (KILM) database¹⁷⁷, is making considerable efforts to assess labour markets. But, even this data source needs interpolation to provide a representative picture¹⁷⁸. Even scarcer are statistical data on economic key performance indicators of the informal sector. This becomes visible in Table 66, where some key indicators of ASM's economic contribution to the study countries could not be reliably extrapolated.

During the internal review process, it was clarified that the study was expected to quantify the net economic contribution of ASM, i.e., the sector's economic benefits less the related environmental and social costs. While quantitative assessments of impacts are already a highly complex task¹⁷⁹ and have not yet been carried out in the study countries, assessment of environmental and social costs in monetary terms is an even more contentious matter¹⁸⁰. Given this complexity, this study intentionally refrains from attempting to quantify social or environmental costs.

Further limitations of this study result from budget constraints, limiting in-country research to assessing the supply chains of two different ASM commodities per country. However, triangulation of data and plausibility checks based on author's work experience allow for results that the authors believe to be reliable. Quantification of data robustness in terms of confidence intervals and margins of errors (with exception of the quantitative household surveys in Kenya) is not possible.

5.3. Findings and Conclusions

Global employment figures for the ASM sector are estimated in the range of 40 million miners (men, women, and children). Some frequently cited numbers were found outdated by more than a decade and had to be adjusted based on anecdotal evidence. The total numbers could be even higher, considering that the systematic review revealed significant gaps related to countries with presumed ASM activity but without published data. For the East African study countries, the ASM population was assessed as follows: Kenya: 140,000; Rwanda: 65,000; Uganda: 300,000.

Prevalence of ASM correlates with countries' economic development level. This could be proven: 80–90% of low income countries can be considered 'ASM countries', while the number decreases to 40–60% for middle income countries and less than 10% for high income countries (Figure 2). This strongly underlines the importance of ASM for low and middle income countries.

ASM has positive and negative impacts on economies and livelihoods of low to middle income countries. The three East African countries assessed present differences and similarities. This allows for generalising the national findings from the study countries in a regional context¹⁸¹ that likely can be extrapolated to many countries with 'more than insignificant' ASM activity.

¹⁷⁷ ILO 2016

¹⁷⁸ See Annex : need for correlation between 'persons in informal employment' and 'persons employed in the informal sector' to obtain data for a representative number of countries.

¹⁷⁹ Such an exercise in Ghana involved 30 researchers over six years (see footnote 42).

¹⁸⁰ See footnotes 43-45.

¹⁸¹ E.g., Some findings from Uganda's construction materials sector are most probably also valid for Kenya as Nairobi presents similar characteristics of a large urban demand. Osiri in Kenya, as a mining village with

Economic impacts of ASM are generally positive. The findings from the three East African countries provide solid evidence that:

- Income of artisanal miners is generally higher than income from other available rural occupations and frequently above the GNI per capita. Given the low GNI per capita of the countries, this confirms ASM's role as an opportunity to escape poverty.
- Local miners spend most of their income in the local economy. This creates spin-off jobs and additional opportunities for local economic development.
- Foreign exchange influx from artisanally mined products for export (gold, 3Ts, gemstones) is significant, and without ASM, the trade balance of the countries would be much worse¹⁸².
- The economic importance of low-value/high-volume ASM commodities for local consumption is frequently ignored by an almost myopic focus of the international ASM community on gold and can ascend to a multiple of the values generated by gold mining.
- ASM (with the notable exception of the 3T sector in Rwanda) operates predominantly in the informal sector and its economic contribution is not accounted for in national statistics. The inclusion of ASM in the formal economy would increase the GDP of the countries by several percent.
- Even entirely informal ASM, not charged any royalties, fees, or direct taxes on mineral extraction, contributes to government revenues through spending on VAT-taxed goods. Without ASM, the money that miners and their families spend would not be available for spending.

Social and environmental impacts on livelihoods are manifold and considerable. The findings from the three East African countries describe impacts common in most ASM countries, as follows.

