“Gold Is Gold”

Understanding the Role of European Actors Along the Supply Chain of Colombian Gold

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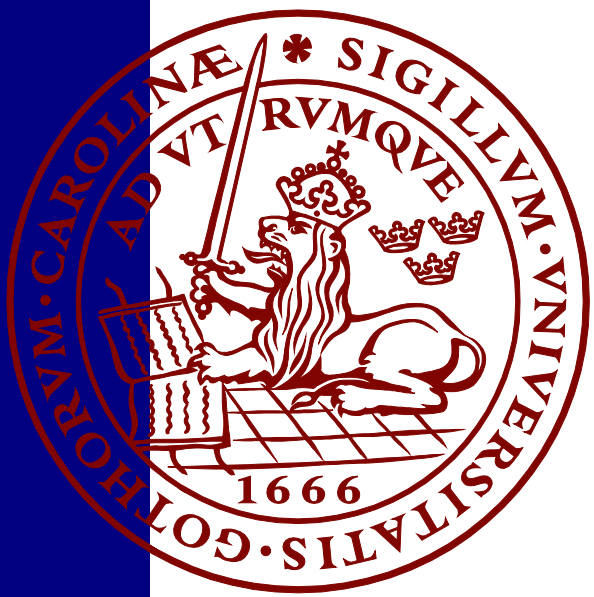

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Catalina Vera Scheer

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Abstract

Gold mining causes various negative social and environmental impacts in countries of extraction like Colombia. Voluntary and legal efforts to tackle these challenges have recently increased in Europe. To understand the complex supply chain and the impact of the newly evolved governance structures better, more research is needed. Based on a literature review and interviews, I identify important European actors involved in the gold supply chain using multi-level governance. Through the lens of telecoupling, I investigate measures and motivation for improvements in sustainability performances. The results suggest that increased expectations pressure large European refineries to increase their sustainability efforts. While EU regulations are enhancing, legal efforts in Switzerland fall behind. Together with other governance gaps, e.g., shortcomings in due diligence approaches, and an overall lack of transparency, this impedes sustainability improvements along the supply chain. The remaining governance gaps reveal the need for further improvements of the evolving governance structures.

Keywords: Supply Chain Sustainability, Conflict Minerals, Gold, Transparency, Multi-Level Governance, Telecoupling

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Abbreviations

3TG	Tin, tantalum, tungsten, and gold
ASGM	Artisanal and small-scale gold mining
CH	Switzerland
EU	European Union
LBMA	London Bullion Market Association
LSGM	Large-scale gold mining
MLG	Multi-level governance
NGO	Non-governmental organization
OECD	Organization for Economic Co-operation and Development
RQ	Research question
SNA	Social Network Analysis
UK	United Kingdom
USA	United States of America

1 Introduction

1.1 From Colombia to Europe: The Gold Supply Chain

Current patterns of global consumption and production create enormous sustainability challenges. They intensify the overuse of natural resources, environmental pollution, and social inequalities, and, thus, contribute to the ecological and social crisis (Bengtsson et al., 2018). The global demand for minerals is rising while their extraction causes various negative social and environmental impacts at their place of origin (e.g., Betancur-Corredor et al., 2018). Mineral supply chains pose a particular challenge to sustainability due to their complexity (Sauer & Seuring, 2019) and lack of transparency (Fraser et al., 2020).

Gold from Colombia is a distinct example of a complex and non-transparent mineral supply chain. While the Colombian government supports gold mining as a way to promote economic growth (OECD, 2017), gold extraction is causing an increased disease burden, primarily from mercury exposure, deforestation and environmental pollution (Betancur-Corredor et al., 2018). Gold mining is further connected to financing armed groups and human rights violations (OECD, 2017). In Colombia, around 80% of gold is estimated to be produced illegally (OECD, 2018b). Legislative loopholes facilitate the legal exports of illegally-mined gold that is connected to conflicts (OECD, 2018b; Robles Mengoa & Urán, 2020). In 2020, 35 % of Colombia's gold was exported to Europe (OEC, n.d.-a).

While the Colombian gold mining sector has been extensively covered in academic literature (e.g., Betancur-Corredor et al., 2018; Idrobo et al., 2014; Palacios-Torres et al., 2018; Robles Mengoa & Urán, 2020; Veiga & Marshall, 2019), the European gold market has mostly been investigated by non-governmental organizations (NGOs) with a specific focus on Switzerland (Society for Threatened Peoples Switzerland, 2018; Ummel, 2020; WWF, 2021).

There are various voluntary efforts towards more sustainable mineral supply chains such as the Organization for Economic Co-operation and Development (OECD) Due Diligence Guidance, the London Bullion Market Association (LBMA) Good Delivery List and certification schemes such as Fairmined and Fairtrade (Young, 2015). Lately, these have been complemented by legal efforts, such as the European Union (EU) Conflict Minerals Regulation introduced in 2017 (Regulation 2017/821, 2017) and the proposal for a Directive on Corporate Sustainability Due Diligence (February 2022) (European Commission, 2022a). The recent emergence of these new governance structures reveals the need for an in-depth analysis of such structures in order to understand the role and impact of European actors along the gold supply chain.

1.2 Research Aim and Connection to Sustainability Science

With this research, I contribute to a better comprehension of complex mineral supply chains, specifically the supply chain of Colombian gold exported to Europe. I provide a better understanding of key actors involved, their roles, connections, and influence on the supply chain. I analyze the underlying drivers for increasing supply chain sustainability and draw conclusions about the governance structure of the supply chain. My research will answer the following research questions (RQs):

RQ1: Who are the relevant European actors involved in the supply chain of gold from Colombia?

RQ2: How do European private actors along the gold supply chain increase their sustainability performance?

RQ3: What motivates European private actors along the gold supply chain to increase their sustainability performance?

I define sustainability performance as a company's efforts to reduce negative environmental and social impacts along the supply chain, specifically in the places of extraction. RQ1 aids in establishing which actors are located along the supply chain and which actors are not directly involved in trading but have an impact on the chain. Having a clear understanding of all actors and their roles is key to comprehending governance structures and answering the other RQs. The second question structures different approaches used by the large European gold-processing industry, mainly large refineries, to increase supply chain sustainability. RQ3 evaluates the motivation behind these efforts which connects the approaches found in RQ2 with the actors identified in RQ1.

The topic of sustainable supply chains is not new to sustainability science (e.g., Ahl et al., 2020; Delabre et al., 2020; Herzberg et al., 2022). My research addresses topics relevant to the field by dealing with complex interactions across different geographies through network approaches (Levin & Clark, 2010). Further, I am analyzing the interaction of global processes, such as economic globalization and trade, with the quest to increase supply chain sustainability and reduce the negative local environmental and social impacts that characterize supply chains at the moment (Spangenberg, 2011).

1.3 Paper Roadmap

In the next chapter, I give a brief overview of supply chain sustainability with a focus on minerals to provide definitions and a basic understanding. Then, I dive into gold production in general and highlight the specifics for Colombia. In the fourth chapter, I present my theoretical entry points, namely multi-level governance and telecoupling. In the methodology section, I describe my data collection and

analysis, including Social Network Analysis. In chapter 5, I connect the results and discussion by describing relevant actors along and outside the supply chain through the Social Network Analysis, showing their understanding of sustainability and analyzing approaches to and motivation for increasing supply chain sustainability. I will connect my findings to the theoretical frameworks. Lastly, I summarize my findings and implications of my results for sustainability in the conclusion.

Though this research focuses on the relationship between Colombia and Europe, data that refers to the gold market in general or gold stream into Europe from other countries were used as well. In addition, I only take into consideration the direct link between Colombia and Europe, yet, there is evidence that gold is being smuggled into Colombia for export (OECD, 2018b) and gold that is imported into Europe is sometimes diverted through other countries to launder it (Ummel, 2020). Further, the focus is set entirely on the flows of primary gold supply, i.e., newly mined gold and not recycled gold. Financial flows are not incorporated in this research either, however, I acknowledge that they play an important role.

2 Background: Supply Chain Sustainability and Gold

In the following chapter, I introduce the state of knowledge on mineral supply chain,[1] its sustainability and governance before explaining the gold supply chain and the specifics of the Colombian gold market.

2.1 Mineral Supply Chains

The OECD (2016) defines mineral supply chains as the "system of all activities, organizations, actors, technology, information, resources and services" (p. 14) that are needed to move minerals from the site of extraction to the final product. This involves various actors concerned with "extraction, transport, handling, trading, processing, smelting, refining and alloying, manufacturing and sale of end product" (OECD, 2016, p. 14). Activities are divided into upstream and downstream activities (Sauer & Seuring, 2017; Figure 1). Actors, also referred to as stakeholders, operate throughout various countries and across several legal jurisdictions (Gurzawska, 2020).

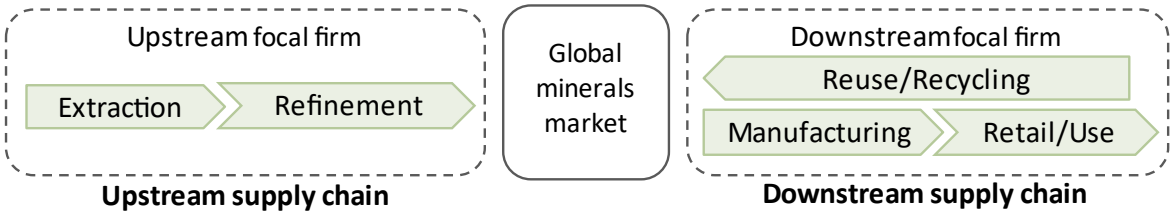

Figure 1. Mineral supply chain concept (adapted from Sauer & Seuring, 2017)

2.2 Sustainability and Governance

In recent years, increased attention has been drawn to the specific complexities and challenges of mineral supply chains. Such challenges include difficulties tracing the origin of minerals due to the many processing steps spread throughout different geographical locations (Fraser et al., 2020; Sauer & Seuring, 2017; Young & Dias, 2011). There is increasing evidence about the negative impacts of mining activities, including human rights violations and precarious working conditions as well environmental damage through pollution and land degradation (Sauer & Seuring, 2019).

[1] I will be using the term supply chain. However, in this context, similar terms like value chain or global value chain are also relevant. The term supply chain is often used in the field of business administration and deals with consumer demand and satisfaction. The term value chain, which is often used in similar contexts, focusses on value adding and competitive advantages for a company (Trienekens, 2012). Both terms focus on an organizational scale (Faße et al., 2009). In contrast, Global Value Chain (GVC) focusses on a spatial scale (Faße et al., 2009). Further, it stresses the "global" perspective where different stages of production take place in different countries (Antràs, 2020).

Throughout the field of supply chain sustainability, different terminologies are used interchangeably to describe managing supply chains sustainably in terms of social, environmental and/or economic aspects. These include “sustainable sourcing” where “sustainable” can be replaced with “responsible”, “ethical”, “green” or “conflict-free” while “sourcing” is frequently replaced with “procurement” or “purchasing” (van den Brink et al., 2019). Accordingly, I will be using the term supply chain sustainability to describe efforts to reduce social and environmental impacts along the supply chain.

While the management of supply chains is concerned with internal decision making and administration within a business, governance deals with the structure and processes that divide power between different supply chain elements (Eltantawy, 2011). Governance plays an important role to understand not only inter-firm linkages but also the influence of non-market institutions (Gibbon et al., 2008). Many solutions for supply chain sustainability include ‘hybrid governance’ structures that combine voluntary instruments with mandatory ones (Le Billon & Spiegel, 2021). This is a result of an interplay between corporations, governments, NGOs and civil society (Eberlein, 2019) which is expected to overcome the limitations of top-down approaches (Vurro et al., 2009). Often, these collaborations are a consequence of initiatives by human rights advocates and are supported by intergovernmental organizations and industry associations (Le Billon & Spiegel, 2021). In this thesis, I will be using multi-level governance, which will be introduced in chapter 3.1, to study governance aspects of the gold supply chain.

2.3 Gold

Gold has unique propositions because it is scarce and its value-to-volume ratio is high (Geenen & Verbrugge, 2020). Since it is indestructible all gold ever produced still exists (Verbrugge, 2020). Gold has multiple purposes and is requested by central banks, investors, jewelers, watch-makers and the electronics industry (World Gold Council, 2021b). The gold price has strongly increased in the past years (57% price increase between 2017 and 2022; World Gold Council, 2022) which is causing an expansion of the global gold production (Verbrugge & Geenen, 2020a).

2.3.1 Gold Production

In this section, I give a general overview of the global gold production following the map from extraction to consumption (Figure 2). In terms of gold extraction, the main distinction is to be made between industrial large-scale gold mining (LSGM) and artisanal and small-scale gold mining (ASGM). ASGM is used as an umbrella term for a wide variety of mining activities which range between different degrees of capital and labor intensity (Verbrugge, 2020). Mostly, it is conducted by poor (rural) communities that are driven by poverty and the need to secure livelihoods. LSGM is usually profit-

oriented and conducted by mining companies (Verbrugge & Geenen, 2020b). Linkages between the two are complex and range from large production and market agreements to informal relationships (Verbrugge, 2020) or conflicts (Carstens and Hilson 2009; Patel et al. 2016). LSGM generates around 80% of the global primary gold production (Fritz et al., 2017).

