Draft Report on Mercury Trade, Supply and Demand

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The views expressed in this publication are those of the authors and do not necessarily reflect the views of the United Nations Environment Programme. We regret any errors or omissions that may have been unwittingly made.

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## Acronyms & Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ASGM</td>
<td>Artisanal and small-scale gold mining</td>
</tr>
<tr>
<td>CCFL</td>
<td>Cold cathode fluorescent lamp</td>
</tr>
<tr>
<td>CFL</td>
<td>Compact fluorescent lamp</td>
</tr>
<tr>
<td>CHRTD</td>
<td>Chatham House Resource Trade Database</td>
</tr>
<tr>
<td>CIS</td>
<td>Commonwealth of Independent States</td>
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<tr>
<td>EEFL</td>
<td>External electrode fluorescent lamp</td>
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<tr>
<td>ESM</td>
<td>Environmentally sound management</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>FY</td>
<td>Fiscal year</td>
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<td>g</td>
<td>Gram</td>
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<td>GMA</td>
<td>Global Mercury Assessment</td>
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<td>GMP</td>
<td>Global Mercury Partnership</td>
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<tr>
<td>Hg</td>
<td>Mercury</td>
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<tr>
<td>HPMV</td>
<td>High pressure mercury vapor (lamp)</td>
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<tr>
<td>HS code</td>
<td>Harmonized commodity description and coding system</td>
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<tr>
<td>IPIECA</td>
<td>International Petroleum Industry Environmental Conservation Association</td>
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<tr>
<td>kg</td>
<td>Kilogram</td>
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<tr>
<td>LFL</td>
<td>Linear fluorescent lamp</td>
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<tr>
<td>mg</td>
<td>Milligram</td>
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<tr>
<td>MEA</td>
<td>Multilateral environmental agreement</td>
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<tr>
<td>MIA</td>
<td>Minamata initial assessment</td>
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<tr>
<td>Mt</td>
<td>Million metric tons</td>
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<td>NAP</td>
<td>National action plan (on ASGM)</td>
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<td>ODS</td>
<td>Ozone-depleting substance</td>
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<tr>
<td>ppb</td>
<td>Parts per billion</td>
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<tr>
<td>ppm</td>
<td>Parts per million</td>
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<tr>
<td>PVC</td>
<td>Polyvinyl chloride</td>
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<tr>
<td>TBM</td>
<td>Transboundary movement</td>
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<tr>
<td>UN Comtrade</td>
<td>United Nations International Trade Statistics Database</td>
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<td>UNEP</td>
<td>United Nations Environment Program</td>
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<tr>
<td>UNSD</td>
<td>United Nations Statistics Division</td>
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<tr>
<td>UI trade</td>
<td>Undocumented and illegal trade</td>
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<tr>
<td>U.S.</td>
<td>United States of America</td>
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<tr>
<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<tr>
<td>VCM</td>
<td>Vinyl chloride monomer</td>
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<td>WCC</td>
<td>World Chlorine Council</td>
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<td>WCO</td>
<td>World Customs Organization</td>
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Key Findings

A.  Background

The Conference of the Parties to the Minamata Convention on Mercury, in its decision MC-3/10 on the arrangements for the first effectiveness evaluation of the Convention, requested the Secretariat to advance work in drafting a report on trade, supply and demand, including information on mercury waste flows and stocks.

At its fourth meeting, in decision MC-4/11, the Conference of the Parties agreed to begin the first effectiveness evaluation of the Convention and adopted a framework, as contained in Annex I to the decision. The adopted framework outlined the development, by the Secretariat, of the report on trade, supply and demand of mercury in two stages during the intersessional period prior to the fifth meeting of the Conference of the Parties: one stage for the development of a plan and another for the development of the full report, with one opportunity for review by Parties foreseen at each stage.

The following are the key findings of the report.

B.  Trade of mercury and mercury compounds

Mercury trade is addressed primarily under Article 3 of the Convention. Paragraphs 6 and 8 provide that Parties shall not allow the export or import of mercury, respectively, unless under specific conditions. For the export of mercury, the conditions include obtaining consent from the importing country, either a Party or a non-Party to the Convention, and for a use that is allowed to a Party or for environmentally sound interim storage. For import, the Convention sets out that Parties shall not allow the import of mercury from a non-Party unless the non-Party has provided certification that the mercury is not from primary mercury mining or excess mercury from the decommissioning of chlor-alkali facilities. Furthermore, each Party is obliged to designate a national focal point for exchange of information under the Convention, including for the consent to import mercury; and each Party must include, in its national reports, information showing that the requirements of Article 3 have been met.

An initial analysis of the global trade of mercury was based on information provided by Parties in their national reports submitted to the Secretariat in accordance with Article 21 of the Convention. However, since national reports give information primarily on whether consent was received by the exporting Party rather than a comprehensive picture of global mercury flows, the analysis of the trade of mercury, ultimately, had to be based primarily on information in the United Nations (UN) Comtrade database. UN Comtrade contains trade data, including for mercury, submitted by countries and compiled by the United Nations Statistics Division.

Based on an analysis of the UN Comtrade data for the years 2018-2020, this report identified a continued decline in reported import of elemental mercury. Briefly, the report identified a yearly average of approximately 770 metric tons of reported mercury import between 2018-
2020, down from the previously reported global import of mercury of approximately 1200 metric tons in 2015 and 2600 metric tons in 2010. While the declining trend in trade is encouraging, it should be noted that there are gaps and inaccuracies in UN Comtrade. Furthermore, the reported data did not include amounts related to undocumented or illegal trade of mercury.¹

According to the analysis performed, Bolivia, Switzerland and India were the major importers in terms of the volume of mercury imported. The vast majority of mercury imported into Switzerland was subsequently stabilized for environmentally sound disposal.

Mexico, Tajikistan, the Russian Federation, UAE, Türkiye, and India appeared as key mercury exporters and/or trading hubs. Bolivia received a large volume of mercury exported by Mexico, as well as from India, United Arab Emirates (UAE) and Türkiye.²

India has emerged as a prominent trading hub for mercury, both for domestic consumption and export to other countries. Similarly, the UAE and Türkiye also continued to report significant imports and exports of mercury from and to various countries.

