

A Golden Opportunity

The Risks and Rewards of Gold Recycling



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1. Introduction

The international supply chains of global businesses present both opportunities and risks for all operators and stakeholders in the supply chain. International guidelines¹ on responsible business conduct, while recognising the benefits of foreign trade and investment, confers corporate social and environmental responsibility on business enterprises to respect human rights, irrespective of their size, sector, or where they operate. In action, these responsibilities mean a policy commitment, a due diligence process, and the provision of remedy where harm has been caused. Due diligence requires the identification and assessment of actual or potential harm (risk assessment), followed by a cease, prevent or mitigation action.

This document is the summary of research focused on the global gold supply chain, particularly, the recycling sector and its related risks.

The Netherlands is committed to the provisions of the OECD Guidelines on Multinational Enterprises and the UN Guiding Principles on Business and Human Rights, and in 2017, endorsed the Dutch Gold Sector International RBC Agreement (the Agreement). The Agreement was signed by companies, the Government, trade associations, and NGOs active in the Dutch gold sector. Its aim is the implementation of international RBC frameworks to realise positive impact in and around gold mines, and in collecting and recycling waste from electrical & electronic equipment (e-waste)². The goal of this research is to aid in these objectives by creating increased awareness of:

1. The economic potential of the e-waste gold recycling sector
2. The human rights violations in gold supply chains
3. The environmental hazards present in informal e-waste gold recycling chains
4. The need for companies to go beyond due diligence and take active responsibility for violations in their supply chain.

The study is based on desk research and interviews with key stakeholders in the industry. Its aim is to inform not only the parties of the Agreement, but also e-waste collectors, gold recyclers, smelters and industry policy makers in general.

2. Gold – Usage and Demand

Gold is used in many different capacities: as investments, monetary metal, jewelry, in dentistry and orthodontics, and in certain medical implants and treatments. It is also used in the manufacture of electrical and electronic equipment. This research estimates that between 2010 and 2018, the jewelry sector accounts for half the mean percentage (51%) of the total yearly demand for gold globally. Investments and national reserves in the form of bars and coins take up about 40%, while the last 10% of demand goes to technological applications, industrial use, and dentistry. The global gold demand is about 4,400 metric tonnes of gold per year. This demand has diminished slightly since 2008, but is actually slowly increasing when examined through a longer timeframe.

¹ The OECD Guidelines for Multinational Enterprises 2011; The United Nations Guiding Principles on Human Rights 2011.

² The Preamble to the Gold Agreement on International Responsible Business Conduct.

The global gold demand is met with ***mined (virgin) gold*** and with ***recycled gold***. The current worldwide supply is around 70% virgin gold and 30% recycled gold³. A review of the recycling trend over a 30-year period shows that the supply of recycled gold increases over time, particularly during economic crises (as it is easily converted to cash), and when there is an upward movement in global price.⁴

a. Gold Sourcing – Mined Gold

Long term projections show that both the mined and recycled gold supply are growing at approximately the same pace. Since 1980, the mean growth rate of recycled supply has been 4% per year. The mean growth rate of mined supply was 3.7% per year⁵. This means that even though the recycled supply is growing, it will remain only a third of the total supply for at least the next hundred years — if the current trend continues as is⁶.

There are risks accompanying such a heavy reliance on mined gold. First, gold ore is not considered an infinite resource⁷. Second, gold mining — especially artisanal and small scale mining (ASM) — is associated with human and environmental rights violations, such as child labor, armed conflict, health hazards and environmental pollution (cyanide and mercury are used to extract gold ore from water). Furthermore, mining gold emits about a hundred times more greenhouse gas emissions than recycling gold⁸.

In light of these risks, increasing the supply of recycled gold is clearly crucial. Another compelling incentive is the prospect that mining gold from electronic waste could be more profitable than traditional mining, while also having environmental, social, and economic benefits. A joint Chinese and Australian study of data from eight Chinese metal recycling companies shows that it is more profitable to extract gold from a metric tonne of e-waste than from a tonne of ore⁹.

