Certification of Metals in Electronics

Guidelines for the certification of minerals sourced from Artisanal and Small-Scale Mining

By

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Summary

The last decade has been marked by an impressive increase of electronic products on the market, and is expected to pursue this trend in the future. As links between mineral trade and armed groups in conflict-affected regions emerge, companies are asked to comply with an increasing number of due diligence regulation and voluntary sustainability standards over their supply chains. Governments, businesses, industry associations, NGOs, and all stakeholders involved in the mineral sector are trying to find ways to make the mineral trade sustainable and more beneficial to society and the environment than it would if it were left to business logic alone. A number of regulations (the Dodd-Frank Act section on conflict minerals in the US and the EU Regulation on Conflict Minerals) have been created for companies to address these due diligence issues, especially related to conflict and human rights, along with a variety of voluntary standards and certifications (the most referred to guidelines are those from the OECD Due Diligence Guidance).

Typically a subsistence activity for miners, the Artisanal and Small-Scale Mining (ASM) sector is more vulnerable to being linked to conflict activities, and to social and environmental risks or impacts; much more than large-scale industrial mining activities. The ASM sector is considered by some a criminal activity that must be eradicated and by others an economic opportunity and livelihood for the poorer citizens. Though a definition of the activity is still debated, miners involved in ASM typically mine shallow and accessible mineral deposits with little or no mechanisation. ASM operations can vary in size from individual gold panning to cooperatives, and are typically poverty driven. ASM is estimated to involve directly 13 million people in about 80 countries worldwide and produces a considerable fraction of minerals globally: 16% of total mined gold, 35% of total mines tin and other minerals used in electronics such as tungsten, tantalum (3TG, the “conflict-minerals”), cobalt, silver and copper.

For many reasons, a large fraction of the sector does not work within the formal economy and activities are therefore deemed illegal. Artisanal miners are often dependent on informal traders or middlemen, minerals are traded through informal channels or smuggled (for gold), and passed on to market hubs (in China or Thailand for instance) to finish onto the global minerals market, into the supply chain of electronic products (or jewellery) and into our hands. The electronics supply chain is a complex chain of several processing and trading steps and tracing minerals back to their source has proven very difficult, if not impossible. It is therefore difficult for companies to comply with due diligence regulations. As a response, several industry coalitions and non-governmental organisations created certifications in the hope of connecting the upstream and the downstream of this supply chain and assuring responsible and sustainable practices.

Though an important and considerable contribution to the mineral extraction sector, ASM is considered risky to source from by companies along the supply chain. Reasons for this include the widespread informality of its activities, making it difficult to assure sustainable (social, environmental and economic) practices in ASM. In an attempt to bridge this gap, this thesis investigates the possibilities of using a certification scheme for two objectives. Firstly, to promote development and social and environmental improvements in ASM. Secondly, to give the assurance downstream of responsible practices through the provision of certified minerals. The aim is to find ways to improve social, economic and environmental

conditions in artisanal and small-scale mines while giving them access to global markets and rendering the process and the supply chain visible to companies and end consumers.

This thesis investigates the following research question: ***What are barriers to social and environmental improvements in the artisanal and small-scale mining sector through certification?*** through desk research on available literature and reports and through 10 interviews with experts in the field. The research reports on the general debate around ASM and identifies barriers to such a certification.

It is structured in three parts: an overview of all certification and traceability initiatives available worldwide to describe the current situation, an overview of the challenges and barriers faced by the ASM sector as reported in the literature and in the interviews, and lastly an analysis and reflection on these results and suggestions.

All actors involved in mineral trade are subject to the regulations of their country and the countries they operate in. Aside from these mandatory requirements, there are a number of voluntary initiatives that focus on different sections of the supply chain, different minerals and different criteria. The Conflict-Free Smelter Program, for instance, is active from mine to smelter and uses the traceability scheme iTSCi to provide conflict-free certified minerals from conflict-affected regions and for which the joining fee is paid by the miner. Other schemes focus on the entire supply chain, like Fairtrade Gold, Fairmined Gold and the Better Sourcing Program, which call on downstream membership fees or investments to not charge miners involved in ASM. The latter have other criteria than conflict, such as social and environmental ones.

Barriers to the certification of minerals from ASM are identified in the following categories and listed:

Governments	**ASM**	**Industry**	**Certification**
· Weak governance · Lack of infrastructure, land, reciprocal services · High taxes · Ill-suited policies	· Debt/dependence · Informality/illegality · Smuggling · Distrust of governments and foreign organisations · Mine specific structure, beliefs, practices · Short-term thinking · Low accountability · Low volumes produced	· Legal restrictions · Risk · Low awareness of ASM challenges · Low demand for certified minerals	· Sometimes paternalistic and controlling · Practical issues (stocking production) · Legal restrictions · High standards · High costs · Too complex or too many criteria

One of the main barriers for certification organisations and industry engaging with ASM is the legal status of their activities. A large fraction of ASM activities is illegal. Many of the factors that encourage miners to work in the informal arena are related to economic and governance issues in their countries.

Certifications that currently exist can greatly improve the social and environmental standards of the mining organisations they work with. However, they can only work with mining organisations where fundamental development has already taken place. Because of the legal restrictions that certification organisations must comply with, they can only engage with already established, registered mining organisations whose

activities are legalised and therefore have a certain level of internal organisation. They cannot, however, engage with the large fraction of ASM that is mining illegally.

This thesis suggests that current certifications cannot improve social and environmental conditions in the majority of the ASM sector unless they work in conjunction with development initiatives whose work will encourage miners to mine in the formal economy. This could be done through facilitating the legalisation of miners' work status, facilitating access to mineralised land reserved for ASM, training, equipment, fair prices and fair working conditions, facilitating organisation into cooperatives or businesses. Projects with aims of creating medical, educational services, infrastructure and security would encourage miners in working in the formal economy, resulting in them joining these development programmes and subsequently certification programmes.

There are limitations to such initiatives. These projects need funding, need the support of local governments and institutions as they must engage with people whose previous activities might have been illegal, and therefore their plans must be aligned with those of the government. These projects can take months or years to show results and require continuous support.

This research also highlights the complex web of actors behind regulations and voluntary standards making decisions with the common goal of making mineral extraction and trade a fairer and more sustainable sector.

Finally, these results can add perspective and understanding on the factors on a local level creating barriers to the certification of minerals from ASM. This has implications for governments, businesses, industry associations, NGOs, mining cooperatives and all actors involved in making decisions on the extraction and trade of minerals.

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List of acronyms and abbreviations

AMV	Africa Mining Vision
ARM	Alliance for Responsible Mining
ASGM	Artisanal and Small-Scale Gold Mining
ASM	Artisanal and Small-Scale Mining
ASMO	Artisanal and Small-Scale Mining Organisation
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe
BSP	Better Sourcing Program
CFTI	Conflict-Free Tin Initiative
CFSP	Conflict-Free Sourcing Program
CSR	Corporate Social Responsibility
DRC	Democratic Republic of Congo
EICC	Electronic Industry Citizen Coalition
EITI	Extractive Industries Transparency Initiative
FLO	Fairtrade Labelling Organisation
FM	Fairmined
FSC	Forest Stewardship Council
FT	Fairtrade
GeSI	Global e-Sustainability Initiative
GOTS	Global Organic Textile Standard
IRMA	Initiative for Responsible Mining Assurance
ITRI	International Tin Research Institute
iTSCi	ITRI Tin Supply Chain Initiative
LSM	Large-Scale Mining
MMSD	Mining, Minerals and Sustainable Development
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
RJC	Responsible Jewellery Council
3TG	Tin, tungsten, tantalum and gold

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1. Introduction

1.1. Context and purpose

In recent years, there has been an increased demand for sustainably sourced metals for use in electronics from consumers and governments. This is a result of increased demand for corporate responsibility over companies' supply chains (Kapelu, 2002; Jenkins & Yakoveva, 2006; Campell, 2003). Meanwhile, several NGOs and campaigns (the Enough Project, Global Witness) have highlighted the situations some minerals are extracted in. Light has been shed on severe human rights abuses, along with considerable environmental degradation at mining sites, for minerals to be sold on the global market (Global Witness, 2012; Prendergast & Lezhnev, 2009).

Most of the trouble was caused by the possible link between the minerals we are buying and conflict in the DRC and surrounding areas. In light of this, the USA passed the Dodd-Frank act on conflict minerals, in 2010, requiring companies to publicly disclose their use of conflict minerals (SEC, 2012). Similarly, the European Union's regulation on conflict-minerals will be put into practice in 2021. Along with other stakeholder, including countries form the International Conference on the Great Lakes Region, the OECD developed voluntary guidelines called the Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, in 2011 (OECD, 2016).

Along with conflict aspects associated with the extraction of minerals in conflict-affected regions, several scholars and NGOs have denounced poor social and environmental practices, especially in artisanal and small-scale mining (ASM) communities, for whom mining has sometimes become the only livelihood. Many refer to a lack of organisation, of long-term thinking, technical and environmental knowledge, keeping artisanal and small-scale miners in a cycle of poverty in an environment where the legislation is not in their favour, where the costs of formality go beyond any benefits and where they are disliked if not hated (Buxton, 2013; Hentschel, Hruschka, & Priester, 2002, 2003). ASM is present in 30 to 80 countries and contributes to an estimated 15 to 20 per cent of global minerals (Buxton, 2013; Hentschel et al., 2003).

The industry has responded through the creation of several certification systems and initiatives touching on several different aspects of mineral production, like conflict minerals in the DRC region (Conflict-Free Smelter Programme CFS, the tin Supply Chain Initiative iTSCi), certification related to gold (Responsible Jewellery Council RJC, Fairtrade and Fair Mined Gold), or touching all aspects of sustainable production for large scale mining especially, like the Initiative for Responsible Mining (IRMA).

The difficulty lies in developing a certification system for metals that can suit artisanal and small-scale mining (ASM), where there are the most social issues as well as unsafe practices and environmental degradation, mainly due to the informality of activities. To complicate matters, challenges in ASM differ from country to country and mineral to mineral. Therefore, the aim of this research project is to consider possibilities of certification for metals that can be applied to all cases of artisanal and small-scale mining.

This research aims to identify barriers and limitations to implementing such a certification system. This will be done through an analysis of existing certifications and initiatives for minerals, and through interviews with experts in the field. The results of the desk research and the interviews will be analysed, mapped and used to conclude on any implications they might have.

1.2. Problem statement

Minerals like gold, tungsten, tin, tantalum, cobalt, rare earth elements and silver from artisanal and small-scale mining enter the black box that is the electronics supply chain and find themselves in our electronic products (our smartphones, laptops, tablets, etc). The ASM sector has been linked to human right abuses, conflict, environmental degradation and social impacts. These issues will be discussed in detail within this report.

Looking at the legislation and voluntary guidelines (OECD guidance, Dodd-Frank Act, EU legislation) on minerals production and the many initiatives and existing certification programmes for the sustainable production of minerals, it is clear there is a gap when it comes to the certification of minerals from artisanal and small-scale mining. It is still relatively difficult for companies to source from ASM because of the risks associated.

ASM is rarely cited in legislation, and only partly cited in certification standards. When ASM is considered in the legislation or in certifications, it is to address the following: human rights abuses, child labour and links to conflict and armed group. However, very few address the underlying issues of ASM (poverty, being subject to institutional weakness, possible lack of technical knowledge and training, and corruption for example) and therefore do not push for developments, for social, economic and environmental improvements in the sector.

Certifications like Fairtrade and Fairmined Gold contain progressive standards for improvements and developments in the sector, but currently cover a relatively little number of mines. There is a necessity to investigate how these kinds of solutions can be scaled up and extended to more minerals and more geographical regions, and assess whether this approach is the best.

The solution aims to find a way to improve social, economic and environmental conditions in artisanal and small-scale mines while giving them access to global markets and rendering the process and the supply chain visible to the end consumers.

1.3. Scope

The aim of this research will be to consider the prospects of certifying metals sourced from artisanal and small-scale mining that can be used as a tool to economic and social development and environmental improvements at the mines, as well as the barriers to such a certification system.

The scope of this research will be restricted to a general analysis of the artisanal and small-scale mining sector in general through literature research and interviews. Information will be likely to come in majority from cases of conflict-minerals (gold, tin, tungsten, tantalum) as these were the one to first appear in legislation and certifications and are some of the most reported on cases.

Little differentiation will be done between regions and countries, though ASM is not a homogeneous sector around the globe and cases will differ. This study will report on the general debate on ASM and will aim discuss the better approach to ASM.

On a general level, this thesis will look at the possible match between certification, the ASM sector and the electronics industry, and therefore look at any barriers to this match.

It will try to cover the barriers and challenges mostly associated with the mining phase, though other parts of the supply chain will be considered, especially the relation with downstream electronics brands.

1.4. Research questions

What are barriers to social and environmental improvements in the artisanal and small-scale mining sector through certification?

Sub questions:

1. What are the characteristics of existing certification schemes for metals and minerals and their relation to ASM?

2. What are the challenges and barriers of certifying ASM?

3. What are key criteria for a potential certification scheme for social and environmental aspects of ASM?

1.5. Research structure

Questions	Details	Methodology
Main: What are barriers to social and environmental improvements in the artisanal and small-scale mining sector through certification?	• Characteristics and limitation of certification schemes for metals and minerals • Main challenges faced by ASM and barriers to certification • Ideas and guidelines on how artisanal mining can be certified.	Sub-questions 1 to 3
1. What are the characteristics of existing certification schemes for metals and minerals and their relation to ASM?	• Characteristics of minerals and regions covered by the schemes. • Characteristics and limitations of these schemes	• Literature research • Analysis of frameworks and standards
2. What are the challenges and barriers of certifying ASM?	• Characteristics of artisanal and small-scale mining • Challenges and barriers to improvements and cerification faced by ASM	• Literature research • Analysis of frameworks and standards • Interviews with experts

3. What are key criteria for a potential certification scheme for social and environmental aspects of ASM?	• Analysis of key findings and key barriers • Discussion on potential solutions	• Analysis of primary and secondary data

Table 1 - Structure of research and methodologies

1.6. Relevance

As the demand for metals is increasing and is expected to keep increasing in coming decades to keep up with innovations and improvements in the electronics sector, companies are faced with challenges regarding their sourcing practices. In the last decade or so, NGOs and activist groups have been increasingly reporting on human rights abuses, on conflict, on considerable environmental degradation even in protected areas, all driven by the demand of metals on the market, linking artisanal and small-scale mining impacts to western companies.

This topic is relevant now because of this established indirect link between consumer products and impacts in developing countries where mining has become the only livelihood for millions of people. The responsibility of companies in this area represents a huge challenge as it is still an emerging issue, limited formalisation has taken place and applying due diligence proves to be difficult. This research is therefore relevant from a business point of view, to help companies avoid contributing to conflict, human rights abuses and environmental degradation, and on the contrary, contribute to the development of a sector they source from.

The many challenges there are in this sector are still relatively new to governments, and the industry. Many of the initiatives or certification schemes related to this have only been established within the last twenty years, and are still trying to find their way towards a more efficient and less impactful approach.

This is also relevant on an environmental point of view. As mineral demand increases and business continues as usual, environmental degradation will only worsen and so will unsustainable practices. Environmental degradation at mine sites can be seen in the form of toxic emissions to water and air, unmanaged waste production, deforestation, contamination of soils and water streams, and many more. This research aims to ultimately decouple the increasing extraction of minerals and environmental degradation through the most efficient approach.

This research is relevant from a point of view of Industrial Ecology as mineral extraction represents the beginning of all metal flows. Assuring sustainable extraction of minerals at the source is necessary for stability along the supply chain. Sustainable sourcing in this case is considered sustainable if all three pillars of sustainability are included: the social, environmental and economic aspects.

2. Preliminary literature review

2.1. Electronics supply chain

Following the increasing demand for certified products and sustainably sourced metals, a considerable number of organisations, initiatives and certification systems were created. However, developing a certification system for metals is an extremely difficult task for many reasons. The supply chain of metals for electronics is very complex. From extraction at the mine, then through traders and through refineries and smelters where they are often mixed, they go through a series of component manufacturers and assembly manufacturers before the final product manufacturing (Resolve, 2010). Unlike diamonds, minerals need to be processed and refined and therefore their origin in the finished product cannot be identified through chemical or physical properties (Scheijgrond, 2011).

For the sake of certification, tracing (from final product to source) and tracking (from source to final product) are very difficult in the electronics supply chain (Young & Dias, 2011). This makes it difficult to perform due diligence over the supply chain.

A study conducted by a non-profit consultancy called Resolve tried to trace and track metals from several OEM companies, including Apple, Dell, HP, etc. Information from these companies was used to trace suppliers all the way back to the mines. The report highlights the difficulties in doing so, a lack of transparency, a lack of response from suppliers contacted (24% replied) possibly due to confidentiality issues, informality in the supply chain or simply incorrect sources (Resolve, 2010).

Mechanisms to verify and assure of the source are missing in such a supply chain, however, there are many promising areas expected to develop like minerals tagging, fingerprinting or bagging and tagging systems.

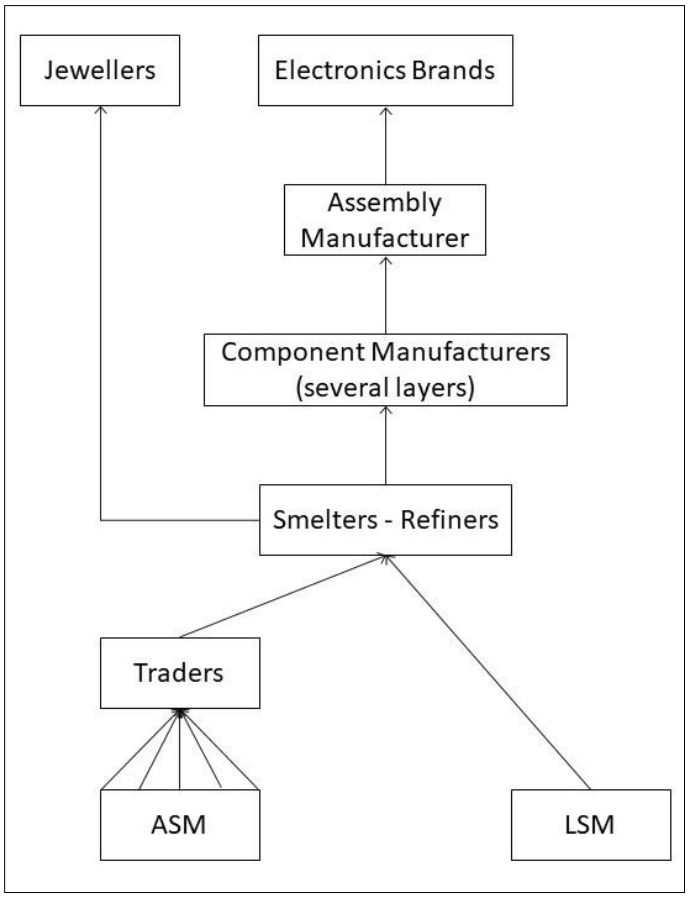

Figure 1 – Simplified overview of the supply chain of minerals in electronics

2.2. Artisanal and small-scale mining

Of the metals present in electronics, a considerable number will have been sourced from artisanal and small-scale mining, rather than large-scale mining. Of those in a smartphone for example, a high proportion of the cobalt, rare earth elements, gold, silver, tantalum, tin, as well as a considerable proportion of the mica, copper and tungsten present will come from ASM (Fairphone & The Dragonfly Initiative, 2017). The focus of this thesis will be on artisanal and small-scale mining rather than large-scale because of the higher number of social, economic and environmental issues artisanal and small-scale miners are faced with and which they are more vulnerable to.

No common definition of artisanal and small-scale mining has been agreed on, for several reasons. One of the key is reasons is that most ASM activities have started informally in different countries and therefore relate to different activities depending on the country and region, the economic situation, the geological framework, the history of mining in the region, etc. (Hentschel et al., 2002). Several have also reported on the difficulty of tracking and studying ASM (Heemskerk, 2005; Maclin, Kelly, Perks, Vinck, & Pham, 2017)

Generally, the definition of ASM refers to mining by individuals, groups or cooperatives with minimal mechanisation (small-scale mining) or purely manual (artisanal mining). All the following aspects are

characteristic of artisanal and small-scale mining, and can be used to define it and categorise the sector (Hentschel et al., 2002):

- Production volume: The United Nations defined the upper limit for ASM to be 50 000 tons a year and 100 000 tons a year for underground and open-pit mines respectively (Janneh & Ping, 2011)
- Low number of workers.
- Labour productivity and inefficiency in exploitation (a vicious cycle forms where this results in a lack of capital investment, and workers stay stuck in this poverty trap).
- Size of mine claim
- Low level of health and safety
- Low qualifications of workers
- Low income, but rather debt
- Low consideration of environmental issues

The World Bank estimates the number of people depending on artisanal and small-scale mining worldwide to approximately 100 million, in approximately 80 countries (World Bank, 2013). The number of people directly involved is thought to be around 13 million people (Starke, 2016). However, more recent estimates suggest these numbers will have risen to 25 million artisanal miners and 150-170 million people indirectly dependent on ASM (Hruschka & Echavarria, 2011). These include mostly Central Africa, Central and South America and Asia. The fraction of minerals from ASM is considerable relative to global production: 10% of total gold or 15-20% of tin and tantalum for example (Blackmore, Holzman, & Buxton, 2013). ASM contributes more in high-value minerals like gold, tantalum, diamonds rather than bulk ones like copper or iron ore (Janneh & Ping, 2011).