With regard to mercury compounds, an analysis of the UN Comtrade data carried out by the Observatory of Economic Complexity (OEC) also confirmed an annual decline in trade. The analysis for 2019 indicated that Germany, France, Vietnam, U.S. and Italy were the main importers, while Argentina, Germany, India, Belgium, and Thailand were the major exporters of mercury compounds.³

Based on information provided by various international organizations, in some regions undocumented or illegal trade may account for a significant share of the total trade of mercury. For example, a large quantity of mercury formally imported by Bolivia was subsequently transferred to neighbouring countries such as Peru without proper customs documentation, especially for use in artisanal and small-scale gold mining (ASGM).⁴ In recognition that illegal trade of mercury is a global challenge, in 2022, at the occasion of the fourth meeting of the Conference of the Parties, the government of Indonesia spearheaded the non-binding Bali Declaration on Combating Illegal Trade of Mercury that focuses on encouraging international cooperation and coordination to combat illegal mercury trade.

¹ The term undocumented or illegal trade (or UI trade) has been used in the report as an umbrella term to refer to any form of trade of mercury that is not done in accordance with the requirements of the Convention or that are deemed illegal, informal, undocumented, or unauthorized as per national legislation.

² Data from China has not been included in the analysis due to an ongoing discussion with the Chinese authorities to acquire validated data.

³ Based on the analysis of data reported under HS code 2852.10.

⁴ See Project Identification Form for Global Environment Facility project 11047 (and national action plans pursuant to article 7.3).
C. Mercury supply sources

The Convention in subparagraph (i) of Article 2 defines “primary mercury mining” as “mining in which the principal material sought is mercury.” The Convention does not differentiate between formal and informal mining. Paragraphs 3 and 4 of Article 3 outline the restrictions on primary mercury mining within a Party’s territory. Existing mines are to be phased out, new mines are not permitted, and mercury from primary mines shall only be used for permissible uses (i.e., manufacturing of mercury-added products in accordance with Article 4, or manufacturing processes in accordance with Article 5), or be securely disposed of in accordance with Article 11.

Regarding other potential sources of mercury supply, paragraph 5 of Article 3 requires Parties to endeavour to identify within their territory individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year. In addition, paragraph 5 requires Parties to take measures to dispose of any excess mercury from the decommissioning of chlor-alkali facilities in accordance with the guidelines for environmentally sound management.

Regarding primary mining of mercury, data was reported by Mexico and China. In its full national report (2021), Mexico reported mining 0.5 metric tons in 2018, as compared with 442 metric tons of mercury mined in 2017, according to its short national report of 2019. In its short report (2019), Mexico reported that 189 concessions were in place and 34 mining permits issued. Of the 34 mining permits, 31 have expired leaving three permits with a valid authorization to mine in 2019, while in its full report (2021) it explained that only two primary mining concessions (4 mines) had valid authorizations to mine until 2020. The status of the mining concessions reported in 2019 without a valid mining license is not clear.

In its full national report (2021), China reported the amount of extracted mercury ore for the period of 2017 to 2020, with an anticipated closure date set for August 2032. It is important to note that the reported amount by China pertains to the quantity of extracted ore, not the amount of mercury produced. At its fourth meeting in 2022, the Conference of the Parties of the Minamata Convention clarified in decision MC-4/8 that the basis for reporting is the total amount of mercury mined, not the extracted ore. This clarification will guide Parties in their future submissions of national reports. In its communication with the Secretariat during the review of the report, China further noted that according to data from China Statistical Annals on Ecological Environment, its primary mercury mining output was approximately 250 metric tons in 2020.

Information from Kyrgyzstan, where primary mercury mining has been reported in past years (UNEP, 2017), was not available for analysis. In its short national report (2019), Indonesia stated that it had no primary mercury mines operating within its territory during the reporting period, but that there were mining sites in the country that could be sources of mercury and that “required close supervision in order to not be used for illegal mining and other activities.” Later, in its full national report (2021), Indonesia added that the government has never issued
any permit for cinnabar mining business either prior to, or after the date of entry into force of the Convention for Indonesia.

While some countries have made creditable efforts to quantify the amount of by-product mercury that is recovered or reclaimed from processes or wastes in which mercury is present as a trace metal or contaminant (typically from non-ferrous mining and processing operations), this remains challenging for most Parties due to lack of data on disposal, environmental release, and commercial capture during refining operations.

Crude oil and natural gas contain varying concentrations of mercury, with higher levels found in certain regions and wells. Within ranges of uncertainty, Qa³ Limited has estimated that approximately 300 tons of by-product mercury were mobilized by the oil and gas sector in 2020,⁵ of which roughly 125 metric tons were recovered from the gas sector for either resale or disposal.⁶ Thailand, for example, has reported the recovery and sale of tens of tons of mercury from its oil and gas industry.

In terms of mercury recovered for commercialization, including recycled mercury (mercury recycled or recovered from mercury-added products or processes) and by-product mercury, the analysis underpinning these findings estimated that a total of 550—1000 metric tons of recycled mercury and 750—1400 metric tons of by-product mercury were recovered and subsequently commercialized in 2019.

D. Sectoral demand for mercury

According to the Global Mercury Assessment 2018, ASGM was the sector with the largest consumption of mercury, resulting in over 2000 metric tons being released into the air, water and soil each year and accounting for almost 38% of the global total. Using different calculation methods, this analysis has estimated that the amount of mercury used in the ASGM sector in 2019 ranged between 1400 and 2800 metric tons (with an average of approximately 2100 metric tons) suggesting that the amount of mercury that was used and subsequently emitted and released from the sector has not declined in relation to previous years. As more countries prepare their National Action Plan (NAP) for ASGM as required by the Minamata Convention, a more updated estimate on their mercury use can be provided in the future. As of this writing, 27 Parties and 3 non-Parties had submitted their NAPs to the Secretariat of the Minamata Convention.

Regarding vinyl chloride monomer (VCM) production, two Parties reported on the use of mercury compounds in their national reports. China reported the estimated annual

consumption of mercury in VCM during 2019—2020 as 670 to 790 metric tons. India reported its annual consumption of mercury in VCM as around 4 metric tons for the reporting period of 2017-2020. A mercury inventory for Russia developed in a UNEP project in 2017 noted the existence of a few VCM production facilities that employ mercury compounds.\(^7\)

Mercury consumption for chlor-alkali production, which has been defined as the quantity of mercury added to the production cells to keep the mercury in the cells at the necessary level, was greatly impacted by the ban of the European Union on mercury-based chlor-alkali production in December 2017, leading to the closure of many such plants. Using information from national reports pursuant to Article 21, as well as data provided by the World Chlorine Council (WCC) and other publicly available data sources (UNEP 2017), the study underpinning the present findings estimated that the annual demand for mercury in this sector was approximately 94 metric tons for 2019.