- **ASM technology:** ASM relies strongly on traditional, simple technology, which primarily is not designed with workplace safety considerations. Occupational health and safety risks due to accidents or exposure to workplace conditions are high. Poor mineral extraction and processing methods also represent a major constraint to increased productivity and involve a low recovery rate. However, where ASM operations progress toward safer and more productive intermediate technologies, they face the risk of losing their recognition as artisanal or small-scale operations.
- **Environment:** In the case of gold mining, misuse of mercury in the production process leads to serious environmental and human health risks. Further environmental risks are impacts on the aquatic ecosystem, such as contamination of water bodies or siltation of rivers; land degradation; deforestation; and forest degradation. Risks to biodiversity through bush meat hunting and poaching are common. In the case of clay and clay brick production, impacts on wetland and forest resources are significant.
- **Vulnerable groups:** Significant gender inequalities in socio-economic status, education, and impacts and benefits are evident and extend beyond the distribution of benefits. Women yield fewer benefits from ASM (e.g., employment, income), but bear greater costs (e.g., land degradation affecting cropland, impacts on water sources, caring for ill family members). Child labour is common in ASM. It is much less pronounced in formal, organised ASM sites, but almost ubiquitous in areas of extreme poverty and where ASM is less formalised. Occupational health risks are more severe for children, and educational deficits during childhood have a lifelong impact.
- **Migration:** ASM produces a crucial source of much-needed rural employment and means to reduce rural-urban migration. Economic opportunities in ASM areas attract in-migration to rural areas, which can become unmanageable during gold rushes. But, even temporary ASM settlements from gold rushes frequently convert within a few years into stable and organised communities.
- **Local value addition:** For commodity-type minerals such as gold or 3Ts, the potential for value adding is limited. Local (or national) cutting of gemstones has a potential for lower-valued stones. Transfer of skills for cutting of the finest stones is highly complex. The potential for local value addition is highest for ASM products destined for local consumption, such as construction materials. The creation of spin-off jobs is the most important multiplier effect, benefitting communities around mines.

flourishing local economy founded only 5 years ago, on the other hand is probably just a 'miniature' of much larger booming gold mining areas in Uganda, such as Mubende.

¹⁸² E.g., Economic data available for Uganda allowed researchers to estimate that export of ASM commodities reduces the trade deficit by 5%. Considering the trade balance without ASM gold production: the overall balance deficit of Uganda in FY 2015/16 would have been almost twice as high. (See section 0)

Political impacts extending beyond the ASM sector may be of great magnitude. As seen particularly in the GLR adjacent and overlapping with East Africa, ASM may have extremely strong political implications.

- **In conflict-affected and high-risk areas**, control over ASM is a main target for armed groups and criminal networks, which siphon off the economic benefits of the sector. Artisanal miners are the victims, not the perpetrators of such conflicts.
- **Traceability of minerals supply chains** is rapidly gaining global importance in consumer countries. As an instrument to de-link ASM from armed conflicts and violence generated by criminal networks, an increasing number of countries comply with traceability requirements through national legislation to the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict Affected and High Risk Areas¹⁸³. Traceability and due diligence aims to benefit the ASM sector, but, as an undeniable paradox, at the cost of the ASM sector and the mineworkers¹⁸⁴.

To maximise the net economic contribution of the ASM sector, negative impacts must be mitigated. This requires, from a sustainable livelihoods perspective 'transforming structures and processes'. The underlying core process is formalisation.

ASM formalisation is a process. Such a process needs to start from a thorough understanding of the sector. Of the East African study countries, Uganda counted on such comprehensive baseline information and a solid strategy¹⁸⁵ when it began to tackle the issue of ASM formalisation in the early 2000s. Examples of other countries that started out from a thorough situation analysis are Peru (through a law-making approach in 2001, guided by a multi-stakeholder process)¹⁸⁶, Tanzania¹⁸⁷, and Colombia¹⁸⁸. From a process perspective, most countries, including the three case study countries, are still in the early phases of ASM formalisation, focussing on the central issue of access to mineral rights. What directly affects the lives of the miners is informal employment, with related issues of gender inequality and child labour. Labour formalisation remains a large gap in ASM formalisation approaches, with a long way to go in this process.