Artisanal and small-scale mining is often informal, and activities are mostly in isolated geographical locations, around marginal deposits and activities are often dangerous. It is labour-intensive and manual work, and on top of health and safety issues, can be very harmful to the environment. However, it is often reported to be the only livelihood for the poorer local population. The sector is often negatively viewed by transnational companies and the large-scale mining sector. Their relationship with large scale mining is rather negative, they are seen as “trespassers” whereas they see themselves as unfairly deprived from land and livelihood by LSM (Starke, 2016). Governments have also had a rather negative view on the ASM sector, sometimes banning their activities, stamping these activities as illegal, or in many cases, neglecting the sector. In few cases is ASM supported (Starke, 2016).

Artisanal and small-scale miners face many challenges. Often, the sector works in the informal sphere without license or land permits, no financial resources or access to credit, and miners are often given loans by traders or middlemen and are therefore prone to exploitation. In some cases, they are vulnerable to exploitation by armed groups, resulting in the funding of illegal trade, conflict and possibly corrupt governments (Blackmore et al., 2013). Poor working condition, child and forced labour, poor health and safety are abundantly found among ASM (Blackmore et al., 2013; Franken et al., 2012).

More attention in the beginning was given to conflict minerals: tin, tantalum, tungsten and gold (3TG) in the Democratic Republic of the Congo and surrounding regions where armed groups benefit from the revenues of mining. In eastern Congo, minerals mining is in the middle of armed conflict and sexual violence. A report by the Enough project has highlighted these facts of violence on civilians in mines by the

FDLR (Democratic Forces for the Liberation of Rwanda, organisers of the 1994 genocide in Rwanda), in North and South Kivu, eastern Congo, for example (Prendergast & Lezhnev, 2009).

The Congolese army has also been reported to control mines and abuse miners and the population, financially for their personal enrichment and physically. Health and safety standards in the mines are poor, wages are low and child labour is considerable. The results of this situation are that every bit of money made from mining and taken by the armed groups does not go into the Congolese economy and does not go into improving living standards (Bleischwitz, Dittrich, & Pierdicca, 2012; Prendergast & Lezhnev, 2009).

The ASM sector often does not have the capacity to work with high environmental standards, and severe environmental impacts have been reported. Most damage includes the following: pollution to air, to water and groundwater, toxic dumping, deforestation, destruction of natural habitats for many species including gorillas in endangered World Heritage Sites (Bleischwitz et al., 2012). This is made worse by the presence of armed groups. A report by ASM-PACE found that sites affected by ASM include at least seven natural World Heritage sites, 12 WWF priority landscapes and impact critical ecosystems like arctic landscapes, tropical rainforests and coral reefs in the Philippines (Villegas, Weinberg, Levin, Hund, & Hund, 2012).

Of the mineral cited, gold seems to be the most mined on a small or artisanal scale, estimated at 50% of total ASM (Anderson, 2013). Numbers vary, because the sector is still not well accounted for, but gold from ASM is estimated to account for 12% (Ramdoo, 2015) to 20% (the World Bank) of gold mining worldwide. Most reported on and found in the literature are the health impacts and environmental impacts of mercury use in artisanal and small-scale gold mining (ASGM), it is considered the largest anthropological source of mercury emissions (UNEP, 2013). The issue with gold is that, similarly to diamonds and because of its high value for its volume, it is not only a mineral resource to be processed like other minerals such as cassiterite (ore of tin) but it is money in itself. This complicates matters in terms of tax evasion, smuggling, illegal buying and selling, and traceability systems (Levin & Cook, 2015).

Bad working conditions, the presence of child labour, weak institutional governance, lack of social and financial support, lack of formal licensing and resulting environmental degradation and health impacts affect artisanal and small-scale miners over the world in Central Africa, Asia and Central and Southern America.

2.3. Legislation and policy

Global guidelines on the issue first were created to disconnect downstream metal and mineral users for benefiting human rights abuses and conflict in the DRC and neighbouring countries, where the issues were first reported. They asked companies to comply with due diligence guidelines in their supply chains.

OECD – due diligence guidance for responsible supply chain of minerals from conflict-affected and high-risk areas.	Global guidance - Voluntary **2010**
USA – Dodd Frank Act, section 1502 on conflict minerals	US regulation - Mandatory **2010**
European Union regulation on conflict minerals	EU regulation - Mandatory To be implemented in **2021**

Table 2 – Guidelines and policies on conflict minerals

OECD Guidance

The Organisation for Economic Co-operation and Development (OECD) issued due diligence guidance for responsible supply chains of minerals from conflict-affected and high-risk areas (OECD, 2016). This guidance was developed following the engagement of the OECD as well as eleven countries of the International Conference on the Great Lakes Region (Angola, Burundi, Central African Republic, Republic of Congo, Democratic Republic of Congo, Kenya, Rwanda, Sudan, Tanzania, Uganda and Zambia), industry, civil society and the UN Group of Experts on the DRC (OECD, 2016). These guidelines, which are not legally binding, were adopted in 2011. The updated edition of 2012 also clarified the scope to include all minerals instead of just tin, tantalum, tungsten and gold. The guidance provides the following: an overarching framework, a model mineral supply chain policy providing a common set of principles, measures and indicators for measuring improvements, supplements on 3TG and the challenges these minerals face.

The framework for risk-based due diligence in the mineral supply chain contains the following five-steps:

- Establish strong company management systems
- Identify and assess risk in the supply chain
- Design and implement a strategy to respond to identified risks
- Carry out independent third-part audit of supply chain due diligence at identified points in the supply chain
- Report on supply chain due diligence

A large majority of certification schemes for minerals based their principles on these guidelines from the OECD.

Dodd-Frank Act

In the US, the Dodd-Frank Wall Street Reform and Consumer Protection Act – hereafter mentioned as the Dodd-Frank Act – was passed by Congress in 2010. This article requires that companies disclose their use of 'conflict minerals'. These include tantalum, tin, gold and tungsten especially if sourced from the DRC or an adjoining country, due to potential conflict financing through armed groups. Companies need to disclose their use of conflict minerals to the U.S. Securities and Exchange Commission (SEC) under the Exchange Act (US Congress, 2010), through a "Conflict Mineral Report" with a description of measures taken to exercise due diligence on the sources of mineral and chain of custody. These measures should include an "independent private sector audit".

The proposed rules of disclosure, for issuers, follow the three steps laid out in Table 2, below.

Step	Details
1st step: determine whether the issuer is subject to the Conflict Mineral Statutory Provision.	An issuer is subject to it if conflict minerals are "necessary to the functionality or production of manufactured product"
2nd step: determine if conflict minerals originated from one of the "covered countries"	Disclose the determination of country of origin in annual report and website
3rd step: if minerals originate from covered countries or unable to determine country of origin, issuer must produce a Conflict Minerals Report	Description of measures taken to exercise due diligence on the source and chain-of-custody, which includes a certified independent private sector audit

Table 3 – Summary of the conflict minerals section of the Dodd-Frank Act (SEC, 2012)

If a company has a product that has not been found to be "DRC conflict-free", they do not undergo financial or legal penalties from the government. This information must be made available on their website, next to each product, and it is up to the consumer to "punish" the company by buying that product or not (Jameson, Song, & Pecht, 2016).

The section on conflict minerals is currently in danger of being suspended by the Trump administration as they plan on major cuts in the Dodd-Frank Act. This could have unknown consequences for the situation in the DRC.

European Union regulation on conflict minerals

The EU are in the process of developing legislation on conflict minerals for minerals used and traded in Europe. The "EU integrated approach to a responsible trading strategy for minerals from conflict areas" has the aim of making it more difficult for armed groups to finance their activities through minerals trading. The European Commission want to propose a system of self-certification for importers of 3TG, through exercising due diligence by monitoring and exercising the due diligence guidance of the OECD (European Commission, 2014). The draft of this regulation was released in 2014.

Shortcomings

One direct result of the Dodd-Frank Act was that a number of companies ended their minerals trade with Africa, in order to be assured conflict-free and not have to bother with the conflict and due diligence issue. However, many would argue that the idea of ending the trade of conflict minerals to end conflict is a misconception and is wrongly advertised, even though it is true rebel groups gain financial benefits from minerals trading (Jameson et al., 2015).

Furthermore, it is argued that boycotting 3TG minerals from mines controlled by rebel groups will not end abuses and violations of human rights. Because of this boycott of Congolese conflict minerals in the Kivu regions, locals have moved to informal mining or joined these armed groups. This boycott has also resulted in negative impacts on government revenues, "economic hardship" and "more smuggling" as well as "weakened governance capacity" (Jameson et al., 2015).

It is worth noting the disastrous impacts of the 6 months ban on all artisanal mining activities in the DRC imposed by its president Kabila. Originally to address the issue of conflict minerals and informalisation in the eastern region of the DRC, it affected a much broader number of livelihoods than expected by the government. The police and soldiers began arranging deals instead of controlling operations, alongside

this, unemployment rose, increasing crime levels and insecurity, while also affecting the whole communities around the mines (Geenen, 2012). It was also the opinion of people that the Dodd-Frank Act had direct repercussions on Kabila's decision to ban artisanal mining, though not much thought was given to the impact on local communities (Cuvelier, Van Bockstael, Vlassenroot, & Iguma, 2014).

The legal initiatives discussed above do not give much way to artisanal and small-scale mining, and to issues other than those related to conflict. This sector is informal and difficult to track, which makes exercising due diligence difficult for companies. And as discussed previously, artisanal and small-scale mining is the only livelihood for a large part of the mining population worldwide and affects people indirectly involved.

2.4. Initiatives and organisations

There are many organisations and initiatives that have been created globally with the intention of sustainability and transparency in the mineral supply chain, with increasing interest in artisanal and small-scale mining. ASM is increasingly appearing in the agendas of global organisations.

National organisations	· German BGR · Swiss SECO · Dutch Ministry of Foreign Affairs · UK DFID (Department for International Development)
World Bank Group	· CASM initiative (Community and Small-Scale Mining) · Promines project (funded by WBG and DFID)
UN agencies	· UNECA (sponsor of African Minerals Development Centre)
European Commission	· Raw Materials Initiative (2008)
Other Networks of Independent Organisations	· Alliance for Responsible Mining (2004) · International Council on Mining and Metals (2001)

Table 4 – Examples of organisations with ASM-related programmes

The **Alliance for Responsible Mining (ARM)** is an independent initiative established in 2004 with the aim of enhancing the equity and well-being in artisanal and small-scale mining communities. Their standards for responsible ASM work towards better social, environmental and labour practices, good governance and ecosystem restoration practices, with the aim of ASM transformation. Their focus is on gold, from artisanal and small-scale mining, part of a more general focus on extractive industries and the value chain from mine to market (ISEAL Alliance, 2016). They developed the Fairmined Standard for Gold from ASM, including associated precious metals. They collaborate with actors from the whole supply chain: miners, legislators, industry and buyers, through a considerably big "stakeholder alliance". Most of ARM's work is currently in Latin America, with their head office in Colombia.

The **Mining, Minerals and Sustainable Development (MMSD)** project ran from 2000 to 2002, originally to see how the mining sector contributed to sustainable development. In the beginning, this was an initiative of the nine biggest mining companies (the Global Mining Initiative) and they commissioned the IIED (International Institute for Environment and Development) to take up the research (IIED, 2016). The International Council on Mining and Metals (ICMM) is a direct result of the MMSD, and brings together 23 member companies and 34 member associates. Together with external organisations, they address environmental and social issues in mines, including water and land issues, climate change and energy,

responsible supply and use of materials, transparency and governance, economic and social progress and health and safety (ICMM, 2016).

In 2002, the **Extractive Industries Transparency Initiative (EITI)** was launched at the World Summit on Sustainable Development in Johannesburg, for transparency in oil, gas and mining globally. Compliance countries meet all the EITI requirements and supposedly amount to 34 countries globally. This initiative has been critically assessed by many and was found to have several positive effects but also some limitations(Aaronson, 2011).

In Europe, the **Raw Materials Initiative** was adopted in 2008 to ensure fair and sustainable supply from global markets, sustainable supply in the EU and resource efficiency through recycling (secondary materials). It proposes a strategy regarding the access of raw materials in Europe, with three main aims:

- Fair and sustainable supply of raw materials from global markets, including a partnership between Africa and the EU, which itself includes the support of African economic integration and development in line with its strategies, including the Africa Mining Vision (AMV, discussed below). Activities include promoting natural resources governance and "developing policy scenarios for promoting the trade and the sustainable development of the mining sector", as well as promoting investments in the mining sector and the rehabilitation of mining sites (Joint Africa European Union, 2013).
- Sustainable supply within the EU
- Resource efficiency and secondary raw materials (through recycling)

This initiative is in the hands of the 'Raw Materials Supply Group', a commission expert group, and works to bring together EU countries, companies, NGOs and researchers together to work on these issues (Commission of the EC, 2008).

The **World Bank Group** has a branch dedicated to the extractive industries and is active in about 70 countries in providing help especially in terms of governance. They focus on increasing transparency, increasing benefits for local people and increasing awareness of local communities and the environment. Examples of their work in the mining sectors include a mining infrastructure plan of shared, multi-use infrastructure in Guinea, or grants for women in mining communities in Papua New Guinea (World Bank, 2016). Since 2009, the World Bank publish annual reports as part of the Extractive Industries Technical Advisory Facility with the progress of their advisory services (EI-TAF, 2013).

Promines is another project of the World Bank aimed at strengthening the capacities of institutions to better manage their mineral sector, and increase its contribution to economic growth and sustainable development at a national, regional and local level (prominesrdc.cd).

The African Development Bank's legal support facility focusses on fair mining concession to attract private investors and develop the sector through increasing government revenues from mining.

The **African Minerals Development Centre (AMDC)** was established to work towards goals of the Africa Mining Vision (AMV) adopted in 2009. The AMDC is sponsored by the Economic Commission for Africa (UNECA), the African Union Commission (AUC) and the African Development Bank (AfDB). The Africa Mining Vision's aim is a "transparent, equitable and optimal exploitation of mineral resources to underpin broad-based sustainable growth and socio-economic development" (African Union, 2009). Through this

centre, experts are available to advise governments, businesses and organisations on licensing, GIS, artisanal and small-scale mining, investments, etc. (UNDP, 2013).

As a response to the United Nations' call for transparency in mineral production in the DRC, the Federal Institute for Geosciences and Natural Resources (**BGR, the Geological Survey of Germany**) initiated two research projects, one on fingerprinting of coltan based on its mineralogical and chemical characteristics, and the other on the concept of Certified Trading Chains (CTC) for transparent, traceable and ethical trading chains, which they started as a pilot in Rwanda in 2009. It is based on documentation and on the geochemical fingerprint for certain minerals. The aim is to use CTC certification as a tool for development in ASM (Franken et al., 2012).

2.5. Certifications

These certification systems and initiatives were developed as a response from the industry to the OECD due diligence guidelines and the US and EU legislation.

Programme	**Developed by**	**Regarding**
Conflict-Free Smelter Programme (CFSP)	EICC & GeSi	Conflict minerals – 3TG
Tin Supply Chain Initiative (iTSCi)	International Tin Research Institute (ITRI)	3T
Standard for Responsible Mining	Initiative for Responsible Mining Assurance (IRMA)	Social and environmental performance of mining
RJC Code of Practice	Responsible Jewellery Council (RJC)	G
Fairtrade and Fair Mined Gold	Fairtrade Labelling Organisation (FLO) & Alliance for Responsible Mining (ARM)	G

Table 5 – Preliminary overview of certification initiatives

Conflict-Free Smelter Program

The Conflict Free Smelter Program (CFS) was founded by member of the Electronic Industry Citizenship Coalition (EICC) and the Global e-Sustainability Initiative (GeSi) in 2008. It provides third party auditing to smelters and refiners and their standards are set per the OECD due diligence guidelines and U.S. Dodd-Frank Act. Over 350 companies and associations are part of this initiative (The Conflict-Free Sourcing Initiative, 2012).

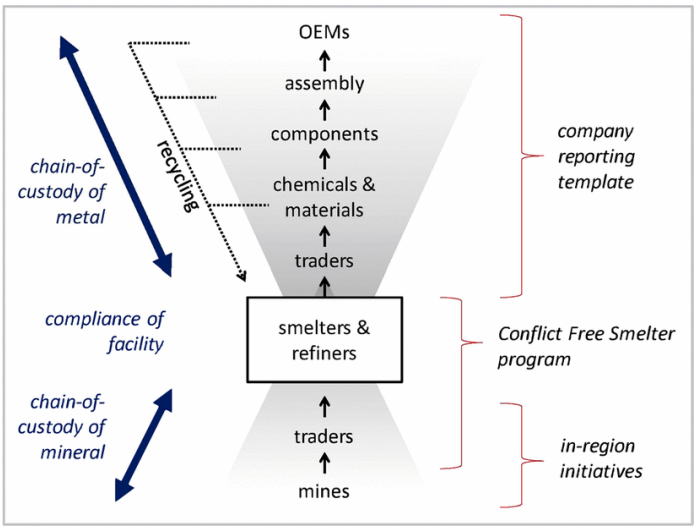

Figure 2 – Scope of operation of CFSP in metals supply chain for electronics (Young & Dias, 2012)

The Conflict-Free Sourcing Initiative provides companies and their suppliers with tools to make informed decisions. Through their Conflict-Free Smelter Programme (CFSP), they identify smelters and refiners that produce conflict-free materials and verify it through third-party auditors. Their Due Diligence Guidance group produces white papers and guidance for companies about best practices and standards. They also host annual workshops to provide a forum for dialogue between stakeholders (CFSI, 2016).

The CFS programme evaluates the following aspects of a smelter's or refiner's site (CFSI, 2012):

- Business process review: company policies and codes of conduct relating to conflict minerals, and evaluate how these are incorporated in management and procurement procedures.
- Material analysis review: complete material analysis to demonstrate that all sources are conflict-free, evaluate whether source locations are consistent with known mining locations and define whether material defined as recycled or scrap meets the definitions.

Tin Supply Chain Initiative

The ITRI (International Tin Research Institute), a not for profit membership organisation, developed the Tin Supply Chain Initiative (iTSCi) in 2008. It has since 2010 expanded to include tantalum and tungsten and has become the main supplier of conflict-free 3T from the eastern DRC (Cuvelier et al., 2014). The programme is currently operating across the DRC, Rwanda and Burundi.

It could be considered as possibly the most dominant initiative in terms of certifying minerals, because of its "bag and tag" process that allows tracing back to point of origin using the bar-coded tags. Participants are also yearly audited (Cuvelier et al., 2014).

iTSCi claim to be successfully operating in a practical manner locally, addressing society, development and governance, alongside the conflict and minerals issue. Through work with partners and funding (from Qualcomm Inc, Apple Inc, Boeing and Microsoft for example) for health and safety, training on management of risks, work on child labour, they state to be active in the artisanal production sector (iTSCi, 2016).

The iTSCi programme operates following the OECD due diligence 5-step framework:

- Step 1: establishing company systems: company procedures and policies.
- Step 2: identify the supply chain: iTSCi mine approval, iTSCi traceability and iTSCi company approval. The company approval includes the assessment of their conflict mineral policies, licenses, authorisation documents, supplier information, due diligence plans and company information. The mine approval includes assessment of mineral type and production, government presence, official security presence, history of armed groups, child labour and official and informal payments
- Step 3: identify and manage risks: iTSCi independent assessments, iTSCi incident management, stakeholder involvement. Local information on risks in the supply chain is collected to be discussed with all stakeholders. This is done through field reports, incident reports, summary and actions, iTSCi whistleblowing policy and governance assistance. The formation of stakeholder committees is also supported by iTSCi. In this stage, on the ground iTSCi staff take the opportunity to look at child labour, safety and business skills development.
- Step 4: independent audit: CSFP smelter audit, iTSCi independent audit. Information from iTSCi is also provided to smelters for their CFS audit.
- Step 5: annual reporting: company reporting (iTSCi, 2016)

Initiative for Responsible Mining Assurance

One of the few schemes in place to have developed standards for environmental and social issues is the Initiative for Responsible Mining Assurance (IRMA). This group was founded in 2006 and their standard covers labour and human rights, conflict response, pollution control, third party verification and many more and focuses on leaving long term positive legacies. This initiative is however targeted at industrial (large) scale mines while "collaborating with initiatives for responsible small-scale and artisanal mining" (IRMA, 2016). The IRMA "Standard for Responsible Mining" is under development and a first draft in 2014 and a second draft in 2016. They plan to beta test their certification in 2017.

Their Standard for Responsible Mining consists of five broad sections (Standard for Responsible Mining, Draft v1.0):

- Business integrity: legal compliance, revenue and payments transparency
- Social responsibility: fair labour and working conditions, occupational health and safety, emergency preparedness and response, human rights due diligence and compliance, mining and conflict-affected or high-risk areas, security and human rights, HIV/AIDS, tuberculosis, malaria, community and stakeholder engagement, obtaining community support and delivering benefits, free, prior and informed consent, cultural heritage, resettlement
- Environmental responsibility: water quality and quantity, mine waste management, air quality, noise, greenhouse gas emissions, protected areas, biodiversity outside officially protected areas, cyanide, mercury management
- Reclamation and closure
- Management systems: environmental and social impact assessment, environmental and social impact monitoring, grievance mechanisms and access to other remedies.

Responsible Jewellery Council

The Responsible Jewellery Council is a standards initiative that cover the whole supply chain of jewellery for its members. It started originally in 2005 from the association of 14 organisations of mining companies, jewellers, banks, trading companies, and more. Their scope includes platinum group metals, diamonds and gold. The members follow a code of practices and are audited by a third-party (Responsible Jewellery Council, 2013). The RJC has been evolving in the past few years in terms of third-party certification and chain-of-custody, as well as its potential for medium and large-scale mining. However, the RJC still have very little focus on artisanal and small-scale mining (Barreto, 2011).