Further, there is formal and informal mining. The latter describes mining operations without social or labor protection (Chen, 2007). Informal mining is not equal to but often mistaken for illegal mining, i.e., mining conducted without proper authorization (Veiga & Marshall, 2019).

Once gold-bearing ore is sourced, it is processed at the site of the mine. This typically involves the crushing or grinding of the ore (Verbrugge, 2020). In ASGM, mercury amalgamation is used to dissolve the gold from the ore. A cyanide process is regularly utilized in LSGM. The gold is then melted into blocks of doré which is an alloy of gold, silver and potentially other metals (Verbrugge, 2020). In this form, gold is usually around 90 % pure and its origin is already difficult to trace (Geenen & Verbrugge, 2020).

The doré bars are sent to refiners located all around the world through intermediaries or directly. Major, or large, refineries are mostly located outside the countries of extraction. Traditionally, many were found in Switzerland, but today China, India and the United Arab Emirates, specifically Dubai, are important refining locations, too (Verbrugge, 2020). Nonetheless, Switzerland is still home to four out of six of the world's biggest refineries, many businesses from the jewelry and watch-making industry and banks. Switzerland has no own gold mines but handles 70% of the globally traded gold (Mariani, 2012). In addition, there are many small refiners all around the globe. While traditionally they used to be mainly located in non-mining countries, there has been an increase in small refineries in mining countries like Colombia. This trend can be explained by the increased accessibility of the technology needed for refining. Large bullion banks act as links between miners, refiners, and the global market for gold (Verbrugge, 2020).

Recycling will not be part of this research. Yet, it is worth noticing that one-fourth to one-fifth of the global supply comes from recycled gold such as old jewelry or industrial recycling, e.g., electronic waste (Verbrugge, 2020).

2.3.2 Sustainability Impacts

Gold mining is associated with adverse effects on the environment and dangerous working conditions (Betancur-Corredor et al., 2018). The expansion of mining areas causes land degradation through, e.g., deforestation, the destruction of wetlands and modification of rivers (Alvarez-Berríos & Aide, 2015;

Betancur-Corredor et al., 2018; Egidarev & Simonov, 2015). In South America, deforestation related to gold mining has become a major threat to areas of high biodiversity (Alvarez-Berríos & Aide, 2015). The use of mercury is not only affecting the immediate environment, e.g. through mercury vapor which is harming workers' and local residents' health (Palacios-Torres et al., 2018) but pollutes water sources and soil which damages the health of humans and wildlife over large areas (Gallo Corredor et al., 2021). Informality and poverty in the mining sector result in poor working conditions (Betancur-Corredor et al., 2018), which are often exacerbated by violence due to the presence of armed groups competing for control over gold resources (Idrobo et al., 2014; OECD, 2017). As part of the 3TGs – tin, tantalum, tungsten, and gold – gold is regarded as a conflict mineral which finances armed groups and supports money laundering and corruption. This means that in politically unstable areas like Colombia, gold mining is characterized by forced labor or other human rights abuses (European Commission, 2021).

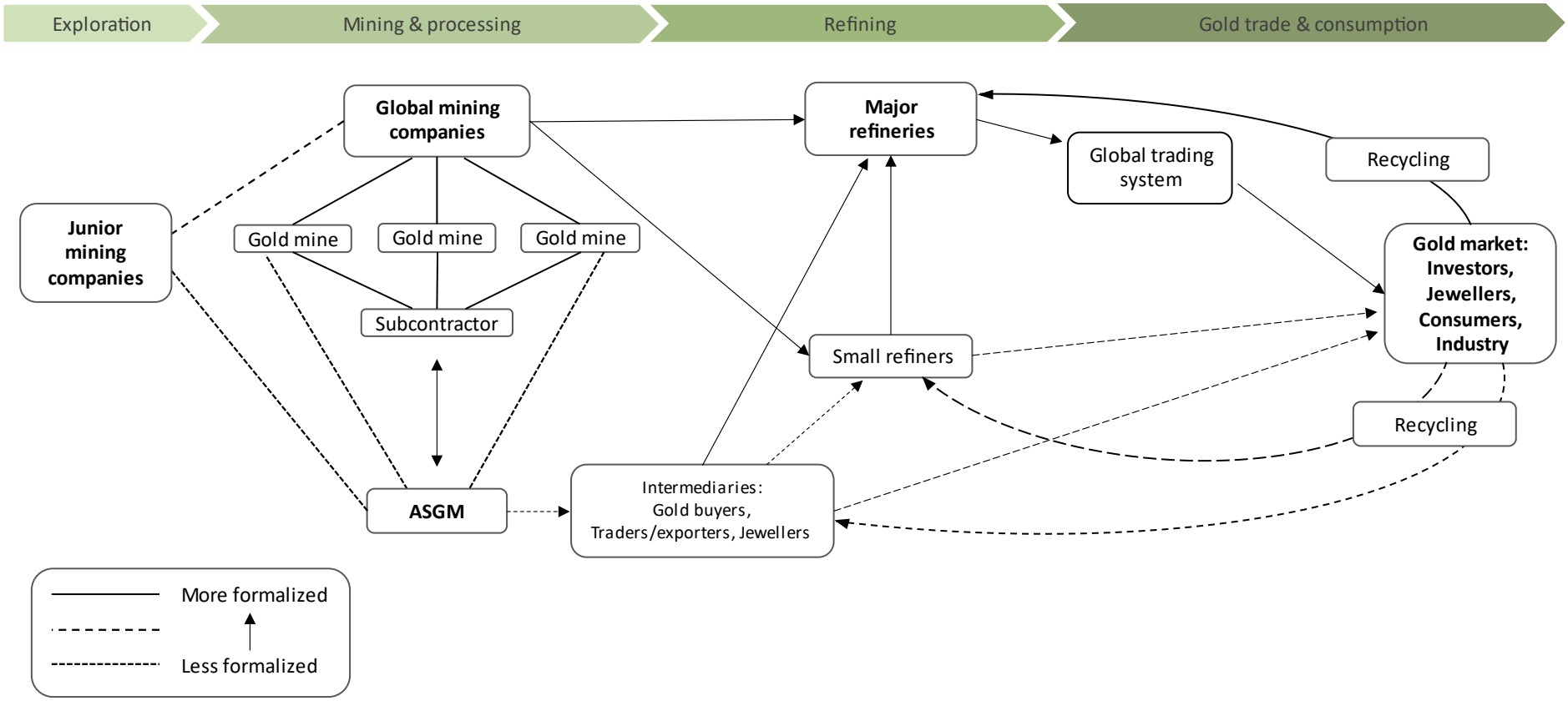

Figure 2. Mapping global gold production. The figure depicts the different stages of gold production as described in the text. There are no clear boundaries between formal and informal trade (adapted from Verbrugge, 2020)

2.4 Gold from Colombia

Gold mining has a long tradition in Colombia dating back to the fifth century B.C. Indigenous communities were producing gold artefacts long before the colonization period (OECD, 2017; Robles Mengoa & Urán, 2020). Colombia produced around a third of the world's gold until the 20th century when production decreased. Colombian authorities started to promote investments in the mining sector in the mid-2000 which has since become an important part of the Colombian economy (OECD, 2017). Between 2001 and 2016 the area covered by official gold titles, i.e., mining permissions, has increased by 700% (Robles Mengoa & Urán, 2020). In 2020, Colombia ranked 19th in global gold production (in volume) (World Gold Council, 2021a). Most of Colombia's gold production (88%) was exported through international traders (Comercializadora International) in 2014, while only 12% were direct exports by companies (OECD, 2017). The rate of gold produced in Colombia that was purchased by refiners listed in the LBMA Good Delivery List has dropped from 98% in 2012 to 55% in 2016 (OECD, 2018b).

In ASGM, a boom has been further pushed by the introduction of new technologies (Robles Mengoa & Urán, 2020). This gold rush has also driven illegal mining and thus conflicts (Idrobo et al., 2014). Because of the profitable business of illegal mining, gold was referred to as the "new cocaine" by the media (Käufer & Papaleo, 2012). Gold smuggling into and out of Colombia became another issue that arose in the 1990s and early 2000s (OECD, 2018b). Though the government has passed legislations to tackle these issues many challenges remain (OECD, 2018b). Today, several legal loopholes in the gold production system in Colombia allow illegally mined gold to be legalized (Robles Mengoa & Urán, 2020). Also, an increasingly large share of Colombia's gold is sourced informally (Veiga & Marshall, 2019). Colombia has a high rate of inequality (World Bank, 2022). Paired with the limited availability of alternative livelihood options for many people, especially for rural populations, this is pushing migration from poor rural areas into gold mining areas (Robles Mengoa & Urán, 2020).

The main importers of Colombian gold are the USA and Switzerland. Italy recently became the third biggest importer. Thus, Europe is the second biggest importer of Colombian gold. Besides Italy and Switzerland, Belgium is the third largest importer in Europe (OEC, n.d.-a; Figure 3). Colombia represents less than 1% of Swiss gold imports in terms of trade value (OEC, n.d.-b).[2]

[2] The overall imports to Switzerland do not only include the trade value of primary gold supplies of newly mined gold, e.g., from Colombia, but also contain gold from countries where it is not sourced but solely refined or obtained from recycling (OEC, n.d.-b).

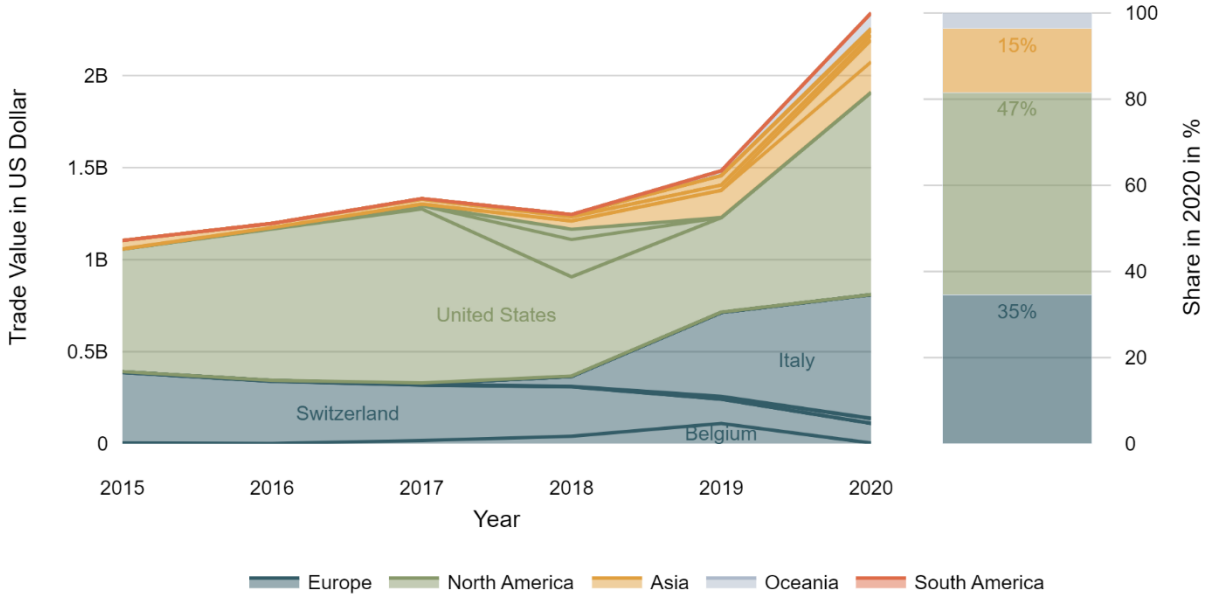

Figure 3. Trade value of gold exports from Colombia between from 2015 to 2020 (own creation with data from OEC, n.d.-a).

3 Theoretical Frameworks

My research builds on two theoretical frameworks which I used as guidance for my data collection and analysis. I apply the multi-level governance (MLG) to understand how governance is organized through multiple jurisdictions (Bache & Flinders, 2004) and use the framework of telecoupling in order to analyze the direct or indirect impacts of human activities between distant places (Friis et al., 2016).

3.1 Multi-level Governance

MLG describes the simultaneous presence of governmental and non-governmental actors at different jurisdictional levels (Piattoni, 2010). The frameworks draws attention to the importance of different levels of authority, for instance, nation states and central governments, but also to other levels and non-state actors. Authority is dispersed vertically (actors at other territorial levels than a central government) as well as horizontally (state and non-state actors). Thus, "governance" refers to the increasing interdependence between state and non-state actors at several territorial levels, while "multi-level" indicates an increased interdependence of actors operating at different territorial levels (Bache & Flinders, 2004). MLG was introduced in the context of EU studies (Bache & Flinders, 2004) but is applied in other fields more and more (Ongaro, 2015). Literature highlights that decentralized governmental arrangements which include non-state actors like NGOs can have positive impacts on sustainability outcomes (Fairbrass & Jordan, 2004; Nagendra & Ostrom, 2012; Newig & Fritsch, 2009).

Elements of MLG have been used to understand different types of interactions and interdependencies along supply chains. Different governance mechanisms have emerged to balance the absence of an overarching authority in complex supply chains (Niforou, 2015). In my research, MLG is used to add to the Social Network Analysis (SNA) by structuring the actors involved in the gold supply chain and contributing to understanding their roles and, thus, answering RQ1.