Estimates of the consumption of mercury for mercury-added products faced major challenges due to the lack of reliable information. The global consumption of mercury in the dental amalgam sector for 2019 was estimated to be in the range of 200 – 500 metric tons. The consumption of mercury in batteries for 2019 was estimated to be 10 – 15 metric tons, as batteries containing mercury have been largely phased out. For other mercury-added products, quantitative information on the remaining use of mercury has not been estimated.

\section*{E. Waste flows}

The analysis behind the present findings initially focused on information contained in the national reports pursuant to Article 21 and other published sources. The paucity of data to quantify the amount of mercury in wastes was evident and rendered a global analysis unfeasible. In addition, an analysis of the flow and quantity of mercury in waste was attempted based on data obtained from national reporting under the Basel Convention, but there were also a number of limitations associated with this approach. These efforts emphasized the important need for improved data collection.

\section*{F. Stocks}

The analysis presented in the report focused on information contained in the national reports pursuant to Article 21 and other sources of information. Quantitative data on mercury stocks was available from only nine countries. The paucity of data rendered a global analysis based on data reported to the Secretariat unfeasible.

G. Concluding remarks

Numerous significant milestones pertaining to the Minamata Convention have either recently passed or are rapidly approaching. For example, phase-out dates for various mercury-added products, including certain batteries, switches, relays, lamps, cosmetic products, pesticides, biocides, and topical antiseptics, occurred in 2020. Additionally, manufacturing processes utilizing mercury compounds as a catalyst for acetaldehyde production had a phase-out date of 2018, while chlor-alkali production using mercury is set for phase-out in 2025. Other products, such as strain gauges, mercury vacuum pumps, tire balancers and wheel weights, photographic film and paper, and propellant for satellites and spacecraft, are also scheduled for phase-out in 2025. The phase-out of products and processes using mercury is expected to reduce the trade, supply and demand of mercury. On the other hand, it may also lead to increased transboundary movement of mercury waste (e.g., mercury waste from the decommissioning of chlor-alkali plants), to be disposed of in an environmentally sound manner. Hence, it needs to be emphasized that an improved and comprehensive understanding of the quantitative aspects of mercury trade, supply, and demand is essential going forward.

The analysis underpinning these findings recognized a number of positive trends and results, despite the remaining gaps in our understanding of mercury trade, supply and demand, which are noted in the following:

(a) The amount of mercury that was traded globally from 2018 to 2020 (as per the UN Comtrade) was significantly less than the amount traded in earlier years. However, trade of mercury that is considered illegal under national law, particularly for the purpose of ASGM, remains a significant concern and has not been adequately quantified.

(b) Trade that is not compliant with the requirements of Article 3, e.g., unreported, informal or illegal trade of mercury according to national legislation, has been raised as an issue by some Parties in parts C or E in their short (2019) and full (2021) national reports. The current reporting format does not have a direct question on such trade, although two Parties shared their concerns over informal trade in the short national reports (2019). It is worthwhile to note the efforts of some Parties to share their concerns and report on measures taken to address trade that is not in compliance with the requirement of Article 3, and such efforts may serve as examples to other Parties. One Party had concerns on falsified or incomplete consent forms, while the other Party provided a recommendation for optimizing the written consent procedure for the import of mercury, including the provision of information on transit countries, re-export points and the role of free-trade zones, and the establishment of a deadline for receipt of responses from Parties concerned. The Party also raised the need to improve identification of the intended uses of traded mercury, to strengthen the capacities of border control agents, and to develop protocols to identify, seize, transport, handle, and label mercury. In the full reports (2021), a Party noted “illegal” mercury trade to be occurring within its national context, and also regionally. The Party called for enhanced cooperation among Parties “to create innovative solutions in preventing illegal mercury trading”. Furthermore,
some Parties in another region noted that there were known informal flows of mercury also in their region and illegal imports into their national territories.

(c) Further on the topic of illegal exports, in its full national report (2021), Canada provided information on exports in 2017 (50.27 metric tons) and 2018 (91.03 metric tons) which they deemed were illegal under their national law. Canada reported measures it took in response to those illegal exports and further reported on another possible illegal export which it is currently resolving. Information on measures taken at national level to prevent trade that is not in compliance with the requirements of Article 3 provide a good example for other Parties that may be facing similar challenges, in particular considering the above-mentioned concerns reported by Parties on the presence of unreported, informal or illegal trade of mercury in their territories.

(d) Although there is a very high level of national reporting by the Parties pursuant to Article 21, in most cases the information provided in those reports is not sufficient to support more precise global quantitative analyses of the trade, supply and demand of mercury. The inclusion of questions in the reporting format that call for the submission of quantitative information related to trade, supply and demand would be useful as a means to fill the identified gaps.

(e) Specifically with regard to trade, the overall level of reporting was found to be insufficient, though certain countries have demonstrated good record-keeping practices. For example, Switzerland reported to the Secretariat their import for 2019 of 290 metric tons of mercury, mostly for treatment and environmentally sound disposal. Japan submitted consent forms for all of its mercury exports. Meanwhile, initiatives like STrIKE hold the potential to enhance data gathering efforts and address existing limitations more effectively.

(f) According to the information provided in the first full national reports pursuant to Article 21, measures to control mercury-added products have been taken by many Parties and mercury use in some products has gradually decreased, but more information is needed for other products.

(g) The number of chlor-alkali facilities using mercury has decreased significantly as per the information contained in the national reports. Excess mercury from decommissioned chlor-alkali plants is expected to be disposed of in an environmentally sound manner and reported on.

8 The EU-funded STrIKE project (Stronger Training and Increased Knowledge for Better Enforcement – Waste & Mercury), 2020-2022, enhanced operational activities and capacities of authorities involved in addressing illegal trade & management of problematic waste streams (e.g., e-waste, batteries & waste mercury), as well as illegal production & trade of mercury-added products. See https://www.scycle.info/official-start-of-the-strike-project-2/.
(h) Switzerland’s imports of 290 metric tons of mercury from Belgium, Argentina, Italy, Slovakia, Peru and Afghanistan in 2019 were identified as coming from natural gas production, the chlor-alkali industry, and non-ferrous metals mining and processing. Virtually all of the mercury imported by Switzerland was “waste” mercury destined for environmentally sound disposal. Information on trade of mercury waste is largely missing and many countries still lack capacity to carry out environmentally sound mercury waste management.