This leads to ***two important conclusions*** of this research:

- Virgin gold will remain the most important supply of gold in the years to come, stressing the importance of addressing the issues in gold mining.
- Efforts are needed to increase the proportion of recycled gold.

b. Origins of Recycled Gold

Information analysis from a wide range of literature and interviews conducted with gold refining companies lead to the estimation that 70% to 90% of recycled gold worldwide originates from jewelry scraps, while 1% to 10% originates from bars, coins, and other high value gold scraps, like dental gold. It was estimated that approximately 5% to 10% comes from low value technological gold — mostly waste from electrical and electronic equipment

³ Average percentage over 2010-2018

⁴ Hewitt, A., Keel, T., Tauber, M. and Le-Fiedler, T., 2015. *The Ups And Downs Of Gold Recycling*. [online] <https://www.bcg.com>. Available at: <https://www.bcg.com/en-nl/publications/2015/metals-mining-cost-efficiency-ups-and-downs-of-gold-recycling.aspx>

⁵ Estimates are based on information analysis from: *The Ups and Downs of Gold Recycling, study on data from 1980 to 2012, WGC and Boston Consulting Group*

⁶ Growth rate calculated with global mined supply data from The Hague Center for Strategic Issues (data points 1980 and 2007)

⁷ U.S. Money Reserve. 2019. *How Much Gold Is In The World? Find Out! | U.S. Money Reserve*. [online] Available at: <https://www.usmoneyreserve.com/blog/how-much-gold-is-in-the-world/>

⁸ Reisert, D., 2019. *Ecological Footprint: What Is More Sustainable – Gold Mining Or Gold Recycling?* - C.HAFNER GmbH + Co. KG. [online] C.HAFNER GmbH + Co. KG. Available at: <https://blog.c-hafner.de/ecological-footprint-what-is-more-sustainable-gold-mining-or-gold-recycling/>

⁹ Zeng, X., Mathews, J. and Li, J., 2018. Urban Mining of E-Waste is Becoming More Cost-Effective Than Virgin Mining. *Environmental Science & Technology*, 52(8), pp.4835-4841.

(WEEE). As previously stated, the biggest share of recycled gold originates from high value scraps such as jewelry. This is logical because, being pure gold products, they have high value and every component of it is recyclable. However, the majority of the worldwide jewelry stock is not recycled because of the sentimental and financial value attached to it. This leaves recycling from electronics (e-waste) as the major opportunity to source recycled gold globally.

3. Potentials in E-Waste Gold Recycling

Electrical and electronic equipment mainly contains gold in the printed circuit board (PCB), where it serves as electrical conduits. E-waste is currently the world's fastest growing waste stream. Out of all e-waste generated globally, mobile phones contain the most gold and therefore have the most potential for the gold sector if properly collected and recycled¹⁰. A number of global agencies, such as the United Nations Environmental Programme and the International Labor Organization, have recently set targets to increase global e-waste recycling by thirty percent (30%)¹¹, aiming to tackle the e-waste crisis and take a progressive step towards achieving the United Nations Sustainable Development Goals¹². They have also called for a more circular electronics system, in which resources previously extracted and used can be re-used in countless ways.

This is supported by previously mentioned research estimations¹³ that there is a hundred times more gold in a metric tonne of mobile phones than in a tonne of gold ore. The Global E-waste Monitor published by the United Nations University (UNU), International Telecommunication Union (ITU) and International Solid Waste Association (ISWA)¹⁴, shows that an estimated 500 metric tonnes of e-waste discarded in 2016 could fetch 18.8 billion euros in revenue as raw material. Although the precise numbers are difficult to find, the UNU estimates that only 20% of e-waste is formally collected and recycled. The rest is neither collected nor recycled in the formal sector; it is thrown in household trash, burned, landfilled, or recycled in the informal sector.

4. Risks in the Recycling Sector

There are, in general, a number of risks associated with recycling gold. Because many gold transactions are done in cash and not formally reported, recycled gold has been linked to whitewashing of criminal activity, money laundering, and smuggling of e-waste to countries without formal recycling infrastructure. There are also the negative environmental and health hazards from non-standard recycling processes to consider, although it is important to note that the majority of gold recycling takes place in the formal sector.

a. How does e-waste enter the informal collection and recycling sector?