3.2 Telecoupling

I am using the framework of telecoupling as an analytical tool to look at coupled human and natural systems over geographical distances and understand their interactions (Liu et al., 2013). Telecoupling builds upon and unifies concepts such as teleconnection (environmental interactions between natural systems over distances) and globalization (socioeconomic interactions between human systems over distances) (Liu et al., 2013). Further, it integrates distant environmental and socioeconomic interactions that have an impact on environmental and social sustainability on local as well as global levels (Eakin et al., 2014; Liu et al., 2013). A system can be linked "to actors and actor networks, to institutions and governance, and ultimately to other land systems and places" (Eakin et al., 2014, p.

153; Figure 4). Interactions can include trade or information exchange. However, tackling problems in telecoupled systems is challenging because of the disconnection between the origin of a problem and its outcomes (Eakin et al., 2014). Sustainability impacts of global trade are manifold and distant forces have been considered at times, but have often been dealt with as external factors (United Nations, 2012).

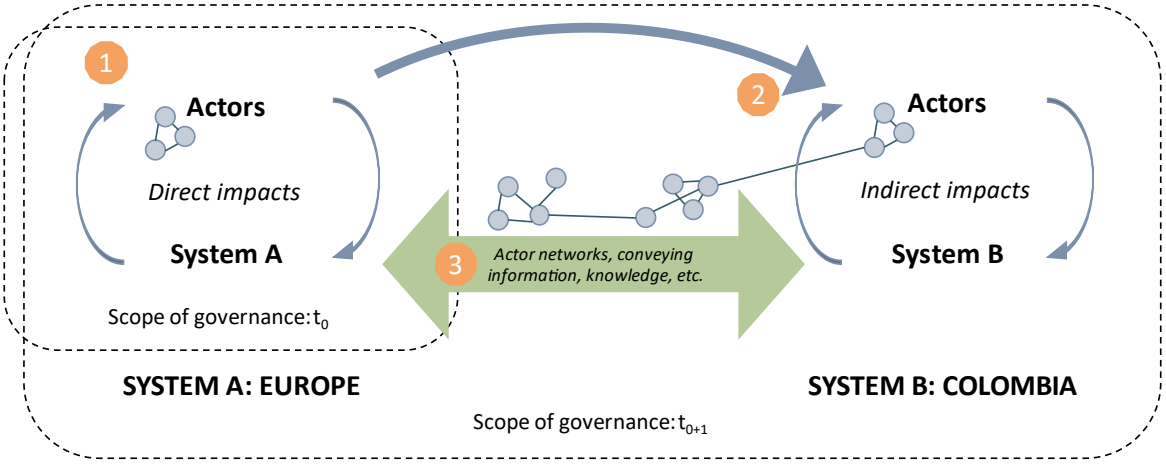

Figure 4. Representation of telecoupling between two systems. The two coupled systems are Europe (A) and Colombia (B). 1: System A is operating within the scope of governance (t_0). 2: System A impacts system B which triggers several indirect impacts and externalities. 3: These externalities trigger feedback mechanisms which pressures the initial governance system (t_0) to change its scope and address the appearing externalities through new institutional arrangements (t_{0+1}) (adapted from Eakin et al., 2014)

Challies et al. (2019) argue that governance research needs to address the implications of telecoupling for governance. Private and multi-stakeholder initiatives like sustainability certification schemes are among governance arrangements to address the environmental externalities of telecoupling (Challies et al., 2019). When governance institutions and mechanisms in one system are unable to account for the consequences, risks and opportunities in the interaction between two systems, the connectivity is "ungoverned" (Eakin et al., 2014, p. 147). In my research, MLG will be used to account for the governance aspects in telecoupled systems. While keeping the telecoupled connection (to Colombia) in mind, the focus of my research is one part of the telecoupled system, the European gold market, and its current and newly emerging governance structures.

I am applying SNA as an analytical tool to understand and approach the telecoupled systems (all RQs) (Eakin et al., 2014). The analysis of the telecoupled systems "require(s) a focus on how the motivations and values of social actors relate to telecoupling process" (Eakin et al., 2014) which will be discussed as part of RQ2 and RQ3.

4 Methodology

I chose a qualitative research approach to analyze the complex supply chain of gold. A literature review contributed to a general understanding of the topic, helped to get an overview of relevant actors and governance tools, and added to the interviews. Semi-structured interviews were central to my research and contributed to a better understanding of the actors' roles and their motivation. They were complemented by informal interviews. I carried out a SNA, categorized sustainability approaches and, as the final step, analyzed what drives the industry's sustainability efforts (Figure 5).

At the beginning of my research, I conducted five informal discussions with experts on the topic of gold supply chains and gold trading in Colombia respectively to narrow down the RQs and confirm the relevance of the research topic.

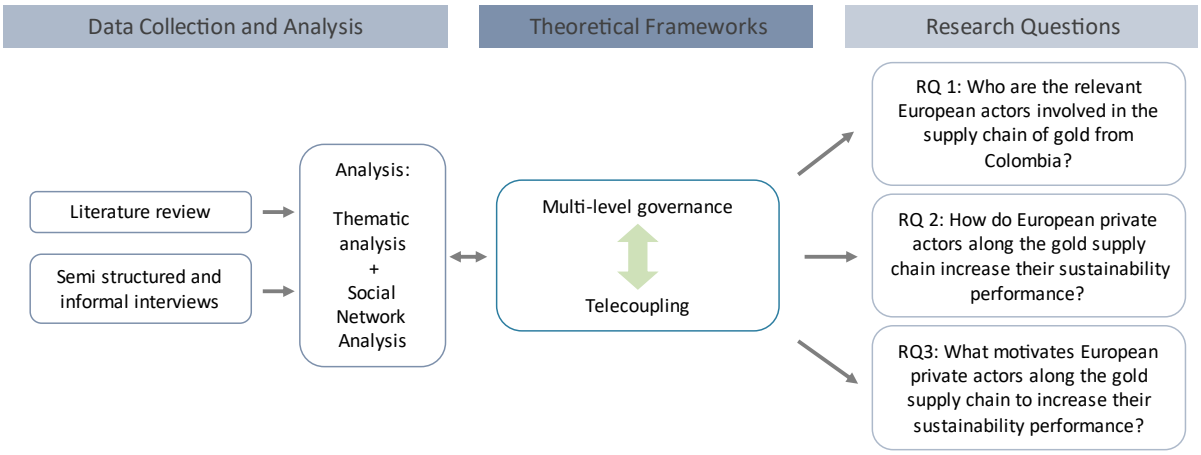

Figure 5. Visualization of research design and use of theoretical frameworks (own creation)

4.1 Research Philosophy

I used a critical realist approach in order to understand underlying drivers of the sustainability performance in the gold industry. This approach acknowledges that there are multiple layers of reality and that this reality is independent of people's perceptions (Edwards & Holland, 2013). As scientific knowledge is not regarded as the only means of accessing this reality, interviews can contribute to an attempt to comprehend the structure of reality. Critical realism further acknowledges that the values of researchers are inherent throughout the research project and that through dialogue truth can be negotiated (Edwards & Holland, 2013). Within the scope of my research. not all relevant aspects were unraveled. However, analyzing actors along the supply chain of gold and their motivation for sustainability efforts contributed to a better understanding of the topic: an understanding that is closer to reality.

4.2 Data Collection

4.2.1 Literature Review

The research process was accompanied by a narrative literature review, i.e., a reasonably comprehensive but not exhaustive assessment of key academic literature (Bryman, 2016). I searched for academic literature on LUB search, Scopus and Google Scholar with multiple keywords (Table 1) and applied a snowball search technique (Bryman, 2016). The literature review was used to gain an initial understanding of the different sub-topics and to complement and deepen the insights from the interviews. I screened the obtained articles manually by looking at the abstracts to identify relevant literature. In addition, a literature review of other relevant documents, i.e., reports by the interviewees' organizations (e.g., sustainability and NGO reports) and EU legislations was performed to prepare and follow up with the interview. I used triangulation, i.e., multiple methods and sources of data (Bryman, 2016), by also utilizing documents to find correspondence with the information gained through the interviews.

Table 1. Keywords and search strings used for the literature review (own creation)

Topic	**Keywords and search strings** *Keywords and search strings for the different topics were combined*
Supply chain	"supply chain*" OR "value chain*" OR "value network*" OR "global value chain*"
Sustainability	"sustainab*" OR "supply chain sustainability" OR "responsibility" OR "responsible supply chain*" OR "responsible value chain*" OR "due diligence"
Minerals / Gold	"mineral*" OR "conflict mineral*" OR/AND "gold"
Gold from Colombia	"Colombia" OR "Colombian gold"

4.2.2 Interviews

Semi-structured Interviews

The core empirical data of my research were ten semi-structured interviews with different stakeholders (Table 2). The interviewees were found through a mix of online research, previous contacts and snowball sampling where contacted persons forwarded my request or interviewees referred me to other experts (Bryman, 2016). The sample of interviewees was chosen by means of accessibility. All actors that indicated their availability were interviewed. Out of 57 actors contacted, 47 either did not reply or declined the request.

Table 2. Overview of interviewees for semi-structured interviews. Short forms used: R – Refinery, N – NGO, O – other (own creation)

Short form	**Organization/ Person**	**Based in**	**Main activity of organization/person regarding gold**	**Position of interviewee**	**Date**
R1	Refinery	Switzerland	Gold refining	*Not to be disclosed*	02/ 2022
R2	Refinery	Switzerland	Gold refining *(not working with gold from Colombia specifically)*	CEO and Director of Sourcing and Bank Products	03/ 2022
R3	Refinery	Belgium	Gold refining and recycling *(not working with gold from Colombia specifically)*	Responsible Supply Manager	03/ 2022
N1	Environ-mental NGO	Germany/ International	Working on environmental consequences of gold mining and other topics, advocating for sustainable development	*Not to be disclosed*	03/ 2022
N2	NGO	Switzerland/ Colombia	Working on gold mining in Colombia and the gold industry in Switzerland	Coordinator	03/ 2022
N3	NGO	Switzerland/ International	Working on gold mining in Latin America	Co-director	04/ 2022
O1	Industry associa-tion	Switzerland	Gold industry association, offer support to ASGM	CEO	02/ 2022
O2	Policy analyst	International	International organization, providing due diligence guidance for responsible supply chains	Policy Analyst working with Responsible Business Conduct	03/ 2022
O3	Research-er	Belgium/ International	Global and local dimensions of extractivist projects	Associate professor	03/ 2022
O4	Policy officer	EU	Working with EU regulations	*Not to be disclosed*	03/ 2022

For the interviews, I used three similar interview guides (one for private actors, one for NGOs, one for researchers/others, Appendix A) with open-ended questions. These guides were developed based on literature and the informal conversations with experts. For each interview, the guide was adjusted to the interviewee, the organization, and what kind of information could be found on the organization's website, in their reports, etc. The overarching thematic blocks and the corresponding RQs for all interviews were

1) Mapping the supply chain (RQ1)
2) Gold supply (RQ1+2)
3) Sustainability (RQ2+3).

The interviews took between 1-1.5 hours and were all conducted online apart from one interview (O3). In accordance with the preferred language of the interviewee, seven interviews were conducted in English and three were conducted in German (N1, N2, N3). The interviewees were informed about the purpose of the research and their right to ask for clarifications or skip questions at any time. All interviewees agreed with their interviews being transcribed and used for this research. I anonymized all interviews to keep the focus of the research on the network of actors and not on a particular actor and to ensure confidentiality (Wiles, 2013). This also respects the requirement of some interviewees who asked to remain anonymous. The interviews were transcribed entirely in order to ensure a systematic analysis.

Informal Interviews

Informal interviews complemented the data collection. An informal interview offers the opportunity for the interviewer to vary questions freely between all interviewees and to follow the natural flow of the conversation (Patton, 2002). The aim was to learn more about the perspective of gold traders and jewelry stores which are often a connection point for end-consumers. I chose Antwerp, Belgium, as a point of interest as it is a renowned diamond trading hub, but also home to multiple gold and jewelry trading businesses as well as Belgium's only LBMA-listed refinery (LBMA, 2022).[3]

The informal interviews were conducted over two days in March 2022. For the interviews, I visited the area known as the "diamond district". While walking around, I identified several stores to either buy and sell gold and/or jewelry. This was judged based on the appearance of the store, guided by statements and advertisements outside the store or included in the store name. In order to not disturb business activities, I chose ten stores (Table 3) that I identified to be unfrequented at the moment of my visit. When entering the store, I approached the staff to request a short conversation for a university project.

[3] Other reasons for visiting Antwerp were the opportunity to meet researchers working on similar topics and conduct a semi-structured in-person interview (with O3).

