

REPORT

Overcoming Practical Barriers for Integrating Responsible Artisanal and Small-Scale Mined Gold into International Supply Chains

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About the Authors



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TIF promotes an inclusive approach to value chain development in resource-rich areas situated in challenging sourcing environments to enable a just transition from a fossil fuel-based to a mineral-based, green economy. Working in partnership with actors across and along complex minerals value chains, TIF seeks to enable equitable access to finance and equipment, capacity development, and fair and formalized markets for their products.

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Abbreviations/Acronyms

Abbreviation Acronym	Definition
AMP	Artisanal and Small-Scale Mineral Producers
ARM	Alliance for Responsible Minerals
ASGM	Artisanal and Small-Scale Gold Mining
ASM	Artisanal and Small-Scale Mining
BGI	Better Gold Initiative
B&C	Book & Claim
CoC	Chain of Custody
CAHRA	Conflict-Affected and High-Risk Area
GEF	Global Environment Facility
LSM	Large-Scale Mining
LBMA	London Bullion Market Association
NRDC	Natural Resources Defense Council
OECD	Organization for Economic Co-operation and Development
SECO	Swiss State Secretariat for Economic Affairs
TIF	The Impact Facility

Purpose of this Report

The importance of artisanal and small-scale mineral producers (AMPs) in the gold value chain is recognized widely by international organizations, national governments, and businesses, from traders and refiners to consumer-facing jewelry and electronics companies. The need for progressive formalization and improved environmental, social, and governance practices of artisanal and small-scale gold mining (ASGM) is fundamental and the subject of regulations in several producing countries. There is a rich body of work documenting the need for overall ASGM sector reform and on the formalization of ASGM particularly. The planetGOLD knowledge repository¹ provides a useful portal to this scholarship.

However, even when AMPs produce gold observing relevant environmental, social and governance standards, there remain practical barriers to their access to international markets. There are a number of voluntary private initiatives to build ASGM supply chains with access to international markets (ASGM Market Access Initiatives). Key goals of such initiatives are to establish traceable international trading routes for ASGM, and for the gold that flows along them to be assured of coming from sites meeting acceptable operating standards. While ASGM Market Access Initiatives alone cannot solve the many systemic issues facing ASGM, they do offer a path to AMPs that have already established themselves as legal operations, can meet the basic expectations of relevant due diligence requirements, and for which international sales offer an uplift in their profitability. The practical barriers facing such ASGM Market Access Initiatives, and examples of how the barriers have been overcome, are the focus of this report.

This report is written to inform the funders, leaders, and managers of existing and planned ASGM Market Access Initiatives, to highlight the impediments such initiatives face in establishing a flow of formal responsible ASM gold into international markets.

Drawing on interviews with practitioners operating ASGM Market Access Initiatives in 12 countries and on relevant literature on the formalization of AMPs and ASGM trading chains, the report describes how ASGM Market Access Initiatives strive to find ways around these challenges and offers insights these efforts hold for securing a brighter future for the legitimate, safe, and clean flow of ASGM material from similar initiatives.

¹ planetGOLD knowledge repository. Available at: <https://www.planetgold.org/formalization>

Executive Summary

Most countries require gold to be exported in a doré bar, a rough bar comprising several metals, of which 50%-75% is gold. Smelting gold-bearing material to form a doré bar achieves greater homogenization and facilitates purity determination; it can be done at any phase of the gold value chain. This process requires special equipment and additional cost. While some AMPs smelt at their sites, it is not viable for many that produce very small volumes. AMPs instead sell to businesses that aggregate the gold from several sites and smelt in one batch, making it economical. By so doing, however, the identity of the gold from a specific AMP is diluted, along with the possibility of tracing it directly to a specific source. ASGM Market Access Initiatives currently favor working with AMPs that smelt at their sites to demonstrate to the end user full traceability to a responsible source. However, doing so can exclude the smallest AMPs who might need the most support to enter the international market. Working with aggregators should be considered by future ASGM Market Access Initiatives because they are well situated in supply chains to provide financing, export, and processing services to multiple AMPs and can enable greater visibility for downstream customers.

Transporting gold from ASGM sites is not straightforward. ASGM sites are often remote and difficult to access. Where there are roads connecting gold mining communities with commercial centers, security risks can be high, and theft is common. If ASGM sites are clustered near a national border, it can be easier for AMPs to cross over into another country and trading post rather than take a longer journey by road, land, or air to a city in their own country, and by doing so risk being complicit in illegal trade. There are specialist security firms that transport gold under guard, but these are expensive and attract attention. Most AMPs prefer to transport the gold by private or public transport themselves or to sell to a trader willing to take the risk for a discount on the price they pay. Alternatively, local buying centers gather services for AMPs - aggregation, smelting, selling, access to mining inputs - while reducing the need to travel large distances and for time away from producing gold.

International gold prices are based on gold refined to above 99.5% purity. The price received by AMPs is calculated using this international benchmark less the costs of smelting, refining, transport, financing and the risks associated with possible theft. AMPs pay particular attention to and often challenge the purity determination of gold and the reductions to price from logistics and processing. This is because an accurate purity determination is most reliably made by professional assayist in laboratories, most of which are in cities far from ASGM or trading centers. It is common for AMPs to have a default mistrust of the pricing process, which can hinder good relations between AMPs and international partners. ASGM Market Access Initiatives are challenged by the need to build trust while at the same time keeping costs low and ensuring transactions are swift and do not hold up cash flow to AMPs. This they do through conducting hand-held X-ray fluorescence (XRF) tests, which generate results within a few minutes and

facilitating triangulation of the finding through conducting several XRF tests with several independent providers. Specific gravity measurement, a lower technology solution designed to determine gold purity, is a common practice that can equally yield reliable results, if executed directly. Regardless of the technique applied, trust-building is a continual confidence-building process that can take many years.

Most gold-producing countries strictly regulate the export of gold to ensure they capture the royalty revenues, export levies, and other payments due from this highly transportable and valuable metal. There are three principal challenges facing AMPs when exporting gold: government bureaucracy or corruption that can hold up or disincentivize the movement of gold across borders, administrative costs to fill all requisite paperwork, and the insecure profile of moving gold through transit countries and to international destinations. These challenges are compounded when the volumes moved are small, making it difficult to justify various costs associated with the process. To circumvent some of these hurdles, ASGM Market Access Initiatives report that the simplest method of transporting gold internationally is in hand luggage on public air, land or sea transport. This does not negate the need to ensure completing the steps for and carrying documentation to show compliance with laws, but it does streamline export as much as currently possible.

The technology and facilities to refine gold to a purity demanded by the jewelry and electronics industries is controlled by a relatively small number of refineries in Europe, the Middle East, and North America. Because refiners are known to receive precious metals from many sources and many different countries, they are subject to increasing scrutiny and more rigorous and rigid regulations on their supply chain management. Generally, refiners view ASM sources of gold as a high compliance and reputation risk, and because of this many still have a policy to not receive ASM gold. Those that are willing to accept ASM gold prefer to segregate it from their mainstream feed in single batch processes. This adds costs to the refining process and so can only be justified if these costs can be passed on to downstream clients, further narrowing the possibility of formal chains of custody linking ASM gold with consumer markets.

The path to establishing full single source supply chain transparency of ASM gold is punctuated by many divots and diversions. The concealed transport of gold from ASGM sites to local buying centers, the local aggregation of gold at the primary smelter phase, the collection and further collation of sponge gold or dore by multiple traders and exporters, and finally the bulk mass balance refining at international refiners, makes the route of small volumes of gold from artisanal mines seem all uphill. ASGM Market Access Initiatives default to documented, paper-based systems favored because of the practicality and track record in building credible gold value-chain transparency. Digital supply chain solutions, although being considered by a number of projects, are yet to be operationalized. Their absence, however, does not represent a barrier to AMP engagement.

Over the past decade, there has been growing awareness around the importance of formal market access for AMPs to enable a formalization of the artisanal mining sector at large. However, current efforts to integrate ASM gold into formal supply chains are limited-time, pilot projects financed or at least subsidized through donor finance or infrequent direct sourcing exercises that rely on price premiums to justify their commercial viability. This does not hold strong promise for scaling or for the long-term sustainability of international ASM gold trading chains. The international gold trade is a volume business. Up until the point of further value addition, when gold is transformed into products for jewelry or electronics, intermediaries and aggregators operate on thin margins, with local traders often offering very competitive pricing to AMPs. To be sustainable, any form of short-term subsidization has to be replaced with sound economic models.

Efforts to formalize markets without offering AMPs tangible incentives for their participation struggle to gain momentum unless enforced through binding regulation. The result: a culture of secrecy, silence, and mistrust; and a tendency to stick with familiar 'informal' routes to market. However, some progress has been made. ASGM Market Access Initiatives are finding ways to build trust through multi-faceted AMP engagement strategies, establishing formal trading chains between ASGM and ethical markets. The next step to raise the profile of ASGM in markets is to see how the number of AMPs selling into the formal international market can be increased, without having to commensurately raise the costs that will only serve to put further pressure on fine margins where these profits are needed the most: with the ASGM communities. The global market and governments cannot rely on ASGM Market Access Initiatives to serve as a solution to transform the sector. These initiatives can, however, make a contribution in some regions and supply chains.

From the point of mineral extraction to a finished jewelry piece, the gold supply chain is shrouded in secrecy. This leaning towards ambiguity will need to be overcome if secure and trusted sources of ASGM are to scale. Also, sharing lessons learnt and the tools and approaches that have proven successful to circumvent practical supply chain barriers, is needed to replicate and accelerate greater inclusion of AMPs in international markets.

1. Introduction

Over the past decade, the growing interest in formalizing artisanal and small-scale gold mining (ASGM) has led to the emergence of several initiatives dedicated to addressing some of the adverse environmental, social and governance effects associated with this largely informal sector. Efforts designed to reduce such harm seek to address the link between ASGM and conflict; the uncontrolled use of mercury during the processing of gold; child labor and the breach of children's rights in mining communities; worker health and safety, and hazardous working conditions; gender inequality; and optimize worker incomes through better sales terms and higher profit margins.

Many of these issues link to the inability of artisanal mineral producers (AMPs) to access the formal market, resulting in permanent dependencies on informal and often illicit supply chain actors. The role of these informal actors – including local buyers and transporters, traders, and exporters – has been explored in other research projects and is well documented.² However, to date, there has been little research into the initiatives set up to enable formal market access for AMPs to create a traceable supply of responsibly produced gold assured as having met appropriate environmental, social and governance (ESG) operating standards into formal supply chains.

Aiming to help fill this gap, this study takes stock of and compares the approaches taken by initiatives and projects that have set out to integrate ASM gold into international supply chains (hereafter referred to as ASGM Market Access Initiatives). Drawing on the experiences of development practitioners, refiners, downstream brands, and local traders and exporters, this report shines a light on the barriers experienced by the managers of these ASGM Market Access Initiatives, and how some of these challenges have been overcome.

² Hunter, M et al. (2021) *Illicit Gold markets in East and Southern Africa*. Available at: <https://globalinitiative.net/wp-content/uploads/2021/05/Illicit-gold-markets-in-East-and-Southern-Africa-GITOC-.pdf>

Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) (2017) *Global Trends in Artisanal and Small-Scale Mining (ASM): A review of key numbers and issues*. Available at: <https://www.iisd.org/system/files/publications/igf-asm-global-trends.pdf>

This report has been created to foster dialogue, collective learning, and future collaboration on responsible sourcing from ASGM and the formalization of the gold trade across the value chain to benefit ASM communities. It reveals that direct sourcing of gold from AMPs through fully segregated supply chains can be associated with significant transaction costs to cover transport, batch processing, and verification, which is not always feasible for some AMPs and trading chains. Gold aggregation from multiple sources can be a highly beneficial business service to scale the international trade of formal and responsible ASGM production and reach many artisanal producers operating in remote regions. Where aggregators are part of a system using acceptable operating and governance standards, they can facilitate the flow of responsible ASM gold. Therefore, this report explores potential solutions for gold aggregation and export from ASGM to help develop replicable, scalable, and economically viable ASGM supply chain models: benefitting AMPs through strengthened businesses that enable better working conditions and production practices; and benefitting gold buyers through facilitating a flow of responsibly produced gold to help meet their responsible sourcing goals.