H. Suggested actions to improve data availability

The report, which is the basis for the present findings, recognized significant gaps in the available data with regard to mercury trade, supply, and demand. Consequently, the results of the analysis underpinning the report may not be sufficient to support a comprehensive evaluation of the effectiveness of the Convention, particularly in relation to the second policy question aimed at supporting the effectiveness evaluation, namely “Have the actions taken [by Parties] resulted in changes in mercury supply, use, emissions and releases into the environment?” Nevertheless, the data shows promising trends, and it is the view of the authors that significant progress is evident since the entry into force of the Convention. In order to further build on the progress, the report identified the following possible future actions to improve the availability of data to support the effectiveness evaluation of the Convention:

(a) Prioritizing the improvement of data availability and reliability by encouraging data sharing, and supporting Parties to the Convention in establishing reliable data sources. This may be achieved by revising the reporting format to prompt the submission of quantitative information related to trade, in particular, as well as supply and demand. For example, it may be helpful to consider how to best utilize the space provided in the relevant questions of the reporting format to facilitate sharing information by Parties on challenges and measures to manage and/or curtail trade that is not in compliance with the requirements of Article 3.

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9 The main sources were recycled mercury from the chlor-alkali industry and mercury-added products, and recovered mercury from natural gas production and from non-ferrous metals mining and smelting.

10 At its third meeting, the COP considered the report of the ad hoc technical expert group for effectiveness evaluation, which included four policy questions aimed at supporting an assessment of whether the control measures are leading to the achievement of the Convention’s objective. The policy questions are: (a) “Have the Parties taken actions to implement the Minamata Convention?”, (b) “Have the actions taken resulted in changes in mercury supply, use, emissions and releases into the environment?”, (c) “Have those changes resulted in changes in levels of mercury in the environment, biotic media and vulnerable populations that can be attributed to the Minamata Convention?” and (d) “To what extent are existing measures under the Minamata Convention meeting the objective of protecting human health and the environment from mercury?”.
(b) It is important to encourage and support countries that are not yet Parties to the Convention, in particular those that are significant contributors to the global supply and trade of mercury, to become Parties to the Convention.

(c) Identifying gaps in data on mercury use, and identifying other areas where data is lacking in order to determine priorities for concerted efforts. These priorities can be tailored to certain countries and regions, taking into account their specific needs and capacities.

(d) Encouraging Parties to promote collaboration between ministries and agencies within their country, so that more accurate country-specific data can be generated.

(e) Promoting the use of customs codes for key mercury-added products, hence streamlining data collection and monitoring.

(f) Encouraging Parties to implement electronic manifest systems to track mercury waste and enhance data generation.

(g) Supporting the development of inventories of mercury supply, use, consumption, emissions and releases to gather data, to help prioritize efforts, and to make informed decisions based on reliable data.
Chapter 1. Scope and Methodology

1.1. Scope

In decision MC-3/10, the Conference of the Parties to the Minamata Convention on Mercury (the “Convention”) requested the Secretariat to advance work in drafting a trade, supply and demand report, which includes mercury waste flows and stocks. The purpose of this report is to gather the relevant information on those subjects with the intent to support the implementation and effectiveness evaluation of the Minamata Convention on Mercury.

This report presents an analysis of the global trade, major supply sources, sectoral demand, waste flow, and mercury stocks from 2018 to 2020. The information included in this report comes from a wide range of sources, including published documents, articles, industry reports, Article 21 reporting, databases and relevant studies. Effort has been made to prioritize the use of data officially provided by countries as much as possible. However, in instances where data was unreliable or not available, supplementary data sources and informed estimates have been utilized. While this report discusses the trade of mercury that is not compliant with the Convention, it does not include a comprehensive analysis of such trade. Instead, it seeks to underscore the importance of analysing both officially reported trade data and data of trade not officially reported in order to gain a holistic understanding of the global trade of mercury.

1.2. Methodology

In order to carry out the analysis of global mercury trade, the preference was to use data officially provided by Parties to the Secretariat of the Minamata Convention. However, due to the limited data available, that was not feasible. Consequently, data from UN Comtrade were utilized as an alternative.

Data for other sections of the report were obtained from national reporting according to Article 21, Minamata Initial Assessments (MIAs), National Action Plans (NAPs) for artisanal and small-scale gold mining, and other relevant sources. Additionally, databases, literature reviews, expert interviews, and toolkits were consulted to supplement the analysis. Verification of data sources was conducted in limited cases with representatives of Parties. Corrections of data downloaded from UN Comtrade were received from some Parties during the review of the initial draft. In general, efforts were made to use officially provided data, including submissions to the Minamata Convention Secretariat as much as possible, but data limitations necessitated the inclusion of alternative sources, such as country reports, published studies, input from relevant experts and internet searches, in some cases. Addressing data discrepancies was a challenge, highlighting the importance of accurate data collection and reporting by Parties.
This report acknowledges the challenges posed by limited data availability, particularly in areas such as the demand for mercury in product manufacturing, recycling of mercury, and waste management.
Chapter 2. Global Mercury Trade

2.1. Introduction

As the toxic effects of mercury releases have become more widely recognized, in combination with the implementation of the Minamata Convention, countries around the world have implemented a range of laws and regulations to phase out or phase down the production and use of mercury-added products; to reduce and phase out primary mercury mining; to more closely scrutinize mercury trade; to safely manage and dispose of mercury wastes; to reduce the use of mercury in industrial processes and ASGM; etc.

The analysis in this chapter focuses on one of those key aspects, which is the global trade of mercury. The intention was to use the most recent data sources provided directly to the Secretariat of the Minamata Convention by the Parties to the Convention. Among other data sources, these included communications to the Secretariat from the Parties during review of the initial draft of this report, data available from Article 21 reporting, etc.

However, the national reports pursuant to Article 21 do not provide a comprehensive picture of global mercury flows. Rather they are more focused on the issue of whether consent to trade mercury was received by the exporting Party. This matter was brought to the COP at its fourth meeting (COP-4). Subsequently, in decision MC-4/8, the Conference of the Parties reiterated the guidance agreed at its first meeting (COP-1), which was to call on Parties that had received consent to export mercury to Parties and/or non-Parties to provide to the Secretariat either copies of the consent forms used, or other suitable information to show that the relevant requirements of Article 3 of the Convention had been met.