There are two main routes:

¹⁰ van Schaik, D., 2011. *Kwantificering Kritische (Grond) Stoffen In Ewaste Producten*. The Hague: Material Recycling and Sustainability, Executive Summary.

¹¹ Ryder, G. and Zhao Houlin, H., 2019. *The World's E-Waste Is A Huge Problem. It'S Also A Golden Opportunity*. [online] World Economic Forum. Available at: <<https://www.weforum.org/agenda/2019/01/how-a-circular-approach-can-turn-e-waste-into-a-golden-opportunity/>>

¹² E-waste management is linked to the following SDGs; goals 3 (Good Health and Well-being), goal 6 (Clean Water and Sanitation), goal 8 (Decent Work and Economic Growth), goal 11 (Sustainable Cities and Communities), goal 12 (Responsible Production and Consumption), goal 14 (Life below Water).

¹³ See footnote 9.

¹⁴ Baldé, C., Forti, V., Gray, V., Kuehr, R. and Stegmann, P., 2017. *The Global E-Waste Monitor 2017 - Quantities, Flows And Resources*. Geneva Bonn Vienna.

1. Electrical and electronic equipment are discarded as e-waste in developing countries without a formal recycling sector. In this case, the e-waste de facto enters the informal chain as soon as it is discarded. This is illegal under the Basel Convention without legal agreement from the receiving country¹⁵, but can still happen — purposefully or naively. An instance of this occurring unknowingly may be when an NGO ships computers to developing countries without properly checking what percentage of the material actually works.
2. Second-hand equipment (which later becomes e-waste) is shipped from developed countries like the Netherlands, the United States or Germany, to developing countries like Bangladesh, Nigeria, Ghana, or to other countries with lax legislation on e-waste disposal. Some companies in developed countries, for example, specialise in collecting second-hand phones and computers from users and IT companies for shipping to contacts in the informal sector of developing countries. These working materials will eventually turn into e-waste in that developing country.

b. What happens to e-waste gold in the informal sector?

E-waste is easily collected and sorted in the informal sector, although the process of collection, dismantling, and sorting is sometimes fraught with occupational and environmental hazards which could be avoided under formal, legal processes. This applies to e-waste gold recycling too. The following risks can be found in e-waste recycling in the informal sector:

1. Child labor
2. Environmental pollution (irresponsible discarding of plastics and batteries, acid sludge dumped in rivers, lead contamination of land, air, and water.)
3. Health hazards caused by exposure to chemicals such as cyanide and mercury.

Informal gold recycling is also highly inefficient. Often, only gold is recovered, and only about 25% of the total deposit in PCBs and mobile phones is collected. In formal processing, up to 99% is recoverable, as well as other metals like silver, copper and tin¹⁶. Thus, there is a case for reaching out to the formal sector — technology companies in particular — to invest in e-waste collection and local recycling facilities, rather than exporting high value e-waste to developing countries where they might end up in the informal collection and recycling sector. According to an analysis of UN data on quantities of unregistered e-waste, the greatest potential for this approach lies in Asia.

All operators directly involved in the collection and treatment of e-waste also have a responsibility, under the 2012 EU Directive on Waste Electrical and Electronic Equipment, to respect the Union's environmental policy to preserve, protect and improve the quality of the environment¹⁷. The Directive, which lays down the regional minimum standards for the treatment of WEEE, has, as a priority, the prevention of WEEE by the re-use, recycling, and retrieval of valuable secondary materials.

¹⁵ *The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal* (1989).

¹⁶ Hagelüken, C. and Corti, C., 2010. Recycling of gold from electronics: Cost-effective use through 'Design for Recycling'. *Gold Bulletin*, 43(3).

¹⁷ Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE)

5. Transparency in High Value Supply Chains

The recycling chain is a vulnerable entry point for whitewashing of criminal gold¹⁸. Criminal gold can originate from conflict mines, terrorist operations, bank lootings, or theft. It can then enter the formal recycling chain in different ways:

- grinding the gold to dust and selling it as 'goldsmith sweepings'
- through cover-ups where the gold is sold knowingly to refiners
- selling the gold at a 'cash-for-gold' shop without showing identification.