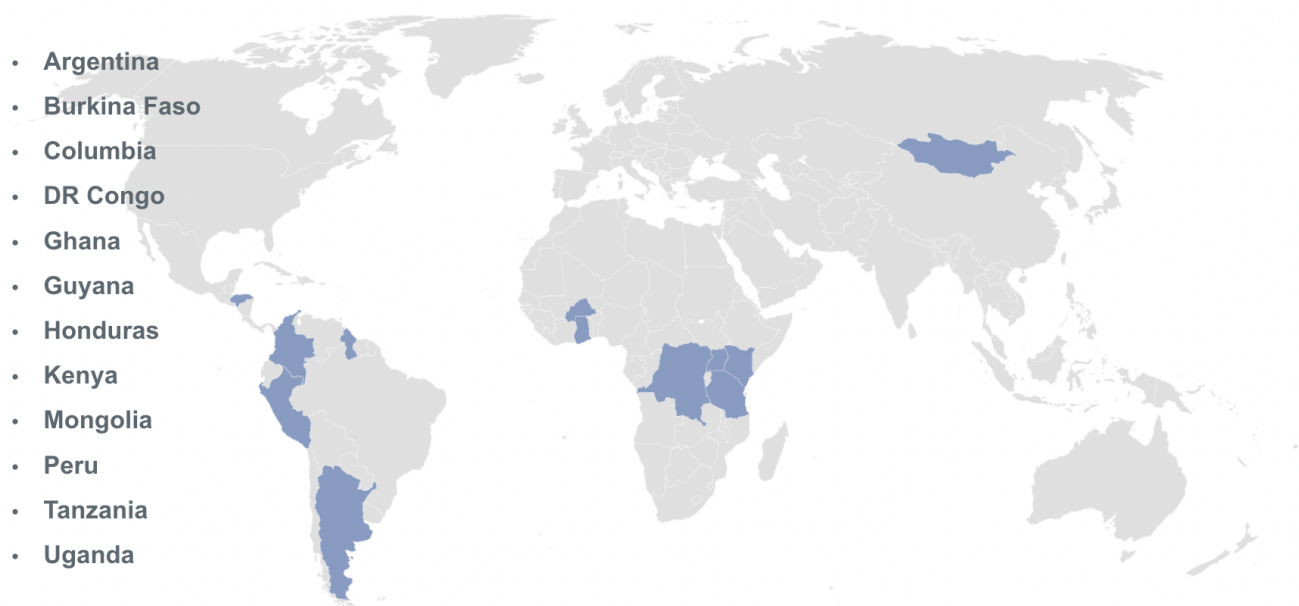
2. Methodology

This study was commissioned by the global coordinating project of the GEF-funded planetGOLD program. The research was undertaken by The Impact Facility (TIF).

This report is the result of a review of the available literature on international market access for AMPs complemented by 15 semi-structured interviews with experts in ASGM trading chains familiar with or managing ASGM Market Access Initiatives between February and June 2022. The interviewees were individuals in organizations active in different parts of the gold value chain, including refiners, local buyers, exporters, jewellers, standard setters, and international NGOs with first-hand experience in setting up formal ASGM trading and sourcing schemes. The report draws on ASGM Market Access Initiatives active in 12 countries.

From extraction to refining, this report looks at barriers to market access experienced by ASGM Market Access Initiatives and efforts deployed at each link in the supply chain to overcome these

barriers. It describes purchasing practices, the mechanics of aggregation, transport and logistics, security safeguards, smelting, and export of gold from AMPs into formal supply chains.



The report draws on insights gained from interviews with actors operating across different geographies and in different legal contexts to highlight general cross-cutting challenges experienced in all jurisdictions, as well as issues that appear specific to a legislative or geographical context.

3. Understanding ASGM value chains

Gold from artisanal and small-scale gold mining sometimes flows from very remote areas via various middlemen and traders, smelters, and aggregators to international refineries, ending up in jewelry, electronics, and gold bullion bars, to name a few products.

Intermediaries in supply chains play many important roles in ASGM supply chains (see Figure 1) to facilitate the flow to market from often difficult to access regions, which can also be

associated with security risk and conflict. The number of intermediaries connecting AMPs with exporters is very often determined by the remoteness of its origin. The closer the AMPs are to buying centers, the more likely they are to travel to engage directly with traders or exporters aggregating larger volumes of gold. Local and regional gold buyers can have multiple roles in the value chain. For example, local buyers sometimes also supply production inputs, such as mercury, or even pre-finance infrastructure or capital equipment for the mining operation. The business terms of local traders are commercial and account for the substantial financial and personal risks often taken to transport and negotiate sales of gold along the value chain. Without local context, and if compared to business terms in Europe or the USA, for example, the interest rates on loans and discounts paid for gold can be perceived to be exploitative. While there are certainly cases where ASGM are in a poor position to negotiate with counterparts, generally, there are no unnecessary middlemen in the chain and the impulse to displace them in the name of establishing fair trading can have negative consequences for AMPs that can be left without a secure route to market, capital, or security measures to safeguard aggregated gold at their sites.³



Figure 1: Understanding the role of intermediaries and aggregators in the gold supply chain⁴

To create a responsible ASGM value chain, it is crucial to know and to understand the roles of all formal and informal actors already involved and to explore how they can remain part of any reconfiguration. When it is not possible to work with existing actors, it is critical either to ensure that new actors replace them or to forge more direct relationships that bypass the linkages lost. Value chain setups need to be fit for purpose, resilient, and adaptable to local conditions.

³ Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF), 2017, *Global Trends in Artisanal and Small-Scale Mining (ASM): A review of key numbers and issues*. Available at: <https://www.iisd.org/system/files/publications/igf-asm-global-trends.pdf>

⁴ TDI Sustainability / Responsible Minerals Initiative, 2021, *Researching The Role Of Aggregators And Crude Refiners In The Gold Supply Chain*. Available at: https://www.responsiblemineralsinitiative.org/media/docs/Researching%20the%20Role%20of%20Aggregators%20and%20Crude%20Refiners%20in%20the%20Gold%20Supply%20Chain_October%202021.pdf

3.1 Different stages of value addition

Most ASGM value chains follow the same steps. Gold is extracted from gold-bearing ore or alluvial deposits. It passes to concentration and processing, to crude refining – or smelting as it is commonly referred to – and then sold to local buyers, in some contexts gold concentrates might be exported prior to being smelted. Gold might be sold to several intermediaries or aggregators, sometimes also sold to industrial miners operating nearby, before export and sale to international refiners as it finds its way into the global gold market.

At the mine...

The ASGM value chain starts with gold-bearing material being extracted from alluvial or primary deposits. Alluvial gold is found in river sediments or soil from shallow earth deposits that contain small particles or nuggets of gold—sometimes known as ‘free’ gold as the gold particles have been released from the host rock after millennia of natural weathering. Primary deposits of gold are those in which the gold is still embedded in the ore (i.e., the gold is not ‘free’) and are mostly found underground in quartz seams. To separate the gold from the ore, the rock is first crushed (Step 1), milled into powder (Step 2), and then the gold powder is concentrated.

Step 1:
crushing bigger stones
(here done manually)



Step 2:
ore milling to powder



Ground ore, ready for
further concentration



Figure 2: ASGM production steps: ore crushing and milling at ASGM site in Tanzania.

Usually, the powdered ore goes through at least one round of concentration; mines with a higher level of mechanization might apply two stages of concentration. At most ASM sites, miners concentrate ore by washing minerals down a sluice box (Step 3). Due to differences in density and weight, gold particles are more likely to be captured by the sluice mat. In very many sites, the concentrate goes through mercury amalgamation (Step 4). This is the application of mercury to the

concentrate where it fuses with gold, separating the gold from other materials. The mercury is then burned off (Step 5), and the AMPs are left with so-called “sponge gold,” ready to be sold to local traders.



Figure 3: ASGM production steps: concentration and mercury amalgamation at ASGM site in Kenya.

While mercury use is still common and the adoption of mercury-vapor capture systems during amalgam burning has been slow, ASGM Market Access Initiatives often introduce gravimetric concentrating technology, such as centrifugal concentrators and shaker tables, to provide chemical-free alternatives to gold production, often promising higher recovery rates than mercury-based processing. While such technology has proven effective in recovering gold, relatively high upfront investment costs have stifled their uptake in many places, as many AMPs do not have sufficient production volumes to justify the investment.

Over the past decade and across many countries, another important development has been the increase in recovering gold through cyanidation. Cyanidation can be used to extract gold from tailings or waste rock, or it can be applied directly to crushed ore. If executed correctly, cyanide can be a more effective method than using mercury in processing gold, which traditionally only captures 40-60% of gold in the ore. This translates to more revenue for the AMP. However, due to cyanide's acutely toxic nature, it requires careful management on-site and appropriate storage facilities and emergency response measures. There are currently very few AMPs that have the necessary management capacity or capital available to ensure the safe management of cyanide.



Figure 4: A miner demonstrating to his colleagues how to operate a retort after training conducted by TIF

Across Africa, it is common practice for AMPs to participate in production-sharing schemes. Production-sharing schemes are where workers divide ore between each other as soon as it is extracted from the ground, rather than processing it in bulk and sharing revenue once the processed gold is sold. This production-sharing approach means that workers sell relatively small amounts of gold individually rather than acting as a group and trading larger volumes of gold.

At the market...

AMPs have different options for selling gold (see Figure 4). They might sell their ore to toll millers: specialist facilities that mill crushed ore from several AMPs for a fee or buy the ore and then concentrate it for onward sale. AMPs might process the ore to the point of smelting at their own operations and sell to traders at the site or external traders who visit the site periodically. If traders do not come to the site, AMPs might travel several hours, sometimes days, to buying centers. Some AMPs might prefer to export their gold directly to an international buyer, arranging everything from ore processing to applying for licenses and permits. As gold is being moved from point A to B, it might be carried by motorcycles, through public transport, private vehicles, or, in rare cases, through secure third-party logistics providers.

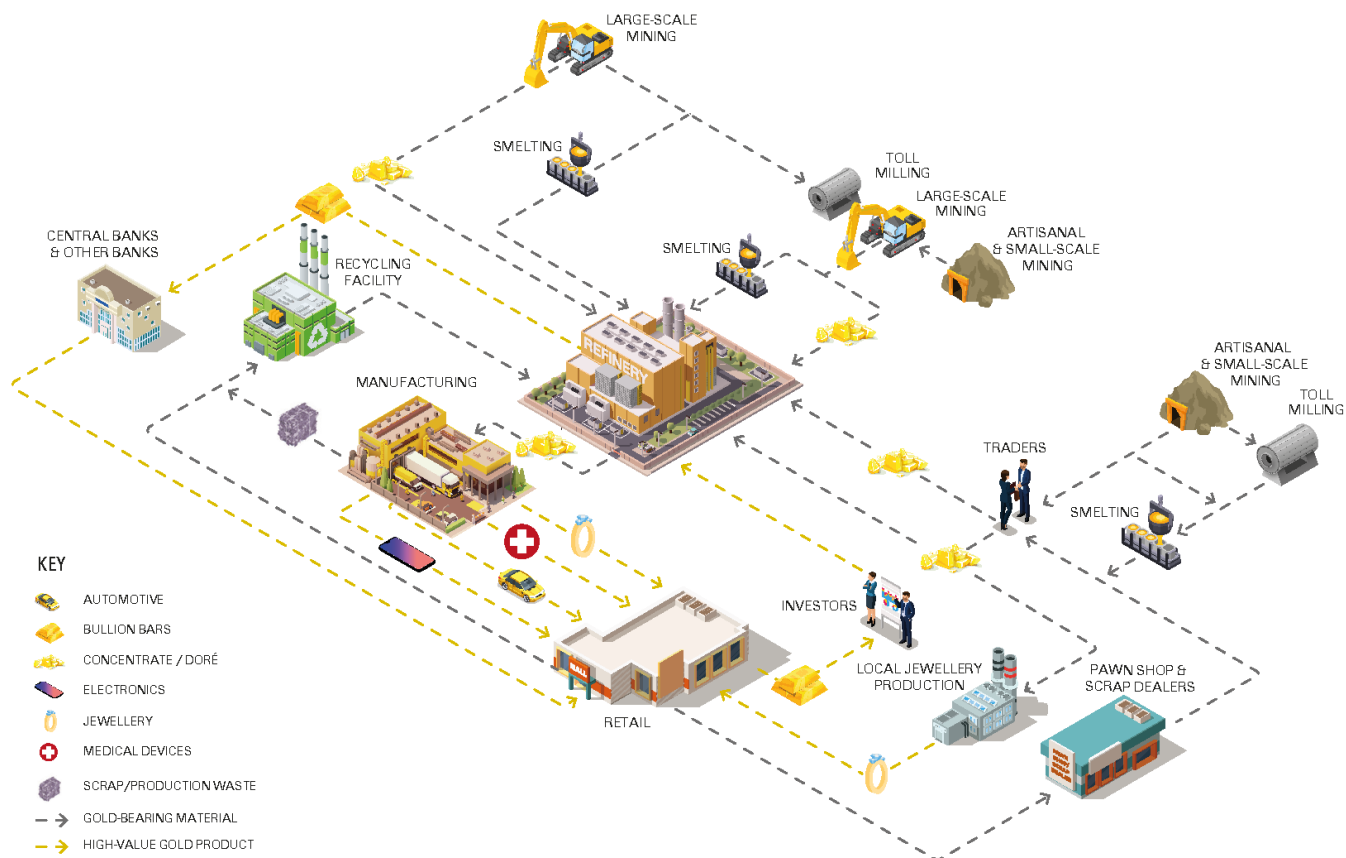


Figure 5: A model of the global gold value chain, highlighting the diversity of possible value chain set-ups. (TDI/RMI, 2021)

The degree of forward integration within the ASGM value chain, in other words, the number of steps of value addition carried out by the AMP, depends on various factors. These include the AMP's level of formalization, their ability to aggregate large volumes of gold, the physical proximity to gold buying centers, as well as the state of infrastructure leading up to the mine site—as further explored in subsequent sections of this report.