Fairtrade Standard for Gold

Developed by the international Fairtrade system, the Fairtrade Standard for "Gold and Associated Precious Metals for Artisanal and Small-Scale Mining" aims to change the conventional trading system into one that benefits small disadvantaged producers, leading to social and economic improvements, as well as their empowerment and environmental sustainability (Faitrade International, 2013). A similar concept to Fairtrade for other commodities, Fairtrade Gold aims to give market access (with a premium and minimum price) to artisanal and small-scale gold miners that reach their social and environmental standards.

The four chapters of the standard cover the following (based on standards v1.2):

- General requirements: certification, membership and boundaries, ASMO responsibilities, relationships with local communities
- Trade (fair trading practices): traceability, product composition, responsible sourcing and market information, use of Fairtrade framework
- Production (methods for sustainable livelihoods): management of production practices, management of toxic substances
- Business and Development (empowerment, social organisation): development potential, democracy, participation and transparency, non-discrimination, pre-finance, pricing

For each these chapters, three aspects are defined: the intent (objectives, scope of application), the requirements (rules) which are either core requirements or development requirements based on continuous improvements, and finally, the guidance is defined to help interpret the requirements.

Fairmined Standard for Gold

The Fairmined Standard for Gold from Artisanal and Small-Scale Mining, including Associated Precious Metals, is an assurance label created by the Alliance for Responsible Mining, based in Colombia (Alliance for Responsible Mining & Fairmined, 2014). This standard (Fairmined Standard v.2.0) is officially recognised by the Responsible Jewellery Council, since 2014, under the RJC Chain of Custody Standard for precious metals (ISEAL Alliance, 2016).

The latest version of the Standard, v.2.0, dates to 05 April 2014. Each requirement of the Standard is defined either as an "Entry Principle", that must be complied with to qualify, or a "Progressive Principle",

that is a requirement that can be met by further progress after certification, and a timeframe of compliance, in years, is also indicated (ARM, 2014).

The standard contains five chapters covering the following (based on Fairmined Standards v2.0 for gold, developed by ARM, 2014):

- General requirements: application, scope, ASMO responsibilities, traceability, gender and non-discrimination
- Environmental protection: management of toxic substances, protection of ecosystems, ecological gold, silver and platinum
- Labour conditions: assessment and improvement plan, health and safety conditions in the workplace, conditions of employment, freedom of labour, child protection and elimination of child labour, freedom from discrimination, freedom of association and collective bargaining, social protection
- Fairmined premium governance and development plan
- Trading relationships: buying from certified producers, pricing and premium, trading relationships and contracts, down payment, traceability in the refining, trading and transport supply chain, Fairmined certificates model

2.6. Conclusions of preliminary literature review

Only in the last 10 to 15 years have the issues surrounding artisanal and small-scale mining and their relation to electronics surfaced, and only recently has the ASM sector entered the agenda of global organisations. Only recently have provisions for ASM and mineral sourcing conditions entered legislation and international guidance, first for "conflict minerals" (tin, tungsten, tantalum and gold) from the DRC and surrounding regions, then for all minerals from conflict-affected areas.

Kickler and Franken (2017) categorise the sustainability issues addressed by certification schemes for the mining sector through a comparative analysis, yet find there is not to this day a common agreement on a classification of these issues that certification organisations can follow in order to be comparable or inter-operable (Kickler & Dr. Franken, 2017). They identify 86 sustainability sub-issues in the mining sector that they group in five overarching categories: human and workers' rights, societal welfare, use of natural resources, emissions and land reclamation, company governance.

Indeed, the large variety of issues covered by different schemes and the differences with issues covered by legislation are a source of confusion and complexity, in a sector that is not yet well-studied and well-understood.

Certification initiatives are trying to link these sustainability issues, which are indirect consequences of the artisanal mining industry, with the downstream demand for these minerals. This study tries to shed some light on the complexity of the sector and the situation it is in, which includes the broadness and variety of actors, organisations, industries, certification standards and impacts involved (see Figure 3).

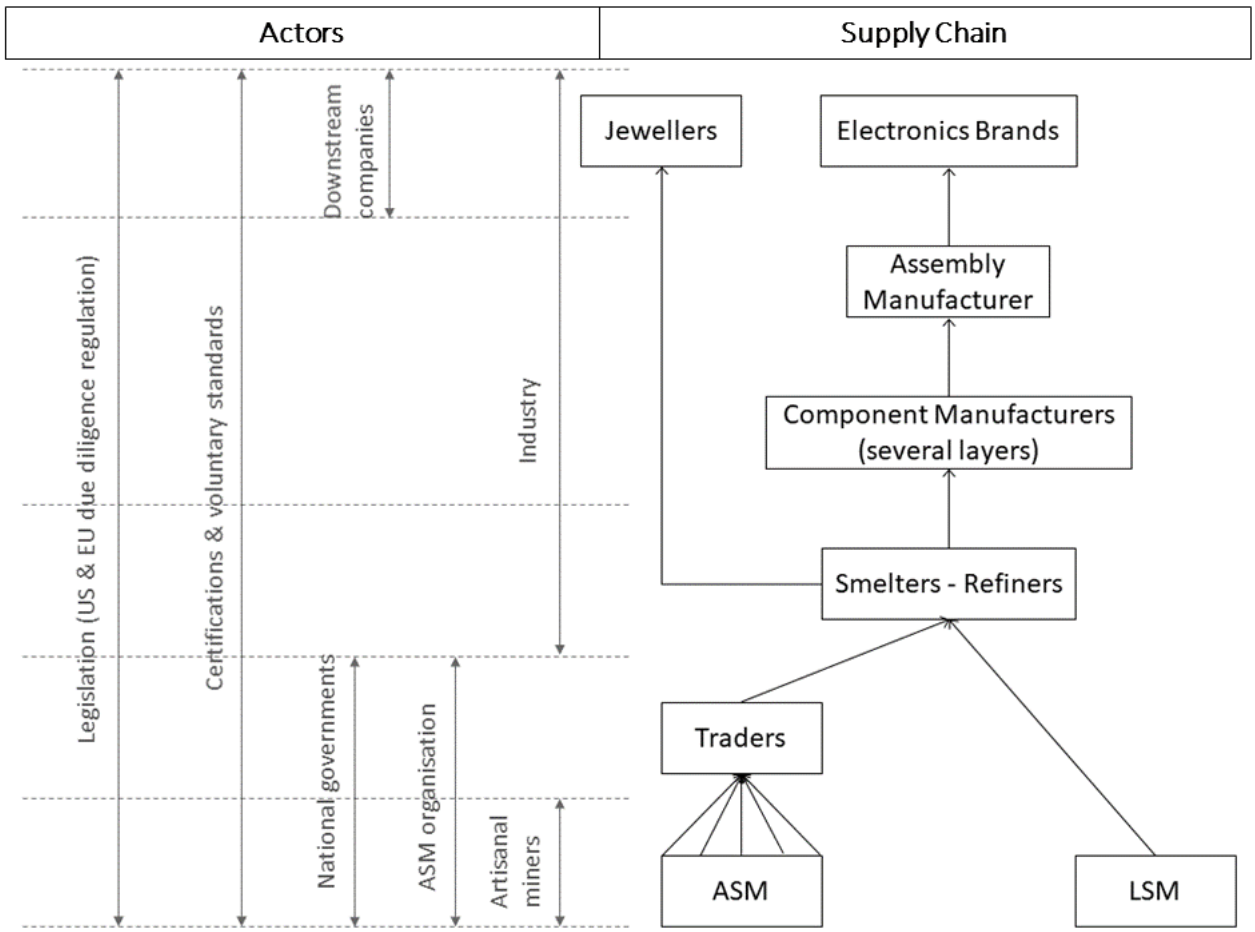

Figure 3 – Map of actors involved in the minerals supply chain

3. Methodology

The methodological approach taken for this thesis consists of the collection of data through several means in order to observe and report on the discussion around the certification of minerals sourced from ASM, and subsequently, analyse the claims made, the barriers and suggested solutions around the issue. This thesis is therefore a qualitative study of issues surrounding the certification of minerals from ASM, reflecting the characteristics of qualitative research described by Creswell (2007) which include the following aspects (Creswell, 2007).

3.1. Data gathering

As described in Creswell (2007), in a qualitative research, the researcher gathers the information, and dot not rely on questionnaires or instruments from other researchers, neither does the research process follow strict guidelines. This is what Creswell (2007) calls "emergent design". In the case of this thesis the questions and data sources may change depending on the problems or issues discovered. The results start with observations on the "natural setting", the state of affairs, with a description of all actors involved, their perceptions and opinions on the problem. The problem being of course the certification of minerals from ASM.

The data gathered for this descriptive chapter comes from three sources:

- **Official documents** from governments, intergovernmental organisations, companies, NGOs, certification organisations, development organisations, and from the industry related to mining.

- **Scientific literature** on artisanal and small-scale mining (ASM), certification, regulations and policies for ASM, environmental and social characteristics of ASM, case studies of ASM in developing countries, conflict minerals, ethical trade schemes for minerals.

- **Informal interviews** with a selection of people with experience in the topic of ASM and certification.

3.2. Interviews

Informal interviews were used in this thesis for several reasons:

- Personal experiences of people that are involved in the field
- Discussions and opinions of people around similar issues
- What issues are pointed at as most important
- Be directed in suggested research paths.

The ideal selection of interviewees would have included stakeholders along the supply chain of mineral processing and electronics, and people with global views on the issue like scholars, research organisations or developmental organisations. Interviewees were selected according to their experience on certification

and ASM or their line of work, and were often suggested during previous interviews, or were found through relevant reports or scientific literature.

- 22 organisations or individual people were contacted by email
- 16 replied, the clear majority of which replied positively
- 11 were contacted regarding their views on the topic, and replied through a variety of means: email or discussions in person or through Skype.

Because of their very diverse backgrounds and experiences, the following open questions were asked at the beginning of each interview:

> **What is your experience with ASM and what do you think are barriers to certifying minerals sourced from ASM?**

The following table gives an overview of people that were contacted, along with their experience on the topic.

Name	**Title**
Jan-Pieter Barendse	**Coordinator of Raw Materials unit at the Ministry of Foreign Affairs of the Netherlands**
Barendse has over 15 years of experience in international trade, innovation and CSR with a focus on the value chain for gold and other minerals. As the Policy Coordinator for raw materials at the Ministry of Foreign Affairs (together with Dirk Jan Koch) leads the ministry's strategy to transition mineral supply chains to responsible practices. This includes a new partnership called the European Partnership for Responsible Minerals; contributing in cooperation with the Swiss government to make the Responsible Mining Index a reality; and supporting the drafting of the OECD Mineral Risk handbook.	
Dr John Childs	**Researcher and lecturer at Lancaster University, UK**
Lecturer at Lancaster University (UK) interested in the political ecological dimensions of natural resource extraction, including the study of minerals, and has extensively published on the Fairtrade certification of gold on aspects of responsibility, fairness and ethics in artisanal and small-scale mining.	
Charlotte Christiaens	**Volunteer at Catapa, Belgium**
Christiaens has been working for CATAPA since 2007, first on a voluntary basis, and as a staff member since 2011, as the Coordinator of CATAPA. She has done research on the impact of open pit mining on local communities in Latin America (in Bolivia, Peru, Guatemala and Colombia), and in Greece. She also did research on fair trade artisanal small-scale mines in Peru and Bolivia.	
Laura Gerritsen	**Value chain team at Fairphone, Netherlands**
Responsible for the sourcing of minerals and what initiatives they want to support. She talks to component manufacturers and refiners, to set up more responsible and transparent supply chains.	
Conny Havel	**Marketing and communications at ARM (Alliance for Responsible Mining), Colombia**
Based in Medellin, has been working at ARM for over 3 years. Develops and implements communications in marketing strategies for ARM and Fairmined. Work includes setting up responsible gold supply chains, helping ASMOs access the international market, advising businesses on how to engage with responsible ASM, promoting the Fairmined initiative and growing the network.	

Mirko Liebetrau	**Formalisation and Certification at BGR (Federal Institute for Geosciences and Natural Resources), Germany**
Work in Rwanda and with the ICGLR	
Dr Ing. Michael Priester	**Director mining department Projekt-Consult GmbH, Germany**
Until 2014 he was an Associate of Projekt-Consult GmbH and Director of the Mining Department at the company's HQ in Germany, now is Senior Advisor. He has been working in the field of Technical and Financial Co-operation with Developing Countries, commissioned by the international donor community (GTZ, BGR, DEZA, EC, UNIDO, World Bank etc.), in different positions in Germany and worldwide for over 30 years. His focus is on mineral sector development and environmental issues related to mining in developing countries. Coming from a more technical background he covers the whole width of small-scale mining related topics, from child labour to policy development, from the mine to the market and from environmental management to training and institution building. As head of the mining department of projekt-consult GmbH he has managed the long and short-term projects of the company in the mineral sector.	
Adam Rolfe	**Mineral Sector Development Manager at Estelle Levin Ltd, UK**
(now Levin Sources) He has more than 6 years' experience in the sector. He provides strategic direction on projects that focus on the development potential of the artisanal and small-scale mining sector to improve livelihoods, working conditions and resilience of raw materials producers and communities. He has worked on mineral sector reform and artisanal and small-scale mining formalisation; public policy; technical training programmes for artisanal miners. Involved in the design of the ICGLR Mineral Tracking Database; the development and implementation of the ICGLR Third Party Audit process; the strategy and action plan for SAESSCAM in the DRC; and baseline studies of Guinea's gold and diamond ASM sector. (levinsources.com, 2017)	
Ana Sarmiento	**Program Analyst at Better Sourcing Program, UK**
Worked as an analyst for boutique consultancy firm RCS Global. RCS specialises in audit and advisory on responsible supply chains. During her time there, she focused on work at smelter level (audits), as well as EITI audit work. Joined BSP at its early stages in early 2015, initially focused on developing the Better Sourcing approach. The desk-based development of the BSP approach also included field work in North and South Kivu, visiting mine sites, the communities around them, as well as the exporters and trading houses based in Bukavu or Goma. Most field work has been and continues to be for mine site assessments (which we conduct as a baseline to see what systems will be deployed and how) as well as to conduct trainings and workshops (like for example, to train the BSP monitors or the traceability agents). She generally travels to either DRC or Rwanda every 2 - 3 months.	
Ruby Stocklin-Weinberg	**Artisanal mining expert (based in Vancouver, Ca)**
Artisanal and small-scale mining and livelihoods consultant. Worked on variety of projects from feasibility studies in diamonds to sustainable supply chains guidance and conflict minerals in the DRC. Led a feasibility study for a Centre of Excellence model for Fairtrade Gold in East Africa. Co-led an assessment of traceability and due diligence programmes for tin, tantalum and tungsten in the DRC for USAID project. Lead researcher for a situational analysis of the tin sector in Indonesia for a working group of electronics companies, NGOs and industry associations.	
Dr Steven Young	**Associate professor, industrial ecologist, University of Waterloo, Canada**
Dr. Steven B. Young is an associate professor in the School of Environment, Enterprise & Development (SEED) at University of Waterloo, Canada. He holds degrees in metallurgical engineering and materials science from University of Alberta and University of Toronto. Interests include sustainability standards and certification, critical materials, and recycling and reuse strategies. Dr Young has extensive expertise in supply-chains, corporate social responsibility and business sustainability, ISO management systems and standards, certification programs and auditing processes, and metallurgy and materials	

engineering. He was a consultant in business sustainability for 15 years before joining academia and continues to work with industry on a selective basis. He engages with the Conflict-Free Smelter Program (CFSP), a business-led initiative, where he is a member of the Audit Review Committee (ARC), whose role is to determine the qualification status of smelters in the CFSP. Dr Young has several publications on sustainability standards and certifications focusing on mineral supply-chains and responsible sourcing.

Table 6 – Description of interviewees

The following table provides more detail on the interviews and categorises them per sector.

#	Name	Company/organisation	Date of interview	Contact method	Sector
1	J.P. Barendse	Dutch Ministry Foreign Affairs	08 Feb 2017	In-person	Government
2	Dr J. Childs	Lancaster University	18 Apr 2017	Skype	Academia
3	C. Christiaens	Catapa	21 Feb 2017	Email	Non-profit
4	L. Gerritsen	Fairphone	06 Feb 2017	In-person	Industry
5	C. Havel	ARM/ Fairmined	27 Apr 2017	Skype	Non-profit
6	M. Liebetrau	BGR	20 Mar 2017	Email	Governmental Institution
7	Dr M. Priester	Projekt Consult GmbH	10 Apr 2017	Phone call	Consultancy
8	A. Rolfe	Estelle Levin Ltd	4 May 2017	Skype	Consultancy
9	A. Sarmiento	Better Sourcing Program	24 Feb 2017	Skype	Private due diligence implementation
10	R. Stocklin-Weinberg	Artisanal mining expert (independent)	08 May 2017	Skype	Non-profit
11	Dr S. Young	University of Waterloo	06 Apr 2017	Skype	Academia

Table 7 – Interview details

3.3. Analysis

The analysis of the results will consist of increasingly categorising the data to make sense of it, into a few key barriers. This will allow to develop a picture of the problem and report on the multiple perspectives and factors involved. This is what Creswell (2007) calls the interpretive enquiry and the holistic account of a qualitative research. Once the perspectives, factors and they interactions are identified, they will be discussed in the discussion.

4. Existing certification schemes

The following table provides an overview of regulations, certifications, projects and traceability initiatives that are involved in artisanal and small-scale mining and/or minerals. This table attempts to help navigate through the confusing and complex certifications, standards and laws available for minerals, and what Bodenheimer (2014) calls the "jungle of certifications".

Name	Organisation Type Year Assurance	Aim	For who	Mineral	Where	How	Details
Mandatory (laws, regulations)							
Dodd-Frank Act (Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Act of 2010)	United States of A. Regulation 2010 Recommends independent private sector audit	Requires that companies disclose their use of conflict minerals (3TG) from the DRC. Aim is to avoid that companies' involvement in conflict	Downstream companies that use 3TG	3TG – conflict minerals	DRC and surrounding regions	3 steps for disclosure: · determine if subject to the provision (if conflict minerals are necessary) · determine origin of conflict minerals (if originates from the 'covered countries') If they are, must produce a Conflict Mineral Report (description of measures taken for due diligence, includes independent private audit)	Due diligence on source and chain of custody on the conflict minerals - it must "conform to a nationally or internationally recognised due diligence framework" like the OECD due diligence
Conflict Minerals Regulation	European Commission Legislation 2021 (Jan-01)	"The EU regulation aims at stopping: · conflict minerals and metals from being exported to the EU · global and EU smelters and	EU-based importers of 3TG (in whichever form). Indirectly, will also affect smelters and	3TG – conflict minerals	Countries affected by conflict minerals	Follow the 5 steps framework of the OECD Due Diligence Guidance	"EU member states' authorities will examine documents and audit reports"

	3rd party audit (as recommended by OECD guidance)	refiners using conflict minerals the abuse of mine workers, and to support local development."	refiners based in EU or not.				
National legislation		Legislation of countries with ASM	For all who want to operate in the country				
Voluntary (standards, initiatives, guidelines)							
OECD Due Diligence Guidance	OECD International guidelines 2011 Recommends 3rd party audit	"help companies respect human rights and avoid contributing to conflict through their mineral sourcing practices; and cultivate transparent mineral supply chains and sustainable corporate engagement in the mineral sector"	Companies that use minerals sourced from conflict-affected and high-risk areas	All minerals from conflict-affected and high-risk areas	Conflict-affected and high-risk areas	5-step framework for risk-based due diligence in the mineral supply chain: · strong company management systems · identify and assess risk in the supply chain · design and implement a strategy to respond to identified risks · independent third-party audit of supply chain due diligence at identified points in the supply chain · report on supply chain due diligence (in their annual sustainability report for example)	Focus on human rights and conflict. · Serious abuses in extraction · transport or trade (torture, forced labour, child labour, violations of human rights) · Direct or indirect support of armed groups · Illegal control of mine sites by security forces Bribery or fraudulent misrepresentation of origin of minerals, money laundering, payment of taxes, fees and royalties.
Conflict Free Smelter Programme (CFSP)	Electronic Industry Citizenship Coalition (EICC) and Global e-Sustainability Initiative (GeSi)	Voluntary initiative. For auditing of smelters and refiners to assure they process minerals from	Smelters and refiners	3TG	World wide	· Review of smelter's business process (company codes and policies relating to conflict minerals, management and	Smelter's conflict mineral policy must include: 3TG containing materials, conflict regions public communication of the policy standard operating

	Certification 2011 Independent 3rd party audit	conflict-free sources. This smelter/refinery certification makes it easier for downstream companies to meet requirements of legislation on conflict minerals.				procurement procedures) · Material analysis	procedures, effective date of policy, conform to annex II of OECD guidance, for tantalum adherence to international transportation regulations to due possible radioactivity of metal
Standard for Responsible Mining	Initiative for Responsible Mining Assurance (IRMA) Standard 2017 Independent 3rd party assurance	Aim is to improve the social and environmental performance of industrial mining activities.	All industrial mining (except for energy and fuels sector). Does not apply to ASM	All minerals from large scale mining.	World wide	· Business, social and environmental requirements · Status levels: candidate or certified	· Integrity requirements · social responsibility requirements · environmental responsibility requirements (water, mine waste, air quality, noise, ghg emissions, protected areas, biodiversity, cyanide, mercury) · positive legacies requirements
RJC Code of Practice	Responsible Jewellery Council (RJC) Certification 2008 Audit from RJC accredited auditor	Aim is to provide a common standard for responsible, ethical, social and environmental practices throughout the jewellery supply chain (mine to retail)	Global jewellery and watch industry	Diamonds, gold, platinum group metals	World wide	· self-assessment against the code of practices · request of certification audit · RJC can grant member certification for 1 or 3 years – depending on result	· General (legal compliance, policy, reporting, finances) · Human rights · Labour rights & working conditions · Health, safety and environment · Responsible mining
Fairtrade Gold	Fairtrade Foundation Standard	Create opportunities for ASM communities, promoting their formalisation.	Artisanal and small-scale mining organisations (ASMOs) – and	Gold and associated precious metals	Developing countries	· core requirements and development requirements	· improve working conditions, social security, gender equality and child protection