ASM formalisation is possible with political will and occurs even faster, if supported by market incentives. Rwanda is atypical insofar that a formalisation process was triggered by the external political shock of the Dodd-Frank Act and the need to 'rescue' the country's 3T sector, not by an in-country and bottom-up process. But, it clearly demonstrates that with a strong political will and market incentives, tangible results can be achieved in a relatively short timeframe. Rwanda's 3T supply chain is highly formalised today, and almost all three 3T minerals are exported legally. Miners are paid mostly through the banking system, and taxes and social security on their revenue are collected. However, even at such an advanced level, formalisation remains a process with room for improvement. A second lesson can be drawn from Rwanda: Measures need to be taken that such market-driven formalisation does not come at a cost, which can render legal production non-competitive against informally produced minerals that don't carry the burden of compliance costs.

5.4. Recommendations

This sub-section provides an indicative list of recommendations for improving the economic contribution of ASM, based on lessons learned from the East Africa country studies and from the comprehensive literature review. The list is subdivided into a set of recommendations for sovereign policy-making of ASM countries related to ASM formalisation and a portfolio of recommended

¹⁸³ On 16 March 2017, members of the European Parliament voted with a great majority for the new legislation on the responsible sourcing of four conflict minerals: tin, tantalum, tungsten and gold.

¹⁸⁴ It is an undeniable paradox that, despite the good intentions of the policy-makers who introduced the Dodd-Frank Act in the US, legislation to de-link minerals and conflict, mineral traceability and due diligence costs are ultimately at the expense of poor (the mine workers) because even if the fees/levies are paid at the point of export, they are inevitably passed up the chain to the point of production. Traceability is a requirement of the downstream end-users, but this end of the supply chain does little to bear the cost burden that applies to the miners. Yet, despite this burden, traceability must be acknowledged as the driver, which differentiates the 3Ts sector in Rwanda from the other ASM minerals and countries studied, making it the most formalised, visible, and accountable of the ASM activities in this report.

¹⁸⁵ MEMD 2009

¹⁸⁶ Gamarra & Reinoso 2009, SDC 2011.

¹⁸⁷ Bomani Committee 2008

¹⁸⁸ MME 2012

interventions (as national projects or jointly with cooperation partners) to improve the economic contribution of ASM.

Several success factors have been identified for almost any country's ASM formalisation policy and strategy.

1. **ASM formalisation requires a clear understanding of segmentation of the mining sector.** A crucial first step of the formalisation process is to craft an appropriate national definition of ASM. This needs to be done from a public policy perspective, identifying parameters that allow for distinguishing ASM from other mining activities. Best practice is to distinguish between AM and SSM segments (as done by Kenya and Rwanda). Failure to do so makes the ASM sector an easy target for criminal elements camouflaging as ASM (e.g., in Ghana).
2. **ASM formalisation needs a development vision.** An ASM definition needs to be based on a development perspective, expressing the vision for what the sector should be in the long term. Countries that describe ASM in their national definition as a subsistence activity limited to simple tools and small areas of short duration will 'get exactly what they asked for': highly migrant subsistence mining without sustainable organisational structures and a short-term vision resulting in serious safety and environmental problems. Countries that define more generous ASM parameters, characterised by areas larger than small plots for family units, security of tenure, and incentives for technologic upscaling, can expect their ASM sector to develop towards being organised into associations, cooperatives, or even companies, re-investing in their mining properties and progressively improving technical and environmental performance. Rwanda is a typical example; other examples are Tanzania, Ethiopia, Ecuador, or Peru (in the southern coastal area).
3. **ASM formalisation must be understood as a permanent role of the state.** ASM formalisation is much more than 'giving someone a piece of paper to do what they've always done'¹⁸⁹. New ASM always starts in the informal sector. ASM does not follow the conventional mining cycle that starts with identifying a prospective area, obtaining prospection and exploration licences, to finally constructing a mine and operating it. ASM miners simply find a deposit and start mining it. The sector is extremely competitive; if the miner who discovers a deposit does not mine it instantly, others will¹⁹⁰. Additionally, the ASM sector is in constant evolution. For example, successful miners outgrow their segment, new persons start to seek a livelihood in mining, rushes occur that attract new groups, and disasters may happen that drive people into mining. All these people need to be accommodated in the formal economy. Therefore, formalisation of such informal operations is a permanent task, as important as negotiating contracts for the LSM sector¹⁹¹.
4. **Formalisation needs to be a win-win option.** Informality has a cost and bears a risk. Artisanal miners (frequently under-estimated in their rational economic behaviour) will formalise if being formal provides an advantage, i.e., if the cost of being formal is lower than the monetarised risks of being informal (i.e., what informality 'costs' in terms of extortion, bribes, and lack of access to formal markets). Considering the recommendation of Otto et al. (2006), for example, eliminating taxes that cause higher administration costs than revenues could be one of the win-win options.
5. **Entry barriers to formalisation need to be low and ideally eliminated.** Applying for and being granted the right to perform ASM activities needs to be a simple, expeditious, and straightforward administrative process¹⁹². In practice (and partly on paper), this is not the case in any of the case study countries. Rwanda is an exception in its 3T sector: Mining rights already are granted and the