More precisely, the Conference of the Parties at COP-1 had adopted specific trade forms and guidance to be used by Parties and non-Parties for providing consent for trade in mercury under Article 3, namely:

- Form A: Form for the provision of written consent by a Party to the import of mercury;
- Form B: Form for the provision of written consent by a non-Party to the import of mercury;
- Form C: Form for non-Party certification of the source of mercury to be exported to a Party (to be used in conjunction with form A and form D, when required);
- Form D: Form for general notification of consent to import mercury.

There has been a clear improvement in the number of trade forms showing consent to import submitted to the Secretariat with the full national reports that were due by the end of 2021, as compared with the consent forms submitted with the short national reports in 2019.

Available data gathered from the trade forms submitted by Parties with their national reports are summarized in Table 2-1. However, as can be seen from the table, the available data is not sufficient to carry out an in-depth analysis of the global trade of mercury. Hence, despite various limitations, data downloaded from UN Comtrade have been used for the analysis of the global trade of mercury, while taking into account the fact that UN Comtrade itself has...
limitations and may not provide an accurate representation of the international trade of mercury. Therefore, the overall analysis of mercury trade, as presented in this report, should be understood as work in progress that may need to be reviewed and adapted as more information becomes available, if and when requested by the Conference of the Parties.

Table 2-1. Examples of available sources of official data regarding import and/or export of mercury*

<table>
<thead>
<tr>
<th>Data source</th>
<th>Party</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Argentina</td>
<td>Import data of mercury for 2017, 2018, 2019 and 2020</td>
</tr>
<tr>
<td>A</td>
<td>Switzerland</td>
<td>Import data of mercury for 2019 and 2020</td>
</tr>
<tr>
<td>A</td>
<td>Spain</td>
<td>Import/export data of mercury for 2018-2020 (zero import/export)</td>
</tr>
<tr>
<td>A</td>
<td>Netherlands</td>
<td>Import data of mercury for 2019</td>
</tr>
<tr>
<td>A</td>
<td>Italy</td>
<td>Export data of mercury for 2018, 2019, 2020</td>
</tr>
<tr>
<td>A</td>
<td>Germany</td>
<td>Export data of mercury compounds for 2018-2020</td>
</tr>
<tr>
<td>B</td>
<td>Bulgaria</td>
<td>Import data of mercury and mercury compounds (zero import)</td>
</tr>
<tr>
<td>B</td>
<td>Mexico</td>
<td>Information on amount included in “import requests” and “export requests” in accordance with Article 3.</td>
</tr>
<tr>
<td>B</td>
<td>Canada</td>
<td>Additional information on export (and re-export) data for 2017, 2018, 2020. Supplemental information on the import of mercury for 2017-2021</td>
</tr>
<tr>
<td>B</td>
<td>Argentina</td>
<td>Import data of mercury and mercury compounds</td>
</tr>
<tr>
<td>B</td>
<td>Brazil</td>
<td>Import data of mercury for 2017-2021 (2021 zero import)</td>
</tr>
<tr>
<td>B</td>
<td>Hungary</td>
<td>Import data of mercury for 2020</td>
</tr>
<tr>
<td>B</td>
<td>Sweden</td>
<td>Export data of mercury for 2019-2020 (for stabilization)</td>
</tr>
</tbody>
</table>

* Only Parties providing quantitative information have been included in the table. Other Parties have also provided supplemental trade information, but that has not been included in this report. A: Information from comments submitted to the Secretariat as a part of the review process of the initial draft of this report; B: Information available in the 2021 Article 21 reporting.

2.2. Analysis of global mercury trade using the UN Comtrade Database

This section presents an analysis of the trade of mercury using data downloaded from the United Nations Commodity Trade Statistics Database (Comtrade.un.org), commonly known as UN Comtrade. Managed by the United Nations Statistics Division (UNSD), it is a comprehensive repository of international trade data reported to UNSD by individual countries. It contains detailed information on the import and export of goods and services between countries and regions worldwide. UN Comtrade uses the Harmonized System (HS) commodity codes

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11 See further details on the limitations regarding the use of UN Comtrade in Chapter 3.
developed by the World Customs Organization (WCO). The HS codes are a standardized numerical system used to classify and categorize goods and services in international trade. The basic HS codes consist of six digits, with additional digits added at the discretion of national authorities for more specific classifications.

In this section, analysis of trade is carried out using HS Code 2805.40 (mercury) and HS Code 2852.10 (inorganic or organic compounds of mercury, chemically defined) for the years 2018, 2019 and 2020. Data from UN Comtrade were downloaded on 7th December 2022 and any updates to the database after that have not been reflected in this report.\(^\text{12}\)

Data used in this section of the report are all drawn from UN Comtrade except when indicated otherwise. It should be noted that in many cases there is a large discrepancy or “asymmetry” between the trade data reported by a country as its import (or export) and the data provided by its trading partners.\(^\text{13}\)

Such asymmetries in UN Comtrade may be due to such issues as:

- Quality of the data: Inaccuracies in the data reported.
- Incomplete reporting: Some countries may report only partial data resulting in data gaps.
- Time lag: It can take some countries several years to report their data, resulting in time lags. Alternatively, the origin and destination of a shipment may occur in two different calendar years.
- Lack of clarity concerning the origin and final destination of a shipment.

Due to these limitations of UN Comtrade, mercury trade data presented by the Chatham House Resource Trade Database\(^\text{14}\) (CHRTD) has also been consulted, as appropriate, for comparison.

Furthermore, the authors acknowledge the significance of analysing mercury trade not only regionally but also for countries with limited imports, a point emphasized by one of the Parties. A regional analysis of mercury trade is expected to provide a better understanding of regional economic dynamics based on the region’s consumption of mercury, while also

\(^\text{12}\) Data from a few countries (Argentina, Germany, Italy, Netherlands, Switzerland, Spain) were revised after the initial commenting period of the report based on their input. Data for China from UN Comtrade have been included for the calculation of global trade, but excluded from figures, tables, and other specific country-level information. This exclusion is due to an ongoing discussion with the Chinese authorities concerning the validation of the data.

\(^\text{13}\) For some countries, there are cases where the exports to specific countries are reported, but the total exports (export to the “world”) are shown in the database as zero. In such cases, exports reported to individual countries have been summed up to calculate the total exports to the “world” (same applies for import data).