Table 3. Overview of interviewees for informal interviews (own creation)

Type of store	Type of interaction	Short form
Jewelry store	Conversation	JS1
Jewelry store	Conversation	JS2
Jewelry store	Short conversation	JS3
Jewelry store	Denied answering my questions	--
Gold trading store	Conversation	GT1
Gold trading store	Conversation	GT2
Gold trading store	Conversation	GT3
Gold trading store	Conversation	GT4
Gold trader (office)	Referred me to email request, did not reply	--
Small Refinery	Refused entry	--

4.3 Data Analysis

4.3.1 Thematic Analysis

I conducted a thematic analysis through the software NVivo. While transcribing the interviews and writing fieldnotes, I familiarized myself with the data and started with pre-coding (Bryman, 2016; Saldaña, 2013). A mix of inductive and deductive coding was used (Miles & Huberman, 2020), and deductive codes were derived from the literature review and the interview guide. For first cycle coding, descriptive coding was used to identify the different topics in the transcripts (Saldaña, 2013). I used an iterative process to review codes and develop them further by dividing them into sub-themes and higher-order codes (Appendix B) (Bryman, 2016).

4.3.2 Social Network Analysis

In order to gain a better understanding of the network of actors involved in the gold supply chain, I conducted a SNA. According to Prell (2012), SNA is an approach that "involves theoretical concepts, methods and analytical techniques to uncover social relations that the individuals and groups together, the structure of those relations, and how relations and their structures influence (or are influenced by) social behavior, attitudes, believes and knowledge" (p. 1). SNA allows for an analysis of relationships and exchange of resources such as information, money, or material flow, among different actors (Eakin et al., 2014). Actors are defined as individual persons, businesses, countries, etc. (Borgatti & Li, 2009). SNA is mostly applied quantitively. Yet, it can also be used within a qualitative approach (Crossley, 2010). In recent years, the relevance of using SNA in a supply chain context has increased as it

contributes to understanding supply chains in times of increased connectivity (Bellamy & Basole, 2013; Han et al., 2020). SNA is not only used to get a better understanding of the relations between different actors in the network but can also be used as an analytical lens for telecoupling. A network's values and capacity to initiate change can be the entry point to such an analysis (Eakin et al., 2014). Further, SNA can contribute to identifying actors (so called "brokers") that ensure the connection between two telecoupled systems and are leverage points for change and regime shifts (Eakin et al., 2014).

Semi- and unstructured interviews are the base for a qualitative SNA (Crossley, 2010). I used them to get an understanding of how interviewees perceive the network through capturing an insider view of it, which enables the creation of a more complete picture (Jack, 2010). SNA was applied to map relationship structures between actors (Han et al., 2020) with regard to trade flows of gold (Chapter 5.1.1) and expectations concerning sustainability performance (Chapter 5.4.2). To get the most out of the interviews, the starting point for the discussions was the map of the global gold production (Figure 2) from Verbrugge (2020). Based on this depiction, interviewees were able to comment on where they stand in the network and how their perception of the network differs from the one depicted. In addition, they commented on their relation to other actors in the network. This enabled me to create a new actor map. As the aim of this research was to look beyond the actors directly involved in the supply chain, the boundaries of the network were defined during research through snowball sampling (Wasserman et al., 1994). This is in line with the boundaries of telecoupled systems which are defined with regard to "place-based social-ecological interactions as well as the potentially aspatial social networks, institutions, and governance structures that directly influence those interactions" (Eakin et al., 2014, p. 142).

5 Results and Discussion

In this chapter, I present and discuss the results of my research. Firstly, I introduce the results of the SNA by introducing relevant actors along the chain and their roles. This is complemented by presenting other relevant actors, including regulatory frameworks and schemes (RQ1). I examine the understanding and awareness of sustainability and present different strategies for increasing supply chain sustainability which I identified (RQ2). Lastly, I reflect on the actor's motivation to implement these strategies (RQ3).

5.1 Actors

In this section, I answer RQ1 (Who are the relevant European actors involved in the supply chain of gold from Colombia?). First, as part of the SNA, I review the map of the global gold production (Figure 2) which I used as a starting point for the interviews and present relevant actors along the Colombian-European gold supply chain by presenting the actor map (Figure 6). Second, I introduced relevant actors outside the supply chain. Based on these findings, I discuss the governance structures using the MLG and telecoupling frameworks.

5.1.1 Actors Along the Supply Chain

Among the interviewees, different adjustments for the map (Figure 2) were suggested. One refinery acknowledged the complexity of the existing map but noted that for them it is crucial to keep it simpler to ensure traceability (R2). From an NGO perspective, the map was heavily simplified (N1, N2, N3). Since there is a fine line between formal and informal activities, I decided not to differentiate between the two in the newly developed actor map (Figure 6). Additionally, formalizing mining activities does not necessarily lead to improved practices in terms of sustainability (N1; OECD, 2018b).

LSGM, ASGM, and intermediaries

When analyzing the European gold market, the interviewees highlighted the importance of noting that there are different ways of sourcing and routes for the gold to take in Colombia. According to O1 and R1, ASGM gold is often traded through Comercializadoras Internacionales who are entitled to trade internationally. Through these traders, it reaches large refineries in Europe. LSGM gold, on the other hand, is usually traded directly between the mines and European refiners (R1) so that supply chains are relatively clear (N1).

All interviewed NGOs mentioned the lack of transparency around the trading of ASGM gold in Colombia (N1, N2, N3). There are several intermediaries that trade formally and informally, i.e.,

potentially illegally, sourced gold (depicted as gold buyers and traders/exporters in Figures 2 and 6) (R1). Though they add an additional step to the supply chain, O1 notes that these intermediary traders are necessary as ASGM miners only produce small amounts of gold and trading it themselves is not economically feasible for them. Overall, there are many routes illegal gold can take before it gets into Switzerland and the European market (N1). N2 stated that it is hard to guarantee that gold from Colombia is "clean", i.e., legal.

The focus of my research lies on the direct trading links between Colombia and European countries. Yet, it is crucial to note that gold from extracting countries does not always get exported directly to Europe. Dubai, for example, is known as a trading hub for risky gold, i.e. gold that is connected to human rights violations and environmental destruction, and exports gold to Switzerland (Society for Threatened Peoples Switzerland, 2018).

Large and small refineries

The role of refineries was identified to be a crucial one along the supply chain as it is the last opportunity to trace the gold back to its place of origin (N3). Refineries are the point along the supply chain where the highest volume of material is processed by the lowest number of actors (O2). Therefore, large refineries are targeted by the EU Conflict Minerals Regulation (O4) and are the focus of the OECD Guidance (O2). From a refinery's perspective, the supply chain must not be too complex in order to ensure sustainable practices (R2). It is noteworthy that some refineries do not own the material but rather offer the service to process it (R1, N2). Details about the role of small refineries remained unclear throughout the research. Smaller refineries were identified as challenging in terms of sustainability as they work with smaller volumes that often fall outside the scope of regulations (N1). R3 mentioned that they, as a large refiner, do collaborate with small refineries. From the refineries in Europe, gold gets exported to banks, and the electronic, watch and jewelry industries (R2).

Gold trading system and sub-suppliers

The map (Figure 2) was further adjusted by adding semifinished sub-suppliers who convert the industrial bars produced by refineries into semi-finished goods for other actors, e.g., watch and jewelry manufacturers (O1). R1, R2 and O1 mentioned that in their operations there is no intermediary ("gold trading system" in Figure 2) between refineries and the industry or the financial markets while R3 specified that trades can happen with or without an intermediary.

Gold market: Investors, jewelers, industry

The gold market was mostly analyzed through the gold traders and jewelry stores in Antwerp. When asked where they receive their gold from, all jewelry stores I spoke to mentioned gold traders in Italy (JS1, JS2, JS3). The gold traders are mainly selling recycled gold (GT1, GT2). JS1 believed that all gold that is being traded in Europe is fair as smuggling is impossible. GT4 stated that they do not see a connection between their gold trading business and sustainability issues, all they could do to be more sustainable is "switching their light bulbs". N1 assumed that many actors in the gold market do not know where their gold comes from as they do not have to disclose this data.

Consumers

On the newly developed map (Figure 6) end-consumers, i.e., private customers were positioned in a separate box to show their specific role and differentiate between them and the actors on the gold market (O1). Consumers were described as more informed (R2) and attentive (O1) and having growing expectations (R1). They pressure large refineries to act and are seen as market regulators (R2). However, only one of the jewelry stores in Antwerp mentioned that consumers occasionally ask for the origin of the gold (JS1). N1 noted that consumers have a lot of power, especially towards consumer-facing companies, e.g., watch and jewelry companies, and O2 stated that the responsible business conduct-movement relies on a bottom-up approach through consumers that influence the market. However, interviewees acknowledged that consumers are "bombarded" with information (R2, O2). According to O2, in this information overload for consumers, certification schemes are an important tool for guidance.

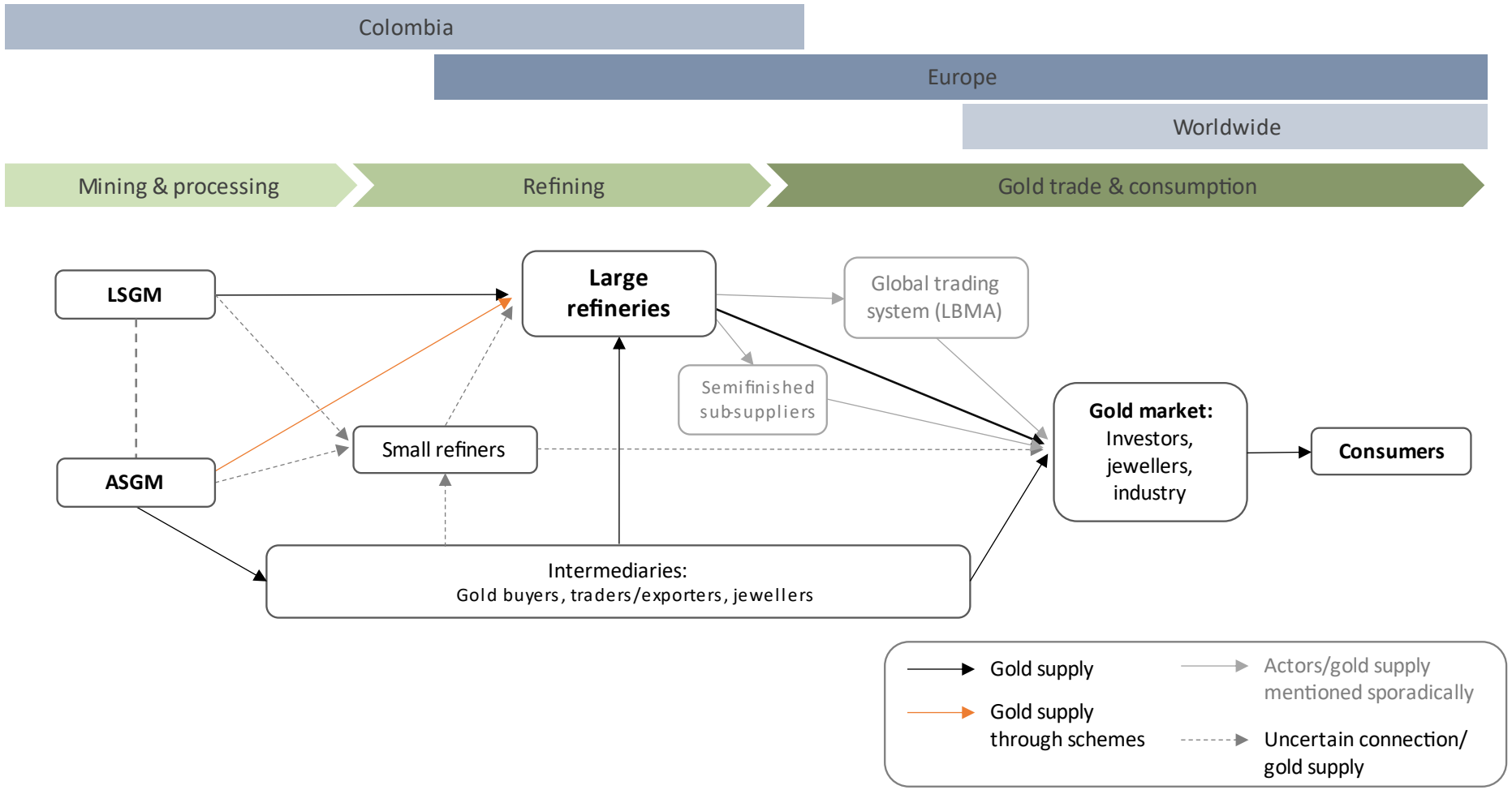

Figure 6. Actor map depicting gold trade along the Colombian-European supply chain. Divided by geographic location and processing step (own creation based on Verbrugge, 2020)

5.1.2 Actors Outside the Supply Chain

NGOs and civil society

NGOs were referred to as an important actor that push for sustainability improvements (O1), shift the debate regarding responsibility and consequently contributes to the creation of sustainability guidelines such as the OECD Guidance (N3). NGOs are perceived to have a big impact on awareness throughout society (R2). In addition, they can give people who are directly affected by the social and environmental impacts of mining a voice (N3).

Several interviewees mentioned a raise in public awareness among civil society (O1, O4) and media (O1). N3 also mentioned the importance of the civil society in the country of extraction as their struggle proves the necessity of the NGO's work on the ground.