¹⁸⁹ Hinton 2012

¹⁹⁰ One of the best documented examples is the history of John Sutter, Swiss pioneer of California. 'In 1848, gold was discovered ... at Sutter's Mill. ... Sutter's attempt at keeping the gold discovery quiet failed. ... Large crowds of people overran the land and destroyed nearly everything Sutter had worked for.' (Cottier & Drolshammer 2015)

¹⁹¹ None of the three case study countries features a legal and regulatory framework for ASM that provides for sustained formalisation efforts. Uganda's formalisation efforts from the early 2000s have stalled, Rwanda is comfortable with a largely formalised 3T sector and misses the opportunity to address the challenges of gold mining and Kenya was until recently stuck in a framework dating from the 1940s. Notwithstanding, the current review of mining policies, laws, and regulations in Kenya (MOM 2016, Kenya 2016) and Uganda (MEMD 2016) are opportunities for a new start.

¹⁹² Because unlicensed areas for ASM are scarce, innovative approaches are needed. Tanzania's approach of holding relinquished and/or expired areas under prospecting licences for a period of 4 months to allow ASM to apply for primary mining licences is a good example for such innovative solutions.

formalisation rate is high. But, even for Rwanda, entry barriers remain high for artisanal gold mining, which consequently will prevent these operations from achieving legalisation.

6. **Formalisation of mining rights needs to focus on ASM organisations, not individuals.** Any ASM formalisation effort attempting to attend individual miners (e.g., miners ID cards) has failed so far. Selling ID cards eventually generates some petty cash government revenues by taxing the poor, but obstructs the formalisation of the sector. Formalisation of the ASM sector is only feasible at the level of organisations. Formalisation and organisation of the ASM sector are indivisible and mutually reinforcing.
7. **ASM legislation needs to incorporate core elements of mineral rights.** Mining at any scale, whether large-scale, small-scale, or artisanal, is a business. Although legislation and regulations for AM need to provide simplified provisions, some rights are as important for ASM as for LSM. These include exclusivity rights, rights of transfer and upgrade, successive permit renewals, right to process minerals, and the right to commercialise products at market price.
8. **The authority in charge of ASM must have adequate institutional capacity to oversee the ASM sector.** Sometimes ASM development can be a very fast process. ASM administrations need the capacity to address new challenges at a similarly fast pace. Particularly in times of high commodity prices, the entire sector can enter a rush situation. This commonly exceeds the capacity of LSM administrations used to dealing with a limited number of mining companies dedicated to long-term investment projects.
9. **Decentralisation, de-concentration, or devolution must ensure easy access to formalisation.** The ASM sector operates in remote rural areas. The closer the ASM administration is to the mines, the better the officials know the miners and the fewer barriers exist for miners to approach a local officer. This reduces entry barriers for miners and access barriers for the administration. Decentralisation of ASM administration is required¹⁹³.

Formalisation needs to be accompanied by a series of targeted interventions to improve ASM's economic, social, and environmental performance. Many of the interventions require inter-institutional coordination between government agencies, development agencies, civil society organisations (CSOs), and the private sector.