\(^\text{14}\) The Chatham House Resource Trade Database also uses UN Comtrade as its source of data, but it manipulates the data with an algorithm that improves the symmetry of the data while ignoring certain data (e.g., extreme data points) that appear inaccurate. It is accessible at [https://resourcetrade.earth](https://resourcetrade.earth).
allowing for the comparison of regional disparities. Analysing lesser imports of certain countries is also crucial because, while the mercury trade may appear insignificant for these nations, understanding the sources of mercury exports to these countries and devising effective measures to address this trade is paramount to mitigating potential environmental and health risks to these countries. Although such analyses are not within the scope of the current report, they remain important matters that could be addressed in future reporting, subject to the decision of the COP.

### Note on the use of the UN Comtrade data

There is no single systematic source of information on global trade of mercury that can be readily utilized. UN Comtrade has been used as the primary data source for the analysis of global trade in this report, as it contains data reported directly by countries themselves. Nevertheless, the authors acknowledge that UN Comtrade may contain gaps and inaccuracies. This database also does not consider undocumented and illegal (UI) trade of mercury, and it is therefore not an accurate representation of the global trade in mercury. The authors also acknowledge that some Parties have expressed concerns about the utilization of UN Comtrade as a primary data source. Efforts were made to address this concern by revising the data based on comments received from the Parties, but only a small number of Parties have provided specific revised data. Further collaboration with individual Parties to validate their respective data will be necessary to enhance the accuracy and reliability of the findings of this report. The authors encourage the Parties to provide country specific data to the Minamata Convention Secretariat to improve the quality of data used in this report.

The term “undocumented and illegal trade” (UI trade) has been used in this report to refer to trade in mercury that is not in compliance with national law. It is important to note that the terms “illegal” and “undocumented” trade are not mentioned in the provisions of the Minamata Convention. In this report, a section on mercury trade that is not compliant with the Convention has been included.

### 2.2.1. Global Trade of Elemental Mercury

Not including UI trade, as mentioned above, global exports and imports of elemental mercury for 2018-2020, based on analysis of HS Code 2805.40 data from UN Comtrade, are shown below. The average annual reported export amount for this period is 679 metric tons and the annual average reported import amount for the same period is 777 metric tons.
Figure 2-1. Global mercury trade during 2018—2020.

Notes: “import” is the sum of imports from the rest of the “world” as reported by the importing countries, whereas “export” is the sum of exports to the rest of the “world” as reported by the exporting countries. Figures rounded to the nearest metric ton.

Figure 2-2 provides a comparison with similar data for 2010-2015, revealing that the reported trade of elemental mercury has been declining since 2012, just prior to the adoption of the Minamata Convention in 2013.15

The average reported trade volume in 2015 was around 1200 metric tons, whereas the total reported trade volume from 2018 to 2020 ranged between 500 to 900 metric tons, indicating a declining trend in reported trade.

It needs to be mentioned that the data obtained from UN Comtrade may encompass both waste mercury intended for disposal and commercial mercury intended for further use. However, a breakdown of the data into these two categories is not available in UN Comtrade and can only be acquired directly from the countries that submitted the information.

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15 It is notable that the U.S. banned the export of elemental mercury from 1 January 2013. The EU banned the export of elemental mercury (and certain mercury compounds) and mixtures originating from the EU from 15 March 2011.
Figure 2-2. Global mercury trade during 2010—2015. Source: UNEP (2017).
Figure 2-3. Major countries importing elemental mercury during 2018—2020. Note: Data reported by the importing countries.
2.2.1.1. Import of elemental mercury

Analysis of the UN Comtrade import data for 2018-2020 for elemental mercury is shown in Figure 2-3. For 2018-2020, Bolivia (148t to 196t from 2018-2020) and India (113t to 141t from 2018-2020) were the top two importers of elemental mercury. Switzerland\textsuperscript{16} reported an import of 290 metric tons in 2019 and 119 metric tons in 2020. Togo and Türkiye were also among the major importers for the period 2018-2020.

\textbf{Figure 2-4. Major mercury importing countries during 2018—2020.} Note: data reported by the importing countries. Shown as the average from 2018 to 2020.

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\textsuperscript{16} Data from the publicly available Swiss-Impex register of the Swiss Federal Office for Customs and Border Security for the Swiss tariff code 2805.4000 (Mercury).
Observations for 2018 mercury trade

According to UN Comtrade import data, the breakdown of the countries exporting to the top two importers for 2018 (Bolivia, India) is shown in Figure 2-5. Almost the entire reported amount of mercury imported by Bolivia (196t) came from Mexico (193t). India, on the other hand, imported 141t of mercury from multiple countries, with Vietnam, Thailand, UAE, Türkiye, and Japan being the major exporters.

Although not shown in the figure, import by Türkiye (77t), another major importer, were from Tajikistan (35t), Russian Federation (21t) and smaller amounts from Togo, Switzerland and Chile. Canada also reported a large import for 2018, almost entirely from Tajikistan.

Figure 2-5. Breakdown by country of export for the two main importers of elemental mercury in 2018. Data reported by the importing countries. Source: UN Comtrade Database.
Observations for 2019 mercury trade

The top 3 importers of elemental mercury for 2019 were Switzerland (290 metric tons), Bolivia (189 metric tons), and India (126 metric tons). The majority of imports by Switzerland came from Peru (88t), Argentina\(^\text{17}\) (80t), Italy (65t), Afghanistan (21t), Slovakia (18t) and Belgium (18t). Imports by Bolivia in 2019 were reported from India (65t), Mexico (37t), Russian Federation (25t), Türkiye (21t), Vietnam (20t) and in smaller amounts from a few other countries. India’s reported import was from multiple countries with Bolivia (66t), UAE (20t) and Guyana (14t) being the main exporting countries.

Observations for 2020 mercury trade

The top 3 importers for 2020 were Bolivia (148t), Switzerland (119t)\(^\text{18}\) and India (113t). Bolivia reported import from Mexico 55 (t), Russian Federation (38t), Vietnam (13t) and a few other countries. The reported import by India is from UAE (47t), Russian Federation (37t) and a few other countries in smaller quantities.