Central Bank domestic ASGM purchase programs

In some countries, governments take a leading role in purchasing ASM gold through centralized buying mechanisms, as further explained in Annex 4. This can be driven by the desire to build national gold reserves and to curb the illicit flow of gold from ASGM communities.⁵ In such circumstances, international buyers might not be able to maintain the sourcing of segregated material from AMPs.

⁵ World Gold Council (2021) *Central Bank Domestic ASGM Purchase Programmes*. Available at: <https://www.gold.org/download/file/15935/Central-bank-domestic-purchase-programs.pdf>; see Annex 4 for more information.

ASM-LSM coexistence

Many AMPs operate near or even on the concessions of industrial miners. Disputes over access to land and minerals are a common cause of friction between artisanal and industrial miners. Industrial miners, however, increasingly seek to coexist in harmony with AMPs. In some setups, AMPs' gold might even flow into the processing of industrial miners, commonly referred to as large-scale miners (LSM). The topic of ASM-LSM coexistence has been further explored in research published by the World Gold Council.⁶

Recycled gold

Once refined, gold is used in several sectors, including bullion, jewelry, and the industrial sector, where it can be found in consumer electronics and medical equipment. In most cases, gold-bearing materials are being recycled – feeding on post-consumer materials such as old jewelry and electronics, as well as industrial scrap. Over the last years, recycled gold consistently made up about 20% of the annual gold supply globally.

4. Steps taken to integrate ASM gold into international supply chains

This section focuses on the challenges of developing commercial linkages between AMPs and international offtakers, and the approaches taken to overcome these. The chapter is organized into two sections:

1. The logistics of international ASGM value chains
2. The supplier-offtaker business relationship

⁶ World Gold Council (2022) *Lessons learned on managing the interface between large-scale and artisanal and small-scale gold mining*. Available at: <https://www.gold.org/download/file/17063/ASGM-Report-2022-English.pdf>

4.1 The logistics of international ASM gold value chains

While supply chains can differ, generally ASM gold moves from a mine to an aggregation hub, to the point of export and then to the refinery, as illustrated in Figures 2, 3 and 4. As part of this journey, the gold may undergo physical transformation where it is smelted, purified, mixed with other gold from other areas, or may be kept separate from all other material. The degree of forward integration of AMPs varies case by case.

4.1.1 Smelting



The gold smelting process⁷ removes impurities from gold ore. These could be the original impurities found in gold deposits in the earth. To remove these impurities, extremely high temperatures, pressure, and several chemicals are used. Sponge gold is typically smelted at local gold shops to remove the remaining mercury and other impurities. In some cases, gold ore concentrates that contain sufficiently high percentages of gold can be smelted without first undergoing amalgamation (a process called ‘direct smelting’. Smelted metal is known as doré and typically contains around 50%-75% pure gold.

To lower the melting points of other minerals to more easily separate gold, a flux, such as borax, is often added to the smelting process. Smelting requires a steady supply of heat requiring a dedicated reliable power supply or a fire-heated furnace. Rudimentary technologies such as blowtorches can also be used for outdoor smelting, though they recover lower volumes of gold. More advanced furnace smelters can result in significantly greater gold recovery but are typically too expensive for most AMPs.

Barriers and challenges associated with smelting ASM gold

Smelting’s inputs can add substantial costs. The fuel used to create heat is by far the greatest operational cost. Other inputs include crucibles⁸ and a chemical agent acting as a catalyst that is added, making it expensive to smelt small volumes of gold. In East Africa, for example, a single

⁷ Smelting is distinct from metal melting. Melting entails a process of mixing metal with no change in material purity, while smelting processes drive increases in the overall levels of gold purity.

⁸ A crucible is a ceramic or metal container in which metals or other substances may be melted or subjected to very high temperatures. While crucibles were historically usually made from clay, they can be made from any material that withstands temperatures high enough to melt or otherwise alter its contents.

smelt costs at least \$25 for the crucible, the chemicals, and the energy. Therefore, small volumes of gold are commonly traded by AMPs as gold sponges, flecks, or nuggets, avoiding the need to smelt.

Direct smelting of gold ore concentrates can be a viable alternative to mercury amalgamation, when AMPs have access to very high grade ore and/or advanced concentration methods, appropriate machinery, stable power supply, and sufficient volumes of gold bearing material to justify the associated costs.

Many countries require gold to be smelted into doré for export. Due to the costs associated with smelting, it is impractical to keep small batches of gold (less than 20g) separated. This means that gold buyers transacting many small trades usually mix gold in the smelting process, making it impossible to maintain physical segregation per AMP (see Annex 3 for further elaboration on different levels of traceability).

How ASGM Market Access Initiatives approach smelting

Most ASGM Market Access Initiatives focus on direct sourcing from AMPs to assure their customers downstream that gold is traceable to its origin. To do this the gold from separate ASGM sites must be segregated to the refining stage. For this segregation to be possible, AMPs that have sufficient volume of gold need to smelt the gold themselves at their sites.

ASGM Market Access Initiatives that operate local buying houses, on the other hand, can engage in micro-transactions of a few grams at a time, smelting the aggregated gold in bulk, but diluting the identity of underlying batches.

Summary

- ASGM Market Access Initiatives focused on direct sourcing rely on the AMPs smelting at their sites before transferring the gold downstream, maintaining the identity of each batch to the point of the refinery, where the final purity determination takes place.
- ASGM Market Access Initiatives working through local aggregation and buying centers usually smelt gold from several AMPs once they have enough volume to justify the effort

4.1.2 Local transport



AMPs or local brokers usually transport gold to buyers as discreetly as possible, following a 'don't ask, don't tell' approach, using motorcycles, cars, or even traveling by bus. While this means transporting gold is affordable, it exposes the individuals carrying gold to significant risk. The distance AMPs need to travel to a buyer varies greatly, taking from as little as a few minutes to a full day.

Barriers and challenges associated with transporting gold

There are many anecdotal reports of AMPs who are transporting gold falling victim to robbery. Most incidents are not reported. Professional security firms offer services to keep cargo and people safe, although this can be prohibitively expensive for AMPs, especially for small batches.

In Kenya, for example, regulations on high-value cargo transport require a police escort of two armed vehicles to accompany the truck transporting gold. Insurance can be included in the security firms' fee, adding to the cost. Firms quoting to transport gold from Western Kenya to Nairobi estimated a minimum price of USD 1,000. Comparatively, the same route would cost an AMP less than USD 20 using public transport.

ASGM Market Access Initiatives' approach to transport

Many ASGM Market Access Initiatives put the responsibility for 'first-mile' transport on the AMP. AMPs prefer to keep a low profile. A strategy of discretion and secrecy when transporting gold is the norm. In some cases, where larger volumes of gold are under consideration, interviewees mentioned offering to cover the cost of using a third-party secure transport. Despite offering to cover associated costs through subsidies, AMPs preferred to continue transporting their gold in person. In a small watchful community, avoiding attention to your routine is considered important to secure personal safety and that of your belongings. Accepting that miners take on the responsibility for first-mile transport, some of the initiatives interviewed developed risk mitigation plans to prevent personal harm or theft during transport.

Minimizing the distance between the AMPs and the aggregation point is key to reducing risk exposure. Setting up regional buying centers close to the AMPs allows for professional and secure aggregation and transport from that point onwards, as is the case for the ASGM Market Access Initiatives in Ghana and Burkina Faso.

In Ghana, a local trade and export company uses high-value cargo transport for secure delivery from their buying office to the airport. Interviewees stressed that volumes of offtake need to be sufficient to warrant this cost. In their opinion, volumes upwards of 20kg per transport justify this expense.

None of the initiatives interviewed took out third-party transport insurance to cover the risks associated with local transport. One reason for this is that applications made to insurance companies are rejected due to the means of transport being considered high-risk by virtue of its link to an informal sector and to ASM gold in particular.

Summary

- For gold volumes of more than 10kg, the use of third-party transport providers is best practice as it avoids the risk of personal harm and theft.
- For small volumes of less than 10kg of gold, 1-st party, personal transport is the best option
- AMPs and international gold buyers jointly should develop risk mitigation plans to prevent personal harm or theft during transport.
- Local or regional buying hubs can help reduce travel distance for AMPs and thus the associated transport risks from mine to point of sale.

How do industrial miners transport gold?

For comparison with ASM gold movement logistics, this section provides an overview of how the large-scale mining (LSM) sector facilitates the movement of gold from mine to refinery.

LSM gold value chains appear to be considerably shorter due to long-term direct offtake relationships with (toll) refiners. Aside from extraction and processing, industrial mining companies are often able to undertake the smelting of the ore to produce the doré on site.

Once assayed, the doré is weighed and locked in a vault in a restricted area before transport to the refinery. Just like in ASM, storing the gold at the mine site for too long poses a security risk, hence the insistence by third-party transport companies to facilitate frequent gold transfer to the refinery.

Depending on the production level and location, the doré bars are transported to a refinery taking one of the following possible routes:

1. **Road transport to the airport:** In this scenario, there will typically be two or three identical convoys of cars, only one of which will have the gold on board. Here, only one of the cars may be armored and the others not, in an attempt to hide the gold in plain sight. The other cars serve as decoys taking on separate routes to serve as a distraction to limit the risk of robbery. These services are often/mostly third-party secure transport options.
2. **Helicopter transport to the refinery:** For remote mines, gold doré bars may be flown by helicopter to the refinery. The helicopter service is contracted to a security firm, or by the mine itself.
3. **Helicopter transport to the airport for export:** If the refinery is very remote and not easily accessible by road, or requires long road journeys, the bars are transported to the airport by helicopter. At the airport, the gold is put into a security depot where the transfer of responsibility – in some cases occurring at this point – can be switched from the mine to the refinery, say in Switzerland, which would take on full liability once paperwork is complete.

4.1.3 Purity and weight determination



AMPs sell their gold in the form of doré, gold nuggets, or gold sponges. Selling price is the product of both weight and gold content, or purity. Purity assessments done locally are usually based on specific gravity⁹ and X-ray fluorescence (XRF) tests¹⁰, generating results within a few minutes. However, the accuracy a professional assay would deliver is difficult, if not impossible, to replicate in the field, due to the lack of appropriate equipment.

Barriers and challenges associated with determining gold purity and weight

Faulty results can occur from miscalibration of the measuring devices or even purposeful manipulation of these devices. Many AMPs look with suspicion at the accuracy of purity and weight measurements by local traders. In gold trading hubs where many traders compete with one another, it is not uncommon for AMPs to request quotes from a variety of different gold buyers to ensure they are receiving the highest possible price. AMPs usually only get paid for the gold content – even though doré might contain other precious metals, such as trace elements like silver and platinum.

ASGM Market Access Initiatives' approach to determining gold purity and weight

Understanding the prevalent mistrust in local trading practices, initiatives focused on international market access are mindful to build confidence in the accuracy of purity and weight measurements, to motivate artisanal miners to participate in international purchasing schemes.