Governments

Governments have a growing impact on supply chains through regulatory frameworks (Table 4). The EU's Conflict Minerals Regulation was identified as a central legislation that is affecting the gold supply chain. It goes beyond national laws like the Modern Slavery Act (UK) and Dodd-Frank Act (USA) (O3). Importers of 3TG have to comply with the regulation when they reach a certain threshold of imports (O4).[4] According to O4, the Conflict Minerals Regulation also affects downstream companies (manufacturers, retailers, etc.) outside the scope of the regulation since it pressures them to implement due diligence practices. The EU works closely together with the OECD and has adopted the OECD Guidance in the Conflict Minerals Regulation. The implementation of the regulation is left to each member state (O4). O4 sees different capacities, expertise, and levels of preparedness between the EU national authorities. Together with different regulatory systems, this impacts the effectiveness of the regulation. In addition to uncertainties about the effectiveness of the implementation, NGOs criticize a lack of sanctions for non-compliance (European NGO Coalition on Conflict Minerals, 2021).

In accordance with the OECD Guidance, the EU Conflict Minerals Regulation focuses on armed conflicts and human rights abuses and therefore does not include environmental aspects (European Commission, 2021). Yet, the EU's newly proposed Directive on Corporate Sustainability Due Diligence incorporates environmental aspects. It seeks to go beyond current national laws in the EU like the German Act on Corporate Due Diligence Obligations in Supply Chains (Germanwatch, 2022). Three other proposals within the EU could possibly overlap with the Conflict Minerals Regulation and

[4] The volume threshold is based on annual import volumes of each 3TG mineral into the EU and ensures that the "vast majority, but not less than 95% of the total volumes imported (…) is subject to the obligations of [EU] importers set out in [the] Regulation." (Regulation 2017/821, 2017, Article 1 (3.)).

therefore be relevant for the gold supply chain. These are the deforestation proposal[5], the sustainable products initiative[6], and the EU Batteries Regulation[7] (O4).

Switzerland is Europe's most important market for gold and has a special position since it is not part of the EU. Swiss legislations are considered to be weaker than EU ones (WWF, 2021). In 2020, the introduction of the "Corporation Responsible Initiative" failed (Business & Human Rights Resource Centre, 2020). Swiss customs have reviewed the custom codes and started to differentiate between imports of freshly mined and recycled gold (O1). However, N3 criticizes that there is a lot of secrecy around Swiss imports which is mirrored by SWISSAID's report which points toward gaps in Swiss legislations when it comes to checking the import of gold and the refineries. Refineries are not obligated to ensure that the gold production is free from human rights violations. Further, the customs agency's import data is not transparent and does not allow to trace back gold imported to Switzerland through third countries (that do not produce gold themselves) like the United Arab Emirates, specifically Dubai (Ummel, 2020).

The OECD Guidance was identified to be the most crucial framework. As mentioned, in EU countries it is implemented through the EU Conflict Minerals Regulation and therefore legally binding (European Commission, 2021). In addition, many certification schemes are based on OECD Guidance (Table 5). According to O2, if private actors want to engage in the world's most important gold markets, they need to abide by the OECD guidance. Apart from the legally binding regulations, important frameworks mentioned were the UN Guiding Principles and the UN Global Compact (R2, O4).

[5] This is a proposal by the European Commission from November 2021 to curb deforestation and forest degradation which is driven by agricultural expansion. It includes agricultural products but no minerals (European Parliament, 2022b).

[6] The sustainable products initiative is used to revise the current Ecodesign Directive and aims to provide legislative measures to make products on the EU market more sustainable (European Commission, 2022b).

[7] This is a proposal concerning batteries and waste batteries to ensure sustainability and competitiveness of the battery value chain (European Parliament, 2022a).

Table 4. Overview of regulatory frameworks that are relevant in the context of increasing supply chain sustainability for gold (own creation)

	Name (short form)	**Region**	**Coming into force**	**Description**	**Relevant for**	**Reference**
European Union	Directive on Corporate Sustainability Due Diligence	EU	Proposal adopted February 2022	Due diligence requirements for larger companies, requires them to identify, prevent and mitigate impacts on human rights and the environment	All EU companies (250+ employee and EUR 40 million+ net turnover worldwide)	European Commission, 2022
	Conflict Minerals Regulation	EU	2021	Concerned with 3TG metals from conflict-affected and high-risk areas. Requires EU importers to identify, manage and report risks connected to their sourcing of materials based on the five steps of the OECD guidance. Compliance is checked by each EU member state.	Directly affecting EU-based importers of 3TG and indirectly affecting smelters and refiners, in and outside the EU	European Commission, 2021; Regulation 2017/821, 2017
Switzerland	Data on raw gold available in Swiss foreign trade statistics	CH	2012	Data on raw gold in Swiss foreign trade statistics including country of origin (if known)	Swiss companies that import gold	WWF, 2021
	Precious Metals Control Ordinance (SR 941.311)	CH	1934	Cases of precious metal imports where legality is doubted must be reported	Swiss companies that import gold	Precious Metals Control Ordinance, 1934; WWF, 2021
	Konzernverantwort-ungsinitiative [Corporation responsibility initiative]	CH	**Rejected** in 2020	Due diligence requirements concerning social and environmental aspects for Swiss companies	Swiss companies	Business & Human Rights Resource Centre, 2020
Other (national)	Lieferkettensorgfalts-pflichtengesetz [Act on Corporate Due Diligence Obligations in Supply Chains]	Germa ny	2021	Due diligence requirements concerning human rights and environmental aspects, including risk analysis, management, and reporting	German companies with 3,0000+ employees	Supply Chain Act, 2021
	Modern Slavery Act	UK	2015	Act to fight modern slavery across supply chains. Companies have to publish an annual report about slavery and human trafficking	Companies with business in the UK and GBP 36 million+ in sales	Business & Human Rights Resource

						Centre, 2016; UK Government, 2018
	Dodd-Frank Act	USA	2010	Improve transparency in the US financial system, introduce reporting requirements for conflict minerals	US stock market listed companies that source conflict mineral from DR Congo and neighboring countries	Dodd-Frank Act, 2010; WWF, 2021
Other (international)	OECD Due Diligence Guidance	OECD countries/worldwide	2011	Full name: "OECD Due Diligence Guidance for Responsible supply Chains of Minerals from Conflict-Affected and High-Risk Areas" Five-step due diligence guide for 3TG	***Not legally binding.*** Businesses in OECD countries and beyond	OECD, 2016
	UN Guiding Principles on Business and Human Rights	World wide	2011	Guideline to prevent, address and remedy human rights violations	***Not legally binding.*** Businesses and states worldwide	United Nations, 2011
	UN Global Compact	World wide	2000	Encourages companies to implement sustainability goals and apply sustainability practices via ten principles (human rights, labor, environment, anti-corruption)	***Not legally binding.*** Businesses worldwide	United Nations Global Compact, n.d., 2015

Certification schemes and associations

Voluntary certification schemes have been developed where regulatory frameworks have shown shortcomings (Uribe Martínez et al., 2021). According to the EU (Regulation 2017/821, 2017), schemes include ”independent third-party audits, developed and overseen by governments, industry associations or groupings of interested organizations” (Article 2(m)). As extensive research on certification schemes for conflict minerals exists (Franken et al., 2020; Kickler & Franken, 2017; Van Bockstael, 2018; van den Brink et al., 2019; Young, 2015), this chapter merely provides an overview of relevant schemes identified in the interviews and analyzed documents (Table 5).

Most of the schemes relevant for the private actors were developed by mining associations or multi-stakeholder collaborations (Kickler & Franken, 2017). Through the interviews, these associations were identified as central actors for sustainability matters and benchmarking (N1, O1). LBMA with its Good Delivery List is the most dominant association (Verbrugge, 2020; Young, 2015). In Europe, all large refineries are LBMA-listed (LBMA, 2022). Schemes play a big role when it comes to ensuring responsible practices in ASGM. According to R1 and R2, the certification enables the refinery to work with ASGM gold as it gives them reassurance in terms of due diligence. NGOs acknowledge that these standards are part of the solution, but not the solution in itself. Their contribution represents small quantities in comparison to the overall volume of traded gold (O3; WWF, 2021).

Several schemes use the OECD Guidance as orientation (Table 5). Multiplying the use of the Guidance in this way is desirable as it can save resources and help to create unified expectations for the market (O2). Yet, it is crucial that the standards are really aligned (O2). In 2018, an alignment assessment showed that this is not always given and it is a challenging and time consuming task (OECD, 2018a). Schemes can also apply for recognition in connection to the EU Conflict Minerals Regulation (Regulation 2019/429, 2019). This can help smaller EU importers with fulfilling legal requirements. However, it also requires a careful review of the schemes (O4).

Table 5. Overview of certification schemes (own creation)

Name	Run by	Details	Reference
LBMA Responsible Gold Guidance	London Bullion Market Association (LBMA)	Standard based on the five steps of OECD Guidance. Compliance is required to be listed on **Good Delivery List.**	LBMA, 2021
Chain of Custody Standard	Responsible Jewellery Council (RJC)	Standard for precious metals in jewelry supply chains based on OECD Guidance	Responsible Jewellery Council, 2019
Conflict-Free Gold Standard	World Gold Council	Standard for companies involved in the extraction of gold, based on OECD Guidance	World Gold Council, 2012
Responsible Minerals Initiative	Responsible Minerals Initiative (RMI)	Supporting downstream companies, use OECD Guidance as reference	OECD, 2018a
ICMM Mining Principles	International council on mining and metals (ICMM)	Ten principles for more responsible mining	International Council on Mining and Metals, 2022
Swiss Better Gold Initiative	Swiss Better Gold Associations (SBGA), Swiss State Secretariat for Economic Affairs (SECO)	Public-private partnership for the certification of ASGM gold	State Secretariat for Economic Affairs, 2021
Fairmined	Alliance for Responsible Mining (ARM)	Certification of ASGM gold	Alliance for Responsible Mining Foundation, 2014
Fairtrade	Fairtrade International	Certification of ASGM gold	Fairtrade International, 2013

5.1.3 Governance of the Gold Supply Chain

The SNA shows that the gold supply chain between producing countries and Europe is majorly impacted by actors outside of the chain, namely the EU, national governments, the OECD, industry associations and certification schemes, NGOs and civil society. Among private actors along the European side of the supply chain, I identified large refiners as the bottleneck for transparency and sustainability. While it is difficult to ensure if gold from Colombia was mined legally, large refineries represent the last opportunity along the supply chain to trace the gold's origin.

From a telecoupling standpoint, the supply chain between Europe and Colombia is not an example of an ungoverned interaction. Though developments are recent, voluntary standards and the work of

NGOs are complemented by the implementation of regulatory frameworks and the development of new institutional arrangements such as public-private partnerships. It is evident that the EU is putting efforts into governing this interaction. However, the EU Conflict Minerals Regulation does not apply to smaller refineries, and it relies on member states for the implementation of legislations knowing the capacity for an effective implementation differs among the members. Also, the lack of legal actions by the Swiss government raises doubt if they have the same ambitions as the EU. This shows that even though the supply chain sustainability in the Colombian-European gold chain is not ungoverned, there are gaps in the governance structures.

From a MLG perspective, authority is divided vertically between actors located at other territorial levels, i.e., the EU and national states. The EU regulations, more specifically the Conflict Minerals Regulation, are crucial for larger refineries. In the future, the regulation might overlap with other legislations like the newly suggested "Act on Corporate Due Diligence Obligations in Supply Chains". Swiss legislations (national level) are weaker than the EU ones and show significant gaps. Though the Conflict Minerals Regulation is only legally binding in EU counties, my research shows its presence and relevance for large refineries in Switzerland. However, refineries' statements stand against the statements of NGOs who doubt that refineries follow through on what they say.

Authority is also divided horizontally between state and non-state actors. Through the Guidance, the OECD, as an international organization, provides a central benchmark for state and non-state actors like associations and certification schemes. The important role of certification schemes is one example of multi-stakeholder initiatives that characterize telecoupled systems and address externalities of the telecoupled relationship (Challies et al., 2019). NGOs function as a "watchdog" for companies (N2). Large refineries are the main focus while large watch-making and jewelry business get some, but comparably little, attention, too (e.g., WWF, 2018).

The analysis suggests that there is not a single actor along or outside the supply chain that can significantly impact its sustainability and, hence, represents a so called "broker" in the telecoupled system (Eakin et al., 2014). Rather, a joint approach is needed (O4). Regulations were identified as a powerful tool by the interviewees, yet it is crucial that market expectations for private actors are matched and double auditing is avoided (O2, O4). Further, I identified consumers, NGOs and civil society, as the main actors to demand sustainability from private actors which I will elaborate in chapter 5.4. O3 noted that consumers not only have an impact through their consumption but also have other roles in the society like citizens and employees. This connects to the question of responsibility, which will be discussed in chapter 5.5.

This chapter depicts that on the European side of gold supply chains, there is a wide network of actors that impacts supply chain sustainability. Governance structures divide authority vertically (EU and national states) and horizontally (states and non-state actors like the OECD and certification schemes). Current governance structures are continually evolving and complemented by newly emerging structures but still show significant gaps.

5.2 Interpretation and Awareness of Sustainability

Before proceeding with categorizing the approaches toward improving supply chain sustainability, I briefly describe the interpretation and awareness of sustainability among interviewees. Acknowledging the interpretation of sustainability of the interviewed actors adds to the findings of RQ1 and prepares for a better understanding and interpretation of the results of RQ2 and 3.