	2013 3rd party audit by FLO-cert	Promote sustainable development and reduce poverty.	traders involved with ASMOs				· strengthen producer organisations and improve governance · improve environmental management · fairer market access
Fairmined Gold	Alliance for Responsible Mining (ARM) & Fairtrade Foundation Standard 2013 3rd party audit – by SCS Global Services	Progressive organisation and formalisation of the ASM sector – creating opportunities for ASM miners and their communities	ASMOs	Gold and associated precious metals	Low and medium income countries that qualify for Official Development Assistance (as published on ARM website)	· Entry principles and progressive principles · Helps ASMOs become viable businesses (economically, technically, environmentally and socially)	· General requirements (scope, traceability, gender, non-discrimination) · Environmental protection · Labour conditions · Governance and development plan · Trading relationships
Better Sourcing Program	Better Sourcing Program Certification (traceability and standards) 2013 Audit at smelter level, documents aligned with CFSP	Helps downstream clients source responsibly and leverage opportunities in the ASM sector	ASM sector	Now: tantalum, tin, tungsten. In theory for any mineral	Now: Rwanda and DRC. In theory, any country with ASM	· Standard with status (minimum) and progress criteria · Finance from downstream · "Better Sourcing Network" transparency · "Information Management System" local people monitoring · GeoTraceability	· Status criteria: transparency, no conflict or human rights abuses · Progress: improving working conditions and environmental performance
iTSCi International Tin Supply Chain Initiative	International Tin Research Institute (ITRI) Chain of custody certification initiative	Help companies maintain their trade relationships with actors in the DRC and around while meeting their due	From local mining cooperatives in Central Africa to international smelters	3T (tin, tungsten and tantalum)	Africa Great Lakes Region. Currently operating in Burundi,	5 steps · establish company systems (policies and procedures) · identify the supply chain (company and mine	Traceability process: · Bags are weighed and tagged at the mine · Weighed in and out at processor and again at exporter

	2011 3rd party audit (by Synergy Consulting Ltd)	diligence expectations. iTSCi provides a chain-of-custody tagging system for wolframite (tin) to differentiate conflict-free from conflict minerals.	(through large or small traders)		Rwanda and the DRC	approval, iTSCi traceability) · identify and manage risks · independent audit · annual reporting.	· stored in large containers and exported by truck and freight with their tags (shipping details recorded) · at trader, then weighed during shipping by trader · smelter (confirms mineral weight and records data storing tags for audit purposes
Better Gold Initiative	Swiss State Secretariat for Economic Affairs (SECO) and Swiss Better Gold Association Project 2013	(3-year pilot project) Develop market for and supply of gold from artisanal, small-scale and medium mining operations – while improving social and environmental conditions	ASM and Swiss gold refining companies	Gold	Peru – first country to launch initiative	Uses Fairtrade Gold, Fairmined Gold, the RJC Code of Practice for guarantee of the origin and extraction.	
Certified Trading Chains (CTC)	BGR (Bundesanstalt für Geowissenschaften und Rohstoffe) Chain of Custody certification initiative 2009 (pilot projects) Independent 3rd audit	Traceability and transparency mechanism in the supply chain – aims to guarantee sources of mineral resources (and assure they meet certain social and ecological standards)	ASM	3T	Current projects in Rwanda and DRC	· Levels of compliance (0-5) · Uses geochemical fingerprinting for coltan ores	5 principles: · Traceability and transparency · Labour and working conditions · Security · Community development · Environmental protection

Conflict-Free Tin Initiative (CFTI)	Multi-stakeholder initiative (with Dutch Ministry Foreign Affairs) Project 2012-2014	Demonstrate it is possible to provide conflict-free minerals to the international market from conflict-affected areas. Support programme for iTSCi	Actors in tin supply chain	tin	DRC		
Scaling up the Mineral Trade	iTSCi, Pact and the Dutch Ministry Foreign Affairs Project (follow up of CFTI) 2015	Similar concept to CFTI but scaled up to 3T mines	Actors in 3T supply chain	3T	Great Lakes Region Central Africa	· Improved data collection · Increased number of trained government representatives · Strengthen capacity to monitor the integrity of the system	Also aims to increase the benefits to the local community, through trainings in literacy, management skills, awareness in safety issues, supporting women and increasing opportunities in the sector
Regional Certification Mechanism (RCM)	International Conference on the Great Lakes Region (ICGLR). Chain of custody certification initiative 2011 Independent 3rd party audit	Provide conflict-free minerals chains in the region – to eliminate support of armed groups. Tracking and certification scheme	Producers, traders and exporters dealing with 3TG from ASM sites in DRC, Rwanda, Burundi and Uganda	3TG	Great Lakes Region	· Uses iTSCi (by ITRI) and CTC (by BGR), compiled in regional ICGLR database (where anomalies can be flagged) · Ensure conflict and child labour free mineral production · Aims to disincentive illegal mineral production and de-value shipments	RCM is part of the Regional Initiative against the Illegal Exploitation of Natural Resources (RINR)
Conflict-Free Gold Standard	World Gold Council (WGC) Standard 2013	Provide assurance for gold producers that gold extraction has not benefited conflict or contributed to human rights	Gold producers, including ASM organisations, producers and refiners.	Gold	Worldwide (not only conflict areas)	· Referred to OECD Due Diligence Guidance supplement on gold	Endorsed by the LBMA and aligns with their Responsible Gold Guidance

	Independent 3rd party assurance	abuses, and therefore comply with international legislation	WGC member companies.		Pilot cases in Mexico and Ghana		
Responsible Gold Guidance	London Bullion Market Association (LBMA) Guidance 2012 3rd party audit	Assure investors and consumers that the gold is conflict free.	Mandatory for all refiners wishing to sell to the LBMA	Gold	Worldwide	· Based on the OECD Due Diligence Guidance and the requirements in its gold supplement · 5 step framework of OECD · Can use the LBMA best practice toolkit	

Table 8 – Guidelines, regulations and voluntary certifications and initiatives for minerals and metals

What can be observed from the above table is that global legislation generally follows the OECD guidance for human rights and conflict-affected areas, and certification standards and initiatives have different aims and areas of focus, which vary in terms of minerals covered, regions covered, and criteria. Some strictly cover the criteria defined in legislation and the OECD guidance (CFSP for example), while some cover additional social and environmental criteria (RFC, Fairtrade gold, Fairmined gold).

Of the certification standards compared in this study, the majority focus on gold and the rest on 3T (tin, tungsten, tantalum, the so-called conflict-minerals). The Standard for Responsible Mining by IRMA is the only standard here that excludes ASM and focuses solely on LSM. As for criteria, human rights and conflict are the most integrated in certification schemes as well as the three chain-of-custody schemes, likely due to the international guidelines and legislation on conflict and human rights.

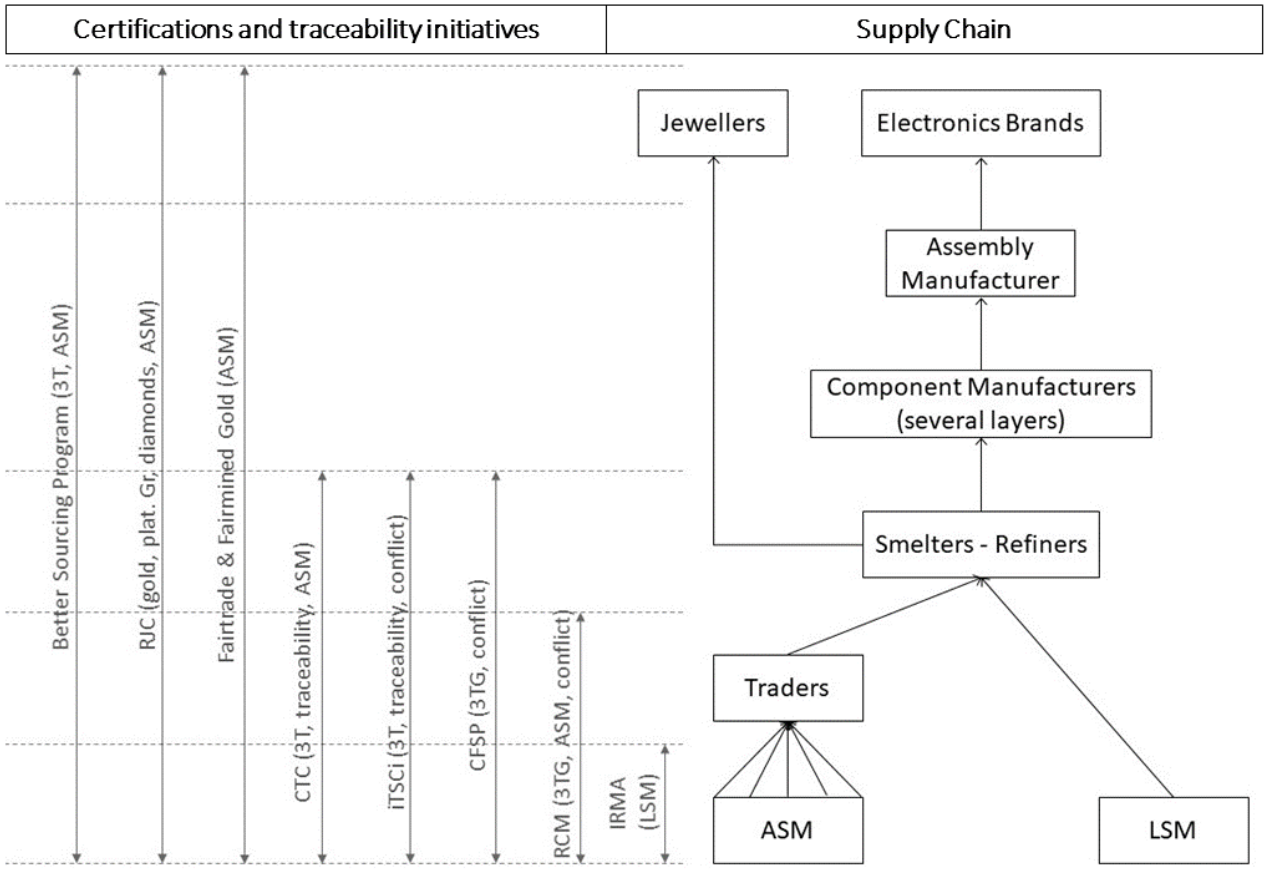

Figure 4 – Area of operation of different certification and traceability initiatives

5. Challenges of certifying artisanal and small-scale mining

This chapter attempts to depict the realities of ASM and what main challenges of the sector are reported in the literature and in my interviews.

Very short summaries of each sub-section of this chapter are laid out in the following table, to avoid getting lost when reading.

Section	Short description
5.1	**Voluntary standards and legislation**
5.1.1	**OECD**: OECD due diligence guidance is considered the basis of most industry and government led provisions for ASM. Its scope includes all minerals from conflict-affected areas, not only 3TG from the DRC. It is oriented to the industry.
5.1.2	**Dodd-Frank Act**: the Dodd-Frank Act was meant to cut the link between conflict and mining. In the beginning companies decided to source away from Africa, due to the difficulty of implementing due diligence in the region. This had harsh effects on ASM in the region.
5.1.3	**EU regulation on conflict minerals**: the EU's regulation on conflict minerals to be put in place in 2021. It aims to stop conflict minerals entering the EU
5.1.4	**Legislation and certification**: the DRC and surrounding countries were the one that were most scrutinized in the beginning as they had most legal push behind them, before the scope of regulations and certifications (OECD guidance, EU regulation, CFSP) expanded to all conflict and high-risk areas.
5.2	**National legislation and issues**
5.2.1	**Marginalisation and reputation of ASM**: ASM are marginalized in many countries, and the general perception is negative. Though ASM is a livelihood to millions, LSM is often preferred by governments. There are debates on whether the view on ASM is changing, if only a little.
5.2.2	**Governmental provisions for ASM and efforts of formalisation**: some countries show less push for the formalization of the ASM sector than others. Laws for ASM are not suited and often the costs outweigh the benefits for artisanal miners. Governments need to understand the sector and need the capacity to enforce laws, which is often lacking.
5.2.3	**Approach to regulating ASM**: formalisation efforts have not been as successful as expected because of cost-benefit issues for miners, because of trust issues between ASM and their governments and because pre-existing structures of ASM were not considered in reforms.
5.2.4	**Certification and formalisation**: if ASM activities are illegal, they will have no opportunities to work with companies or organisations, as these work only with registered and licensed miners. Even when a premium is offered, it might not outweigh the costs of formalisation and paying taxes.
5.3	**ASM sector**
5.3.1	**Short-term thinking:** ASM is often driven by short-term decision making, and miners will often favour instant and highest pay for their minerals. They will also favour unsustainable practices if these are cheaper. This is unattractive to potential investors.
5.3.2	**Geography and geology**: volumes produced by ASM are low when compared to LSM, and for certifications, the pooling of production is a challenge. There are many factors playing in

	whether minerals will be sold through illegal channels. ASM have their own geological knowledge.
5.3.3	**Vulnerable groups**: women and children play important roles in the ASM sector and are not always fairly accounted for. There are also debates and different opinions on whether ASM is poverty-driven and whether children are neglected.
5.3.4	**Environment, health and safety**: many environmental and safety issues are related to ASM activities, and often these are due to financial issues rather than ignorance.
5.3.5	**Miners' motivations and viewpoints**: ASM can be a better livelihood than farming. There are often little services for ASM miners and their families (education, health, infrastructure). There are trust issues between mining communities but also strong relationship between miners and middlemen, who give loans.
5.3.6	**Artisanal miners and certification**: increased production and the premium might be incentives for miners to join a certification programme, but there are other factors are play, like cheap equipment coming from elsewhere.
5.3.7	**Challenges**: ASM is not the same in all countries or even regions, and this should be considered by policy makers and certification organisations. Challenges for certifications include: distrust, improving practices to reach standards, the commitment of organisations and making sure they can work on their own.
5.3.8	**Barriers**: a big barrier to certification: ASM need immediate payment, however, certification systems need to aggregate production to ship it and process it at low costs. A limitation to certification is that they can only work with ASM that already have a degree of organisation, and therefore cannot access those at the bottom.
5.4	**Downstream Actors**
5.4.1	**Responsibility**: the industry has the duty to apply due diligence along their supply chain. For the case of minerals in the electronics supply chain, this has proven to be difficult.
5.4.2	**Interest and sincerity**: there is interest in finding ways to source minerals responsibly and many projects were initiated by downstream stakeholders. Different ways include going through a programme (like a certification system) or practising due diligence case by case, by the company itself.
5.4.3	**Risk**: for downstream companies, sourcing from ASM is risky, as they are liable for any social or environmental impacts, for human rights abuses and links with conflict. Companies need transparency and accountability, often difficult to get from ASM.
5.4.4	**Awareness**: there is a lack of awareness among the industry and consumers of issues faced by the ASM sector, and therefore there is a lack of demand for certified minerals. It is even more difficult for the case of electronics as it would involve certifying the huge number of metals used, only present in small amounts.
5.4.5	**Cost Barriers**: there are still inhibitions on the part of the industry to joining certifications due to their costs.
5.5	**Certification**
5.5.1	**Local understanding**: key to a successful certification system is the understanding of how ASM work, what their motivations, structure, power relations and practices are.
5.5.2	**Certification standards**: generally, certification standards for ASM contain entry and progressive standards. However, these seem to be generally too high for many artisanal miners. Certifications make their own criteria, and some have extra social and environmental criteria on top of human rights and conflict ones. Some say less criteria is more efficient.

5.5.3	**Chain-of-custody**: some advise for a mass-balance chain of custody to overcome the problem of the low volume of production.
5.5.4	**Traceability**: iTSCi is the main traceability system in the DRC region, and it is not digitised. Other traceability systems are emerging, like that used by the Better Sourcing Program: GeoTraceability, which is digitised.
5.5.5	**Costs**: schemes like Fairtrade, Fairmined, or the Better Sourcing Program avoid placing the costs burdens upstream. If they are not paid upstream, they must be paid downstream. Dividing these costs is a challenge.
5.5.6	**Interoperability of schemes**: currently, certifications standards are not standardized. There are schemes who mention other schemes and can work together. However, this should be more systematic to avoid duplication, extra costs and recognition by laws.
5.5.7	**Scalability**: there are bottlenecks to scaling up schemes like Fairtrade or Fairmined, and they are primarily financial. A lot of financial support is needed upstream to improve practices but it is difficult to get the money downstream from the industry and consumers, especially if only the tiniest fraction of certified material is in their electronics.

Table 9 – Short description of each sub-section of chapter 5

5.1. Voluntary standards and legislation

5.1.1. OECD

The OECD (consensus membership driven organisation) due diligence framework for minerals from conflict-affected and high-risk areas was limited to gold, tin, tantalum and tungsten. However, in the most recent updates version of the guidance, the approach is extended to cover all and any geographical region and type of minerals (Manhart, Gsell, Hay, & Schüler, 2017). Therefore, instead of focusing on 3TGs in the DRC, it aims to be relevant for all minerals or metals from conflict-prone areas.

The OECD guidance is considered a beacon for the industry and governments to focus on. National legislation (in the US and EU) as well as NGO and industry-led initiatives are based on and aim to comply with the OECD due diligence guidance (Barendse interview; Jameson, Song, & Pecht, 2016). However, the OECD guidance, as well as the Dodd-Frank Act, are criticised in Hilson (2016) for being oriented towards companies rather than ASM operators, and that though they claim to want to foster local development, they do not seek partnerships with informal ASM operators.

The Annex II of the OECD due diligence guidance, on Responsible Supply Chain of Minerals from Conflict-Affected and High-Risk Areas, says companies anywhere in the supply chain must identify, manage and mitigate their risks. Unlike the Dodd-Frank Act, the OECD guidance is process-based rather than results based. Companies must evaluate, understand and mitigate their risks and report on the process rather than the result only.

5.1.2. Dodd-Frank Act

When the Dodd-Frank (Wall Street Reform and Consumer Protection) Act came into effect in 2010, pushed by pressure from international NGOs and human rights organisations (already in the 1990s Global Witness,

Partnership Africa Canada, Human Rights Watch and Amnesty International published reports on the topic), most consumer electronic firms were uncertain about whether their supply chains could be considered DRC conflict-free. The easiest response was to shift their supply chains away from the DRC rather than try complying, partly because demonstrating that they were not contributing to conflict in their supply chains was very challenging, partly as there were no existing systems and methods to trace materials to its exact origin (Fairphone interview; Cuvelier, Van Bockstael, Vlassenroot, & Iguma, 2014; Manhart & Schleicher, 2013). Hilson et al. (2016) also points out the 8-10 million people making a living from informal ASM that were not consulted before the passing of the Dodd-Frank Act ad were very negatively affected by its consequences

Although president Kabila at the time announced a mining embargo, directly after the enforcement of the Dodd-Frank Act, which had dramatic impacts on livelihoods and local economies (mineral trade is the driver for money circulation in these regions), the Dodd-Frank Act also served as a wake-up call for actors in the industry and sped up the mining reforms (Cuvelier et al., 2014). The Dodd-Frank Act and the mining embargo together, meant to de-link minerals and conflict and annihilate the funding of rebel groups, was harsh in the beginning to the local mining communities in the DRC (Barendse interview, Fairphone interview). As companies responded by avoiding or even banning minerals from the DRC in their supply chains, the income and livelihoods of local mining communities were severely negatively affected (Fairphone interview). Some argue that there is evidence of increased smuggling to neighbouring countries during that time, especially for tantalum, tungsten and gold (more easily smuggled compared to tin ore (Manhart & Schleicher, 2013; Radley & Vogel, 2015). In the years after it came into action, electronics manufacturing companies and mining companies started recognising that resources supply chains, CSR and business ethics should be part of their broader manufacturing process (Cuvelier et al., 2014). Cuvelier et al. (2014) mention the “slowness” with which mining reforms are being implemented, and as a result ASM operates in a grey zone of legality and illegality. Radley and Vogel (2015) see two contrasting futures for the situation in the DRC. Either the sector risks to be green-washed where multinationals and Western governments improve their image while no solutions are found. The other option is re-shape current rules and policies based on a more detailed analysis of the ASM sector, of the local mineral trade and of the underlying causes of violence and instability (Radley & Vogel, 2015).

Whether or not the Dodd-Frank Act has served well in the end is very much debated, and seems to be very nuanced. Radley and Vogel (2015) find that violence and the presence of armed groups have not significantly decreased in the region. Similarly, Seay (2012) finds that it has done little in the way of improving security or the daily lives of local people (Seay, 2012). These results largely contrast with the findings of the Enough Project’s findings that significant positive impacts can be seen on the ground, including a reduction by two thirds of armed groups and army presence in 3T mines, and the decrease in economic viability for armed groups to mine three of the four conflict minerals (Bafilemba, Mueller, & Lezhnev, 2014). Various other analyses of the security impacts have been put forward: security situations have improved in many of the larger mines under companies, authorities and civil society observation, increased smuggling has been benefiting armed groups which increased after the Dodd-Frank Act and the suspension, or even that the collapse of artisanal mining and removal of economic opportunities following Dodd-Frank and the embargo fuelled conflict, and pushed young people to join armed groups (Manhart & Schleicher, 2013; Matthysen & Montejano, 2013).

5.1.3. European Union regulation on conflict-minerals

Starting in 2021, the EU regulation on conflict minerals will attempt to stop the export of conflict minerals and metals to the EU, smelters and refiners from using conflict minerals and stop the abuse of miners (European Commission, 2014). Back in 2013, Manhart and Schleicher (2013) made several recommendations for Europe's approach to conflict minerals, to avoid unintended side-effects on the economic activity and people's livelihoods. These include using resources directly to support responsible mining in the DRC rather than on downstream chain-of-custody systems, support responsible sourcing projects in the DRC, develop a system that benefits companies who engage in responsible sourcing directly, engage in a dialogue with the ICGLR and Congolese and European stakeholders to agree on common understandings and commitments, among others (Manhart & Schleicher, 2013).