10. **Address technical training needs.** Knowledge transfer, capacity building, and training are needed to improve mineral extraction, mineral processing, workplace health and safety, and productivity and to reduce environmental impacts and, in particular, mercury emissions from gold mining. Miners learned their craft by replicating existing local practices and the majority is not aware of existing alternatives. Training needs and most effective training approaches vary and need to be identified within the corresponding cultural context. Potential negative implications of new technologies (e.g., gender risks) need to be assessed before dissemination.
11. **Strengthen local and national ASM organisations.** Local ASM organisations play key roles as focal points of formalisation, multipliers of training efforts and awareness-building campaigns, translators of national law into local customary rules, and even catalysts for local economic development. National ASM organisations can play the important roles of interlocutor, facilitator, and mediator between the ASM sector and the government.
12. **Improve the business skills of miners.** Like with technology, miners repeat locally common business practices and errors. This makes them vulnerable to cheating, such as being misled on the pricing of gold, incorrect appraisal of gemstones, and sale of unsuitable equipment. Unfavourable profit-sharing agreements and obscure financing agreements, among others, often lead miners to debt bondage. Improvement of miners' business skills is crucial to reducing poverty and converting locally mined minerals into locally generated wealth and development.
13. **Implement targeted policies and programmes that benefit vulnerable groups.** Prioritise women's participation and training, including within formalisation efforts, to address inequalities at ASM sites. Promoting cultural shifts in terms of the roles of the women in ASM will empower women to have access to better quality jobs and a fairer share of benefits. Address child labour

¹⁹³ Surprisingly, Kenya declared 'devolution' as a policy priority (Kenya n.d.; Kenya 2015), but the mining sector appears to remain under administration of the central government.

through a combination of awareness raising and an offer of adequate and accessible educational opportunities.

14. **Promote the evolution of labour relations** between employers and miners because they currently prevent ASM workers from acquiring the stable rights they need and deserve.
15. **Improve miners' access to markets.** The value chain for ASM products is commonly characterised by many intermediaries. Some provide important services; others are parasitic. Extending access of legitimate buyers to mine sites and access of miners to legal markets will contribute to transparency of minerals supply chains and have the additive effect of helping to better capture, disseminate, and distribute the local economic contributions from ASM.
16. **Improve miners' access to finance and the formal banking system.** With many ASM miners lacking access to the banking system, the sector is an easy target for the informal finance sector. The spectrum ranges from legitimate local 'financers' investing in ASM mines to criminal networks engaged in money laundering. Policies and programmes to encourage engagement of the banking sector with ASM or strengthening savings and credit cooperatives are only two of the many possible options.
17. **Enhance the value-adding potential.** The ASM sector already has significant added value by creating spin-off jobs. Some commodities, such as gemstones or non-metallic minerals, offer to create additional added value. Legal measures, such as export taxes or restrictions, are of limited effectiveness because they are easy to circumvent. More chances are seen in incentive-based approaches to attract manufacturers or systematic support to the creation of a national manufacturing sector like gem cutting. High-end manufacturing, like domestic cutting of the finest stones, will remain a long-term aspirational goal.
18. **Make costs of compliance with international standards reasonable.** Due diligence of minerals supply chains has become imperative, and downstream operators increasingly demand compliance with standards and traceability requirements. These market requirements come with costs that need to be balanced with the costs of achieving that standard to avoid formalised minerals being non-competitive against informal production. While costs to achieve certain standards cannot be avoided per se, options to reduce the cost burden on producers (i.e., the ASM sector) need to be explored. This implies harmonisation of requirements, reduction of audit costs, and measures to convince the downstream supply chain to bear a fair share of this cost, among others.

More detailed recommendations are contained in the individual country case studies on Kenya, Rwanda, and Uganda.

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Annex 2: Selected Definitions of Artisanal and Small-Scale Mining, Compiled by Hilson & McQuilken 2014