Many actors used the term “responsible mining” rather than “sustainable mining” (R2, N1, O1) to account for the fact that extractive activities can never be fully sustainable but still be conducted in a way that respects social and environmental standards. While several social factors such as human rights violations and armed conflict were frequently mentioned factors like environmental degradation were emphasized less (R1, R3). N3 and O2 stated that even though the focus is on conflicts and human rights, environmental issues go hand in hand with social ones and are often the root of the problem. As mentioned, the OECD Guidance, which plays a central role for many actors, focuses on conflict and human rights (OECD, 2016). However, the OECD is developing an additional tool to cover environmental aspects (Federal Environment Agency, 2021). In contrast to the current Guidance, which is binding for EU-based companies through the Conflict Minerals Regulation, the new tool will not be legally binding (O2). In addition, the EU will revise the Conflict Minerals Regulation. Environmental aspects might be added if they are considered to make the regulation more effective (O4).

All interviewed refineries stated that they are aware of the situation in mining countries (R1, R2, R3). Through the informal interviews I conducted in Antwerp I found that there is a gap in terms of awareness between larger and smaller actors on the gold market. As described in chapter 5.1.1, none of the stores had detailed knowledge (or were seemingly interested or concerned) in the origin of their gold (JS1). This was seconded by O4 who expressed that there is an information gap between what is happening on the ground and tracing the supply chain which means that even in the EU, some actors are not aware of the EU Conflict Minerals Regulation.

This chapter shows that private actors often refer to “responsible practices” to describe supply chain sustainability. The term primarily refers to social aspects such as human rights and armed conflicts.

There are major differences in awareness of sustainability between large refiners and small gold and jewelry stores.

5.3 Approaches to Supply Chain Sustainability

Private actors adopt different approaches to improve supply chain sustainability (van den Brink et al., 2019). To answer RQ2 (How do European private actors along the gold supply chain increase their sustainability performance?), I categorize the main approaches to supply chain sustainability of large refineries that I identified through the interviews. The three interconnected approaches found (transparency and traceability, due diligence efforts, and certifications schemes and associations) are presented and, lastly, discussed with regards to their interconnectedness and gaps.

5.3.1 Transparency and Traceability

Transparency is a key for supply chain sustainability and can help to explain complex supply chains (Fraser et al., 2020; Gardner et al., 2019). Without transparency in mineral supply chains, responsible sourcing is difficult as upstream suppliers cannot be identified (van den Brink et al., 2019). Egels-Zandén et al. (2015) see traceability as one dimension of transparency and corporate disclosure. In the interviews, the terms were used interchangeably and the interviewees mostly spoke about traceability.

Having less complex, i.e., shorter, supply chains was brought up as an important way to achieve traceability (R2). O1 pointed out that as an industry association, they encourage direct supply chains. Technological solutions, like blockchain technology, were brought up as another pathway toward traceability (O1, O2). However, N3 criticized this approach for not ensuring the quality of the information fed into the system ("garbage in, garbage out"). Another technological approach is the geoforensic passport. It validates the origin of the gold based on its composition (R1, O2).

All interviewees agreed that traceability is crucial for supply chain sustainability. Refineries mentioned traceability as an important factor in their business activities (R1, R2, R3). According to O1, traceability is non-negotiable even though it is challenging. NGOs criticized a lack of traceability or transparency (N1, N3) which enables irresponsible business conduct (N3). Therefore, traceability is the key to sustainability (N3).

5.3.2 Due Diligence Efforts

An approach to responsible sourcing and supporting traceability is supply chain due diligence (van den Brink et al., 2019). The OECD (2016) describes due diligence as "an on-going, proactive and reactive process through which companies can ensure that they respect human rights and do not contribute to

conflict" (p. 66). In accordance with the OECD Guidance, which is most frequently used as a tool for due diligence, due diligence practices entail establishing a management system, identifying and assessing risks in the supply chain, implementing a responding strategy, carrying out third-party audits and reporting on due diligence (OECD, 2016).

Choosing the right trading partners was identified as an indirect approach to due diligence (R1). Long term relationships between partners stood out as a trust-building approach (Sauer & Seuring, 2017). R2 stressed that long-standing partnerships and engagement with suppliers are an important part of their strategy. This approach was also found to be the major one in the gold and jewelry shops that I visited in Antwerp (JS2).

Yet, due diligence efforts were also criticized as they are a risk-based approach (O4) and do not address unsustainable mining itself (O3). N2 critiqued that it is not clear who checks the due diligence efforts of private companies and that sustainability reports often only entail vague information on how they follow the guidance or certificates. N3 was under the impression that most refiners are not doing enough to include larger social and environmental risks.

5.3.3 Certification Schemes and Associations

Another approach to supply chain sustainability is sourcing via certification schemes. As explained in chapter 5.1.2, it goes hand in hand with being part of industry associations that often offer an own certification scheme. Certifications are frequently used for sourcing ASGM gold (O1). Many certifications work in the countries of primary production, e.g., on formalization and improving working conditions (R1). Thereby, certification schemes support traceability. R2 points out that by sourcing through a scheme, refiners do not yield their responsibility but share it with the certification schemes. O3 notes that schemes and responsible sourcing initiatives are good but criticizes that their impact is not big enough to make a difference.

5.3.4 Interconnection and Gaps of Approaches

The three approaches to increasing supply chain sustainability are interconnected (Figure 7). They overlap, e.g., when schemes use the OECD Due Diligence Guidance or refineries work with schemes to source ASGM gold. Due diligence efforts and the use of certification schemes contribute to more transparency. On the other hand, transparency is needed to ensure due diligence and the use of schemes.

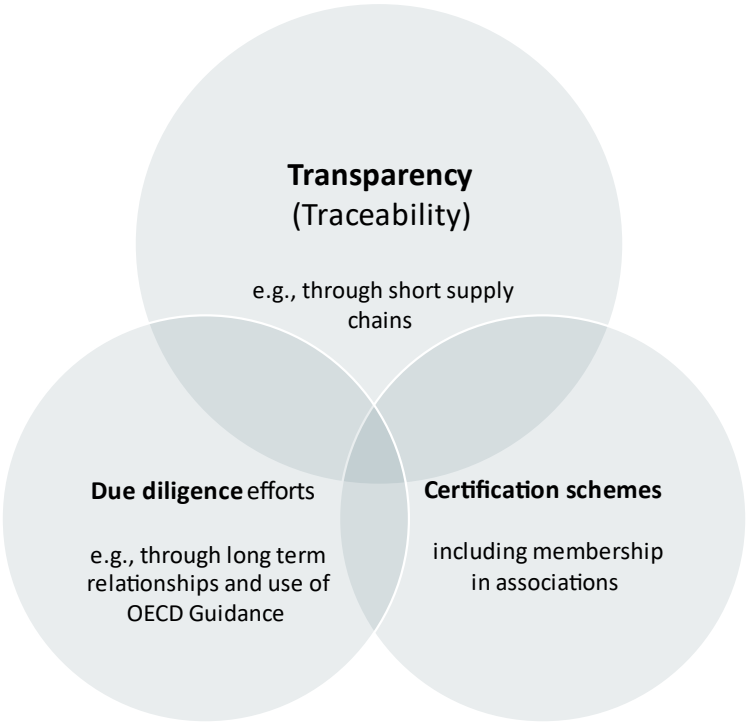

Figure 7. Approaches to more sustainable gold supply chains (own creation)

Adding to the findings from chapter 5.1, the approaches show how different actors along and outside the supply chain work together in multi-stakeholder networks to govern the chain and the externalities of the telecoupled system. However, some gaps in these approaches and the governance of sustainability along the supply chain are seen. In some cases, there is doubt about the extent of due diligence measures and the correctness of third-party audits to check these approaches (Society for Threatened Peoples Switzerland, 2018). Reporting, as part of due diligence efforts, does not imply a comprehensive approach to sustainability issues. N2 mentioned the example of a Swiss refinery which was pressured by their NGO to publish a human rights report. Yet, the published report had "holes like an Emmental cheese" (N2). This shows that the identified approaches to increase sustainability performance do not automatically translate into an actual improvement in sustainability performance let alone in a reduction of negative environmental and social impacts along the supply chain. This is in line with N3's critique that the debate around supply chain sustainability focuses on due diligence, but without transparency, companies can act as they please. Transparency is needed as an additional instrument for due diligence (N3). Transparency cannot replace due diligence but is also not equal to sustainability.

This chapter shows that the different approaches of large refineries, as a central actor in Europe, to increase their sustainability performance overlap. Though transparency and traceability are often lacking, they are central and necessary for due diligence efforts and the effective use of schemes. None

of the approaches automatically ensures an actual improvement in sustainability performance. Further, this section highlights the importance of the actors outside the chain (chapter 5.1.2) for increasing sustainability performances.

5.4 Motivations

To answer RQ3 (What motivates European private actors along the gold supply chain to increase their sustainability performance?), I analyzed the motivation of private actors, mainly large refineries, for implementing the measures to increase supply chain sustainability which I presented in the previous section. In this chapter, the identified motives, interest in change on the ground and stakeholder expectations, are presented and discussed through the lens of telecoupling.

5.4.1 Interest in Change on the Ground

Some actors expressed an interest in seeing change on the ground in the country of production**.** According to O1, private actors' knowledge of the situation on the ground motivates them to improve their sustainability efforts. This also shows in their participation in schemes that work on improving sustainability in ASGM. It reveals a recent shift towards a pro-active approach which focuses on engaging with ASGM rather than pulling out of a country of production entirely (O3). In addition, R1 mentions that they cannot do business at any price while R2 names the future of the planet and the wellbeing of future generations as their intrinsic motivation.

5.4.2 Stakeholder Expectation

The most commonly named motivation to increase sustainability efforts was the need to live up to the expectations of stakeholders (Figure 8). Stakeholders are consumers, other industry actors, governmental institutions, NGOs, associations, and civil society (R2, R3). While in the past, there was an interest to know more about direct suppliers, stakeholders now require greater information (R3). R1 and R3 note a trend regarding increased interest from consumers in knowing about the origin of their products over the last couple of years. R3 suggests that the increased interest is partly caused by stronger regulations. Even though refiners are not directly connected to end-consumers, R2 sees the questions they ask cascading down to the manufacturer. In addition, refiners need to meet the standards of the industry associations they are a member of, such as LBMA and the Responsible Jewelry Council (R2). Further, there are expectations regarding increased sustainability performance among the private actors involved in the supply chain. Trading partners require disclosure about the origin of the gold to continue the business partnership (R1). Large refineries describe that they need to ensure responsible sourcing from ASGM sources, which is done through schemes (R1, R2). They also

experience expectations from the gold market towards them. For example, refineries need to be LBMA listed in order to sell to the international financial market (R1). However, the expectations toward smaller intermediaries, refineries and LSGM remain uncertain. All refineries note that they must comply with national and international laws.

O3 notes that with an increase in public attention, sustainability efforts are part of protecting the company's interests and reinforcing its position in the market. Reputational risks for larger refineries were not only brought up by NGOs (N1), but also by the refineries themselves (R2, R3). This connects to maintaining the social license to operate (R2) which describes the acceptance of a company's operations by stakeholders and the general public (Demuijnck & Fasterling, 2016).

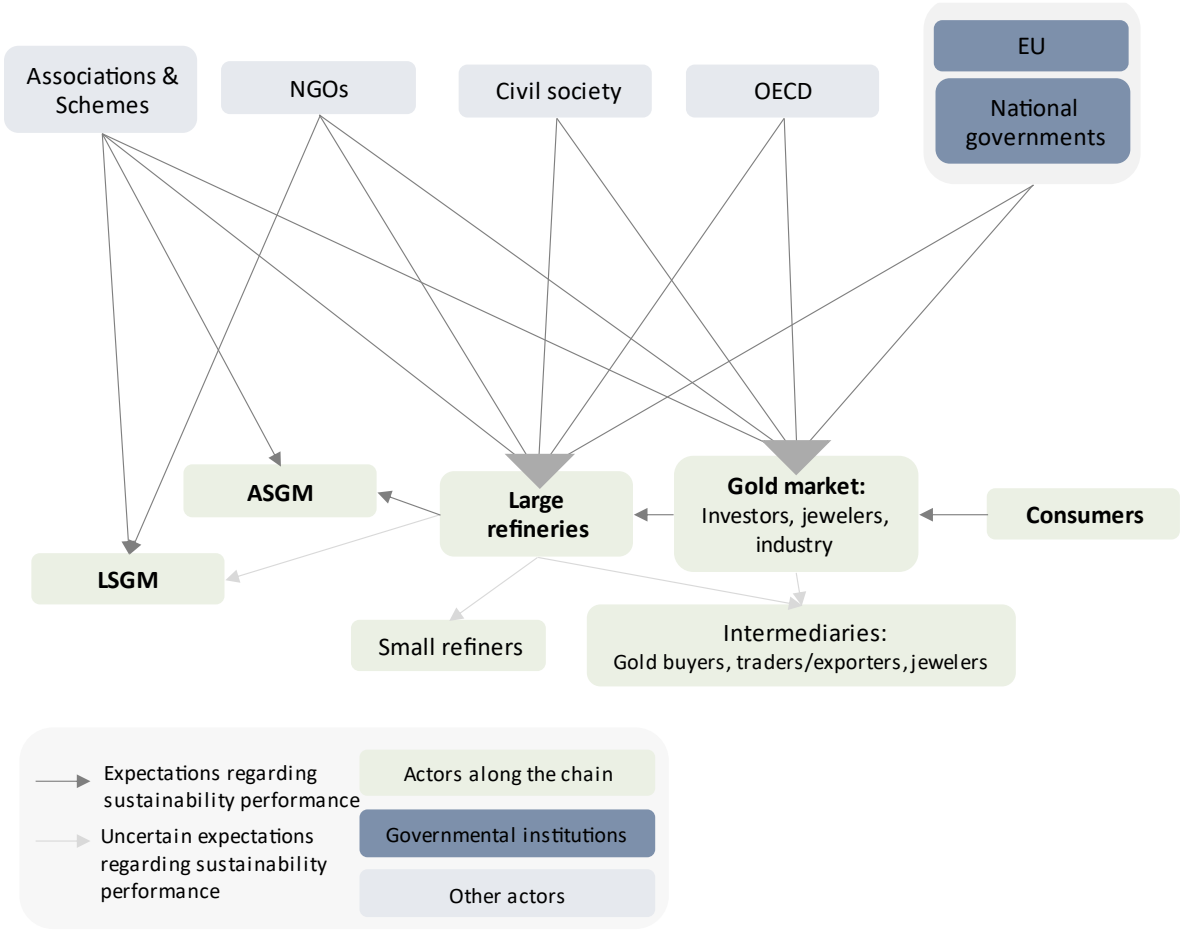

Figure 8. Actor map depicting expectations regarding increased sustainability performance within the network of the gold supply chain (own creation)