The initiatives examined for this study usually made use of XRF measurements for an initial purity determination, in most cases seconded through government assessments at the point of export. For higher accuracy, it is best practice to conduct several XRF measurements checking for consistency of the results. The gold content is finally confirmed or corrected through laboratory assays by accredited refiners. Most initiatives relied on the XRF measurement to release partial payment for the gold at the time of taking over physical possession. AMPs received full payment through a second tranche transfer, once their gold arrived at the refinery

⁹ Specific gravity: Involves testing the ratio of the density of a substance to the density of a reference substance; in the case of gold, water is used.

¹⁰ XRF testing: X-ray fluorescence is a non-destructive analytical technique that determines the chemistry of a sample. Each of the elements present in a sample produces a set of characteristic fluorescent X-rays that is unique for that specific element, an excellent technology for qualitative and quantitative analysis of rock material composition.

and the gold content was confirmed through official assay results. Unlike local traders, refiners also compensated for side elements, such as silver and platinum; although refiners could also charge AMPs for the occurrence of deleterious elements such as mercury more than tolerance levels.

Summary

- Accurate purity and weight assessments require professional assays.
- XRF-based purity assessments are a useful tool to determine the gold content of doré, triangulating results through multiple measurements.

4.1.4 International export



Most ASM gold enters international trade flows without following formal export procedures, often disregarding prerequisite payments for licenses, permits, and royalties. ASM gold tends to flow into major gold buying centers in India, UAE, and Saudi Arabia. A portion of the South and Central American informally traded ASM gold, from countries like Peru, also flows to the United States and Mexico, due to its geographical proximity.

Barriers and challenges associated with the international export of ASM gold

There are three principal challenges facing AMP for the export of gold. These include state-level bureaucracy, administrative costs, and the insecure profile of gold during transit and international transport.

In some geographies like Burkina Faso, the costs associated with gold exports are so high that illicit exports of gold through smuggling are almost impossible to compete with. An interviewee shared that AMPs are required to pay 18% VAT on the value of the gold and an export tax of \$400/kg, making it prohibitive to export gold without the need for subsidies – assuming AMPs receive a competitive price, as explored in section 3.2 – and ultimately discouraging formal market entry.

In the DRC, provincial and national governments levy several different types of payments on gold exports – limiting export at scale.¹¹ One initiative in the country, when trying to facilitate bringing conflict-free, traceable, and legal gold to the formal market, documented the existence of 26 steps after smelting to enable the export of the commodity.

One interviewee highlighted the vulnerability when operating in environments of low governance, sharing that the exporter for their initiative had been illegally detained by local police enforcement under allegations of gold smuggling, with their team also occasionally exposed to unwarranted harassment from local authorities.

Within Uganda, in 2016/17, as little as 16kg of gold from AMP sites were logged through legal export channels, with an estimated 8,000kg of gold being recovered from AMP sites, indicating that 99.8% of AMP gold is either sold for domestic use or exported illegally.

Finally, informants noted cases of AMP gold going missing during international transit, including in the brief periods between gold being checked in for cargo and the connected flight landing at its destination. These trends point to low levels of security along transport routes where gold trade is common.

ASGM Market Access Initiatives' approach to global export and transport

At the point of export, ASGM Market Access Initiatives only make commercial sense if volumes of gold are high enough to justify the costs. The initiatives reviewed in this study exported as little as 250 grams of gold per transaction, with a significant subsidy for transport – up to around 10kg per transaction within the most established trade routes. Unless initiatives export a minimum volume of 5kg at any one time, it would be difficult to transport the gold to the refiner and maintain a reasonable margin at sale.

While it might appear more professional to engage third-party logistics and insurance providers specialized in transporting high-value cargo, it is common practice to transport gold in volumes of less than 5kg in hand luggage. This reduces transport costs to the price of an individual airfare and provides higher degrees of control and safety.

Most ASGM Market Access Initiatives communicated in favor of this practice, as long as the appropriate documentation is kept and carried. Other reports suggest that exporting gold through hand luggage is a common practice for illegally exported or smuggled gold, leading to mistrust in

¹¹ Katho, O et al. (2021) *The Just Gold Project: Lessons for the future for artisanal gold in Democratic Republic of Congo*. Available at: https://impacttransform.org/wp-content/uploads/2021/03/IMPACT_Just-Gold-Lessons_March-2021_EN-web.pdf

the approach. When done legally, however, transportation via hand luggage eases the facilitation of ASM gold into responsible supply chains.

Summary

- Practitioners and responsible sourcing experts interviewed for this study agree that transporting gold in airplane hand luggage for export, which is the most prevalent method for small quantities, is in line with international best practice when fully compliant with regulatory requirements and carrying appropriate documentation.

4.1.5 Refining



Refining is the most sophisticated method of purifying gold to above 99.5%. Leading refiners can achieve purity of 99.99% (known as “Four Nines” gold) for use in jewelry and bullion bars, and 99.999% (“Five Nines” gold) for use in electronics.

Working with a high-value commodity, most refiners operate on small margins, purchasing gold from industrial mines for as much as 98-99% of the product value. This means that relative profit margins of refiners are generally low, depending on high processing volumes and low transaction costs to remain profitable. Most LBMA-accredited refiners are not actively sourcing ASM material, citing the significant costs required to comply with international regulatory requirements and implement OECD-aligned due diligence on ASM, generally considered a high-risk source.

Barriers and challenges associated with refining

Although there is an increasing appetite for in-country refining¹², within both East (Tanzania and Uganda) and West (Ghana) Africa, there are currently few refiners operating at scale. Most of the gold is exported in pre-refined forms into informal markets or formal supply chains linked predominantly to Swiss and US refiners. Given the increased risk profile of ASM gold, most Swiss and US refiners appear reluctant to mix ASM with conventional material, which leads to higher refining costs as refiners maintain a segregated processing line.

¹² Several interviewees pointed out that contrary to the notion of promoting refining as a means of local value addition, the value capture around refining is minimal, accounting for just a small fraction of the gold value (1-2%) and creating only few jobs.

Segregated refining of ASM gold is very expensive due to the smaller volumes coming in from the sector. Deleterious chemicals such as mercury also discourage refiners from off-taking ASM gold. When processing ASM gold, refiners often employ alternative methods such as electrolysis, which is feasible for amounts of more than 100kg of gold.

ASGM Market Access Initiatives' approach to refining

Some ASGM Market Access Initiatives' find it difficult to onboard refiners willing to offtake small volumes of ASM gold – subject to segregation due to the increased costs. Where refiners have been engaged, they prefer direct offtake engagement with the AMPs as they are able to exert more control over the value chain.

For small volume transactions, initiatives usually engaged refiners solely through toll refining services, usually linking the refiners to downstream users interested in integrating ASM material into their supply chain and able to cover associated costs, or, by leveraging third-party subsidies designated to enable international market access. Without downstream companies willing to absorb additional costs or external financial support, it appears difficult for refiners to justify investment in refining relatively small volumes of ASM.

Where there are increased costs due to segregated refining, these costs are usually passed on to the downstream companies commissioning the transaction.

Some refiners seek opportunities to build ASGM supply in sufficient volumes to justify the due diligence and supply chain costs that will enable them to tap into new supply chain sources while also fulfilling social responsibility objectives.

Summary

- Despite additional costs associated with single batch segregation, refiners prefer to keep ASM material separate from their mainstream feed.
- Refiners are unlikely to engage in ASM sourcing unless associated costs can be passed on to downstream clients.

4.1.6 Gold value chain transparency

To ensure market acceptance of ASM material by downstream businesses, full visibility of the value chain is often required. Full visibility is accompanied by a credible provenance claim for the material in question: *where did the gold originate?* Also, ESG assurance: *under which conditions was the gold produced?* The below section focuses on the implementation of chain of custody protocols (CoC) that substantiate provenance claims.

Guaranteeing that the initial production meets good practice ESG standards is an essential part of a 'responsible' CoC. This premise of this report is that ASM gold sourced through ASGM Market Access Initiatives has been responsibly produced. There are a growing number of projects and initiatives from both private sector and institutional donors that are dedicated to ensuring the formalization and professionalization of ASGM operations. Third party certification schemes such as Fairmined¹³ and Fairtrade¹⁴ were pioneers in the sector and paved the way for the development of the CRAFT Code¹⁵ for ASM market access in alignment with OECD DD Requirements. Other noteworthy institutions in the space are the Swiss Better Gold Association¹⁶ and its Better Gold Initiative (BGI) and the growing number of projects financed through the European Partnership for Responsible Minerals (EPRM) or USAID focussed on supporting AMPs and enabling market access.

Capacity support for AMPs is also intrinsic to the planetGOLD¹⁷ programme that will soon operate across 23 countries. CoC describes a system of control and transparency, specifically, the documented record of the sequence of companies and individuals that have custody of minerals as they move through a supply chain. A CoC system is closely linked to the concept of traceability, which can be defined as the ability to identify, track and trace elements of a product or substance as they move along the supply chain from raw goods to finished products.

Barriers and challenges associated with establishing gold value chain transparency

Current CoC mechanisms as practiced by ASGM Market Access Initiatives reviewed do not provide real-time information on the location of the gold as it moves across the supply chain. According to a planetGOLD report on supply chain solutions, "Gold effectively vanishes from the moment it leaves a miner's hands until it arrives at the top of the chain with an exporter. Also, as

¹³Learn more about the Fairmined scheme on their website. Available at: <https://fairmined.org/>

¹⁴Learn more about the Fairtrade gold standard on their website. Available at: <https://www.fairtrade.net/standard/gold>

¹⁵Learn more about the CRAFT code. Available at: <https://www.resolve.ngo/craft.htm>

¹⁶Learn more about the Swiss Better Gold Sourcing Criteria. Available at: <https://www.swissbettergoldassociation.ch/our-approach>

¹⁷Learn more about planetGOLD Criteria for Environmentally and Socially Responsible Operations. Available at: https://www.planetgold.org/sites/default/files/planetGOLD_Criteria_for_Environmentally_and_Socially_Responsible_Operations_Feb21.pdf

data is not digitized, it is difficult to generate statistics regarding gold production by site, for example, or gold trades by trader, or generate other analytics. In short, the chain of custody can assure buyers of the route taken by the gold, but generates little other useful data.”¹⁸

ASGM Market Access Initiatives’ approach value chain transparency

When trading gold and tracking material through the refining and further value addition process, there are several different levels of traceability that could be achieved. It is up to the supply chain actors to determine which traceability level is adequate or needed to satisfy the final customer. The level of material segregation required generally decreases as the material moves along the value chain into less ‘risky’ value chain stages. As such, a CoC lends credibility to product-related sustainability claims, as a working CoC system ensures that material of foreign origin does not enter the production system.

Most initiatives have adopted paper-based chain of custody documentation, with photographs used to supplement evidence as the gold moves along the supply chain. Tamper-proof bags are used by most of the ASGM Market Access Initiatives during export to avoid contamination with material from different mine sites.

Digital track and trace technology is also being considered for implementation. Taking advantage of digital tools, bag & tag systems are being employed with smart signs attached to the bags to provide GPS data that cannot be manipulated.

Some ASGM Market Access Initiatives are considering the addition of blockchain technology to bolster the credibility of their chain of custody but are yet to integrate that into their programs. Sector experts do not advocate in favor of digital solutions for digital solutions’ sake; paper-based solutions are generally considered sufficient, until the additional benefits from a digital option can be demonstrated.

¹⁸ planetGOLD (2021) *Supply Chain Technology Solutions for planetGOLD Projects*. Available at: https://www.planetgold.org/sites/default/files/Supply%20Chain%20Technology%20Report_final.pdf

Summary

- A documented, paper-based system is sufficient and practical to establish credible gold value-chain transparency.
- Digital supply chain solutions, although being considered by a number of projects, are yet to be operationalized. Their absence does not represent a barrier to AMP engagement.



LEARN MORE: *Supply chain technology solutions*

If you are interested in learning more about supply chain technology solutions that can be considered for the integration of artisanal and small-scale mined gold into formal markets, check out the paper titled: "Supply chain technology solutions for planetGOLD Projects."¹⁹

4.2 Supplier-offtaker business relationship

International actors looking to source responsibly-produced gold from AMPs need to negotiate terms and conditions that are of mutual benefit for all parties. This means that offtake terms need to be commercially competitive, and take different factors into consideration, including:

Financial incentives:

- Pricing
- Payment terms of the transaction
- Inventory and pre-financing

Non-financial incentives, such as:

- Legal compliance
- Technical support

¹⁹ planetGOLD (2021) *Supply chain technology solutions for planetGOLD Projects*. Available at: https://www.planetgold.org/sites/default/files/Supply%20Chain%20Technology%20Report_final.pdf

4.2.1 Financial incentives

AMPs are small and medium-sized enterprises (SMEs) seeking to enter commercial business transactions. Pricing that is competitive in local markets is key to getting AMPs interested in selling their products to international buyers. Equally, AMPs need to know how and when they can expect to receive payment as they are used to getting cash quickly.