ASM definition	Organization
'Definitions...are disputed...but broadly speaking, ASM operations exploit marginal or small deposits, lack capital, are labour intensive, have poor access to markets and support services, low standards of health and safety and have a significant impact on the environment'. (Buxton, 2013)	International Institute for Environment and Development.
'...largely a poverty driven activity, typically practiced in the poorest and most remote rural areas of a country by a largely itinerant, poorly educated populace with little other employment alternatives'. (World Bank, 2013)	The World Bank
'An artisanal and small-scale miner is self employed, but can also be an employee, working as an individual or in a family unit linked to a local community, mining group, co-operative, or ASM organization. Those involved are usually poor, vulnerable men, women and children driven to artisanal mining for survival...[new miners entering the sector] scavenge for a time'. (Maldar, 2011)	Fairtrade Foundation and Alliance for Responsible Mining
'There is no formal definition for ASM, but it is broadly understood to refer to mining activities that are labour-intensive and capital-, mechanization- and technology-poor'. (ICMM, 2010)	International Council on Mining and Metals (ICMM)
'There is no consensus on what constitutes a small-scale mining operation; neither is the boundary between ASM operations clearly defined. This is partly because definitions vary by country. Despite differences in definition, common attributes stand out: most miners are seriously under-capitalized, rarely operate as proper business enterprises and lack appropriate and modern technology'. (UNECA, 2011)	United Nations Economic Commission for Africa (UNECA)
'...[ASM] commonly represents a spectrum of activities ranging in scale from small to large that is generally distinguished from 'formal' mining by a relatively low degree of mechanization, high degree of labour intensity, poor occupational and environmental health standards, little capital investments and lack of long-term planning...ASM is typically an informal and highly disorganized activity'. (Hinton, 2005)	Communities and Small Scale Mining (CASM) and UK Department for International Development (DFID).
'The majority of workers in ASM exploit small deposits in remote rural areas, from where it is difficult for miners to get their goods to the market. Their work is labour-intensive, low paying, extremely hazardous, and almost always avoided if other work is available'. (ILO, 2003)	International Labour Organization (ILO)
'A definition is fundamental in distinguishing ASGM from other mining activities. While challenging, legally recognizing the many different types of ASGM that exist is an important tool in deciding how to address the activity and for adapting regulations to appropriate levels of control for different types of activity...Ultimately, the appropriate definition is best decided at the national level...'. (UNEP, 2012).	United Nations Environment Program (UNEP)
'...at [the] global level ASM still means different things to different people... Nevertheless, ASM operations all over the world share common characteristics...ASGM is usually a spontaneous self-organizing social system, while industrial mining is planned and centrally coordinated. Artisanal miners engage in mining to earn a living, while industrial mining (large, medium and small-scale) is driven by profit expectations...'. (SDC, 2011)	Swiss Agency for Development and Cooperation (SDC)

Annex 3: ASM Countries and Number of ASM Miners According to Different Sources

Additional countries known to host ASM operations but without systematic assessment of size of the ASM sector and ASM workforce are: Bangladesh (LM), Cambodia (LM), Costa Rica (UM), Djibouti (LM), El Salvador (LM), Eritrea (L), Gambia (L), Honduras (LM), Iran, (UM), Lao PDR (LM), South Sudan (L), Timor-Leste (LM), Turkey (UM).

A broad knowledge gap exists regarding the existence and extent of ASM in CIS (Commonwealth of Independent States) member and associated countries (formed during the breakup of the former Soviet Union) such as Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan and Ukraine.

Country	Econ ¹⁹⁴	ILO 1999	MMSD 2002 ¹⁹⁵	IIED 2013 ¹⁹⁶	UBC 2014 ¹⁹⁷	Selected Updates ¹⁹⁸
Afghanistan	L					80,000
Algeria	UM				7,000	
Angola	UM				218,000	
Argentina	UM	5,800				
Benin	L				15,000	
Bolivia	LM	100,000	72,000	72,000	130,000	209,800
Botswana	UM				15,000	
Brazil	UM	250–100,000	10,000	10,000	861,000	75,200
Burkina Faso	L	60–70,000	100–200,000	100–200,000		
Burundi	L	10,000			91,000	
Cameroon	LM				44,000	
Central African Rep.	L	45,000		> 100,000	291,000	
Chad	L	10–15,000			146,000	
Chile	H	6–12,000			17,000	
China	UM	4,300,000	3–15,000,000	3–15,000,000	2,746,000	
Colombia	UM	100–200,000			268–418,000	0.3–2 million
Congo DR	L	150,000		2,000,000	2,910,000	
Côte d'Ivoire	LM	10–25,000				
Cuba	UM	5,000			7,000	
Dominica	UM	125				
Dominican Rep.	UM	2–3,000				
Ecuador	UM	60,000	92,000	92,000	128,000	
Ethiopia	L	> 100,000			728,000	
Equatorial Guinea	UM				15,000	
French Guyana (FR)	H	5–10,000			7,000	
Gabon	UM				36,000	5–10,000

¹⁹⁴ Low (L), lower middle (LM), upper middle (UM), and high (H) income classes according to World Bank Country and Lending Groups. <http://databank.worldbank.org/data/download/site-content/CLASS.xls>