5.4.3 Motivations Through the Lens of Telecoupling

Increased stakeholder expectations motivate private actors to increase their sustainability efforts and reveal information connectivity which is another characteristic of a telecoupled system. It describes that actors in one location are informed about outcomes in a distant location (Eakin et al., 2014). This

shows through a general raise in awareness from civil society and increased consumer and market expectations. Yet, little light was shed on the details of or the extent to which consumers demand sustainability. The unstructured interviews only gave a narrow impression of Europe's gold market that suggests that there is little consumer interest in the gold's origin in the smaller jewelry industry. N1 noted, gold-selling companies generally deal with the "top 5% of society". Hence, they do not represent broader parts of society. Therefore, it cannot be easily assumed that an increased interest from civil society and NGOs in this issue translate to an increased concern or even change in habits of these end-consumers. In line with that, not all private actors were found to have an interest in increasing their sustainability efforts. The small gold and jewelry stores in Antwerp did not express any approach or motivation to increase sustainability efforts. Moreover, some of the stores I visited in Antwerp and many private actors I asked for an interview did not want to talk to me. From this, I can reasonably assume that they are not facing the same expectations and pressure to show their engagement towards sustainability as bigger refineries.

Additionally, the increased visibility of the telecoupled connections through knowledge contributes to the enhancement of standards and to embedding sustainability standards which in legislations is seen as a positive effect of telecoupling (Eakin et al., 2014). It is reflected in an increased expectations through industry associations and higher legal requirements in the EU. Switzerland, as the biggest market in Europe, is not directly tied to the EU legislations which was established as a governance gap in chapter 5.1. According to O1, however, Swiss refiners cannot operate in an isolated manner due to their close interlinkages with the EU marked and therefore have to follow the same regulations. Yet, N3 notes that while this is a promise the refineries make, no one is checking on this. If Swiss regulations are not adapted to the EU ones, N3 sees a risk of Switzerland becoming the new Dubai, i.e., trading hub for illegally sourced gold.

The increased visibility and knowledge of the telecoupled connection likely influences the awareness of private actors about the situation on the ground in Colombia. As a consequence of this, the sustainability performance of large refineries is also driven by intrinsic motivation. Refiners stated that their commitment goes beyond mere compliance (R2, R3). Though an increased awareness is positive, it remains questionable if this results in more effective sustainability measures. The interviews with and reports from NGOs show that refineries do not follow through on everything they state. The undertaken due diligence efforts do not require any monitoring of changes on the ground which, according to O3, implies "that there is no genuine interest in seeing change on the ground." Considering the increased stakeholder expectations, it seems like refiners have a great interest in maintaining their social license to operate. O3 argues that companies are rather protecting their image and securing their supply chain than aiming for change on the ground. This is in line with what Landau

(2019) describes as the risk of cosmetic compliance in due diligence approaches (mentioned by O3). It describes companies complying and "tick the box" but fail to have meaningful impact. This is reflected by O2's statement that it is crucial for companies on the gold market to undertake and "extra step" by checking the risk assessment and audit report of smelters and refineries. The lack of proper audits and sanction (chapter 5.1.2 and 5.3.4) in general seems to support the practice of cosmetic compliance.

Beyond the matter of the motivation of private actors, it has not been examined what drives the action of other actors to work towards more sustainable supply chains. The motive of the EU to pass stronger regulations remains uncertain in my research. In addition, N3 raised the point that NGOs, even though acting as a "watchdog" for private actors, governments, and others, have no one watching over them. N3 claims some NGOs act ideologically and not always in the interest of, e.g., miners or indigenous communities in countries of extraction.

In summary, the information connectivity and consequential increased visibility of the telecoupled connection lead to higher sustainability expectations towards private actors, mainly large refineries. Smaller actors are likely not experiencing the same expectations. Large refineries in Switzerland are facing different legal expectations which once more reveals a gap in the governance system. Together with other governance gaps, this entails a risk for cosmetic compliance in order to maintain the social license to operate.

5.5 Bigger Picture

My analysis shows how actors along and outside the gold supply chain engage in new governance mechanisms to increase sustainability along the Colombian-European gold supply chain. Due diligence efforts of large refineries are mostly aiming for compliance with the OECD Guidance. Certifications schemes, which are partially implemented by industry associations, use the Guidance, too. Further, the EU adopts the Guidance in their Conflict Minerals Regulation. My research shows that unified market expectation (O2) and a level playing field, i.e., the same conditions for all actors in the market (R2), help the gold market to implement sustainability efforts. However, in line with the OECD Guidance, these efforts mostly focus on social issues and neglect environmental matters. While large refineries experience growing stakeholder expectations, smaller gold retailers do not seem to face the same pressure from consumer or governments. My findings reveal governance gaps connected to sustainability in the global gold supply chain, for instance, the lack of regulations in Switzerland and the risk-based due diligence approaches. Combined with a general lack of transparency, the effective implementation of sustainability efforts is therefore impeded. The perception that "gold is gold" characterizes the entire supply chain and summarizes that gold has a high financial and cultural value and is used to launder money from illegal activities (R1, O1).

If the new governance structures in this telecoupled system can account for externalities, i.e., negative social and environmental impacts, remains unclear. Literature argues that the implementation of sustainability measures, including legislations and due diligence efforts, do not necessarily lead to improvements in practice (Landau, 2019) and might not improve the situation on the ground but rather aim to further serve the economic interest of companies (Hilson et al., 2016; Le Billon & Spiegel, 2021). My findings suggest that increased stakeholder expectations mean that refineries have to increase sustainability efforts to maintain their social license to operate. Further, the risk-based approach that is taken through due diligence measures does not include measurement of impacts on the ground and therefore leaves doubt about the genuine interest of refiners in seeing improvements.

From my research, the question of who is responsible for demanding sustainability arises. Institutional change in telecoupled systems partly results from the "recognition of responsibility by consumers, corporations, governments, and other actors in the system" (Eakin et al., 2014, p. 160). Interviewees argued for a need for more engagement from private actors (N3) but also from consumers (R2, O1). On the other hand, interviewees recognized that consumers are "bombarded" with information (R2, O2) and "consuming in the right way is not going to solve all the problems" (O3). My research shows that consumer pressure is a crucial tool for increasing sustainability efforts. Yet, this does not imply that consumers are the ones who have to demand more sustainability which leaves this question up for discussion.

My research supports the claim that in the context of mining, sustainability is an oxymoron (Sauer & Seuring, 2017). Mining cannot be sustainable, but millions of livelihoods depend on it (O4, N1). Formalization can provide a solution on a small scale but does not guarantee sustainable practices. Even if the EU continues to strengthen its legal efforts, "dirty" gold would still be produced which ultimately finds its way into Europe for instance through Switzerland. Additionally, current efforts for more sustainable supply chains target the seemingly weak part of these chains which is mostly cheap labor and poor working conditions. Yet, these efforts overlook structural issues and the fact the system of global capital needs cheap labor (O3). Most findings from my research apply to gold supply chains in general. Yet, Colombia's high share of ASGM gold and its role as a transit country for smuggling intensify the identified challenges.

5.6 Limitations

My research approach shows some limitations. Qualitative research is always subject to the researcher's bias when interpreting the data (Bryman, 2016) which is considered in critical realism by acknowledging the researcher's inherent values (Edwards & Holland, 2013). Informal interviews allow for biases more than structured approaches. Their outcome highly depends on the interviewer's skills

(Patton, 2002). In my research, the informal interviews only give a minor insight into the gold market but were the only representation of it (apart from literature). Due to the low response rate of the semi-structured interviews, interviewees were chosen by means of accessibility. Both samples are not representative which means that the insights gained from the interviews cannot be generalized (Bryman, 2016). Further, the scope of the research only allowed for a qualitative SNA which entails that some aspects of the network, like its development, i.e., why and how relationships have evolved, remain unclear. In addition, using the supply chain map (Figure 2) as a base for the interviews was necessary considering the time constraints of the interview. However, this can create a bias since interviewees were commenting on the map rather than contributing independent ideas.

Telecoupling was useful as a broader framework to understand the interconnection between the situation in Colombia and Europe. Yet, it did not aid in explaining the difference between the impacts of the telecoupled connection among the actors of the system. My research shows increased visibility of the telecoupled connection between Europe and Colombia. The lack of awareness of sustainability issues of gold and jewelry stores, however, shows that the increased visibility does not affect all actors in the European system.

5.7 Closing Remarks and Future Research

I contribute to the field of supply chain sustainability research and the analysis of how global processes, i.e., economic globalization and trade, are connected to local contexts. Combining the thematic analysis with a SNA enabled me to structure the complex results of my data collection. The MLG and telecoupling frameworks were usefully employed to extend the understanding of actors along the gold supply chain, their roles, and their motivation to increase sustainability efforts. Using a critical realist approach enabled me to better understand the underlying drivers of the sustainability performance in the gold industry.

Future research needs to investigate the role and impact of actors that have not been the focus of my analysis, such as small refiners and other (smaller) actors along the supply chain in Europe. In addition, analyzing the role of the EU and its motivations for more effective supply chain-related legislations would be a valuable contribution. This should be extended by a deeper evaluation of the effects of EU legislations within and beyond the EU borders. In addition, future research should connect the results of my research to an investigation of financial flows along the gold supply chain between Colombia and Europe.

6 Conclusion

The aim of my research was to enhance the comprehension of the complex supply chains of Colombian gold exported to Europe by identifying key actors and their roles and to analyze the underlying drivers for increasing supply chain sustainability. This enabled me to draw conclusions about the governance structure of the supply chain. My research shows that large refineries, as central actors along the gold supply chain, are facing increased expectations from consumers, NGOs, civil society and other actors on the market. With stakeholders expecting increased sustainability efforts, refineries are pressured to improve their sustainability performance to maintain their social license to operate. This entails a risk of cosmetic compliance. The multi-level governance perspective helped me to deduce that authority between different actors is dispersed vertically, between the EU and national governments, as well as horizontally, between state and non-state actors, e.g., the OECD and associations.

My findings reveal that even though new governance structures have evolved to account for sustainability impacts in the telecoupled connection along the Colombian-European gold supply chain, there are also governance gaps. While the EU is expanding their legal efforts, regulations in Switzerland fall short. Swiss refineries point out the relevance of EU regulations to them, yet the extent to which they follow them is uncertain. Further gaps are the risk-based nature of due diligence efforts and a lack of checks on those efforts or third-party audits. In addition, smaller refineries fall outside the scope of the EU regulation. Paired with a general lack of transparency, these governance gaps allow for illegally mined gold to get imported to Europe. Though the OECD Guidance has a large impact on sustainability, its focus on human rights violations and conflict does neglect environmental aspects. There is an urgent need to close these governance gaps. Simultaneously the transparency along the gold supply chain needs to be improved. This requires joint efforts from all stakeholders, including governments and private actors. Further, the newly emerged governance structures have to continue to constantly adapt and improve.

My research contributes to a better understanding of the gold supply chain between Colombia and Europe. However, the chain remains complex, and the lack of transparency impedes efficient sustainability improvements. Ultimately, increased efforts towards supply chain sustainability do not ensure change on the ground. Even with increased joint efforts from all actors, social and environmental impacts could be reduced but never eliminated. With a continuously rising global demand for gold, and the environmental destruction and human-rights abuses gold mining causes in Colombia and other regions, there needs to be a global realization that all that glitters is not gold, and the price paid for gold is higher than its financial value. Bringing this to public awareness, working for a cultural shift concerning gold, reducing the demand for newly mined gold, and supporting more

environmentally and socially friendly ways of producing gold are crucial. After all, my research has once more demonstrated how complex the gold supply chain is and how challenging it is to address sustainability issues because, after all, “gold is gold”.