5.1.4. Legislation and certification

Although several published reports call for the support of local development initiatives and conflict-mineral and responsible sourcing projects in the DRC, these initiatives cannot replace development policies by the DRC government and country-wide action (Jameson et al., 2016; Matthysen & Montejano, 2013). Companies visibly have a legal push (OECD, Dodd-Frank, EU regulation) to support and use certification and traceability initiatives in Central Africa because the possibility of benefiting conflict is very risky for a company (as well as serious human rights issues). Minerals from the DRC and the 9 adjoining countries have a lot more regulation behind them, as they were the ones stated in the Dodd-Frank Act, first to address the conflict issue. Only recently has the scope expanded to Conflict and High-Risk Areas without reference to specific countries, in the EU regulation, in the OECD guidance or in the Conflict-Free Smelter Program. Latin America, did not have the same regulation behind it, and for certifications to operate there, companies had to voluntarily put efforts and finances into socially and environmentally responsible minerals, but this might change soon (BSP interview).

5.2. National Legislation and issues

The reputation of the ASM sector and the way it is seen by local governments and by society will partly play a role in the way that sector will be approached and until it is a good one, the government will be reticent to work with ASM (Childs interview). However, it is important to point out the fact that the ASM sector is viewed very differently, and there are different beliefs around ASM, in different countries (Childs). There are three important points that stand out when it comes to the relation of ASM with local governments: the reputation of ASM and the often-cited preference for large-scale mining, existing regulations and provisions for ASM, and the motivations behind artisanal miners' choices.

5.2.1. Marginalisation – reputation of ASM

There is a common characteristic to artisanal and small-scale mining that can be found in most of the literature: artisanal and small-scale miners are marginalised in society (Buxton, 2013; Childs, 2014b). They are reported to be operating illegally on land they have no right to mine on, their practices are often environmentally polluting and degrading, and their practices often involve some of the worst forms of

social and human rights abuses. Yet, artisanal and small-scale mining is a livelihood to millions of dependent people in South-American, African and Asian countries. Hence the call for governmental action, and in many areas governments (with donors and researchers) are taking action, recognising the role of ASM in national development (Jønsson & Fold, 2011). The fact is, however, that in many countries, large-scale mining is preferred over artisanal and small-scale mining – understandably for developing countries, as taxes and royalties can be collected easily, but often ASM is neglected (Childs interview). Part of the problem is also that governments are reticent to working with artisanal and small-scale miners because these are considered as criminals and crooks (Childs, 2014b). They are quickly pointed at for criminal offences for example (Childs interview). This view could be slowly changing though, as development initiatives and certification initiatives cast a different light on the sector and change the narrative about artisanal miners and the way they are seen in their countries and beyond (Childs, 2014a; Jønsson & Fold, 2011). On the other hand, some are pessimistic about the future of ASM, as even after decades of awareness by intergovernmental organisations about the potential of including ASM in poverty alleviations strategies, governments still lack interest and is part of the cause for the marginalisation of the sector (Labonne, 2014).

5.2.2. Governmental provisions for ASM and efforts of formalisation

A study by Mutemeri et al. (2016) analyses the provisions for ASM of five African countries (DRC, Tanzania, Sierra Leone, Ghana and South Africa) and find that all of them mirror those for large-scale mining, except they are scaled down to suit smaller areas and have shorter validity periods, less rigorous requirements and limited trading boundaries (Mutemeri, Walker, Coulson, & Watson, 2016). Indeed, some have described a lack of political will in, some countries like the DRC, to increase control over their ASM sector (Matthysen & Montejano, 2013).

Saying this, there are countries which are very eager to formalise the artisanal mining sector, one being Colombia. One of the main reasons is the potential revenue from that sector. If mining operations are illegal, they cannot be taxed, resulting in large financial losses for the government (Bodenheimer, 2014; G. M. Hilson, 2002). Of course, on the side of the government there is the challenge of getting to grips with a very large and valuable sector, that is almost completely informal to this day. This means governments must start from the bottom when it comes to taxation and investment in the sector, as well as the provision of reciprocal services. However, government should keep in mind that the benefits of formalisation must outweigh the costs for artisanal miners, as they will be in competition with all other systems at play including illegal ones and those which confer short term benefits to miners, especially in remote areas where state resources are hard to find (Rolfe interview).

This is an aspect that governments have seemed to ignore. Several scholars have argued ASM regulations are badly suited and not thought through (Bodenheimer, 2014; Mutemeri et al., 2016; Salo et al., 2016; Verbrugge & Besmanos, 2016). The past and current approach of governments to attempt to regulate and formalise the sector has been through permits, licenses and concessions (Verbrugge & Besmanos, 2016). Even in countries where there are provisions for ASM like Ghana or the DRC, only a fraction of ASM activities are found to be legal. For example, in Ghana less than 25% of miners operate legally even though it has been legal since 1989; and in the DRC, 90% of gold and half of coltan and cassiterite is produced informally (Bodenheimer, 2014; Geenen, 2012). It does not have to do with the unwillingness of miners to legalise but rather with the number of obstacles making it unattractive for them (Bodenheimer, 2014).

There are several issues associated with this approach that have been pointed out during interviews and in the literature.

Some of the practical reasons behind governmental provisions' failures include the following. For governments to not make losses on gold sold through illegal routes, for instance, Zimbabwe has made it mandatory to sell to the government's central bank, but was often bought for as little as 1/30th of the market price (Imparato, 2010). Especially with the case of gold, with it being easy to smuggle and readily bought.

Another obstacle to complying with regulation has to do with the nature of artisanal and small-scale mining: mine sites are remote and miners are mobile. Traveling to the appropriate mining offices, and losing time, to apply for mining licenses is costly to artisanal miners (Bodenheimer, 2014; Verbrugge & Besmanos, 2016). Sometimes this is a process which needs to be repeated several times due to slow and inefficient bureaucratic institutions (Bodenheimer, 2014). Miners need great mobility and flexibility when looking for viable mining areas, which keeps them from actively seeking permits and licenses (Verbrugge & Besmanos, 2016). Miners can also be put off from applying for licences because of their low literacy rates and the need to fill in a lot of official paperwork (Bodenheimer, 2014).

Large-scale mining has also limited the availability of land for artisanal miners, because large land concessions have gone to multi-national large-scale mining companies, which have taken over sizable sections of countries like Tanzania, Ghana, Uganda, which are now under the control of foreign multi-nationals (Bodenheimer, 2014; G. Hilson, Hilson, & Mcquilken, 2016; Verbrugge & Besmanos, 2016). This makes it hard for miners to acquire land titles and leaves them with the only option of operating illegally in large companies' concessions. It becomes clear that the costs of formalisation clearly outweigh the benefits for artisanal miners, making some of their choices very rational.

There are also issues on the side of the government. Some argue that in general, governments lack the capacity to implement their regulations. An example of this is the case of the Madre de Dios region in Peru, where informal gold miners have polluted rivers and destroyed forests. The Peruvian government has had difficulties implementing their formalisation plans from reasons addressed by Damonte (2016): the state could not enforce its laws and regulations because the state seems to be more interested in extracting resourced rather than fostering development in local communities, and because their framework for ASM is based on LSM, leading to issues when trying to regulate, contradictions and errors. Not understanding and recognising the differences between LSM and ASM would indeed lead to failure (Damonte, 2016).

Artisanal and small-scale mining is in most cases spread over large regions, and sending people out to collect taxes would be nearly impossible. Governments must also recognise that ASM itself is not a homogeneous group either (Verbrugge & Besmanos, 2016).

5.2.3. Approach to regulating ASM

Mainstream formalisation follows the idea that transforming pre-existing activities (access to resources) into private property and enforcing rights and obligations to those property owners, the recipients will have the opportunity to capitalise their possessions. Allocating these property rights through permits and licenses should in theory give people the incentive to invest and develop. It is then assumed that recipients will then abide to social and environmental norms related to their activities (Salo et al., 2016; Verbrugge & Besmanos, 2016). Salo et al. (2016) argue that these (property rights and duties) are not necessarily

linked. These kind of formalisation efforts have often failed, for several different reasons, and have resulted in the frustration of all stakeholders involved (Salo et al., 2016; Verbrugge & Besmanos, 2016).

There is also the view that miners do not have the incentives to comply with regulation because of their relations with their government. If they did pay taxes, they often do not see the benefits of it, do not get anything in return (Matthysen & Montejano, 2013; Verbrugge & Besmanos, 2016). It can be argued that some governments are situated on the line between being for themselves or being for the people, asking the question of whether, for the government, citizens are a means to an end or an end in themselves. Is the aim to improve people's lives or purely to generate revenue? If the aim is purely to generate revenue, at the expense of improving people's conditions, policies and regulations are likely to show this. Policing, the lack of reciprocal services, and taxes higher than income, will all create a sense of distrust for the government among artisanal and small-scale miners (Rolfe interview, Barendse interview). In the case of the DRC for example, the reported lack of political will to control its ASM sector could come from the lack of financial incentive (low potential financial return) versus the effort needed to deal with such a large informal sector. However, the Congolese government should recognise the importance of artisanal mining for its population and local development (Matthysen & Montejano, 2013). As corruption is ubiquitous in the DRC and instead of protecting miners, state agents extort miners and local traders, their relationship is largely one of mistrust, which is an enormous barrier to formalisation (Matthysen & Montejano, 2013).

Several studies in the literature identify a failure on governments' part to consider pre-existing organisational arrangements of the sector (Mutemeri et al., 2016; Salo et al., 2016; Verbrugge & Besmanos, 2016). Reform policies for ASM were found to have been too paternalistic and top-down and lack engagement with mining communities (Childs, 2008). It is argued that governments' attempts to formalise and regulate the sector will only succeed if it recognises those informal rules that are currently applied in the sector (including the socially accepted arrangements and embedded institutions (Persaud, Telmer, Costa, & Moore, 2017). This means an understanding of local arrangements is needed, these include details of how miners' financial situation works. The design of future policies for ASM should be based on the existing interlinkages between illegal and legal actors that currently operate (Fold, Jønsson, & Yankson, 2014). O'Faircheallaigh and Corbett (2016) argue that often ASM has often been ignored by politicians and regulators, and when it has not, there tend to have been inconsistencies in policies and regulations, meaning the full potential of ASM has not been realised and the negative impact have not been addressed (O'Faircheallaigh & Corbett, 2016). An example of local arrangements can be seen in the master thesis by van de Camp (2017) on artisanal gold mining in Ghana, where in order to mine within the legal framework, a so-called leader owned the concessions and allowed miners without concessions or permits to mine on pieces of his concession.

Several ways forward have been suggested in the literature. These include pushing for collaborative approaches and including the participation of local actors, before or during any formalisation process, allowing for more bottom-up, locally designed and implemented measures for ASM (Salo et al., 2016). Similarly, Mutemeri et al. (2016) propose an inclusive policy making process (self-regulation), and a strengthening of local forms of organisation (country and sector specific). Local authorities and governance institutions therefore play a key role, as they have local knowledge and are present on the ground. Affordable and tailored services for ASM should play a big role in the formalisation debate, along with access to mineralised land and to credit (Fold et al., 2014).

Collaborations between large-scale mining and artisanal and small-scale mining have also been put forward in the literature and have been tested in some countries. Considerable opportunities for mutual benefit and cooperation have been expressed, these include LSM serving as comptoirs for ASM or LSM giving some of their sites for ASM (Levin & Cook, 2015). An example of this is the company-led creation of ASM reserves in the Guianas, initiated by the government and a mining company. They however found several limitations to the success of this approach, including a distrust between ASM and both the government and the company, disagreements between ASM and the company on the roles to be played by each, and a lack of communication between the company and displaced miners (Smith, Smith, John, & Teschner, 2017). LSM is largely favoured by governments over ASM and this is usually reflected in policies that fail to protect ASM. Similarly, policies for resettlement are poorly thought through and fail to understand the context of ASM (Buxton, 2013). Again, there is much distrust and misunderstanding between the sectors (Buxton, 2013; Smith et al., 2017).

5.2.4. Certification and formalisation

There are inconsistencies in the literature about formalisation, legalisation and formalising the ASM sector. It is argued that the issue is not so much about operating legally, but rather, operating responsibly, and that formalisation is a process, it is not only legalisation, and requires presence in the field and continuous education (Stocklin-Weinberg interview). Legality and formalisation are sometimes used interchangeably, but legality is part of formalisation (Fairphone interview). Similarly, some argue that before any certification can be introduced, the sector must be formalised to a certain degree and there must be basic monitoring of ASM activities (Liebetrau interview).

The key issue is that if artisanal mining activities are illegal, these miners will have no opportunities whatsoever. No environmental or social issues can be solved without organisation, legality and formalisation. Companies and organisations are unlikely to work with illegal mining organisations as that means they would not have a legally recognised partner to work with (Fairphone interview). As an example, the NGO Pact is currently working on a project of artisanal and small-scale tin mining in Indonesia, with the aim of developing a training programme. However, they are only limited to a small fraction of all mining communities because the local government will not allow a programme that engages with illegal mining. However, some of the most serious health, safety, social and environmental problems occur in these communities that mine illegally (Stocklin-weinberg, Veiga, Villegas, Sulaiman, & Michaux, 2017). The Better Sourcing Program, also for example, work only with legal mining cooperatives that are registered with the government (BSP). As standards only cover legal activities, the issue of formalisation and legality is not addressed by any of these certification initiatives (Jønsson & Fold, 2011). And therefore, the legal status of artisanal mining activities is considered by most the biggest hurdle (Bodenheimer, 2014).

If a certification were to try and encourage legalisation and formalisation of artisanal mining activities through their certification, then the benefits for artisanal miners must be higher than the other option of staying informal. Taking the example of certifications like Fairtrade (FT) or Fairmined (FM) Gold that work with a premium and minimum price concept. These premiums are fixed by FT or FM. The level of taxes however changes per country. When the costs of formalisation and taxes not yet paid of the miner are higher than the premium offered by FT or FM, there ends up being little outlook for successful certification and formalisation. This will also depend on the country in question and its governance system. If the quality of governance of a country is low, the application of legal texts is weak and miners will be tempted to stay

informal (Priester – Projekt Consult). Certification organisations should therefore consider the legal framework of a country and the point of view of miners.

An unwillingness on the part of governments to get on board certification initiatives in their countries has also been observed. Especially outside the Great Lakes region, where governments are less likely to see the merits of costly traceability and certification systems whose costs are largely assumed inside the country and can undermine international competitivity. The costs are often assumed by the exporters, people along the supply chain and commonly passed on to the miners themselves (Rolfe interview). This issue also goes back to the question about national sovereignty and how these initiatives have presented themselves as a challenge to national sovereignty. In Tanzania for example, Childs found that the state was weary and almost suspicious of Fairtrade Gold because they felt it was removing the sovereignty of gold as a resource from Tanzanian people in a way (Childs).

5.3. ASM sector

Artisanal and small-scale miners have certain characteristics proper to their sector and that can be viewed as barriers to attracting interest from the government or investment from companies.

5.3.1. Short-term thinking

ASM is a short-term activity driven by short-term decision making, and there is often little or no long-term thinking (Buxton, 2013). This was described by Buxton (2013) as a result of vulnerability, itself a "coping mechanism for poverty". Many artisanal miners worldwide work on a seasonal basis and may prefer to stay informal as to receive instant money (Fairmined interview). Not being paid instantly might also encourage miners to sell through informal channels. For instance in the case of Guinea, Rolfe (Levin Sources) reports on comptoirs in Conakry delaying payment to the traders (themselves buying from ASM), which would leave them with a financing gap, which might encourage selling informally (Rolfe interview). Artisanal miners have little business acumen or financial literacy and therefore no long-term planning, though they might be organised in practice. For example, Seccatore and Theije (2017) find that small-scale gold mining in Suriname is led by informality and insecurity, resulting in short-term mining solutions such as the use of cheap, polluting and inefficient technologies, instead of clean and efficient technology for stable, long-term mining and secure business planning (Seccatore & de Theije, 2017).
This makes the sector very unattractive to any potential financer or for microfinance (for which they often do not qualify for or which have too high interest rates). Artisanal miners can become stuck in a cycle of poverty where they are incapable of investing in equipment and become dependent on informal lenders.

Due to the nature of artisanal and small-scale mining, only easily accessible deposits are mined and often quickly exhausted. Hence the mobile nature of artisanal and small-scale miners in the search for mineralised areas (O'Faircheallaigh & Corbett, 2016). Alluvial gold miners need to move around to follow the "call of rich finds". This often keeps them from operating legally, as mobility keeps them from obtaining a mining title in many cases (Projekt Consult).

5.3.2. Geography and geology

In many cases, artisanal miners work in remote areas with poor transport links and poor access to market, making them less able to access information, technologies or infrastructure (Buxton, 2013).
In African countries, artisanal and small-scale mines are typically more scattered whereas in countries like Peru, there are many more mining hubs and more miners per deposits. This will have an impact on the ability to aggregate all the material from different mines and move it to the next stage of processing (Fairphone interview). Volumes produced by ASM are low when compared to LSM, and the pooling of production is a challenge. Miners typically work with informal traders that come to the mine sites (Stocklin-Weinberg interview).
Many countries where ASM takes place also often have limited infrastructure (Buxton, 2013). This will affect the decisions miner take when it comes to where to sell their materials, especially in contexts of insecurity. It might be easier for a miner to go through secure, developed, direct and quicker routes to a neighbouring country than travel for long hours to reach his country's capital to sell his minerals (Rolfe interview).
There is also the fact that many ASM do not do prospecting or exploration the same way large-scale mining does. They therefore cannot provide reports with ore quantities contained in the ground or provide any information on the likely return on investment (Fairmined interview). It is often reported that artisanal miners do not know how much gold is available in an area and do not have any geological knowledge. In Colombia for example, ASM often occurs in regions where large-scale mining was extracting before but left because it was unsustainable for them to continue mining there (Fairmined interview).
This will also be an issue for any potential investors. There is no point investing if the deposit is not viable in the long run.

The master thesis of E. van de Camp (2017) suggests otherwise. Through field work in an artisanal gold mining neighbourhood in the village of Gbani, Northern Ghana, she finds the gold mining activities are relatively organised. She observed visible knowledge about the geology in theirs and neighbouring gold mining areas, including the solidity of the ground, purity of the gold, the depth and shape of the ore as well as the directions and shapes of gold veins. Their decisions on where to mine will also factor in the location of neighbours and their mining activities, and cultural beliefs about ancestors and land spirits, which van de Camp (2017) found was very present. She argues miners are not mining "blindly" and the social-political, geological and spiritual dimensions come in to play in their decision making. Van de Camp highlights the gap between the miners' approach to gold mining and the perspective of policy makers and the scientific community (van de Camp, 2017).

5.3.3. Vulnerable groups

There are significant differences in how women participate in artisanal and small-scale mining and are involved in the communities, compared to men. They often specialise in ore crushing and the processing of minerals, in providing sustenance, cooking, washing and are involved in the logistical side of activities (Buxton, 2013; Childs). They are expose to harmful chemicals, even during pregnancy. Their jobs are often as manual as the men, the only difference being they do not go down the shafts (Childs). They often are abused (domestic violence or forced into prostitution). Cultural and traditional factors were described as the determine factors for the role of women. On site, they are often invisible and their contributions have generally been poorly researched (Buxton, 2013). Women's roles however generally tend to decrease as

mines develop and become more mechanised, and therefore do not benefit from developments (Buxton, 2013).

The people that do go down the shafts are often young men, and sometimes young boys as young as 12 (Childs) or 9 (Buxton, 2013). However, it is important to keep in mind that it is not possible to generalise here as every mine as a different division of labour and can be completely different to the next. There is no particular pattern, apart from young men often being the ones going down the shafts. Potter and Lupilya (2016) argue, however, that child labour in ASM is more nuanced than just poverty-related (Potter & Lupilya, 2016). Though poverty is the main driver behind child mining (children work in mines to cover school contributions and/or help with their family's economic welfare), they also found that in some instances, families believe mining provides vocational training for their children. They also describe the culture of consumption among miners, where money is often spent on alcohol, prostitution and conspicuous consumption rather than on the education of their children, leaving the burden on mothers. Potter and Lupilya (2016) indicate two strategies to overcome these issues: eliminate additional school contributions, and address the causes of household fragmentation: addressing the traditional practices of polygamy and patrilineal inheritance through family planning and legal changes, addressing the culture of consumption (by mitigating the danger of mining through education) and increase support from national and regional governments for at-risk children (Potter & Lupilya, 2016). Buxton (2013) finds that the situation of children is closely linked to that of women (poverty, lack of education and control over earnings).

5.3.4. Environment, health and safety

Many health and safety issues associated with artisanal and small-scale mining have been reported in the literature and in the introduction of this thesis. Exposure to dust, noise, vibrations, poor ventilation can lead to several health issues, along with long-working hours and over-exertion, and lack of hygiene and sanitation services (Bodenheimer, 2014).
The most discussed issue in ASM is the use of chemicals, especially the use of mercury in gold amalgamation, which releases mercury vapour and is absorbed in the bloodstream and can cause several serious conditions. It is also released in the environment, polluting water and air and other animals. Other environmental impacts common for ASM are: deforestation, air pollution, erosion, acid mine drainage, land degradation (Bodenheimer, 2014). As a short-term thinking activity, generally the long-term consequences on the environment are overlooked, and miners lack the knowledge and resources to practice environmentally friendly mining (Buxton, 2013).
Some of the certification initiatives involved in artisanal and small-scale gold mining assumed that miners did not know the damaging impacts of mercury on the environment and their health. However, some would argue otherwise. Artisanal and small-scale miners are more or less aware of the fact that mercury usage is damaging to their health and to ecosystems and waterways (in which they fish in and wash their clothes). From his experience in Tanzania, Childs finds that miners treat mercury as a kind of precious commodity and try to save it and reuse it as much as possible, partly because of the costs but also partly because of the environmental impacts (Childs). Mercury tends to be very cheap and accessible, which any alternatives are not (Buxton, 2013). Similarly, protective helmets or masks may be too costly for miners and even those motivated to improve safety often lack resources (Buxton, 2013).