¹⁹⁵ Mining, Metals and Sustainable Development (MMSD) projects; Hentschel et al. 2003

¹⁹⁶ International Institute for Environment and Development (IIED); Buxton 2013

¹⁹⁷ Study by University of British Columbia (UBC); Seccatore et al. 2014

¹⁹⁸ Afghanistan: Hruschka (personal notes); Bolivia: SPDA 2014; Brazil: SPDA 2014; Colombia: Echavarria & Reynolds 2015; Gabon: Hollestelle 2012; Ghana: Hilson & Hilson 2015; Guyana: SPDA 2014; Kenya: ARM 2017a; Liberia: Small 2012; Madagascar: Cook & Healy 2012; Mali: Hilson & Hilson 2015; Peru: SPDA 2014; Rwanda: ARM 2017b; Sierra Leone: Hilson & Hilson 2015; Sudan: Personal communications (H.W. and M.O.); Tanzania: Hilson & Hilson 2015; Uganda: ARM 2017c; Venezuela: SPDA 2014

Country	Econ ¹⁹⁴	ILO 1999	MMSD 2002 ¹⁹⁵	IIED 2013 ¹⁹⁶	UBC 2014 ¹⁹⁷	Selected Updates ¹⁹⁸
Ghana	LM	50–300,000	200,000	180–200,000	406,000	1 million
Guinea	L	40,000			200–300,000	
Guinea Bissau	L				7,000	
Guyana	UM	10–20,000			28,000	35,000
Haiti	L	>4,500				
Honduras						2,000
India	LM	1.0–1.1 million	500,000	12,000,000	915,000	
Indonesia	LM	300–500,000	109,000	109,000	250,000	
Jamaica	UM	1,200				
Kenya	LM	30–40,000			146,000	140,000
Liberia	L				146,000	100,000
Libya	UM				7,000	
Madagascar	L	5–20,000			437,000	450–500,000
Malawi	L		40,000	40,000		
Malaysia	UM	4,600				
Mali	L	100,000	200,000	200,000	361,000	500,000
Mexico	UM	20–40,000			56,000	
Mongolia	LM			40–60,000		
Morocco	LM	5–10,000			73,000	
Mozambique	L	100,000	60,000	60,000	291,000	
Myanmar	LM	14,000				
Namibia	UM	5–10,000			29,000	
Nepal	L	500		120,000		
Nicaragua	LM	3–6,000			20–30,000	
Nigeria	LM	10–20,000				
Niger	L	440,000			291,000	
Pakistan	LM	90–370,000		400,000	515,000	
Panama	UM	3–4,500			63,000	
Papua New Guinea	LM	15–20,000	50–60,000	50–60,000	108,000	
Peru	UM	25–50,000	30,000		70,000	150,000
Philippines	LM	200,000	185,000	185–300,000	366,000	
Rwanda	L	5–15,000			73,000	65,000
Senegal	L	3,000			15,000	
Sierra Leone	L	30–40,000			437,000	200,000
Somalia	L				15,000	
South Africa	UM	10,000	10,000	10,000	37,000	
Sri Lanka	LM			165,000		
Sudan	LM				291,000	1.5–2 million
Suriname	UM	15–20,000			28,000	
Tanzania	L	450–600,000	550,000	550,000	994,000	1 million
Thailand	UM	21,500				
Togo	L				15–20,000	
Uganda	L	5–10,000		196,000	218,000	300,000
Venezuela	UM	30–40,000			25–70,000	15,000
Viet Nam	LM	35–45,000			63,000	