Besides the counties mentioned above, Togo, Türkiye, South Africa, Guyana, and UAE reported notable imports at some point during the 2018-2020 period. For comparison, the same UN Comtrade import data, after being processed by the Chatham House Resource Trade Database (CHRTD) algorithm, are shown in Table 2-2.\(^\text{19}\)

Table 2-2. Top five importers of mercury during 2018—2020*

<table>
<thead>
<tr>
<th>Year</th>
<th>Importing countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>Bolivia (205t), India (160t), UAE (84t), Turkey (72t), South Africa (29t)</td>
</tr>
<tr>
<td>2019</td>
<td>UAE (269t), Bolivia (158t), Russian Federation (139t), India (110t), Netherlands (103t)</td>
</tr>
<tr>
<td>2020</td>
<td>Bolivia (137t), India (113t), UAE (109t), Russian Federation (72t)</td>
</tr>
</tbody>
</table>

* Amounts are shown in metric tons. The data in this table are presented as downloaded and without any revisions. Data from China has not been included due to an ongoing discussion with the Chinese authorities concerning validation of the data. Source: Chatham House Resource Trade Database. Data accessed: 25 July 2023.

17 Argentina notified the Secretariat that the mercury exported to Switzerland was for the purpose of environmentally sound disposal and not subject to Article 3 of the Minamata Convention.

18 Data provided by Switzerland to the Secretariat. The vast majority of mercury was imported into Switzerland to be stabilized for environmentally sound disposal.

19 CHRTD draws data from the UN Comtrade database and applies a methodology to rectify data gaps and errors, providing enhanced data reliability and comprehensiveness. Additional information is available at https://resourcetrade.earth/about#MethodologicalOverview.
2.2.1.2. Exports of elemental mercury

An initial analysis of UN Comtrade data revealed a significant inconsistency in the data reported by exporting countries versus importing countries that was particularly evident at the level of individual countries. To better understand this inconsistency, a comparison of the amounts of mercury exported globally was conducted based on:

- Data reported as “export” by individual countries to UN Comtrade;
- Separate calculation of exports based on the import data provided by the importing countries.

The graphical representation in Figure 2-6 indicates that the export amount reported by the exporting countries is typically slightly lower than the export amount calculated using the import data provided by the importing countries. Some of the reasons for these inconsistencies have been mentioned previously.

![Comparison of mercury export data based on the source of data](image)

**Figure 2-6. Comparison of mercury export data based on the source of data.** This figure illustrates the asymmetry in UN Comtrade between data provided by the export and import countries. The data presented in the figure are taken directly from UN Comtrade and have not been subject to any data correction based on information provided by the Parties during the review of this report. As a result, there may be variations between the data presented in this figure and other sections of the report, where revised data provided by the Parties have been used to update information from UN Comtrade.
Table 2-3 below presents the countries whose export of elemental mercury exceeds 50 metric tons, as indicated by UN Comtrade export and import data. For comparison, the same data after being processed by the Chatham House Resource Trade Database (CHRTD) algorithm are shown in Table 2-4.

Table 2-3. Countries exporting more than 50 metric tons of mercury (UN Comtrade raw data)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Based on reported export data</th>
<th>Based on export amount calculated from import data</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>Tajikistan (121t), Russian Federation (105t), Türkiye (101t), UAE (99t), Canada (91t)</td>
<td>Mexico (228t), Tajikistan (101t), UAE (66t), Türkiye (62t), Russian Federation (54t)</td>
</tr>
<tr>
<td>2019</td>
<td>Russian Federation (327t), UAE (170t), Peru (92t), Tajikistan (79t), India (62t)</td>
<td>India (112t), Argentina20 (80t), Mexico (70t), UAE (68t)</td>
</tr>
<tr>
<td>2020</td>
<td>Tajikistan (152t), Nigeria (111t), UAE (77t)</td>
<td>Russian Federation (89t), Mexico (69t), UAE (53t)</td>
</tr>
</tbody>
</table>

* Amounts rounded to the nearest metric ton. Data from China have not been included due to an ongoing discussion with the Chinese authorities concerning validation of the data. Source: UN Comtrade Database.

Table 2-4. Top five exporters of mercury during 2018—2020 (Chatham House database)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Exporting Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>Mexico (221t), Tajikistan (188t), Russian Federation (124t), Türkiye (103t), UAE (97t)</td>
</tr>
<tr>
<td>2019</td>
<td>Russian Federation (326t), UAE (216t), Tajikistan (102t), India (101t), Peru (92t)</td>
</tr>
<tr>
<td>2020</td>
<td>Tajikistan (179t), UAE (129t), Nigeria (111t), Russian Federation (93t), Mexico (54t)</td>
</tr>
</tbody>
</table>

* Amounts are shown in metric tons. The data in this table are presented as downloaded and without any revisions. Data from China have not been included due to an ongoing discussion with the Chinese authorities concerning validation of the data. Source: Chatham House Resource Trade Database. Data accessed: 25 July 2023.

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20 Argentina has informed the Secretariat that any mercury export from Argentina is only for the purpose of environmentally sound disposal of hazardous waste and falls under Article 11 of the Minamata Convention.
Using UN Comtrade raw data, Figure 2-7 illustrates the main exporting countries for the period 2018—2020. In Figure 2-8 and Figure 2-9, mercury flows from these countries are shown for 2018 and 2019, respectively. Some of the values shown in the figures have been adjusted based on information provided by some Parties to the Secretariat during the review of this report.

Looking at both the export and import data, it can be noted that there was a large flow of mercury to Bolivia not only from Mexico, but from countries such as India, UAE and Türkiye. (UNEP 2017) mentioned that as of 2015, large quantities of mercury imported by Colombia and Bolivia were transferred informally to neighbouring countries such as Peru, primarily for use in artisanal and small-scale gold mining. Analysis of Comtrade data for 2018-2020 seems to indicate that the same trend is still present.

For 2018-2020, India also appeared to be one of the prominent trading hubs for mercury, not only for domestic consumption, but also for export to other countries. Russia continued to be a major exporter of mercury, mainly to countries like India, UAE, Tajikistan, Türkiye and others. Similarly, mercury trade from Tajikistan to other countries was also prevalent. UAE continued to report both import and export of mercury from multiple countries and continued to be a trading hub for mercury. A similar trend was also seen for Türkiye. Moreover, Canada reported to the Secretariat that Canada’s exports of mercury to the U.S. in 2019 consisted of high purity waste mercury recovered as a by-product of smelting operations that was being transferred for environmentally sound disposal.
Figure 2-7. Main exporters of elemental mercury during 2018—2020. Based on data provided by the import countries (A) and export countries (B). Source: UN Comtrade.
Figure 2-8. Main export flows of elemental mercury in 2018. Based on data provided by the import countries (A) and export countries (B). Source: UN Comtrade
Figure 2-9. Main export flows of elemental mercury in 2019. Based on data provided by the import countries (A) and export countries (B). Source: UN Comtrade.
As mentioned, even though UN Comtrade is populated by data furnished by national statistical agencies, it is not a perfect representation of the trade flows of mercury. Issues like inaccuracies in HS codes being reported, inconsistency in reporting by some countries, and the lack of information on UI trade are some of the issues that add a level of uncertainty. For comparison, the top trading partners for elemental mercury from 2018 to 2020 are shown in Table 2-5, which presents the UN Comtrade data after processing by an algorithm in the Chatham House Resource Trade Database.