Miners generally recognise the risks associated with mining and miners identify ASM as one of the most hazardous livelihood option available (Smith, Ali, Bofinger, & Collins, 2016).

5.3.5. Miners' motivations and viewpoints

Motivations and incentives

Contrary to the assumption that artisanal and small-scale miners want to leave the sector for other livelihoods, some literature suggests ASM activities can be quite lucrative, three to five times more than other poverty-driven activities like forestry, fishing or farming, and in some instances, have supported local communities (Buxton, 2013; Smith et al., 2017). And as discussed above, ASM has been present in some regions for generations and many people have developed skills specific to mineral mining and trading (Smith et al., 2017). In Senegal for example, artisanal gold miners live well above the rural poverty line and often have large potential for saving especially when pairing incomes with the household (Persaud et al., 2017). Similarly, ASGM in Sekotong, Indonesia, was found to improve income and create job opportunities (Suhartini & Abubakar, 2017). When the mines are closed in winter months, most gold miners are involved in agricultural activities (Persaud et al., 2017).

Artisanal and small-scale miners often want to mine responsibly and would like to practice environmentally and health friendly activities, but often there are barriers and other priorities keeping them from being more responsible, such as their economic wellbeing, trust, security. An example of this is the way the Fairmined Gold was initiated, it was inspired and developed based on the experiences of Oro Verde, a Colombian initiative by artisanal miners who wanted to show that artisanal mining can be done responsibly (Fairmined interview).

Taxes

In some countries, miners have no motivations or incentives to legalise their activities and pay taxes as very often they will never see the benefits of those taxes.

Communities where ASM happen can be neglected by the state, as it is the case in the Guianas for example, where there is a lack of educational services, poorly maintained roads, and intermittent access to electricity resulting in distrust towards the government. Similarly, the Guianan government hardly recognises land rights for communities that have lived in the area for centuries (Smith et al., 2017). If people from the government harass miners instead of protecting them, they will have even less motivations to pay taxes. The revenues from ASM reach the governments, as described by Labonne (2014) in Brazil, but the local institutions rarely receive the financial benefits from the sale of minerals which would be used for services in ASM communities. Labonne (2014) describes a lack of capacity at the local level to influence the central government through strategies and policies (Labonne, 2014).

If taxes in a country are high; some taxes on gold or tin can be as high as 20%; it might be easier to smuggle to a neighbouring country where these are lower. For ASM gold from the DRC, for example, the provincial taxes are too heavy for miners and négociants when compared with tax rates in neighbouring countries (Levin & Cook, 2015). Levin and Cook (2015) estimate undeclared ASM gold in the DRC to reach 97%, because it is almost entirely informal.

Trust

The whole ASM sector is very heterogeneous, mining communities lie along a whole spectrum of organisation, productivity and formalisation. The miners whose activities are the least formalised, those

at the very bottom of the food chain, have a fundamental mistrust of the mining organisations that attract support from organisations like Fairtrade (Childs interview). The level of mechanisation of a mining organisation, for example, results from the investment put into it. Microcredit loans were tried for this but were quickly siphoned off by the more formalised and more organised (Childs interview). The issue is reaching those communities that lie at the very bottom. The internal dynamics are difficult to get an understanding of and role of local politics should not be underestimated.
An example of this can be seen in Tanzania for example, where there are mining unions (regional mining associations) where everyone in the mining community, from the very bottom to very top of the formalisation ladder, are represented at the negotiating table. What can be seen, however, is that not everyone is equally represented. Most of the negotiations are conducted in English and therefore must be able to speak English to participate. Generally, the poorest members are the least educated and do not speak English (Childs). This issue of getting ASM voices heard at the local negotiating table is a problem that must be addressed.

What should also be taken into account is the existing structure of artisanal and small-scale mining, which has been built from the bottom up. Generally, mining communities work with middle men (négociants in Congo) between the mine sites and the buying houses. Négociants in Congo have a double function of pre-financing miners for the minerals and being the middle men (Fairphone interview). There often are pre-existing relationships between miners and buyers (Fairphone interview, Childs interview). These buyers sometimes provide forms of social security, which are rudimentary and not particularly fair but worth taking for miners. In many case, these buyers also lend money in times of hardship or help in other ways (buy schoolbooks for their children). These structures were set up locally, and are relationships that are very hard to break. Though ASM is viewed as disorganised and chaotic, the reality is that it is organised and built upon years of cultural practice and social interactions (Buxton, 2013).
In some cases, miners that struggle to accumulate income to improve their livelihoods end up securing finances through informal means and can become trapped in a vicious cycle of poverty, as they are vulnerable to exploitation by middlemen (Buxton, 2013; G. Hilson & McQuilken, 2014).

Security
Insecure mine sites might involve problems of prostitution, theft, vandalism and armed conflict (Buxton, 2013).
The motives pushing people to engage in ASM activities is largely different per country and economic context. In the literature, miners are generally categorised depending on whether they engage in ASM to diversify their activities because of desperation and to escape poverty, diversify their activities for greater economic return, or the entrepreneurial viewpoint of “getting rich quickly” (Maclin et al., 2017). However, whether it be push or pull factors causing people to engage in ASM, security has been found to be an important cause of displacement to ASM sites, especially in conflict-affected areas, though it did not negate the role of economic factors (Maclin et al., 2017).
Buxton (2013) identifies several points leading to conflict and insecurity: institutional weakness, corruption in governments, complex trading chains and easily smuggled minerals. In the DRC for example, the central government has little control over regions (Buxton, 2013).

5.3.6. Artisanal miners and certification

Why join a certification?
While the biggest incentive for mining communities to join programmes like Fairtrade or Fairmined Gold would be the premium (of $4000 per kg for Fairmined), there are barriers to joining such as the amount of administration, the whole formalisation process and the audits (Catapa interview).

However, other players are involved in miners' decisions to join or not a certification. Foreign communities provide equipment for much cheaper than Fairtrade or Fairmined are able to. Childs has seen big Lebanese and Chinese communities and even Russian machines on the ground. The issue here is if there are issues with the equipment, there are no forms of support and the sellers are often long gone. Certifications therefore must make their equipment price competitive.

5.3.7. Challenges

Understanding of local communities
Foreign developmental or certification organisations working in ASM areas must know the internal organisation and have a good baseline analysis of the communities they work with. The definition of ASM also is different per continent or per country, it looks very different in Latin America when compared to African countries. ASM in Latin America would be considered medium scale mining in Africa because of the higher levels of mechanisation (still rudimentary) (Childs). Though ASM over the world face similar challenges, their structure and drivers will be very different. These differences, mine specific challenges and varying incentives must be understood by policy responses and will have major implications for certifications like Fairtrade or Fairmined and how they approach both continents and specific mining communities (Buxton, 2013).
Currently, knowledge flows are poor between ASM and policy-makers or certifications. A system to capture citizen knowledge, structural challenges and livelihood opportunities is lacking, constraining any influence on policy improvements (Buxton, 2013). As pointed out by van de Camp (2017), there is misinformation on artisanal miners' practices and organisation, and the gap between the sectors is problematic when trying to involve them in the decision making.

Improvements to reach standards
Bringing mining organisations to Fairmined Certification sometimes is a challenge for the Alliance for Responsible Mining. Once they have identified mining organisations with potential, they try to facilitate access to funding and provide them with technical support, and accompany them during the whole process until they are ready to be certified and audited by a third party. It is a long process and getting through the improvement plans is an arduous and costly process (Fairmined interview).

Mistrust
Alongside mistrust between miners, and between miners and governments, a lack of trust can also be seen between miners and foreign organisations. Childs observed mistrust in Tanzania for example in a Fairtrade Gold mine where miners did not trust Fairtrade was weighing the gold and measuring its purity accurately (Childs).

Commitment
Certifications can only operate with legal miners, and generally only the miners who own land titles will be willing to invest the time and effort into acquiring certification (Bodenheimer, 2014). Commitment of the mining organisations is necessary to reach certification. A potential threat for certification is a leadership change in a mining organisation which decides not to proceed with the certification process (Fairmined interview).

Legacy
Once an organisation has finished bringing a mine to certification, it cannot keep giving support and must leave the responsibility in the hands of the mining organisation. There is a certain amount of risk associated with this, and the certainty that miners will pass on the best contents and best practices in peer to peer learning (on training, business administration, environmentally sound practices…). For instance, in one of their programs, Fairtrade were exploring the avenues for peer-to-peer learning where the mining organisation supported by Fairtrade would provide training to other mining organisations, however, there were no guarantees this would work (Stockling-Weinberg interview).
Medium-scale mining companies seem to be outside of the scope of most sustainability certification schemes, which either address ASM or LSM (Kickler & Dr. Franken, 2017). Schemes possibly developed for either one or the other due to their very different requirements. This asks the question of, once an artisanal mining community develops and increases its production and efficiency to the level of a medium-scale company, will it no longer be eligible for any support or scheme that will help them develop to the next scale through incremental requirements (Kickler & Dr. Franken, 2017).

5.3.8. Barriers

Volume of production
As artisanal mines only produce small amounts of material compared to large-scale mines, the production of different mines must be aggregated to be sent to the next step of processing.

This is a challenge for material from certified mines, as it should not be mixed to non-certified material. As an example, the first pilot of the Conflict-Free Tin Initiative (CFTI) was a closed-pipe supply chain, meaning one mine delivered to one trader which delivered to one refiner and one component manufacturer and so on. This helped for internal discussion and understanding, and to keep the whole supply chain transparent and accountable (as well as demonstrate that it is possible to source in a transparent way from conflict free validated mines in conflict areas, and develop the trust and confidence to be able to scale the pilot up and increase acceptance in the market of conflict-free minerals from conflict-areas). However, this system is not efficient and not feasible for ASM, because of their low volumes of production. Mines would have to stock material for weeks before being able to ship at reasonable costs, meaning that they would only receive payment after weeks, which is not desirable for artisanal miners (who would get paid every several months, meaning they would not get a steady income – unfeasible for them) (Fairphone interview). Keeping mineral batches separate would greatly increase the costs of shipping but also processing as generally several different batches are needed to refine to required grade.

Limitations

As discussed above, the ASM sector is not homogeneous, and mining cooperatives vary in their levels of formalisation and responsible practices. Though, for certification programmes to achieve some results they must work with those who feasibly are able to reach certification and already have a degree of internal organisation and structure.

The Alliance for Responsible Mining identifies mining organisations that have the potential to become certified, then help them reach their improvement goals to become certified. They were working on a project in West Africa in the last 2 to 3 years but the gap to certification was too big and the mining organisations were not able to become certified within the timeframe. Follow-up projects are being sought to help them reach the aim in a future project cycle (Fairmined interview). The Better Sourcing Programme work with mining cooperatives in the DRC and in Rwanda and work with already established exporters and mining companies and provide a stable selling point and foreign investment (BSP).

These are examples of how these interventions from foreign organisations and ethical mineral trading schemes target already established small-scale miners rather than the poor, needy and marginalised miners. Most retrace and fortify already existing mineral supply chains to facilitate the supply of tracked minerals (G. Hilson et al., 2016). Hilson et al. (2016) gives a critical view on ethical minerals schemes and standards saying their messages are ambiguous and gives a reminder these are not development initiatives. He goes on to say some standards are transparent about the fact their requirements and standards will be too high for many artisanal and small-scale mining enterprises (Conflict Gold Standard from the WGC), or not intended for ASM (IRMA), but very often the reality behind their messages tell a different story, among others he cites Fairtrade and Fairmined gold. He argues that these ethical trade schemes do little to challenge the trade and policy structures which have marginalised these miners in the first place (G. Hilson et al., 2016). Similarly, Bodenheimer (2014) finds that the Fairtrade and Fairmined standards are only accessible to those at the "top of the pyramid".

Mining communities need a minimum degree of internal organisation to be closer to the situation where not too much has to be invested to become certifiable. Cooperatives or other forms of organisations of artisanal or small-scale miners without a management structure will not be able to translate the standards into practice. This is a very big barrier for artisanal and small-scale mining (Projekt Consult).

5.4. Downstream Actors

5.4.1. Responsibility

The concept of extended producer responsibility (EPR), defined by the OECD as the integration of upstream and end-of-life environmental costs into the market price of a product (Scheijgrond, 2011), along with the concept of corporate social responsibility (CSR), downstream companies are called to take responsibility for any environmental or social impacts along the supply chain, generally going beyond legal requirements and including international guidelines, corporate codes, best practices (Risso, 2012). The industry is expected to enforce standards along their supply chain, even producers whom they do not have a contractual relationship with, and create transparency (Risso, 2012; Scheijgrond, 2011). Legally, this has been translated into the Dodd-Frank Act in the US and the conflict-minerals regulation in the EU, expecting companies to trace back the source of their minerals.

Difficulty of applying responsibility

The biggest challenge for downstream consumer electronics manufacturers is creating a fully transparent supply chain, partly because of the enormous number of tiers between the mine and the brand (Scheijgrond, 2011). Other points causing difficulty are the lack of supplier response, confidentiality issues or inadequate information, as can be seen in the research conducted by RESOLVE in 2010. As minerals in a product cannot be identified though chemical or physical methods, all the origin information must be collected through documentation, making sourcing from artisanal and small-scale mining particularly difficult (Scheijgrond, 2011).

5.4.2. Interest and sincerity

There is increasing interest of downstream stakeholders in social, environmental and ethical responsibility upstream. There is a sincere interest from some companies in wanting to be involved in the development of ASM and responsible sourcing, but the difficulties in doing so were, or are, often too high (Fairphone interview). Back when human rights organisations started denouncing companies for being related to conflict in the DRC and neighbouring regions, companies realised what was at stake but there were no guidelines or programmes that showed how to source responsibly (Young interview, Fairphone interview). Philips for example were a big driver behind the Conflict-Free Tin Initiative (CFTI), Kemet and AVX developed their own closed-pipe supply chain to source conflict-free from the DRC, and companies, NGOs and industry associations came together to form the Global e-Sustainability Initiative (GeSI) and the Electronic Industry Citizenship Coalition (EICC) with the aims of promoting economic, environmental, social sustainability for all those involved in the electronics supply chain (Jameson et al., 2016; Resolve, 2010). Especially since the EU regulation on conflict minerals has come into play, there has been increased interest from EU companies and among the industry, as an example, the number of people attending the OECD forum on responsible mineral supply chains increased six-fold between 2010 and last year (Barendse interview). Focus has been mostly on conflict-minerals with many initiatives trying to source responsibly from conflict-affected areas. The Netherlands' Ministry of Foreign Affairs have played a large role in awareness and in financing projects along the supply chain, including the project to scale up mineral trade in the great lakes region for which the Minister of Development and Cooperation, Lilianne Ploumen, said it is partly thanks to the "many stakeholders who refused to give up on the Great Lakes as a provider of minerals to the world" (iTSCi, 2015).

Though the legal push behind conflict-free minerals has certainly helped create interest and demand, especially for the 3Ts (tin, tantalum and tungsten), the case of gold is more complicated and is faced with more challenges. The gold aimed at jewellers and the finance sector have the advantage of traveling through a relatively short supply chain and comprising the total of final products, which is not the case for electronics. There are currently no operational traceability systems for gold in the DRC for example, and most of it (estimated 97%) is traded illegally (Levin & Cook, 2015).

Jewellers over the world have interest in Fairmined Gold or Fairmined Eco Gold, and Fairmined counts over 150 clients, the large majority of which are jewellers and the rest finance companies (Fairmined interview). The Netherlands have set up a gold covenant signed by the gold industry, frontrunner companies and NGOs to assess risks over the entire gold supply chain through a multi stakeholder dialogue with national roundtables (Barendse interview; Ramdoo, 2015).

When it comes to certification like Fairtrade or Fairmined gold, who's aims are social and environmental improvements in ASM and do not have a legal push supporting the, they must rely on companies wanting

to participate voluntarily. There are also more barriers, including the extra costs an electronic company would have to pay.

Outside of the Great Lakes region, companies shift increasingly towards due diligence measures rather than pure traceability systems and away from certification schemes, by doing risk assessments in the region for the criteria that are important to them. These company-led (downstream-led) responses to international requirements seem to have become a trend (Rolfe interview).

5.4.3. Risk

Investing in ASM is considered risky by downstream companies. Sourcing responsibly from ASM in the DRC is risky, especially with the political climate, and generally companies are not willing to put in the money considering the risks involved, when compared to large-scale mining. Proving that the sites from which they source are not associated with conflict financing or other negative social, environmental or rights impacts, for which companies are answerable, can be very difficult with ASM (Rolfe interview). For conflict-minerals there are a lot of due diligence systems out there but system to evaluate their performance is lacking. Downstream companies and the industry need the assurance that these initiatives are robust and effective, which calls for improved accountability, transparency, standardised evaluation (Levin & Cook, 2015). Indeed, for downstream companies it would be easier to engage with upstream small-scale and artisanal mines if the system was more efficient and databases were more accessible. Several solutions to this have been put forward including new technologies to make the system digitised, which would enable scaling up. People need more information on the actual conditions under which minerals are extracted. This is what the Better Sourcing Program tries to work towards by collecting a lot of information on the ground and report on contextual and situational information, and hoping to appeal to CSR policies of downstream companies (BSP interview).

5.4.4. Awareness

For a certification to work there needs to be a demand for certified products on the market. For the 3Ts, this was the case through conflict-mineral regulation like the Dodd-Frank Act. Some argue companies will only purchase certified products as long as they are obliged to by regulation (Bodenheimer, 2014). For the case of Fairtrade gold for example, Bodenheimer (2014) found that the FLO did not do enough marketing or advertising campaigns for it. The FLO need to invest more in promoting Fairtrade gold among jewellers, consumers and policymakers, and big awareness raising campaigns are lacking to inform about its added value (Catapa interview).

It is complicated for companies to explain the added value and the meaning of Fairtrade gold to customers (Bodenheimer, 2014). The first issue is the large number of standards that use the same terminology making it difficult for producers and consumers to keep an overview of available initiatives. The second issue is explaining to a customer that in the case of mass balancing, only a certain percentage of their piece of jewellery will be sourced from a Fairtrade mine (Bodenheimer, 2014). Though it would add value to electronics companies' CSR efforts, it is difficult to sell the idea that only a small fraction is sourced responsibly from the DRC (Rolfe interview). Bodenheimer (2014) recounts the suggestion of ARM to introduce mass balancing for the FT/FM standard, which would assure only a percentage of the final gold

to be certified. This suggestion was met with outrage with jewellers around the world who would rather FT/FM gold keep its purity.

The demand for responsibly sourced minerals is therefore key for these certifications to sustain themselves. The more demand for responsibly sourced materials, the more push there will be to produce responsibly. Industry have a big influence, especially when combining their demand. Worth mentioning is the European Partnership for Responsible Minerals (EPRM) which work on projects in Europe and abroad and try to raise awareness about the origin of materials. Through the EPRM, the industry can cooperate and create more demand for responsibly sourced minerals (Resolve, 2016; Barendse interview).

Levin and Cook (2015) suggest a market barrier for gold that is not conflict-free that would lead to the stigmatisation of non-certified gold and consequently decreasing its supply.

5.4.5. Cost barriers

The demand for Fairtrade or Fairmined gold did not increase as much as expected, and many found certification is not a key criterion for customers. The price difference between FT and FM gold when compared to normal gold is also significant enough to keep undecided companies from participating in the certification (Bodenheimer, 2014). Though companies might be interested in standards like Fairtrade or Fairmined gold, they do not necessarily want to pay the extra costs associated (Barendse interview). From a CSR perspective, they are willing to make their supply chain more sustainable, but often the company with the CSR office is not the one that ends up paying the premium.

To produce responsibly, certification standards are needed, along with auditing and monitoring, all of which are costly. Generally, companies are still about maximising their profit and will not join programmes that are cost-negative if there is no legal push for it or increased awareness and demand from consumers (Barendse interview).

5.5. Certification

Driven by supply chain due diligence legislation (Dodd-Frank Act, EU regulation on conflict-minerals) and voluntary guidelines (OECD due diligence guidance), companies need to involve and assure good practices along their supply chain. This goes along with increased involvement of ethical aspects in customers purchasing decisions (Kickler & Dr. Franken, 2017). Therefore, mining companies and electronic manufacturers increasingly participate in certification and assurance programmes, many of which are described in chapter 4 of this report. As described then, these certification schemes and initiatives address different social, environmental or economic aspects of the mineral and metal supply chain, different parts of the supply chain, different minerals and requirements differ between them. It is important to keep their goals in mind in order to compare them.
Through leveraging market demand for sustainability, certification aims to improve the social and environmental conditions of mining. Meeting certification standards, along with the process of auditing, gives an assurance to downstream companies, investors and consumers that the product has been produced according to certain criteria (Blackmore et al., 2013).

Though ASM is an important target for its higher accounts of human rights abuses and environmental degradation, Kickler and Franken (2017) find that only 16% of all mineral and metal schemes address ASM, and 31% that address all company scales. In many schemes, ASM is only a niche part of their scope.

5.5.1. Local understanding (communities)

Any initiative or policy will need to incorporate ASM communities or involve ASM in their decision making in order to be successful, effective and better suited. Acquiring an understanding of these communities, of their incentives, motivations, benefits, and challenges is key to creating a well-suited developmental programme or certification (Buxton, 2013). To influence policy, Buxton (2013) suggests creations of knowledge networks, for this knowledge to be shared and communicated. This very well applies to any certification for ASM.