While many of the ASGM Market Access Initiatives aim to raise incomes of individual workers, there is little information on how much individual miners receive for their labor once allowance is made for the payments made to land-owners, providers of capital and the payments to government and security officials.

While fair pricing plays a crucial role in ensuring adequate value is captured by upstream producers, discourse is shifting towards enhancing production efficiencies and, thus, reducing costs to increase profit margins, rather than relying on financially unsustainable and difficult-to-scale price premium.

4.2.1.1 Pricing

The price paid for gold on informal markets is the product of the transaction volume and the gold content or purity, but the price offered per unit of gold depends heavily on the location. Generally, the more remote a transaction, the higher the margins for the traders and intermediaries, as they perform the functions of transport and aggregation. Moving closer to regional or national gold buying centers, however, often brings gold prices closer to the LBMA gold price.

From an AMP's perspective:

AMPs are looking for the highest price for their product. It is not uncommon for AMPs to request different offers prior to making a selling commitment. This said, while the spot price offered to them is of great importance, AMPs are willing to accept discounts on their gold in return for financing or non-financial incentives, as further explored in subsequent sections.

Contrary to popular belief, many AMPs are receiving very competitive pricing, unless they operate and sell in remote areas. In the Ugandan capital Kampala, for example, studies show that the local market rate for gold can reach as high as 97.5% of the LBMA gold price.²⁰

²⁰ Barreto, M., Schein, P., Hinton, J. & Hruschka, F., 2018. *Economic Contributions of Artisanal and Small-Scale Mining in Uganda: Gold and Clay*, Somerset, UK/Envigado, Colombia: Pact Global UK & Alliance for Responsible Mining.
Available at: https://delvedatabase.org/uploads/resources/EARF_Economic-Contributions-of-ASM-in-Uganda-2018.pdf

In some geographies, gold buyers might even offer above market price, a phenomenon that can be explained by the fact that gold trade in Africa is used to avoid foreign exchange losses, relying on the gold as a universal currency and might, beyond this, be linked to illicit activities such as money laundering, tax evasion, and illegal exports. In such environments, formal market actors might have difficulty competing on price without resorting to premiums, paid to the AMPs and passed on to downstream actors.

From the offtaker's perspective:

Offtakers looking to source responsibly produced ASM gold correctly start with the assumption that AMPs need to receive a competitive price for their product. However, given the range of operating costs associated with integrating material in the international market, means that offtakes require gold volumes large enough to justify those costs without discounting the price offered to the AMPs.

In other words, as production volumes per AMP are usually low, the economics of direct exports would require aggregation or stockpiling of material as well as building a more efficient logistical network to reach remote locations.

How formal market access initiatives approach pricing

Most interviewees attested that AMPs are receiving upwards of 95% of the LBMA price. A refiner that sources from a cooperative in Honduras, for example, paid 95% of the market price through direct bank transfer. In Peru, Colombia, and Mongolia, a gold reseller offtaking from Fairmined and Fairtrade certified mines pays between 96% and 99% of the refined value, exclusive of producer premiums.

Only in remote or localized schemes relying on aggregators does the price go down, as is the case in Burkina Faso, where AMPs are paid in cash between 85% and 87% of the LBMA fix at the mine-site level for micro-transactions of as little as 1-5g, with exporters being paid 97% of the LBMA price by the international actors receiving the material.

Producer premiums or other benefits

Central to the approach of Fairtrade, Fairmined, and Swiss Better Gold Association, although the mechanisms differ, is for AMPs to receive an additional payment, or premium, on top of the revenue from the sale of gold transacted at the commercial gold price. Conditional on compliance with their respective environmental, social, and governance (ESG) requirements, this

approach provides a strong incentive for some AMPs to participate in such initiatives, especially the smaller artisanal groups. Given the high expectations and difficulties to meet the social and environmental requirements set by these organizations, the uptake of certification remains limited to a small number of sites largely located in South America, however.

Even without a premium above local market rate, an AMP can have long-term supplier relationships with gold buyers in exchange for pre-financing, or other non-financial incentives, as further explained in subsequent sections. AMPs appear willing to accept significant discounts on the gold price of up to 15%, as was the case for one of the interviewees, in return for upfront financing of their operations.

Summary

- For AMPs to remain engaged in ASGM Market Access Initiatives', locally competitive pricing is a prerequisite.
- Beyond a competitive price for their golds, AMPs are incentivized by attractive financing terms.

4.2.1.2 Mode and timing of payment

The artisanal gold sector is largely informal, operating predominantly through cash transactions to maintain a continual cash flow for their business, with AMPs receiving payment on the spot. Exchanging large payments in cash poses a security concern, exposing both buyers and AMPs to the risk of theft or even assault.

Informal actors who avoid paying relevant taxes or engage with illicit actors benefit from the lack of transparency that cash payments provide. AMPs willing to formalize might not yet have access to bank accounts that would allow them to engage in cashless transactions.

Some gold traders transact in US Dollars, rather than offering payment in local currency. In such instances, AMPs might incur currency exchange charges.

From an AMP's perspective:

Having limited access to working capital, most AMPs seek to optimize cash flow and receive payment as soon as possible, making on-the-spot cash transactions the norm for the informal market. Local traders, transacting in small volumes, usually operate in local currency. Programs that work through intermediaries and aggregators, engaging through small and frequent transactions, also offer on-the-spot cash payments.

From the offtaker's perspective:

Given the sector's association with money laundering and other illicit activities, cash payments pose a risk to downstream buyers of gold. Most international refiners and traders have adopted policies prohibiting or restricting cash transactions in line with international anti-money laundering (AML) regulatory requirements. As such, international refiners engaged in direct purchasing agreements with the AMPs have a clear preference for bank transfers. International transactions are often executed in USD, with the option of sending money to local currency accounts.

How formal market access initiatives approach payment conditions

With many initiatives promoting financial and business literacy among artisanal miners, formalized AMPs should have access to bank accounts and are willing to make cashless transactions.

As mobile payment solutions become more popular, gold buyers can offer payment options that have the same merits as cash transactions in regards to the immediacy of payment, without facing any of the risks or costs associated with cash transactions. For large transactions, bank transfer remains the preferred option.

Summary

- AMPs require immediate (partial) payment when they transfer gold.
- Small transactions, by aggregators, are usually executed in cash.
- Larger transactions, through direct export, are usually executed through bank transfers.

4.2.1.3 Access to finance

Many AMPs rely on informal financing provided by local investors or traders to finance their operations. Most artisanal miners, however, are unable to access formal finance. This leads to AMPs turning to informal financing arrangements, which, in worst-case scenarios, can result in AMPs being “locked into unfavorable agreements, with enterprises owing significant portions of future gold production to lenders, becoming trapped in perpetual debt cycles or intertwined with illicit financial flows.”²¹

To have supply agreements with international actors, AMPs require sufficient working capital to produce and aggregate the volumes needed to justify export. Providing financing upfront, however, is perceived as extremely risky, with few formal financial institutions willing to provide working capital. In the absence of alternatives, informal finance remains crucial to maintaining operations.

Possible solution: supply chain finance options

To enable participation in formal market schemes, international buyers can provide an alternative to current financing arrangements, such as by providing working capital, equipment, and inventory financing.

Providing working capital

Working capital, provided in the form of either loans or as pre-financing of future offtake, is an efficient method of achieving exclusive offtake and potential discounts when purchasing. The common practice of production sharing (as opposed to paying for labor in cash) diminishes the gold volumes retained by AMPs and thus their ability to commit large volumes of gold to international buyers. The provision of working capital allows AMPs to pay miners directly in cash, they can increase the volumes left for export.

Provision of equipment and inputs

As demonstrated above, the current relationship AMPs have with offtakers can include the provision of inputs such as mercury. Formal buyers can also provide inputs upfront, such as mercury-free equipment alternatives for processing, pre-financing to enable aggregation and

²¹ planetGOLD (2020) *Unlocking Finance for Artisanal and Small-Scale Gold Mining*. Available at: https://www.planetgold.org/sites/default/files/2020-04/Unlocking-Finance-for-ASGM_final_0.pdf

sometimes equipment to increase mine productivity as an incentive for engaging in offtake agreements. AMPs might be willing to compromise on the offtake price if other incentives are also of benefit in the short term – often boiling down to access to working capital.

Inventory financing

If AMPs need to regularly sell small volumes of gold to maintain cash flow, gold volumes will not reach large enough amounts to sell to aggregators or exporters that offer higher prices but require travel to reach. This is because AMPs need to factor in the time and money spent for each time they sell to the aggregators, hence the preference to sell to local traders instead, often in smaller volumes and at lower prices. If they could afford to keep gold and amass larger volumes, AMPs would be able to sell the commodity in bulk and afford to work with international actors. Inventory financing, which can either be a loan facility or prepayment by the offtaker, allows the AMP to stockpile gold. Different from pre-financing, inventory financing is linked to already produced gold, and as such, creates a lower engagement risk to the offtaker. The financing is provided either to toll millers to facilitate on-the-spot payments to AMPs and aggregate on behalf of the offtaker, or to the AMP to enable them to amass their inventory in stock.

How formal market access initiatives approach access to finance

To enable aggregation, a precious metals trader interviewed provided millions of dollars in pre-financing to a toll miller in Peru that engages directly with AMPs – circumventing the issue of aggregation while also ensuring immediate payment to the AMP delivering their gold to the miller. A toll milling facility has proven to be cost-effective as it enables gold aggregation at scale to justify export costs, which oftentimes the management also has permits to undertake export. The financier, in this case, benefits from purchasing the gold from the toll miller at a discount, resulting in a win-win situation for all actors involved.

In Ghana, AMPs engaged with a local trader and exporter sometimes benefit from the provision of working capital and equipment. The trader then benefits from a 10-15% discount on the gold price.

One refiner interviewed was willing to wait up to six months to allow for aggregation, paying AMPs an on-the-spot fee of 90% with the remaining 10% delivered as soon final assaying is done upon receipt of the gold at the refinery. One refinery reportedly provided pre-financing to an AMP to help increase its production capacity.

Summary

- Pre- or inventory finance from formal actors, allows AMPs to break commercial ties with informal actors that might otherwise keep them in captive offtake agreements.
- Inventory financing is required by most AMPs to aggregate volumes that justify export to international actors, without relying on premiums or discounting the price received by AMPs.

4.2.2 Non-financial incentives for AMPs

Non-financial incentives offered by an offtaker, such as the enhanced reputation of working with an international actor, are a factor that is also taken into consideration by AMPs. From the offtaker's point of view, these are a means to de-risk the engagement such as through capacity building and technical support.

This also relates to the efforts of AMPs to be legally compliant with local and international regulations. To avoid the fear of a halt in their activities, some AMPs seek security by collaborating with international actors who offer program support services that help them professionalize their businesses and enable a transition towards legal and responsible production.

How formal market access initiatives approach non-financial incentives

Different initiatives provide support around business formalization, looking at improving bookkeeping practices of the AMPs, providing mine-site planning and geological data to increase production efficiency and operational safety. The installations of pilot plants that demonstrate and make available the use of alternative mercury-reduction and elimination processing technologies is also often provided to AMPs. These interventions proved to be successful in establishing a more stable trading relationship as they rendered direct results to the AMPs.

PPE provision is also very common across programs to limit the health effects of mercury use and protect miners when underground. Training on high-quality smelting techniques is

occasionally provided to AMPs engaged, as well as formalization support. At least one program helped raise the capacity of rudimentary gold processing technologies. In other instances, support after natural disasters to help restore the community demonstrated the good faith efforts of projects to the AMPs, raising the level of trust and engagement in sourcing. This support is often done by leveraging donor programs such as planetGOLD and the EPRM. However, from the interviews held, most AMPs appeared to lose interest when the focus was solely on social and environmental capacity building, without a focus on the production capacity or profitability of an AMP.

Summary

- AMPs are receptive to technical support as long as it results in short and medium-term gains to their business, rather than focusing solely on OHS or environmental improvements.