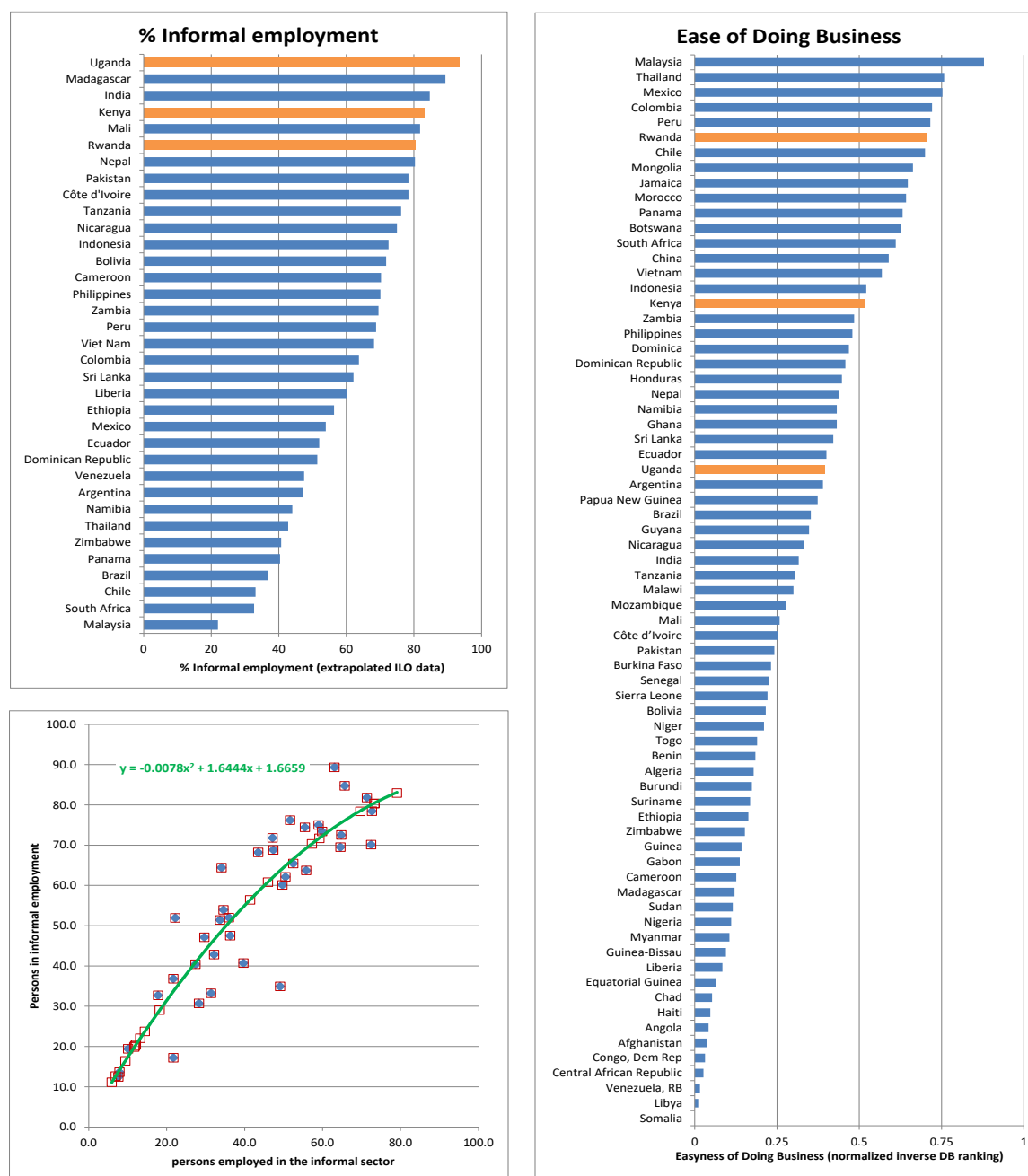
Country	Econ ¹⁹⁴	ILO 1999	MMSD 2002 ¹⁹⁵	IIED 2013 ¹⁹⁶	UBC 2014 ¹⁹⁷	Selected Updates ¹⁹⁸
Zambia	LM	20–30,000	30,000	30,000	87,000	
Zimbabwe	L	50–350,000	350,000	350–500,000	509,000	

Annex 4: Proxy Indicators for Business Context of ASM Formalisation

Figure 7: Business Context for ASM Formalization

Left: 'Share of persons in informal employment in total non-agricultural employment (%)'¹⁹⁹ for ASM countries (Annex 3). For countries where the share of persons in informal employment is not available, data was extrapolated by a binomial regression from 'Share of persons employed in the informal sector in total non-agricultural employment (%)'.

Right: Ease of doing business for ASM countries (Annex 3), calculated from Doing Business Ranking²⁰⁰ of 190 countries, normalised to a range of 100 (Rank 1 = 100%, Last Rank = 0%).



¹⁹⁹ Data Source: KILM 9th Edition, Table 8. ILO 2016.

²⁰⁰ World Bank 2016a