Similar to the knowledge networks suggested by Buxton (2013) and recognising the importance of information flow between the upstream and the downstream, the Better Sourcing Program has developed the "Better Sourcing Network" which is a voluntary membership platform in order to support mineral supply chain transparency and improvement objectives derived from the Better Sourcing Standard. Members of the Network are supply chain stakeholders (upstream and downstream participants, funding partners, community-based organisations, international experts) whose contribution helps fulfil Program goals and who will have to agree to a disclosure policy within the network, and will allow for information to flow both ways. This will allow auditors for example to have access to all information in one location: the online Information Sharing Platform with all documentation of each shipment (BSP).

It is important for the Alliance for Responsible Mining to develop profound understanding of the mines they work with. They perform a scoping study in regions they want to work in and identify mining organisations that comply with the legal requirements to mine. This is followed by a gap analysis to identify the improvement stages that are needed to be able to comply with the Fairmined Standard (Fairmined interview). The Better Sourcing Program go further with acquiring data through their Information Management System (IMS): people on the ground, "BSP monitors", record any incidents along the supply chain as well as any other contextual information (accidents, smuggling, injuries, presence of armed forces, interviews with miners on their families, salaries, dependence) on their smartphones during rotation schedules, and each incident has a risk score and its associated response measures, and all affect the overall risk score. These people can be, depending on the country, government agents, local NGO agents or specific people hired by BSP, though they all must undergo training on their Information Management System. This "Information Management System" is a system they set up alongside their traceability system with GeoTraceability, and gives their programme added value (BSP). This strategy could also potentially reduce overall costs of auditing by reducing the frequency of third party auditing, through increase first of second party verifications, as suggested by Blackmore et al. (2013).

5.5.2. Certification standards

Incremental standards can be found in about all schemes addressing ASM, which require organisations to comply with increasingly difficult or an increasing number of requirements over time (Kickler & Dr. Franken, 2017). These incremental standards are generally in the form of entry criteria and improvement criteria, as is the case for the RJC, Fairtrade and Fairmined gold and the Better Sourcing Program.

However, as discussed in the "artisanal miners" chapter, many suggest the entry criteria of these standards are too high for the majority of artisanal and small-scale miners, and they (and other ASM development organisations) end up working with already established and secure mining organisations (Bodenheimer, 2014; G. Hilson et al., 2016; Childs interview; Projekt Consult interview; Barendse interview; Stocklin-Weinberg interview). The Alliance for Responsible Mining (ARM) are developing a new Market Entry Standard for gold from ASM, therefore suggesting the majority of artisanal miners are still unable to attain Fairmined standards requirements. With financial support from the EPRM, ARM and RESOLVE, it aims to answer expectations from artisanal gold producers and downstream actors through a standard for minimum market accessibility, using the OECD due diligence guidance Annex II as a starting point. A consulted draft of this standard is expected for July 2018, with two pilots in Colombia (ARM, 2017).

There is also another line of argument that says that schemes are effective exactly because they narrowly focus on one aspect. Among others, iTSCi and the CFSP work because they focus on the conflict aspect. If other criteria were added, like environmental, education, labour conditions, women's rights, they are likely to complicate the scheme and render it less effective (Young interview). If a scheme only focuses on one aspect it is easier to be accountable and transparent in the supply chain. And though other aspects like environmental or social goals are not part of the schemes, they could potentially be exposed and dealt with as long as there is accountability and transparency (Young interview).

Certifications also have a reputation among companies and customers, which is their most valuable asset and without which they could not function. Therefore, there is a contradiction between lowering the standards to reach more ASM communities or keeping the standards high to preserve a reputation and reserve it for those ASM organisations who have made significant progress (Bodenheimer, 2014).

5.5.3. Chain-of-custody

Chain-of-custody represents the movement of products through a supply chain and their ownership and control (Blackmore et al., 2013). For certification schemes, one can identify the following types of chain-of-custody (ISEAL, 2016):

- Identity Preserved – the certified product is kept physically separated from production to the final end-user
- Segregation – similarly to identity preserved, products only come from certified sources, but mixing among them is allowed along the supply chain (the source of a product is not maintained)
- Mass Balance allows for mixing of certified and non-certified products in the supply chain and only a certain percentage of the final product will be certified
- Book and Claim – instead of a physical link to certified products, this system works with credits that are sold and bought between certified producers and other companies that are not related

Contrary to LSM, ASM is addressed in entire supply chain sustainability schemes because it needs the support of downstream companies, through a closed-pipe or mass balance chain of custody system (Kickler & Dr. Franken, 2017).

Blackmore et al. (2013) recommend a mass balance or book and claim chain of custody system for ASM, as they could offer more potential for inclusion. It is also more realistic for the electronic supply chain to

use a mass balance system instead of one that keeps the materials separate, at the refiner level. It is unfeasible to stop production at the refinery while refining only the certified material and keep it separated, as it would cost unfeasible amounts (Fairphone interview)

5.5.4. Traceability

The aim of traceability is to prove the chain-of-custody. Such a system aims to identify batches of all products and record when and where they are moved and processed; all this data must be part of a system (Blackmore et al., 2013). Unlike large-scale producers, ASM do not have the benefit of good organisation and infrastructure and of economies of scale. As their production is relatively small, the transaction costs associated with traceability systems are expected to be higher (Blackmore et al., 2013).

iTRi's iTSCi (iTRi Tin Supply Chain Initiative) traceability programme is the main traceability system active in the region of the DRC and is described as having a position of monopsony by Radley and Vogel (2015). Though it is considered a success and many are in favour of it, the iTSCi system is still relatively leaky (Young interview), and is accused of lobbying against competitors in the traceability market to continue to levy large fees from its partners locally, leaving the producers with the choice of selling at a reduced price or selling through illegal channels (Radley & Vogel, 2015). iTSCi is nonetheless sufficient for chain-of-custody, though it is not perfect, it is effective and it works. It can be improved, but it was designed to be low-tech and fit with artisanal mining in remote regions (Young interview).

An electronic system to record traceability data would work much more efficiently. This is the case for the traceability system used by the Better Sourcing Program. They work with GeoTraceability, a company specialised in data collection and the traceability of commodities, which develops a software specific to each individual supply chain (what goes where, adapted to the number of warehouses and number of scanning of the bags). The tags are tamper proof, once opened, they cannot be reused, and their bar codes are scanned with Motorola (or other brand) scanners or scanners with GPS, so the system is digitised. Any discrepancies are therefore found immediately (BSP interview).

Other groups like KEMET or AVX developed their own private independent systems. KEMET, one of the biggest manufacturer and user of tantalum developed the Partnership for Economic and Global Sustainability which includes a closed-pipe conflict-free supply chain for tantalum from the Katanga province of the DRC. AVX, in partnership with Motorola Solutions, created the Solutions for Hope tantalum program also in the aim of sourcing conflict-free tantalum from the DRC, and currently source from two mines in the north of the Katanga province (Jameson et al., 2016).

5.5.5. Costs

Dividing the costs in a certification programme are a challenge. For the sake of developments upstream, in the mining communities, it is important that the benefits end up at the mining level (Fairphone interview). The traceability systems, monitoring and third-party auditing, as well as the creation of standards are all costly.

There is criticism that certification schemes place burden and costs on the upstream and eventually on the artisanal and small-scale miners themselves (Blackmore et al., 2013). As if the costs are not paid downstream, they must be paid upstream. This is the case for the iTSCi traceability system for the 3Ts, where part of the value of the material (2-3%) goes to the system and keeping it up and running. This might put miners in a situation of difficulty but it is their entry to the market (Barendse interview).

The majority of the Alliance for Responsible Mining's certification projects are financed by international and bi- or multi-lateral organisations and companies. After they identify potential mining organisations to become certified, they pitch their improvement plans to potential donor organisations that may be willing to fund these projects (example donors are Chopard and the International Development Bank). Once they get through the improvement plans and the mining organisations are Fairmined certified, the suppliers, who buy from the mines, are the ones to pay the premium and the minimum price, with a fraction going to ARM to support the sustainability of the Fairmined Initiative (Fairmined interview). Consequentially, the price of Fairmined gold is higher for jewellers, because of its added value. Similarly, the Better Sourcing Program will never charge a fee to the miners, and aim to make these due diligence practices convenient and accessible for them. Their aim is to attract interest from downstream companies to invest, by making their system as transparent as possible and provide large amounts of collected information and data. Each supply chain is different and any actor after the exporter (included) is likely to end up paying the extra costs (BSP interview).

Costs will also vary depending on the aspects considered in the certification scheme, and will tend to be higher the more are considered, for the certification and for the audit (Projekt Consult interview).

5.5.6. Interoperability of schemes

Kickler and Franken (2017) call for a holistic standard applicable to all minerals, mine types and parts of the supply chain, and which would allow all schemes to refer to it and use its requirements according to their own scope and area. This would allow all schemes to be comparable, reduce costs for companies, reduce standard diversification and might also reduce barriers to implementations (Kickler & Dr. Franken, 2017). Indeed, the interoperability of schemes (cross-recognise or reference other standards), with recognition of regulations and laws, will reduce duplication and overlapping, therefore improving costs efficiency for companies and scheme performance (Blackmore et al., 2013; Mori Junior, Franks, & Ali, 2015). From the point of view of downstream companies and through an analysis of different codes of conduct, Risso (2012) also argues there are too many differences in CSR strategies, resulting in too many different requirements for suppliers. She calls for more cross-industry collaboration for increased consistency and efficiency in order to get to the sources of environmental and social non-compliance. This holds true for mineral certification whether or not it is part of a company's CSR strategy.

5.5.7. Scalability

Schemes like Fairtrade or Fairmined gold still cost money to operate. Their level of production remains low at present – there are only very few cooperatives producing Fairmined gold for example – and these schemes consequently struggle to appeal to big buyers (Rolfe interview).

Fairphone was the first pilot project in which Fairtrade Gold was used in electronics, but there are bottlenecks when it comes to scaling it up (Fairphone interview). Part of the reason is the increased costs of Fairtade or Fairmined gold because of the premium, and the low production levels. As gold in electronics is scattered throughout many components in very small fractions, there are operational issues with incorporating Fairtrade gold in electronics.

5.6. Summary of chapter 5

The issues, barriers and solutions that have been laid out in the literature and during interviews are summarised in the following table.

<table>
<tr>
<td>Voluntary standards and legislation

· No involvement of ASM
· Need for regulations downstream to push responsible sourcing and certification
· Reshape current policies based on analysis of ASM sector</td>
<td rowspan="2">National legislation and issues

· Marginalisation & reputation
· Illegal ASM activities
· Neglect from government, lack of reciprocal services and lack of benefits from paying tax
· Official buyers' gold price lower than illicit
· Low government capacity to monitor and implement regulations. Low governance.
· Land availability for ASM
· Reform policies for ASM too top-down and paternalistic, no acknowledgement of existing structures
· Distrust between government and ASM
· Costs of staying informal versus that of paying taxes</td>
</tr>
<tr>
<td>Downstream Actors

· Difficulty of transparency in supply chain, especially from ASM
· No previous example or model of responsible sourcing from ASM
· Increased interest
· Risk of sourcing from ASM (liability)
· Shift towards due diligence and risk assessment
· Awareness, low demand for FT and FM gold for example
· Chain-of-custody, mass-balance versus segregated
· For voluntary aspects (social, environmental), as cost-negative for companies, difficult to get participation</td>
</tr>
<tr>
<td>Certification

· Too high standards for ASM
· Understanding of local structures and organisation</td>
<td>ASM sector

· Short-term thinking, little business acumen which is unattractive to investors
· Dependence on informal lenders, world of debt
· Remote areas and bad transport links and infrastructure
· Low production volumes that need aggregating, ship for reasonable price
· No prospecting or geological reporting
· Mine specific structure based on local socio-political aspects, geological knowledge and spiritual beliefs
· Gap between what foreign organisations think miners know and what miners know</td>
</tr>
</table>

· Their aim: if they focus on more aspects than one, might get too complex and less effective · Costs: investments and improvements to meet standards, create standards, audits, premium, funding, finance, etc. who pays? · Interoperability of schemes and alignment of standards across industry to increase efficiency and costs savings · Ethical minerals schemes currently cost money to operate · Miss ASM at bottom of pyramid	· Distrust between mining communities (within the ASM sector), and between ASM and foreign organisations · Pre-existing relationship with middlemen that provide loans, world of debts · Insecurity (related to institutional weakness)

Table 10 – Summary of identified barriers to ASM minerals certification

Certain aspects are recurrent across the five topics, and many will influence each other. An analysis of barriers can be found in the next chapter.

6. Analysis of barriers and the potential of certification

This chapter will assess the findings of the interviews and the literature of the previous chapter. The following topics are assessed: the validity of the results, the legal and voluntary frameworks under which actors operate,

6.1. Validity of results and clarifications

As a qualitative research on the issue of challenges around ASM, rather than a quantitative one, a lot of information will have come from experiences, observations, opinions and a lot of the information could therefore well be biased. For instance, someone mostly treating with large-scale mining is likely to view the ASM sector as a burden that creates more problems than solutions. Distinctions should therefore be made between unbiased observations and public opinions.

The first aspect that should be made clearer is the definition of ASM. It is a recurring statement that there is no agreed upon definition of ASM, because the sector is very heterogeneous. it is often characterised in terms of its mechanisation levels (little to no mechanisation in artisanal mining), productivity, size, number of miners (independent, cooperatives), with high risks, low health and safety standards, low social and environmental standards. The OECD define ASM as “formal or informal operations with predominantly simplified forms of exploration, extraction, processing and transportation. ASM is normally low capital intensive and uses high labour-intensive technology” (OECD, 2016, supplement on gold).

This is also where the confusion on formality and legality comes in. Some authors wrongly define ASM as a name “typically used for illegal mining” (Hilson, 2002) or that it describes an informal and unregulated system of small-scale mining (Suhartini and Abubakar, 2017). Though a fraction of the sector operates outside the formal arena, it is wrong to say they all do and it is wrong to not make the distinction. Illegal mining means it is outside the legal framework (does not comply with it, and therefore can be sanctioned), in which case miners do not hold land titles or mining licences, and where the production is therefore not “followed” and is not taxed. Illegality is part of informality, where, on top of going against the legal framework, there is an absence of contracts, official traders, buyers and sellers and minerals can be sold in other countries. The name of Artisanal and Small-Scale mining, however, does not give any indication on whether the activities are informal or illegal. To complicate the matter, the distinction between the informal and formal spheres is not black and white. As an example, a licensed miner might have a concession to mine a piece of land, as well as a permit and all required documents, yet might employ miners to work on that piece of land that do not have the required papers. They, therefore, are likely not to have a contract or salary or working rights. This also highlights the need for more data on practices in the sector, and an understanding that the sector is not homogeneous and something that might hold true somewhere is likely not to be somewhere else.

6.2. Legal and voluntary frameworks

The legal framework which miners should work in will depend on the legislation of every country and what their provisions for ASM are. On the side of the government, decisions are made about what is legal and

what is not. If governance is weak, the state is not likely to be capable of strictly implementing that regulation or making sure the regulation is suited to the party it was created for (i.e. ASM). On the other hand, the ASM sector will generally work in ways which bring most benefits for the least costs (and burdens). Benefits might include access to finance (informal loans), security, services, even if these are not in the legal framework of their country. Costs might include taxes, administrative barriers or lower buying prices.

Downstream companies, NGOs, certification programmes are all restricted to complying with the legislation in their country of origin and in the country they want to operate in or with. They, therefore, are restricted to working with those mining cooperatives that are registered with the government and whose operations are legal or they might be sanctioned. The power relations between actors and the hierarchy is presented in Figure 5.

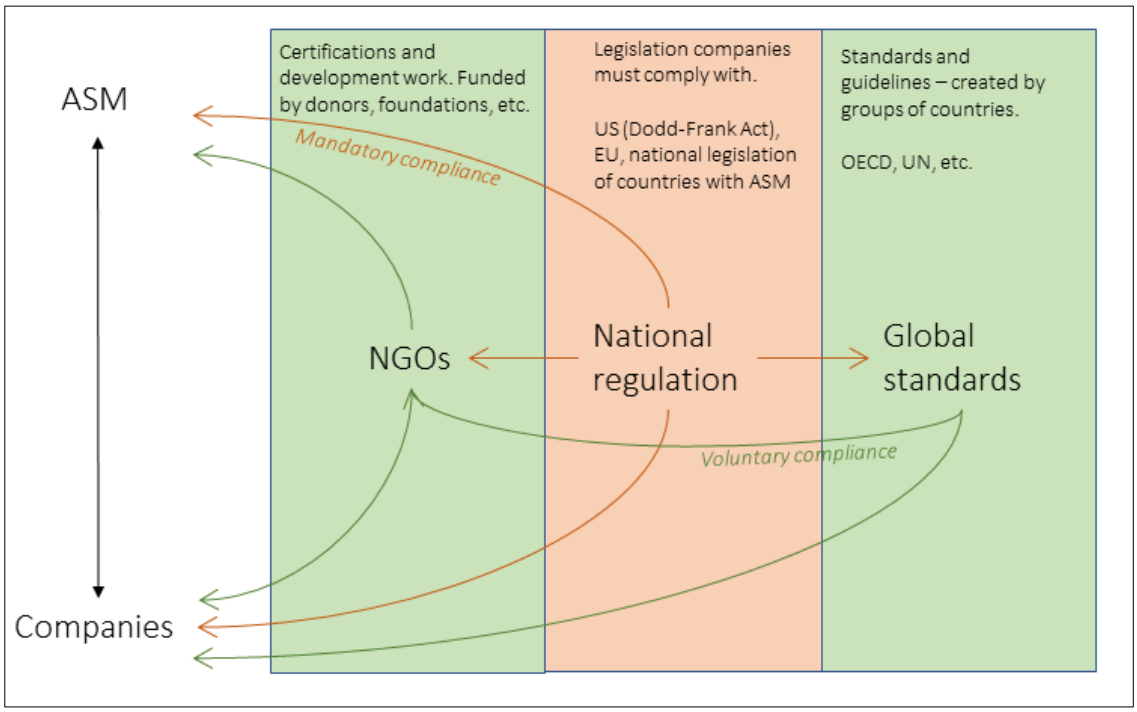

Figure 5 – Map of groups of actors and how they influence each other

ASM organisations must comply with national regulation in their country. The key issue highlighted by this thesis is that a large fraction of ASM actually does not comply with regulations and work in the informal arena. Downstream companies that want to source from ASM must comply with the national regulation of the countries they source from (and therefore cannot source from mining organisations that work illegally) and must comply as well with national regulation in their country of origin (the Dodd-Frank Act in the US, the Conflict Minerals Regulation in EU countries for example), or they will be sanctioned (and their image will be impacted). Standards and guidelines like those developed by the OECD were created by its member countries and certification standards were generally created in partnership with charities, NGOs and the industry. These, however, are voluntary and represent best practice.

6.3. Map of barriers and linkages

Each group of actors face barriers when trying to implement due diligence initiative and certifications. The following table (Table 11) categorises the barriers in each sector alongside their goals (ideal situation).

Actor	Ideal situation	Barriers
Global voluntary standards organisations	· Everyone along supply to address due diligence issues	· Difficult for companies in practice · What should be voluntary vs mandatory
National governments	· ASM to contribute to economy · Formalised sector · Good livelihood for its citizens	· Uncertainty in best way forward · What should be voluntary vs mandatory · Weak governance and limited capabilities · Top-down policies · Corruption
Artisanal and small-scale miners	· Security, stability, lucrative livelihood, services (hospitals, schools, etc.)	· Debt towards middlemen or traders · Mine specific socio-political structures, geological knowledge and spiritual beliefs · Distrust towards their government
Companies	· Comply with national regulations · Align with voluntary standards and guidelines · Facility in reporting on risks along the supply chain: transparency and accountability · Stable production from ASM	· No perfect system in place to source from ASM · Certifications systems are not always cost optimal for them
Certification organisations	· Connect the upstream and the downstream · Assure responsible practices · Improve conditions upstream (social, economic and environmental)	· Low demand from downstream · Rely on donors for funding and cost money to operate · Standards are too high for the majority of ASM · Complying with national regulations means being restricted to a small fraction of the ASM sector · Sometimes considered too paternalistic and controlling

Table 11 – The needs of each sector and their barriers

Further demonstrating the complexity of the relations between the different sectors, Figure 6 shows the barriers in each sector and how they might influence each other, forming a complex web of relations.