4.3 Assessing the viability of formal ASGM value chains

All interviews conducted for this study indicate that the integration of relatively small volumes of gold into the formal sector, comes with oftentimes significant costs, many of which are not experienced in the informal market, making it difficult to compete solely on price. Nevertheless, some AMPs actively seek to participate in efforts dedicated to formalizing the ASM gold trade. For these AMPs, the incentive can be non-financial and include capacity support, technical assistance, the prospect of accessing competitive financing, and the expectation that regulatory enforcement is pending and that a professionalization of their operations will be beneficial in the medium to long term, despite short-term 'disadvantages.'

This section seeks to assess cost factors associated with integrating ASM gold into formal supply chains at different steps in the value chain. Value chain costs differ from geography to geography, making it difficult to make blanket generalizations. Beyond that, there is a lack of academic literature or public reporting on the topic that would allow for a quantification of different cost items.

All the ASGM Market Access Initiatives reviewed in this study that pursued the physical integration of gold from a mine to a downstream buyer had ended up with costs higher than international market prices, even if AMPs received rates near local buying rates. ASGM Market Access Initiatives focused on aggregation through local buying centers usually purchased gold at a discount and channeled it into conventional markets without maintaining a segregated identity to keep costs low.

The table below provides a qualitative overview of the cost line items incurred by ASGM Market Access Initiatives compared to costs borne in local markets. In the table, costs are grouped as either fixed²² or relative costs.²³

	Costs to consider		vs. local markets
	fixed	relative	
Transformation & Trade			
Smelting cost			= or >
Penalties / charges for deleterious elements (such as mercury)			>
Aggregation & Transport			
AMP / 1st-party transport			=
3rd-party transport cost*			>
1st-party aggregation			=
3rd-party aggregation*			>
3rd-party insurance*			>
Legal Costs			
Royalties / export fees			= or >
Pre-requisite licences			= or >

Figure 6: An overview of the cost factors to take into consideration when facilitating market entry for ASM gold

*costs usually only encountered by formal markets.

²² Fixed costs remain constant throughout regardless of the volumes being transacted. This means that small transaction volumes incur the same absolute cost as larger transactions would, resulting in a competitive cost disadvantage, or, to frame it positively, allowing one to improve relative margins by reaching economies of scale.

²³ Relative costs increase in direct correlation to the transaction volume, This means that there is no immediate disadvantage from transacting in small volumes. The principle of economies of scale does not apply.

Summary

- Physical supply chain integration of ASM gold is likely to result in increased costs around security, transport and refining, making it difficult to integrate gold into downstream supply chains at international market price while offering AMPs a locally competitive price
- AMPs are incentivised to participate in ASGM Market Access Initiatives that can demonstrate fair payment terms and the provision of capacity support, technical assistance, and access to finance.

5. Case studies

The Barequeros Sourcing Project

ISSUE: In a region that has endured the presence of various armed groups for decades and is still affected by internal conflict, the Barequeros are highly vulnerable to exploitation by illegal actors. The program's partners would like to see the El Chocó artisanal mining practices protected, conserved, promoted, validated, and given access to formalization and international markets under fair conditions.

SOLUTION: Establish a direct sourcing relationship between the AMPs and the project's refiner, while engaging various stakeholders across the value chain that also provide a route to market to a jewelry company.



Photo: Chopard

Project runtime: 2019 – ongoing

Project status: In operation

Area of focus: El Choco, Colombia

Financed by: The Swiss Better Gold Association and the Swiss Secretariat for Economic Affairs (SECO)

Led by: El Choco, Colombia

In partnership with a local exporter, Atabaque (an NGO supporting formalization of the Barequeros), Chopard, Swiss Better Gold, and a Swiss refiner.

Gender equality: 46% of the beneficiaries involved in the project are women and awareness is raised on the topic of gender by Swiss Better Gold through Atabaque.

Operational Health & Safety: Facilitated through an awareness campaign by Swiss Better Gold through Atabaque.

Number of artisanal miners reached: at least 1,300

Is it possible to source gold? Yes

Gold offtake management

Set up by the Swiss Better Gold Initiative (SBG Initiative), a public-private partnership between the Swiss Better Gold Association and the State Secretariat for Economic Affairs (SECO), this program supports the miners to improve their productivity through technical assistance and capacity building, all while undergoing strict due diligence to meet downstream expectations of responsibly sourced gold. The SBG Initiative team conducts and verifies the assessments as defined by Swiss Better Gold's criteria for social and environmental mining practices before the gold is sold to the trader for export.

The "Barequeros" – the local name of the traditional gold panners – produce mercury-free gold as it exists in the form of alluvial gold dust. A pre-condition for individual miners to qualify for offtake under the program is their compliance with local regulations to legally obtain special permits to manually produce gold of up to 420 grams per year.

The refiner has entered into contractual agreements with the trader providing a ready market of all their verified gold production at a competitive selling price.

Since the inception of the program, 700 of the 1,300 miners have been able to get support in getting access to banking services, and the beneficiaries of the program access a set impact

premium that Chopard pays of \$1/gramme of gold that meets the responsible sourcing criteria, of which \$0.70/gram is directly allocated to Barequeros to improve their living conditions and \$0.15/g go into technical assistance activities for ASM which are in step 1 of the Swiss Better Gold escalator. At the end of 2021, the total impact premium paid back was \$70,797.

Non-financial incentives for AMPs

Swiss Better Gold, through its Initiative on the ground and the Better Gold fund (capitalized by an 'impact' premium paid by participants from the jewellery industry), provides awareness of Swiss Better Gold criteria, such as biodiversity management, gender equality, child labor, and health and safety at work.

Smelting practices undertaken

The gold is collected in the form of gold sand (powder), and final refining takes place in Switzerland. The gold powder is collected by a trader until there is a sufficient "exportable" volume before being shipped to the refiner in Switzerland.

Gold security and aggregation

The project is engaged with a local aggregator and exporters to enable transfer to the refiner.

Logistics and export mechanisms

Miners are responsible for getting their gold to the exporter through their own means of transport. Sometimes, the refinery provides the miners with several secure transport options but leaves the final decision to the AMP. The exporter will pay the royalty and all relevant taxes to the state on behalf of Barequeros.

Project Chain of Custody/traceability mechanism

To date, exports have been documented through a paper-based chain of custody solution in line with international due diligence practices. Complete physical segregation of the commodity is observed along the value chain all the way to the refiner, and the project partners are currently assessing the potential for blockchain-based traceability to be applied across the supply chain.

Refining

Single batch processing of the ASM gold that is separated from other input material is undertaken at the refiner level.

Fairever-Artisanal Gold

ISSUE: In developed countries, there is a distinct lack of fairly-traded precious metals from responsible artisanal and small-scale mining from developing countries.

SOLUTION: Direct sourcing from certified cooperatives in South America while facilitating export to the refiner as well as the payment of premiums to the AMPs.



Photo: Fairever

Project runtime: 2015 – ongoing

Project status: In operation

Area of focus: Colombia, Peru, and Mongolia

Financed by: Fairever

Led by: Fairever

In partnership with: Alliance for Responsible Mining (ARM) for Fairmined cooperatives and Fairtrade International.

Gold offtake management

Miners need to have mining licenses to participate in the Fairmined and Fairtrade programs. To build a trusting relationship, Fairever visits the cooperatives to get to know the miners/people personally during mine visits to the countries.

Fairever purchases gold from Fairtrade and Fairmined cooperatives at between 96% and 99% of the LBMA price, even though Fairmined and Fairtrade only obligate the reseller to pay a minimum of 95% of the market price. On top of this, Fairever pays social premiums of \$4000 per kilo for Fairmined gold or \$6000 per kilo for Fairmined ecological (mercury-free) gold. For Fairtrade gold, the premium is \$2000 per kilo.

Payments are made via bank transfers to the cooperatives. 50% of the payment is done when the gold is delivered to the export agent in Lima or Bogota and the other 50% when the gold has been received at the refining partner location.

Non-financial incentives for AMPs

Fairever provides AMPs with consultancy and knowledge about international exporting. In addition, the premiums AMPs receive when selling certified gold to the company enable their investment in operational health and safety.

Smelting practice undertaken

The mining cooperatives are responsible for smelting before delivering the gold to the export agent.

Gold security and aggregation

Fairever does not aggregate gold because legislation in the sourcing countries does not allow for combined shipments. The gold's security is left under the responsibility of the cooperative until the moment when it is on an airplane to the exporting country.

Logistics and export mechanisms

The cooperatives are responsible for transporting the gold to the export agent. The export agents are responsible for making royalty and tax payments for export.

Project chain of Custody/traceability mechanism

Traceability and chain of custody are documented on paper through airway bills, order confirmations, and invoices. In addition, photos are taken at the mining cooperative, the export agent, and the refinery when receiving the gold. Another critical factor is the Fairtrade or

Fairmined ID, which must be indicated on each document for each actor and transaction along the supply chain.

Refining

Fairever works with a refinery in Western Europe that employs a chemical refining process called aqua regia digestion for the segregated ASM feedstock, where chemicals are only used in a strictly controlled system.

Economic viability of the project

On top of the buying price, Fairever pays all premiums due to the AMP as stated above. These costs are transferred to the customer, creating a market-based model that pegs on buyers willing to pay the fair price for responsibly sourced gold from ASM.

Gold by Gold

ISSUE: Non-certified gold still finds its way to formal international markets regardless of the sourcing and supply-chain risks involved.

SOLUTION: Provide a formal route to market for both certified and non-certified gold by directly engaging with AMPs and verifying the provenance and sourcing mechanisms employed while offering a competitive price for the commodity.



Photo: Gold by Gold

Project name: Gold by Gold

Project runtime: 1992 - Ongoing

Project status: In operation

Area of focus: Colombia

Financed by: Gold by Gold

Led by: Gold by Gold

In partnership with: Alliance for Responsible Mining (ARM) for Fairmined cooperatives

Gold offtake management

Gold by Gold has set up a buying subsidiary – a gold consolidating smelter – in Colombia that sources both certified and non-certified gold from an average of 10 – 50 customers all throughout the year to enable gold aggregation and export before reselling internationally.

The company undertakes its own KYC checks and value chain audits on top of facilitating systematic and regular visits to the mine sites. These procedures and audits are verified by 3rd party providers on a regular basis.

The transactions per mine range from 0.1 – 2 kg at a time regardless of certification status. Certified gold is bought from Fairmined certified mines that are legally organised into cooperatives or companies. Certified AMPs receive a minimum of 95% of the LBMA price and on top a \$4000 per kg Fairmined premium.

For non-certified gold, Gold by Gold is not allowed to buy directly from individual AMPs known as Barequeros but sources from them through local traders who are allowed to buy from them. This is because panners in Colombia cannot sell directly to the international trading house by law. Gold by Gold does the KYC checks on the traders and checks that individual AMPs are registered and free from criminal records. The company also verifies the consistency of the volumes with the field visit reports and numbers of miners involved. The company offers the traders no different prices from the certified mines.

For traceability and auditing purposes, all gold providers of Gold by Gold are paid through bank transfers only. The company offers a provisional payment of up to 90% based on XRF and/or gravity density test and settles the balance once the fire assay done in-house is available. This settlement period takes between 1-2 days. Once all elements are known and invoices issued, the remaining balance is transferred.

The market for the ASM gold is largely Asia, Italy, the USA, and the Middle East.

Non-financial incentives for AMPs

The premium paid to the certified mines enables their investment into operational environmental, community or health and safety improvements according to the standard against which they are certified. The only certified mines in Colombia are Fairmined certified.

Smelting practice undertaken

The consolidating smelter is responsible for the smelting of the gold into bars before export.

Gold security and aggregation

All certified gold is smelted in bulk to produce bars. Where downstream clients seek provenance gold, they are required to pay the extra costs attached to full segregation.

Logistics and export mechanism

The consolidating smelter has all the export permits and international commerce licenses to facilitate the export of the bars.

Project chain of custody/traceability mechanism

The company determines the purity and marks the smelted gold bars and uses security tags on the containers used for transport. At the destination, tags and bars are checked against the weight and marking and purity in order to detect any integrity breach during the transportation.

Refining

Gold by Gold operates a refinery in France for segregated refining of certified gold. For the non-certified gold, the company works with other refineries outside of Europe as there is a de facto ban on non-certified ASM gold in Europe.

Economic Viability of the project

The company has two flows of gold into its supply chain: 1) Non-certified consolidated gold that is sold with no premium to downstream off-takers and: 2) fully segregated gold from certified mines that is sold with a premium to its clientele after refining. This enables the company to adapt to the needs of the off-taker. The company acts as a consolidator in Colombia allowing small producers top benefit access to the international markets.