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Appendix

A. Interview Guide

Interview guide with questions for private actors (2.1), NGOs (2.2) and researchers/others (2.3). All questions were adapted according to the interviewee and their organisations. For the policy analyst and the policy officer, the researcher-guide was strongly adapted to the context of their work. Sub-questions were used when needed. Questions in grey were used as optional question when time allowed for it.

1 Starting the interview

Topic	Question	Sub-questions
Kick-off questions	Introduction including name, organisation, role, field of work	- How long have you worked with these topics
	What does your organisation do? What are your key topics? (incorporate information found online)	- E.g., core business activities? - Classification (private actor, NGO, government, etc.)
	How do you work with the supply chain of gold (from Colombia)? (incorporate information found online)	- How does your role/position relate to that?

2 Main part

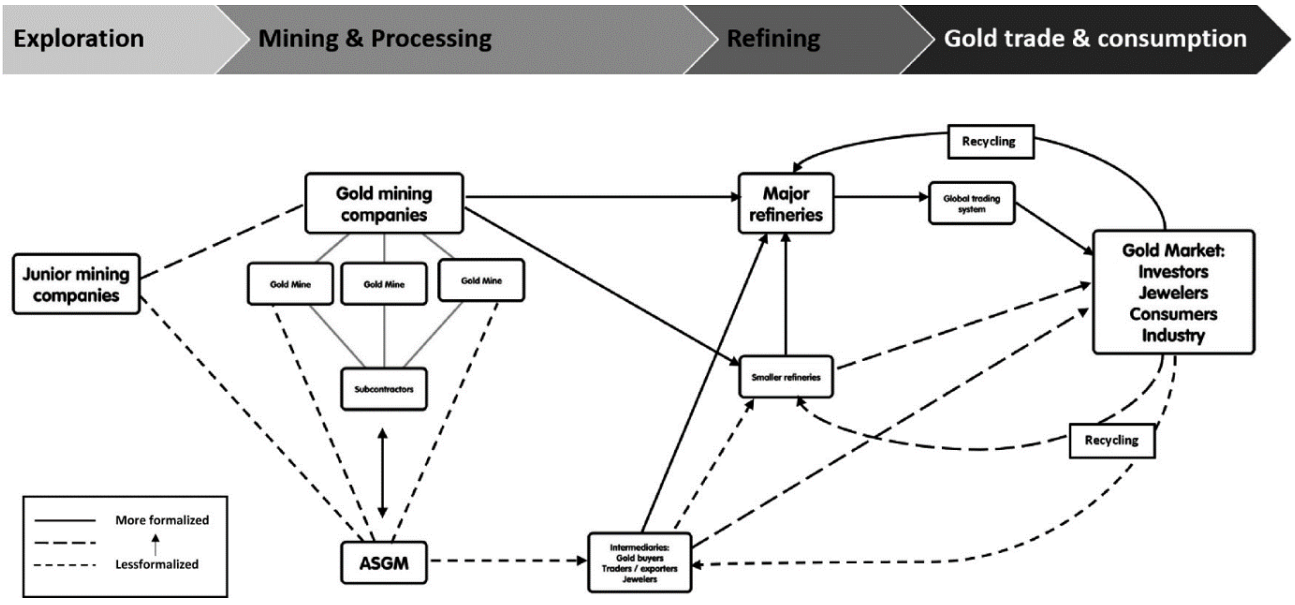

Figure 1. Mapping global gold production (Verbrugge, 2020)

1.1 Guide for Private Actors

Topic	Question	Sub-questions
Introduce Figure 1		
Mapping the supply chain	How does the map in Figure 1 differ from your supply chain? Where does it overlap?	- Who are the actors along the supply chain? - Where are they located geographically? - Who is working together with whom?
	What other actors, like NGOs or governments, are important in the gold supply chain?	- Gold mining industry, gold processing and retail sector - National vs. international level - How do these actors interact with the displayed/described actors?
	Where does your company stand in the supply chain?	- Whom are you trading with? - Who are your closest partners? Private or public? Why?
Gold supply	Are you able to trace where the gold you buy/work with comes from? To what extent? How do you trace gold?	- Where do you see your limits when it comes to traceability?
	Do you buy Colombian / Brazilian gold / purchase from Colombian mines / providers? Where else do you buy gold from?	- How relevant is gold from Colombia/Brazil for your business? Why?
	Has the purchasing behaviour changed over time? How? Why?	
Sustainability	What does sustainability mean to you?	- As an organisation and personally
	What does your sustainability strategy/approach look like?	E.g., close collaboration with suppliers, participating in a network, use of voluntary standards - How do these strategies impact the supply chain (for instance in terms of improved transparency, better working conditions for miners, lower environmental impact / environmental pollution etc.)? *Refer to documents from website for follow-up questions if needed*
	Why is sustainability important to you?	- As an organisation and personally
	Do your customers demand sustainability from you? Do you demand sustainability from your suppliers?	- To what extent? - How do you ensure that suppliers meet your sustainability expectations / standards?
	Which laws and regulations are affecting your supply chain sustainability?	- National level - International level
	How do these laws and regulations affect your supply chain?	

	Are there other factors that influence your supply chain sustainability?	
	Are you aware of the environmental and social impacts of gold mining at the extraction sites?	- How does this knowledge influence your business practices?
	Who is responsible for ensuring sustainable practices at the site of extraction?	
	Which actors along the chain has the biggest impact on sustainability?	- How big is your influence in comparison to them?
Outlook	What is the biggest challenge when it comes to supply chain sustainability that your organisation is facing?	
	What do you consider as important for the future for gold supply chains? How do you think supply chains will change in the future?	- In general - In terms of sustainability - What are the most likely scenarios?

1.2 Guide for NGOs

Topic	**Question**	**Sub-questions**
	Introduce Figure 1	
Mapping the supply chain	How does the map in Figure 1 differ from the supply chain you are working with? Where does it overlap?	- Who are the actors along the supply chain? - Where are they located (geographically)? - Who is working together with whom?
	Where does your organisation stand in the map or how does it relate to the actors displayed?	- Whom are you working with? - Who are your closest partners? Private or public? Why?
	What other actors, like other NGOs or governments, are important? How do these actors interact with the displayed/described actors?	- National vs. international level
Gold supply	How and to what extent can the gold supply chain be traced back?	- Where do you see your limits when it comes to traceability?
	Where do the actors you work with purchase gold from?	- Is the market in Colombia/Brazil relevant for you? Why/why not?
	Has the purchasing behaviour changed over time? How? Why?	- E.g., in terms of country of origin, importance of traceability, etc. - What drives the change in purchasing behaviour?
Sustainability	What does sustainability mean to you?	- As an organisation and personally
	What sustainability strategies/approaches do you see along the gold supply chain? By which actors? How do these strategies impact the supply chain?	- E.g., close collaboration with suppliers, participating in a network, use of voluntary standards - Impact for instance in terms of improved transparency, better working conditions for miners, lower environmental impact / environmental pollution etc.)?

	Which laws and regulations are affecting supply chain sustainability?	- National level - International level
	How do these laws and regulations affect the supply chain?	
	Are there other factors that influence supply chain sustainability?	
	Who, in your opinion, is responsible for ensuring sustainable practices at the site of extraction?	
	Which actors along the chain has the biggest impact on sustainability?	
	Are the actors along the chain aware of the environmental and social impacts of gold mining at the extraction sites?	
Outlook	What is the biggest challenge when it comes to supply chain sustainability that your organisation is/your partners are facing?	
	What do you consider as important for the future for gold supply chains? How do you think supply chains will change in the future?	- In general - In terms of sustainability - What are the most likely scenarios?

1.3 Guide for Researchers/Others

Topic	**Question**	**Sub-questions**
	Introduce Figure 1	
Mapping the supply chain	How does the map in Figure 1 differ from the supply chain you are working with? Where does it overlap?	- Who are the actors along the supply chain? - Where are they located? - Who is working together with whom?
	What other actors, like NGOs or governments, are important?	- National vs. international level
	How do these actors interact with the displayed/described actors?	
	How does your research relate to the actors displayed?	- Whom are you working with? - Who are your closest partners? Private or public? Why?
Gold supply	How and to what extent can the gold supply chain be traced back?	- Where do you see your limits when it comes to traceability?
	Where do the actors you work with purchase gold from?	- Is the market in Latin America relevant for you? Why/why not?
	Has the purchasing behaviour changed over time? How? Why?	
Sustainability	What does sustainability mean to you?	- As part of your research and personally
	What sustainability strategies/approaches do you see along the gold supply chain? By which actors?	- E.g., close collaboration with suppliers, participating in a network, use of voluntary standards - How do these strategies impact the supply chain (for instance in terms of

		improved transparency, better working conditions for miners, lower environmental impact / environmental pollution etc.)?
	Which laws and regulations are affecting supply chain sustainability?	- National level - International level
	How do these laws and regulations affect the supply chain?	
	Are there other factors that influence supply chain sustainability?	
	Who, in your opinion, is responsible for ensuring sustainable practices at the site of extraction?	
	Are the actors along the chain aware of the environmental and social impacts of gold mining at the extraction sites?	- Which ones more? Which ones less?
Outlook	What is the biggest challenge when it comes to supply chain sustainability that your organisation is/your partners are facing?	
	What do you consider as important for the future for gold supply chains? How do you think supply chains will change in the future?	- In general - In terms of sustainability - What are the most likely scenarios?

B. Codebook

Codes (grey) and child codes (light grey and white) were used for easier structuring of the results. "Files" refers to the number of documents, i.e., interviews, in which the code was applied, while "References" indicates the total number of times the code was applied.

Name	Files	References	Codebook (short description)
Map (general)	5	19	Comments about the supply chain map (general comments and annotations)
Map - matching	4	8	The supply chain map displayed matches the map described by the interviewee
Map - not matching	6	25	The supply chain map does not match with the description of the interviewee
Actors	5	14	Actors that are relevant along the supply chain, i.e., for the supply chain map, and their role in the supply chain including possible shortcomings, critique, and actions they take
Private actors (general)	7	32	
Miners and mining companies	2	4	
Traders	2	3	Intermediaries between mines and refineries
Refineries	4	19	
Consumer facing companies	1	2	For example, jewellery, watch or IT companies
Demand and market	7	17	Aspects concerning the market structure, competition on the market, or demand
Consumers	7	14	Aspects concerning the end-consumer
EU	2	2	
Switzerland	3	9	Comments about the role, position, etc. of Switzerland
OECD	2	4	
Associations	2	5	
NGOs	6	14	
Civil Society	5	7	
Civil society in extraction country	1	1	
Media	1	1	
Partnerships	5	12	Statements on collaborations between organisations/businesses/governments
Regulations and schemes	1	1	
Regulations	7	21	Laws and regulations that effect the supply chain and its sustainability
EU Conflict Minerals Regulation	5	22	
EU (general)	3	14	EU laws and regulations excluding the EU Conflict Minerals Regulation
Switzerland	5	16	Swiss laws or regulations
UN Guiding Principles	2	2	
OECD guidance	3	16	

Schemes	8	29	Certification schemes used along the supply chain of gold
LBMA	5	9	Information connected to the LBMA Good Delivery List
Collaboration	1	1	Comments on collaboration between schemes
Sanctions, consequences	2	5	Sanctions or consequences for wrongdoing
Sustainability approaches	3	6	Strategies and approaches a (private) actors uses to make the supply chain more sustainable (according to their definition of sustainability)
Traceability	6	17	The traceability of gold along the supply chain
Transparency	2	16	The role of transparency along the gold supply chain, where it is given, where transparency is lacking, etc.
Due Diligence	5	11	
Specific approaches	2	2	Specific approaches to a more sustainable supply chain that were mentioned by different actors
Formalisation	1	1	
Responsible sourcing	2	2	
Technological solutions	4	8	Listing of or comments on technological solutions like blockchain and geoforensic passport
Trust and long-term collaboration	2	2	
Work in country of origin	2	6	Projects or collaborations in the country of origin of the raw material
Environmental aspects	3	7	Approaches that affect environmental aspects in the country of origin of the raw material
Short and direct supply chains	2	2	
Sustainability (other)	1	2	
Definition sustainability	8	19	Definition and understanding of sustainability or related concepts like responsible sourcing, green supply chains, etc. General statements and statements in relation to the gold supply chain.
Impact on sustainability	9	27	What is impacting the sustainability performance of private actors (this can be a certain actors, law, event, etc.)
Motivation	6	21	The motivation of private businesses along the gold supply chain to implement sustainability measures
Expectations	3	3	Statements concerning motivation for acting more sustainably in connections to expectations by other actors (e.g. consumers)
Awareness	7	15	Awareness of the impact of actions (e.g. business of a private firm in Europe) on the ground in Colombia
Recycling	3	9	Comments referring to the recycling of gold
Environment	3	7	Comments referring to environmental impacts in the place of extraction or along the supply chain
Challenges	2	7	Comments referring to challenges that currently exist along the supply chain

Future development	5	14	How will gold supply chain develop in the future? What does the interviewee wish to see?
EU Conflict Minerals Regulation	2	4	Future development of the EU Conflict Minerals Regulation
Colombia	5	21	Specifics about gold from Colombia or Colombia as a country of origin
Big picture	3	5	Statements that refer to the "bigger picture" of the gold supply chain and zoom out