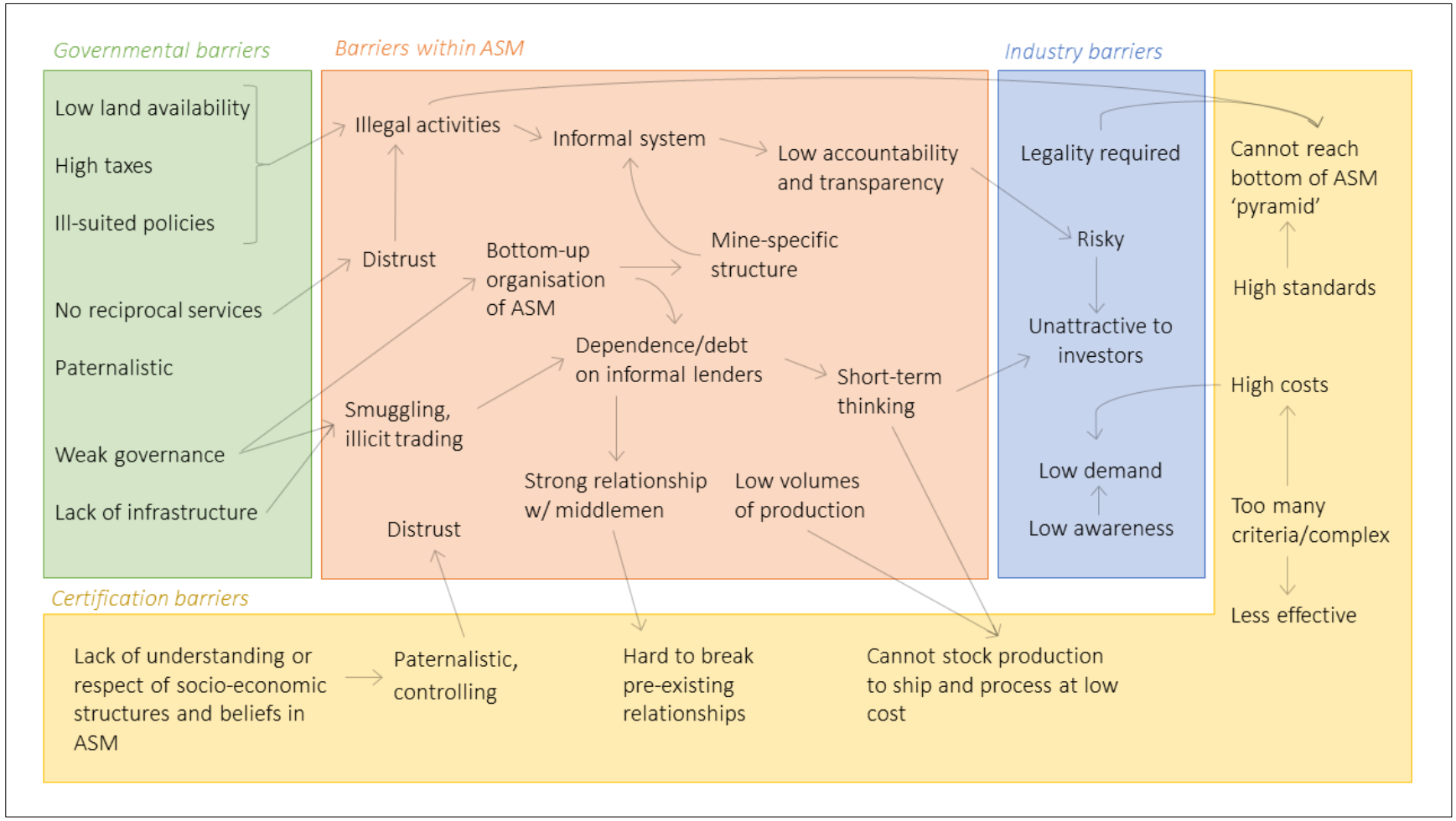

Figure 6 – Barriers in each sector and how they influence each other

What can be seen is that a lot of issues in the ASM sector stem from issues in the government, including weak governance, badly suited provisions for ASM and a lack of infrastructure.

Mainly because of the legal restrictions NGOs and companies have, and because of the often-seen weak governance in countries where ASM occurs, certification schemes will have the barriers and challenges shown in Figure 6. Most of the fundamental issues faced by the ASM sector are a result of governmental issues in their country and certification schemes are unlikely to be able to get to the roots of those problems, as long as they are restricted by national legislation.

For instance, Fairtrade gold, Fairmined gold and the Better Sourcing Program all work with registered and legalised mining organisations. Though they put a lot of resources, effort and money into improving conditions in these mining organisations to reach the level of their standards and certification, they are not in a position to reach out to those miners who are working illegally and trading through illegal channels.

6.4. Suggestion of intermediate step

This thesis suggests the insertion of an extra step, to overcome the legal barriers certification organisations might have and allow action to affect the largest possible proportion of the ASM sector. This extra step would be there to help governments in areas where they are failing artisanal miners and increase the likelihood of miners to work in the formal arena. As per the barriers identified, things like easier access to registration, licenses and permits, larger representation among their government, services, access to mineralised land, training and equipment, would encourage and motivate miners to work in the formal arena and subsequently join a certification programme.

This role could be taken on by development initiatives or aid initiatives by NGOs that work in developing countries. It would be aligned with and help governments with the services, support, infrastructure, security they are supposed to provide to its citizens. Of course, there is a fine line between helping develop communities and supporting illegal mining activities, and that is a point on which governments and NGOs must be aligned on. How such a programme would fit within the whole scheme of things is represented below in Figure 7.

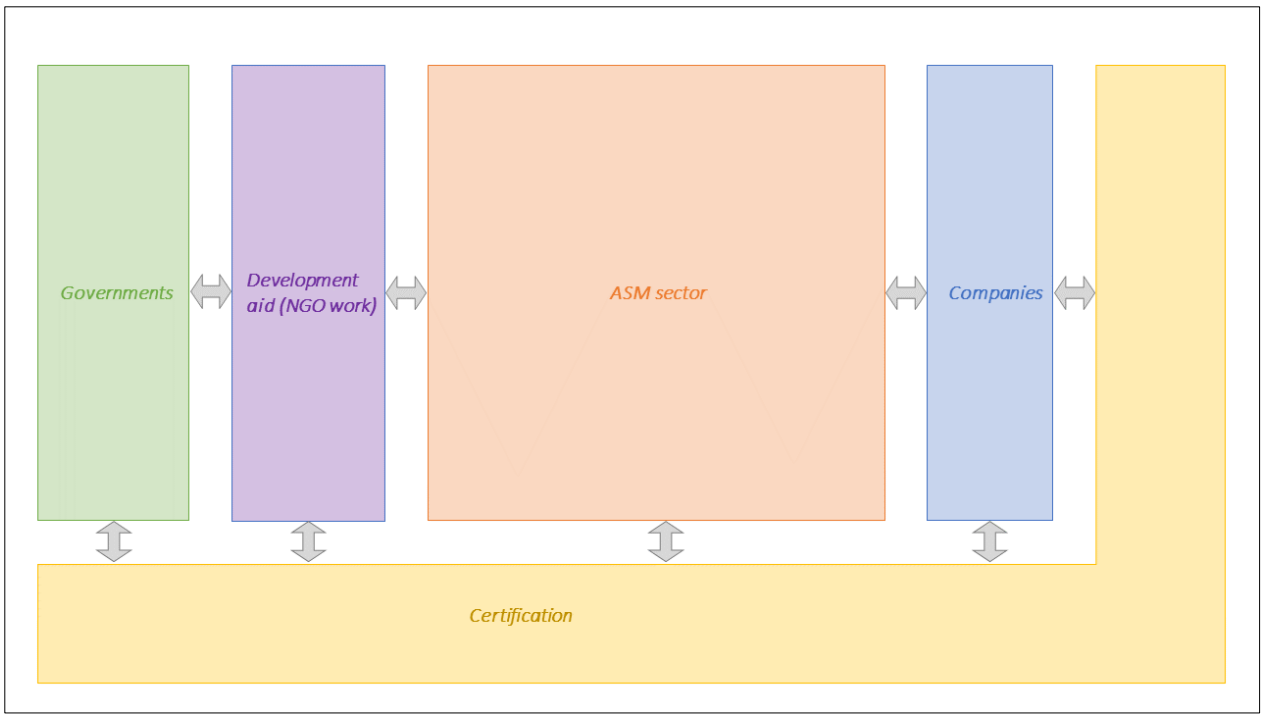

Figure 7 – Role of development programmes in bringing down barriers to certification

Through a partnership with a development organisation (whose role is to help the state), a certification scheme can reach a larger fraction of the ASM sector than it does without. This would work using a three-step process, summarised in Figure 8, starting with development initiatives and helping miners acquire legal working status so they can then be considered to join certification programmes. It is also important to include aspects like fair prices and fair working conditions, equipment, training that were found to discourage miners from participating in the formal economy.

Governments, NGOs, certification programmes, companies and the ASM sector must all the aligned in their decision-making processes and their operations. Hence, the importance of increasing communications between these actors, possibly through the development of networks.

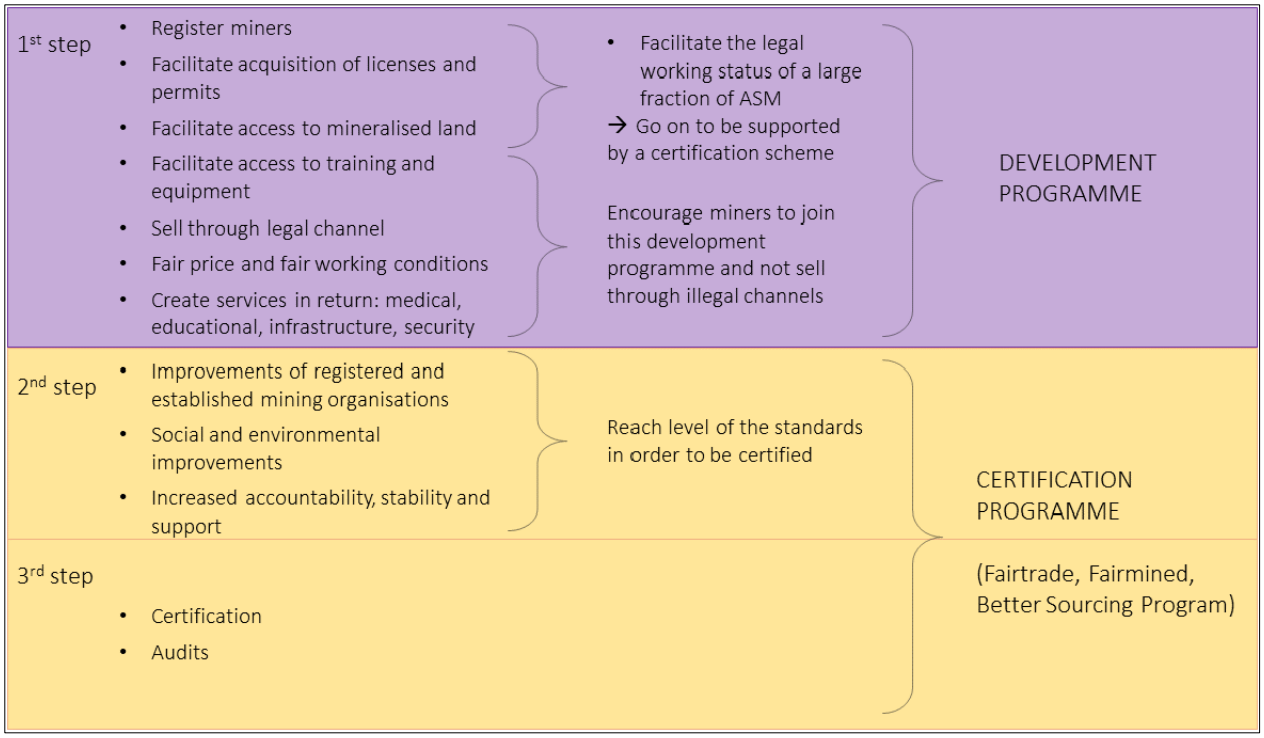

Figure 8 – Three-step process to certification to include largest fraction of ASM

This development process described in step 1 is similar to the work of the non-profit Solidaridad (Dutch organisation) and they project called "on the Road to Good Gold" where they work towards providing support for miners to obtain a legal working status but also land rights, environmental risk assessments, labour rights, etc. They support this programme by building partnerships between the miners and buyers (Solidaridad, 2015).

7. Conclusions and recommendations

The social, economic and environmental challenges faced by the artisanal and small-scale mining sector have increasingly been mentioned in national and CSR agendas, especially over the last decade. This led to many efforts of traceability, certification and development in artisanal and small-scale mines to assure downstream users that there were no links with conflict, human rights abuses, poor working conditions or environmental degradation. However, these efforts themselves face challenges and the best path forward is still uncertain. Hence the aim of this thesis research: reflecting on the **barriers to social and environmental improvements in the artisanal and small-scale mining sector through certification.** This research attempted to answer this question using three sub-questions.

7.1. Sub-question 1 conclusions

What are the characteristics of existing certification schemes for metals and minerals and their relation to ASM?

Several conclusions can be made of the review of all initiatives and projects in chapter 4. Certification and traceability schemes, but also pilot projects in countries with ASM are often created and run by members of the industry (electronics companies for example), development or mining NGOs, and national institutions (Dutch ministry or UK department for international development for example). They all comply with the regulation they are subject to (like the Dodd-Frank Act on conflict minerals in the US and laws in countries they work in), and they generally follow the guidelines for due diligence created by the OECD (Due Diligence Guidance). The large number of schemes operating in the world is confusing at first, especially as they all focus on different aspects of mining. They will differ per the following: the section of the supply chain they focus on, traceability vs production standards, criteria used in the production standards (social, environmental, productivity, etc), mineral of focus (gold, tin, tungsten, etc.) and the geographical region they operate in (DRC and surroundings or globally). When it comes to those operating in the ASM sector, the traceability scheme iTSCi could be considered successful in the region of the DRC as it is very widely used. It is a simple bag and tag programme assuring no links to conflict or human rights violations from extraction to the smelter phase. Programmes like Fairtrade Gold, Fairmined Gold and the Better Sourcing Program, that work specifically with ASM, have additional social and environmental goals for their certification, take the whole supply chain into account and are driven by demand from the industry. However, these schemes have limitations and face challenges keeping them from operating in more regions, growing, reaching the majority of ASM. The reasons for this were explored in the second sub-question.

7.2. Sub-question 2 conclusions

What are the challenges and barriers of certifying ASM?

Barriers to the successful implementation of certifications were identified in each of the following categories: voluntary standards, national legislation, in the ASM sector itself, downstream actors and certification programmes. Issues of weak governance, lack of infrastructure, lack of land and services and

top-down policies from the governments were found to cause problems within ASM such as distrust, smuggling, illegal mining and trading and therefore informal operations, but also socio-economic structures specific to individual ASM communities and dependence on middlemen, land owners or traders. The informality of ASM activities is a barrier to working with certification schemes as these require activities to be legal and require transparency and accountability. Certifications are therefore not legally allowed to work with the large fraction of the ASM sector that mine illegally. This problem of legal barriers was found to be key in the case of certifications. Barriers were also identified downstream. The world of debt miners generally live in prevents them from focusing on long-term engagements. This, along with the low volumes of material produced by ASM (when compared to LSM), keeps production from being stocked until a larger volume of material can be shipped and processed at low costs. Also on the downstream side, certifications like Fairtrade or Fairmined are driven by consumer and industry demand, and while awareness is low, so will be the demand, feeding positively into higher costs and less funds available for more projects. Currently, these programmes are funded by multi-lateral organisations or private donors, and therefore are dependent on these.

7.3. Sub-question 3 conclusions

What are key criteria for a potential certification scheme for social and environmental aspects of ASM?

One of the main conclusions of this thesis is that current certification schemes with progressive standards can greatly improve the situation in the ASMOs they work with, they cannot, however, replace the state and solve some of the fundamental issues that were identified, because of their legal restrictions. That is, unless they have a development component to their work. Meaning that current certifications can greatly improve the sustainability of already advanced and established mining organisations, when fundamental development has already taken place. Therefore, the other main conclusion of this thesis is that a certification scheme could be successful in improving the social and environmental conditions under which the majority of artisanal and small-scale miners work if it worked in conjunction with a development programme. It would therefore cover all steps shown in Figure 8 and would bring down many of the barriers identified in Figure 6. Development measures however would involve working with people who might have up to then mined illegally. These kinds of efforts therefore require the involvement of national governments and local institutions and for their plans and goals to be aligned. The first steps would involve encouraging miners to work in the formal economy and allow for organisation into cooperatives or democratic businesses with training in governance and business.

This thesis also recommends further study into the ASM sector to obtain more data on practices, about individual miners and their motivations, on socio-economic structures and power relation within the sector, on families and their financial situations. A larger social study on the sector would help provide unbiased input into decision making processes.

8. Discussion and further research

This chapter assesses the validity of the findings in this thesis research and further explores their significance and any limitations that might be out of the scope of this research. The following topics are discussed: limitations of development projects, working with developing countries, the creation and governance of certifications, alternatives to certification, and finally the contributions of this research to the general debate.

8.1. Limitations of development initiatives

The answer to the third research question is that current certification might be able to improve social and environmental conditions in the ASM sector if they are paired with development projects. This would bring down many of the barriers identified that have been keeping certifications from growing and scaling up. However, there are limitations to this idea.

Development programmes themselves might have difficulties implementing their plans. These could include similar barriers to those found when implementing certifications, such as trust issues or paternalistic control over operations. Furthermore, these projects require the commitment of the mining communities they work with and the support of local institutions and governments. They are also limited by the funding they are able to receive. Therefore, the process of encouraging miners to work within the formal economy and be organised into cooperatives or small enterprises (before being eligible for a programme like Fairtrade for instance), might take years.

The support and engagement of local authorities and the government is essential for development projects as they might engage with miners that previously mined illegally. This is a topic that should be further investigated: how development initiatives can still work within the legal framework of local countries but engage with people who might have not worked within that legal framework.

8.2. Working with developing countries

Development and certification programmes might be faced with difficulties when working in countries with weak governance and in countries where the ASM sector does not hold an important place in agendas. These might result in issues such as corruption, land availability or minimal (if not at all) representation of ASM among decision-makers.

However, this research is lacking input from government officials of countries where ASM occurs. To understand the bigger picture, and how development and certification projects fit within a country, it is essential to incorporate the point of view of governments, their opinions on certifications and other initiatives and what their plans for ASM are. Development projects must be in line with governmental provisions to be implemented, and it would, therefore, be interesting to study the relationship between governments and certification organisations and how they are received.

Similarly, the point of view of miners involved in ASM is lacking from this research. Understanding the motivations of miners is essential to designing projects that are more likely to be successful, if not involving miners in the decision-making process directly. Further empirical research on ASM practices, motivations, opinions on certification, financial situations, family situations would complete the answer to the research questions of this thesis, along with a study of governments views. These studies are necessary to give further clues on how these kinds of projects would be received in ASM communities.

Further research is recommended on the ASM sector and governmental action in ASM, through for example a large social study (or survey) to understand the motivations and challenges of each group. Lessons can also be learnt from other sustainability certifications for other commodities that were implemented in developing countries (Fairtrade for instance) and from whether they were successful and why.

8.3. Creation and governance of certifications

There are still debates on how certification schemes should be designed. And this can be seen in the variety of certifications available, from the simple bag and tag traceability iTSCi programme to a scheme like Fairtrade Gold where all sustainability criteria are considered. Further research is recommended on the whole process and decision-making behind the creation of certifications schemes. Decisions are to be made regarding their simplicity, the criteria considered in the standards, the funding and costs and whether they respond to consumer demand or mandatory regulations.

In the bigger scheme of things, it would be interesting to study who makes these decisions and what their restrictions and motivations are. It is important to note that there is a complex web of actors behind the decisions of making standards voluntary or mandatory. This web of actors might encompass coalitions of countries, the industry and companies, and NGOs. All these decisions are part of the larger debate on how to make the minerals industry, and all the transactions within it, fairer for all stakeholders involved (upstream and downstream) and for the environment.

Though voluntary standards might be preferred by companies over mandatory regulations, they might or might not be the most efficient way of having positive impacts upstream. For instance, certifications like Fairtrade or Fairmined Gold are driven by consumer and industry demand, who pay for the added value of certified gold. While certified minerals stay segregated along the supply chain, the processing costs will remain high. For the jewellery and financial sectors which require only refined gold, segregation might be feasible but when it comes to electronics, the costs will be too high of keeping the certified minerals separate. For the electronics supply chain (which contains many more processing and manufacturing steps), a mass balance system would be more feasible. However, selling a product at extra costs (for the certification) only because a small fraction of all metals is certified is not attractive to companies or consumers. For the electronics industry, a different business model might be needed or a regulation that would support the progressive introduction of Fairtrade or Fairmined minerals into the supply chain.

Further research is recommended on the decision-making practices and the stakeholders involved in the creation of voluntary standards and mandatory regulations, as well as their hierarchies, how these

decisions might affect the success of certifications and the efficiency of social and environmental improvements in ASM.

8.4. Alternatives to certification

This thesis finds that, currently, many of the certifications available have barriers to scaling up their operations or reaching out to a larger fraction of the ASM sector. Some companies might decide to move away from certification schemes towards their own due diligence measures. More research is needed into the alternatives of certification programmes and their characteristics. It would be interesting to compare the advantages and disadvantages of both and compare which alternative is more beneficial in terms of: encouraging social and environmental change in ASM practices, implementation capacity in ASM communities, the social impacts and impacts to power relations and socio-economic structures that already exist in the sector.

Further research could also consider the pros and cons of using sustainability certifications in general and compare to the pros and cons of other methods of assuring responsible sourcing. The following aspects can be considered: the costs involved, the chain of custody, legal restrictions, facility of implementation in ASM communities (considering their characteristics), benefits to the miners, assurance to the companies of the source of their materials, assurance to consumers that companies are sourcing responsibly, support given to ASMOs and development opportunities.

8.5. Contributions to general debate

This thesis research identified barriers to the implementation of sustainability certifications in the artisanal and small-scale mining sector. This research hopes to add perspective and understanding on the push and pull factors behind ASM activities, along with the livelihood and growth opportunities ASM represents for many citizens and their countries. The results show that the drivers for ASM are strong and eradicating the whole sector is likely to be impossible. For local governments, these results can help change their perspective on the sector and see the opportunities from a human rights perspective and the contributions it can make to their economy, as well as highlighting the opportunities of partnership with foreign organisations.

The barriers identified and the local factors linked to those barriers can contribute to the discussion on making trade with ASM fairer and more sustainable. They can add insights and perspective to all actors involved in decision making and engaging with ASM directly or indirectly, to governments, businesses, industry associations and NGOs, with the aim of creating correct policies and management.

For businesses that wish to source from ASM, these results can help identify projects and initiatives they can invest in that have the potential of having more of an impact and be more efficient. These insights can give an idea of what their decisions and actions might imply down the line for artisanal miners.

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