6. Conclusion

Cash is king in the ASGM sector. AMPs engage in commercial relationships that offer them a tangible incentive. On-the-spot payments on par with or above what informal and local actors offer are a precondition to ensuring the long-term interest of AMPs to participate in ASGM Market Access Initiatives. Competing with informal actors at the point of purchase can easily result in above-market price costs of ASM gold by the time it reaches international refiners.

The biggest bottleneck for mid-and downstream actors to purchase from AMPs appears to be the small production volumes of individual mine sites, which are perpetuated through the common practice of production sharing – a direct result of the lack of working capital AMPs experience. Inventory financing agreements are required to enable gold aggregation in the short term. In the medium to long term, the provision of working capital or equipment can lastingly increase mine productivity and subsequently profitability, enabling AMPs to offer higher volumes and directly engage in long-term supply relationships. Producer premiums, as demonstrated by the Fairmined and Fairtrade certification schemes, also serve as incentives for miners to engage.

Buyers willing to provide pre-financing benefit from exclusive offtake and significant discounts on the gold price, as increased levels of productivity result in net profit gains for the AMP, even after factoring in the discounts granted to the respective gold buyers and equipment providers.

Running their business on thin margins, refiners can only engage in such responsible sourcing programs if their clients and off takers are willing to absorb all and any costs associated with these engagements, including but not limited to the costs of transport and export, physical traceability, and (segregated batch) refining. This excludes all and any expenses related to due diligence, upstream assurance, or the provision of technical support to local AMPs as part of these engagements.

As explored across this paper, efforts to integrate ASM gold into formal global supply chains are contingent upon two sometimes competing realities.

On the one hand, there are tangible steps that donors, impact investors, and downstream offtakers can take to increase the volumes of gold recovered by AMPs to form effective and traceable aggregation models at scale, and to incentivize incremental improvements in ESG performance. Crucial to these changes is the provision of working capital, inventory finance, and applied technical assistance via trusted, local third-parties. Although the financial package provided to mine sites – especially linked to gold pricing – needs to be carefully calibrated to compete with informal traders, the offtake and export of ASM gold is both possible in principle and in practice.

Therefore, alongside reviewing the technical, supply-chain partnership, and financial forms of support that may be necessary to bring gold to market, first, a deep-rooted understanding of the national context is a 'must' and will play an essential role in dictating the success or failure of any future responsible supply chain initiatives.

This said, the broader enabling environment within which AMPs operate cannot be overlooked. The bureaucracy and fragility of many countries that host AMPs means that the enforcement of a simple, legal route to market is often lacking and can present itself as a significant stumbling block for the licit export of ASM gold.

Achieving a step change in conditions for artisanal and small-scale miners is only likely to occur if governments take a more active role and to institute formalization programmes that provide the right sort of incentive structures. International standard setters and compliance bodies, as well as other institutions such as the OECD, World Bank or IGF have a role to play in building capacity for more effective formalization approaches – since their guidelines have played such a big role in highlighting the vulnerability of artisanal miners.

Annex 1: Contributors to this research

With thanks to those who shared time, experiences and insights, including:

- Anna Bugmann, Artisanal Gold Council | ASGM Expert
- Eduard Stefanescu, formerly Heimerle + Meule | ASGM Expert
- Edward Bickham, World Gold Council | ASGM Expert
- Florian Harkourt, Fairever Gold | Gold Reseller
- Josh Sandin, University of London | ASGM expert, Academia
- Louis Marechal, OECD | Standard Setter
- Matthew Chambers, Chambers Federation | Impact Investing
- Patrick Schein, Gold by Gold | Gold Trader and Reseller
- Pauline Evequoz, Chopard | Offtaker
- Sergio Philbrick, GoldRidge Holdings Ghana | Gold Trader and Exporter
- Tirza Voss, formerly Fairphone | Responsible Sourcing Expert
- Virginie Bahun, Valcambi | Offtaker

This is not an exhaustive list of all the sector experts that contributed to the study. Some of the contributors preferred to remain anonymous.

Annex 2: Interview Topics overview

Introductory Questions

1. Please describe your role and experience working in artisanal gold value chains.
2. Which other parties have you engaged to work on this project?
3. Based on your expertise and experience, what elements of the value chain would you like to focus on during this interview?
 - a. Your background and experience in ASGM
 - b. Gold Offtake Management – Purchase, Payment & Financing
 - c. Smelting / Processing
 - d. Gold Security and Aggregation
 - e. Logistics & Export
 - f. Chain of Custody / Traceability
 - g. Refining
 - h. Other. Please describe.
4. When did your program start? Is it still active and how many unique purchases from miners and exports have you had to date (both number and total volume)?

Gold Offtake Management – Purchase, Payment & Financing

5. Please describe your buying processes with/from ASM actors?
 - a. Location

- b. Frequency
 - c. State of gold (e.g. gold dust, nuggets, sponges)
 - d. Mode of payments
 - e. Deleterious elements (such as mercury)
6. What kind of ASM structures/businesses have you traded with? (Individuals, cooperatives, limited liability companies, saving groups, associations, others...)
7. What is the procedure for agreeing on the price with artisanal miners? Who are the parties involved in agreeing on this price?
8. Who is responsible to ensure legal compliance, making royalty and tax payments?
9. What incentives do you provide to miners to sell to you??
- a. on-the-spot payment
 - b. Pre-financing
 - c. Equipment
 - d. Technical support
 - e. Other (please describe)
10. Could you describe how you document transactions throughout the value chain?
11. What is the range of transaction volumes when trading ASM gold?

Smelting / Processing

12. Who is responsible for processing the gold prior to export?
13. Is gold from different sources mixed during smelting?
- a. Do you have the capacity to offer segregated batch processing?

14. What process do you use for smelting?

- a. Volumes and Chemicals

15. What measures were taken to protect against exposure to and emission of mercury fumes during smelting, if any?

Value Chain & Export

16. How is the gold transported from the mine to the refiner?

17. What is the minimum volume of gold for you to be able to export?

18. What measures have you taken to ensure the security (theft and physical safety) of your gold and involved parties (personnel) during aggregation and transport?

- a. Insurance
- b. Private security / armed guards
- c. Other; please describe.

19. What licenses and permits are required to trade and export gold? How do you obtain such permissions?

20. Are you at liberty to share a breakdown of costs, both fixed costs and variable costs, you encountered from purchase to export?

If not, could you provide a qualitative weighting of various cost factors?

Chain of Custody/Traceability

21. What traceability mechanism do you use when sourcing ASM gold?

Refining

22. Did you segregate the ASM gold feedstock from other non-ASM materials?

Closing Questions

23. What would be needed to scale your route to market mechanism?

24. Do you think (elements of) your model are replicable elsewhere?

Annex 3: Potential sourcing models explained

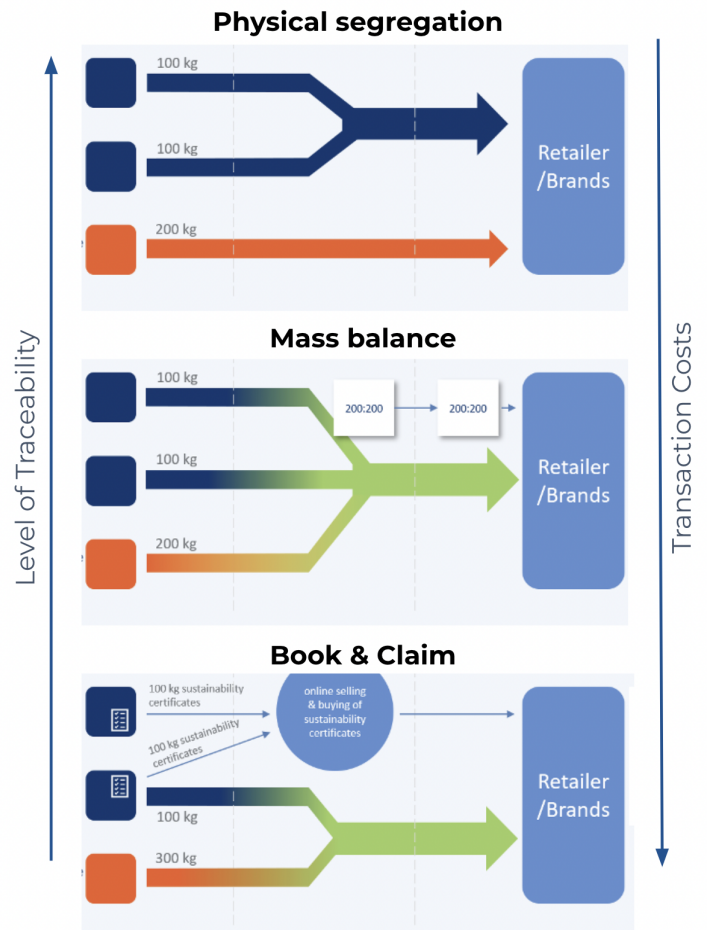
This Annex provides an overview of the different responsible sourcing models that exist²⁴, starting with a model of physical segregation and direct integration into the supply chain, up to a Book & Claim model, where the physical traceability is detached from the sustainability claims.

Different programs and certification schemes utilize different ways of integrating material. Each brand should determine for themselves what level of traceability, ESG assurance and sourcing claim is right for their company.

As a rule of thumb: the higher the level of traceability and control, the higher the cost of engagement.

Model 1: Identity preservation

The physical product can be traced back to its sustainable source in this comprehensive chain of custody model. Throughout the supply chain, the production of each identifiable source is kept separate from the products of other sources, even if the latter were produced according to the same standards. At the point of sale, consumers can be informed about this unique source.



²⁴ ChainPoint (2018) *Supply chain traceability for commodities and products*. Available at: <https://www.chainpoint.com/solutions/supply-chain-traceability/>

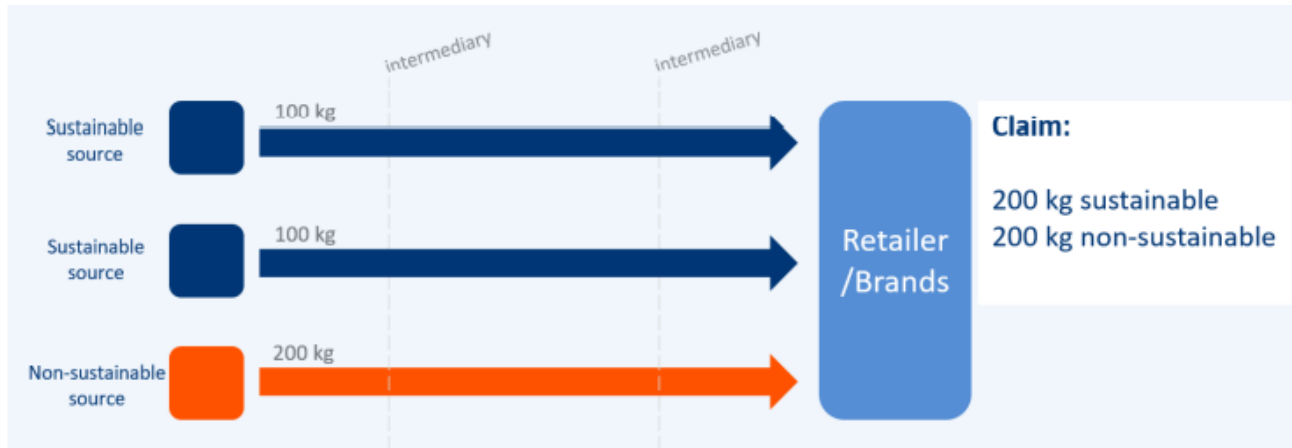


Figure 7: Identity preservation

This level of traceability is something that finds its application in specialty coffee or single-origin cocoa supply chains in the food and agriculture sector, where intrinsic and measurable quality (in this case, taste) is the result of maintaining the identity of the origin until the end. Identity preservation also adds to value perception in the trade of precious stones of higher value, e.g., diamonds that might be assessed and indexed individually. Here the concern is not the intrinsic quality of the product, but the associated Environmental, Social, and Governance (ESG) claim of not being a 'blood diamond.' Only by proving the origin can the consumer be assured that the diamond on their wedding ring or necklace has not been associated with human rights abuses.