Although a lot of due diligence is done to avoid this type of gold entering the formal chain¹⁹, it is still extremely difficult to ensure no criminal gold is recycled at legal refineries. Thus, due diligence remains an essential part of a refiner/jeweler/gold handler's job.

6. Understanding the Links Between Mined and Recycled Gold, and Between Formal and Informal Recycling

Gold supply chains do not exist in parallel to each other, but rather form an intricate web of connections that cannot be separated. For instance, formally mined gold which passes through formal supply chains and ends up in electronic goods, is later discarded as e-waste at the end of the device's life. Even if it is collected and recycled informally, gold from this e-waste can end up in the formal gold sector. Where e-waste is formally collected by municipalities, electronic retailers, or third-party recycling services, then processed and refined by specialized refiners, it re-enters the production supply chain alongside mined gold. However, the same holds true for informally collected PCBs and mobile phones purchased by a formal refiner, or where a jeweler who recycled his scraps might in return receive virgin gold to produce new products. This is not necessarily a bad thing, as you would want to assume this gold was recycled in a responsible way. However, it means that one cannot totally distance themselves from the informal recycling sector.

Businesses that use or refine gold handle that gold mostly through 'weighted accounts'. These are just like bank accounts, except the currency is gold. This allows them to move gold around without paying huge sums up front, and without interference from the fluctuating daily gold price. It also means that the paper trail and physical trail of a lump of gold are separated — just like money in your pocket and money in your bank account do not originate from the same source. Recycling gold is like paying for green electricity: it is contributing to the reduction of risks, but it does not mean the product itself is free from these risks.

¹⁸ Verity, A. and Robinson, T., 2019. *Gold, Drug Money And A Major Auditor's 'Cover-Up'*. [online] BBC News. Available at: <<https://www.bbc.com/news/uk-50194681>> [Accessed 1 May 2020].

¹⁹ In more regions than in others. Members to the Gold Agreement undertake to carry out due diligence in their supply chains.

7. Conclusion and recommendations

It is important to increase the amount of recycled gold available, given that the world's mined gold resources may decrease, that recycling reduces greenhouse gas emissions, and that there are obvious economic benefits from e-waste recycling. Especially important is to increase collection of high value e-waste, that is, electrical and electronic equipment such as mobile phones, as it contains the highest volumes of recyclable gold. This could be done by creating easily accessible formal collection points.

It is recommended that investment in better social and environmental conditions in gold recycling is needed to tackle the risks associated with these processes. This responsibility does not fall on the companies alone, but also to the Government under the UNGP and EU Directive on waste electrical and electronic equipment. In order to recycle gold responsibly from e-waste sources, there is a need to develop responsible (gold) recycling guidelines containing substantial guiding principles to identify the direction the gold/e-waste recycling sector should take.

It is also recommended that to prevent e-waste from developed countries being shipped to developing countries with lax legislation and inadequate disposal methods, e-waste created in developed countries should be kept *in* those countries. Exporting e-waste can be decreased through an information campaign for users and companies on discarding such waste in responsible ways.

As the gold recycling chain is vulnerable to social and environmental risks and as it an entry point for whitewashing of criminal gold, value tracking of e-waste is vital. Efforts must be made to enhance traceability; organizations exporting second-hand electronics should collect/ensure the recycling of a corresponding amount of e-waste in the importing country.

Last but not least, it is expected that mined gold remains an important source for gold to meet the world's demand. It is therefore advised to further invest in improving social and environmental conditions in gold mining, particularly in ASM.

Colophon

This is a publication of the *Dutch Gold Sector International RBC Agreement*. The Agreement is a coalition of goldsmiths, jewelers, recyclers, NGOs, electronics companies, trade unions, and the Dutch government. The aim is to ensure respect for human rights and the environment throughout the entire gold value chain.

This publication is the result of research conducted by Alix Dodu, intern at the Fairphone Impact Innovation Team. Fairphone is building a market for ethical phones and motivating the industry to act more responsibly.

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