This mechanism lends itself to products/materials that require little or no (bulk) processing; materials that usually are not mixed, and where processing costs develop linearly, meaning that economies of scale are difficult to achieve. Refined gold usually does not fall into this category.²⁵

Model 2: Segregation

Suppose an aggregated flow of products that were produced according to the same sustainability standard is kept strictly separated from other products as they traverse through the supply chain. In that case, this is in line with a segregation model. The product a consumer holds may not be traced back to a single source, but they will be guaranteed 100% sustainable.

²⁵ Adapted from OECD (2016), OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas: Third Edition, OECD Publishing, Paris.

An example of such a claim would be cocoa or tea that is certified organic, a trait that would be lost as the product gets mixed with material originating from foreign, uncontrolled sources. For gold in the context of ASM projects, a segregated claim should be maintained up to the level of refining to ensure the integrity of sustainability claims.

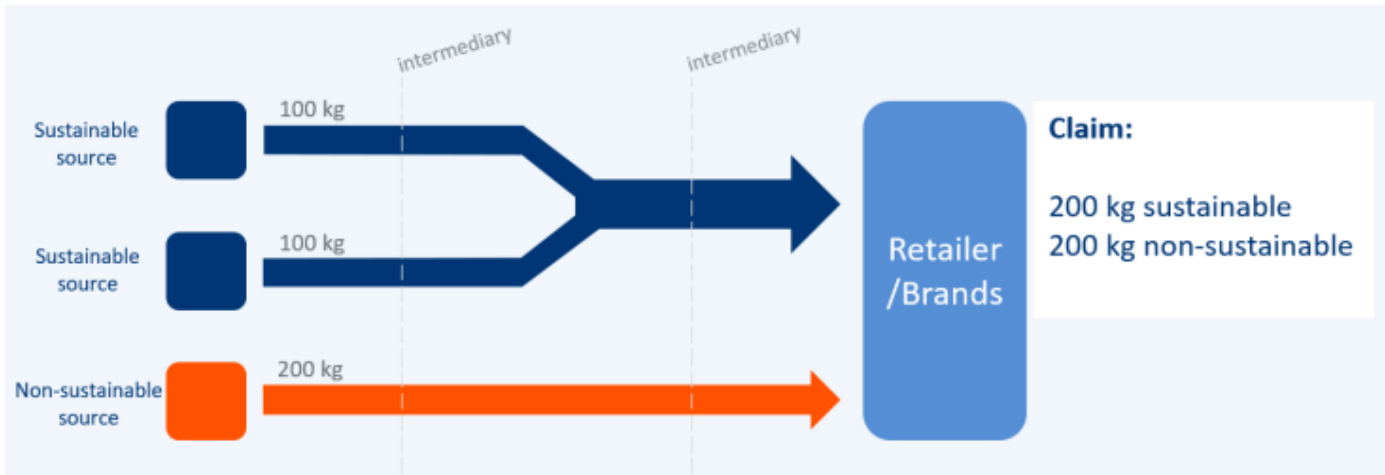


Figure 8: Physical segregation

Segregation of the gold only works or makes sense if the origin is verified. In a system maintaining full segregation from mine to market, the final user/consumer buying a piece of jewelry or an electronic device can trace the origin of each component or mineral back to a group of mines, which are being monitored and assessed against a credible ESG framework. Once traceability is lost or materials are physically mixed with other non-traced materials, full-segregation status cannot be regained.

When talking about a verified origin, this could refer to either a specific mine site (allowing identity preservation as described above) or a selection of mines. Still, it also could refer to an entire area that is effectively controlled and monitored. Examples of segregated supply chains can be found in the textile and food sectors. One such example would be food items or cotton fabrics that are certified as organic. In a fully segregated system, consumers expect to receive uncontaminated products from a group of producers that all meet the standards stipulated by the relevant certification system. In the case of organic food, the resulting claim can be verified by

checking for (traces of) banned pesticides and chemicals. To maintain (contamination-free) organic status, processing facilities must either exclusively utilize certified material or, alternatively, halt production to clean all processing facilities to the degree that contamination cannot occur when switching between certified and non-certified production.

Maintaining traceability in the gold sector through full segregation comes at a significant cost once ore reaches industrial refining. Gold refining to bullion grade (99.99% purity) is a complex (chemical) industrial process based on the continuous throughput of material. Consequently, to maintain physical segregation of gold from a specific group of mines, refineries would either need to invest in an additional production circuit used exclusively for the project at hand (this option will usually be cost prohibitive), or stop production, clean their facilities, and swap all chemicals that contain gold (which also would incur significant additional costs).

As a closing thought, segregation down to the final processing step or sale to consumers only makes sense if it affects intrinsic product properties (such as organic 'non-contamination') or is legally required or expected by the consumer (as seen in the diamond sector). Refined gold is a globally traded commodity that cannot be distinguished from gold from elsewhere. Accordingly, the preliminary recommendation is to either avoid refining and instead, using smelted material for jewelry production or alternatively operate using a mass-balance claim.

Model 3: Mass-Balance

For efficiency, production process, or cost reasons, it is not always feasible to segregate sustainable and non-sustainable products, especially when there is no physical difference between the two. In the mass-balance traceability model, products from both sustainable and non-sustainable sources are mixed, but as they move through the supply chain, an exact account of volume ratios is maintained. Keeping track of the mass-balance ensures that the amount of sustainable product sold to consumers (after it has been mixed with non-sustainable material) equals the amount (or volume ratios) of sustainable product originally produced.

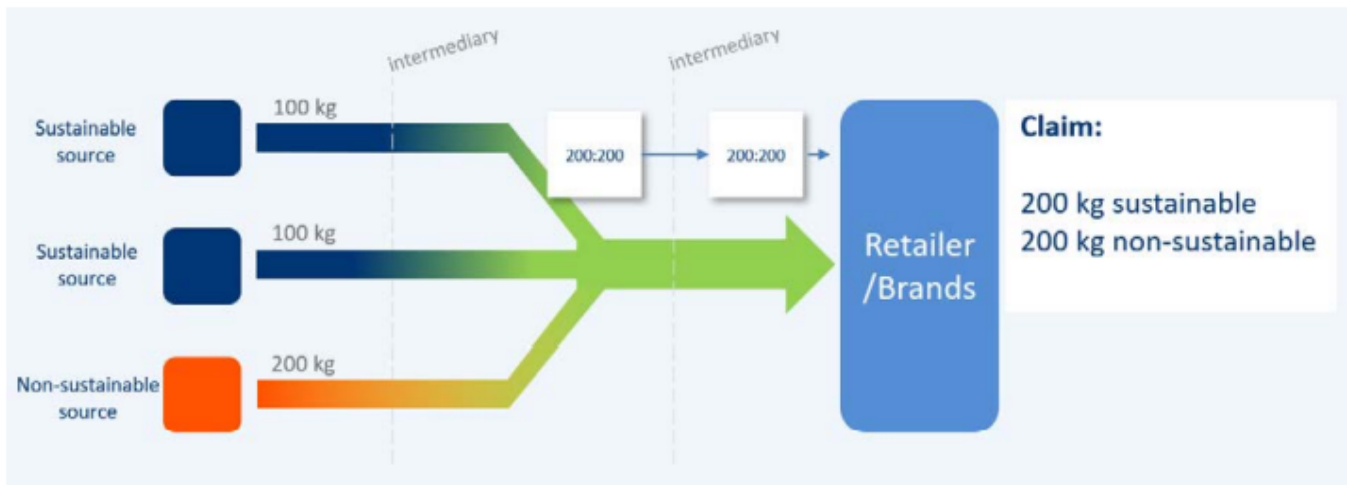


Figure 9: Mass-balance

Mass-balance is adequate or reasonable to consider for a commodity such as gold, as buyers want assurances that the gold they buy meets international due diligence criteria. In practice, mass balance means that the sustainable material is mixed with other non-certified/foreign material, but at the end of processing, no more than the original volume is sold on to the next actor. The point is that this tracing system should preclude the sale of products with illegitimate claims to sustainability.

This means that if an AMP provided 1kg of gold doré, at 95% purity to a refinery, the refinery would later provide 950g of pure gold back to the organization (or a designated buyer) – gold that is physically mixed with gold from other sources. Non-mineral examples of mass-balance systems can be found in a palm oil certification system (Roundtable for Responsible Palm Oil), where producers gradually increase the content of certified material without segregating the palm oil in the process. In ASM gold production, mass balance accounting is currently allowed and used by both Fairtrade and Fairmined certification systems due to the difficulty of maintaining full traceability throughout the refining process.

Model 4: Book and Claim

In supply chains that are not yet thoroughly organized, it may not be possible to segregate or carefully account for the volume ratios of sustainable and non-sustainable products. In this case, a Book and Claim model can be applied. Where physical products are mixed and traded as

conventional, the “right to claim sustainable sourcing” is traded separately in the form of sustainability certificates. The sustainability claim as such, is not tied to the physical product, but to the production volume reported through the creation of certificates.

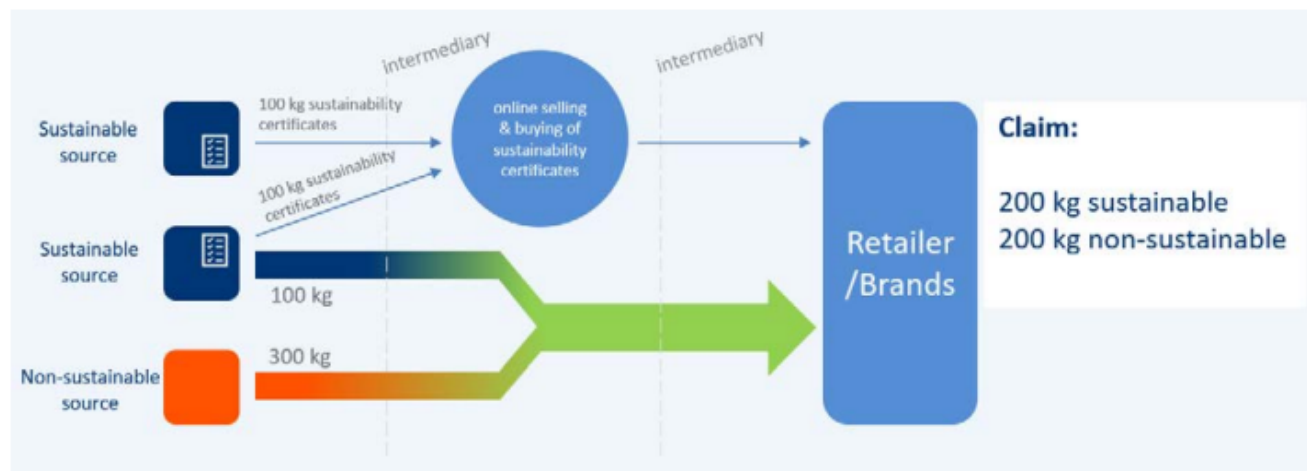


Figure 10: Book & Claim

This system makes sense if the product attributes are indistinguishable from other products. Maintaining any level of traceability would neither increase the intrinsic nor the attributed value, and often the transport costs or feasibility of logistics for these products are cost-prohibitive. Two examples of this are ‘green energy’ on the consumer market (as all energy is fed into one grid) and the second is carbon certificates, traded internationally for carbon offtake.

In reference to gold, this would mean that the organization implementing gold exports track production volumes of mercury-free gold, for which certificates are created and sold separately from the physical gold.

Annex 4: State-buying programs

While not the focus of this report, it would be an omission not to at least reference the role that state buying schemes can play in enabling fair market access for AMPs, driving the formalization of the sector by creating trust in trading practices.

The World Gold Council (WGC) published an in-depth analysis of the role of central banks' domestic ASGM purchasing schemes. The report illustrates that state buying schemes can effectively prevent ASM gold from entering the illicit economy and, subject to satisfactory due diligence checks, enable integration into formal international markets.²⁶ The report draws on four country case studies, zooming in on the Philippines, Mongolia, Ethiopia, and Ecuador.

The report further points out that “in the case of direct purchase [through central banks] arrangements, potentially predatory ‘middle men’ can be displaced and artisanal mining groups can receive fairer treatment.” While state-run buying programs appear to be a catalyst for formalization, their research found that “there is limited international evidence of purchasing programs being used decisively to raise safety, social and environmental standards.”

Worthwhile noting, however, that systems in which the state executes a monopoly for the purchase and aggregation of gold, will make it difficult for private actors to engage with ASM through direct purchasing agreements.

²⁶ World Gold Council (2021) *Central Bank Domestic ASGM Purchase Programmes*. Available at: <https://www.gold.org/download/file/15935/Central-bank-domestic-purchase-programs.pdf>

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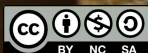


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