Table 2-5. Top trading partners for mercury during 2018—2020*

<table>
<thead>
<tr>
<th>Year</th>
<th>Mercury trade flow</th>
</tr>
</thead>
</table>
| 2018 | Mexico to Bolivia (194t)  
      | Tajikistan to Canada (57t)  
      | UAE to Sudan (48t)  
      | Russian Federation to UAE (47t)  
      | Tajikistan to Vietnam (45t) |
| 2019 | Russian Federation to UAE (239t)  
      | UAE to Russian Federation (139t)  
      | Peru to Netherlands (88t)  
      | Argentina to Switzerland (80t)  
      | Tajikistan to Vietnam (79t) |
| 2020 | Tajikistan to UAE (104t)  
      | UAE to Russian Federation (65t)  
      | Tajikistan to Vietnam (48t)  
      | Russian Federation to Bolivia (48t) |

* Amounts are shown in metric tons. The data in this table are presented as downloaded and without any revisions. Data from China have not been included due to an ongoing discussion with the Chinese authorities concerning validation of the data. Source: Chatham House Resource Trade Database. Data accessed: 25 July 2023.

From the different analyses of the data, the following observations can be made:

(a) The primary mercury exporters for 2018—2020 include Mexico, Tajikistan, the Russian Federation, UAE, Türkiye, and India.

(b) Mexico was responsible for the vast majority of mercury exported to Bolivia in 2018. Additionally, Mexico exported to other nations in the South American continent.

(c) In its full national report, submitted in 2021, Canada provided information on its exports: in 2017 it exported 50.27 metric tons, and in 2018 it exported 91.03 metric tons. Canada also reported that these exports were deemed illegal under its national law and detailed the measures taken in response.

(d) India, UAE, and Türkiye reported significant quantities of both imports and exports, and these nations exported to numerous other countries.
In 2019, Argentina exported 80 metric tons of mercury to Switzerland for the purpose of environmentally sound disposal of hazardous waste.

2.2.2. Global trade of mercury compounds

2.2.2.1. Priority compounds

Trade related provisions of Article 3 of the Minamata Convention on Mercury regulate only elemental mercury, while mercury compounds are not subject to any restrictions under these provisions. However, several Parties to the Minamata Convention have placed restrictions on the trade of mercury compounds.

For example, as of January 1, 2020, the export from the U.S. of specific mercury compounds (mercury (I) chloride or calomel, mercury (II) oxide, mercury (II) sulfate, mercury (II) nitrate, and cinnabar or mercury sulfide) is prohibited unless they are destined for environmentally sound disposal in OECD member countries, according to the U.S. Environmental Protection Agency (USEPA 2023). The European Union has also restricted the export of certain mercury compounds since 2011.

A recent feasibility study (NRDC 2023) highlights the lack of good data on the global trade, supply and demand of specific mercury compounds, and identifies various sources of data that may be used to better understand the situation. According to the study, the compounds (including those listed in the Minamata Convention) that appear to be most commercially available are:

- Ammoniated mercury
- Mercury(II) acetate
- Mercury(I) chloride, also known as calomel
- Mercury(II) chloride
- Mercury(II) iodide
- Mercury(II) nitrate
- Mercury(II) oxide
- Mercury(II) sulfate
- Mercury(II) sulfide (cinnabar, in its natural form)
- Mercury(II) thiocyanate
- Phenylmercury(II) acetate

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21 In accordance with Paragraph 13 of Article 3 (The Conference of the Parties shall evaluate whether the trade in specific compounds compromises the objective of this Convention and consider whether specific mercury compounds should, by their listing in an additional annex adopted in accordance with Article 27, be made subject to paragraphs 6 and 8), matters related to the trade of mercury compounds are expected to be addressed by the Conference of the Parties in the future.
2.2.2.2. Commodity codes for mercury compounds

Some countries and regional trade bodies such as MERCOSUR have taken measures to identify the trade of specific compounds.\(^\text{22}\) For example, the Instituto Nacional de Estadistica y Censos (INDEC) in Argentina\(^\text{23}\) uses the MERCOSUR commodity codes to track the mercury compounds shown in Table 2-6.

<table>
<thead>
<tr>
<th>Commodity code, or NCM</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2852.10.11</td>
<td>Oxides of mercury, inorganic</td>
</tr>
<tr>
<td>2852.10.12</td>
<td>Mercury I chloride (mercurous chloride)</td>
</tr>
<tr>
<td>2852.10.13</td>
<td>Mercury II chloride (mercuric chloride), f/ photo</td>
</tr>
<tr>
<td>2852.10.14</td>
<td>Mercury II chloride (mercuric chloride), other uses</td>
</tr>
<tr>
<td>2852.10.19</td>
<td>Other inorganic mercury compounds</td>
</tr>
<tr>
<td>2852.10.21</td>
<td>Mercury acetate</td>
</tr>
<tr>
<td>2852.10.22</td>
<td>Thimerosal</td>
</tr>
<tr>
<td>2852.10.23</td>
<td>Mercury stearate [mercury(2+) octadecanoate]</td>
</tr>
<tr>
<td>2852.10.24</td>
<td>Mercuric lactate [mercury(2+) lactate]</td>
</tr>
<tr>
<td>2852.10.25</td>
<td>Mercury salicylate</td>
</tr>
<tr>
<td>2852.10.29</td>
<td>Other organic mercury compounds</td>
</tr>
<tr>
<td>2852.90.00</td>
<td>Other mercury compounds</td>
</tr>
</tbody>
</table>

*Source: Instituto Nacional de Estadistica y Censos (INDEC), Argentina.

In general, however, the trade data of most countries still tend to group various mercury compounds, mostly under HS codes 2852.10 and 2852.90 as seen below in Table 2-7, from the U.S. International Trade Commission’s Harmonized Tariff Schedule (2022 Revision 7).


\(^{23}\) Accessible at [https://comex.indec.gob.ar/#/](https://comex.indec.gob.ar/#/).
Table 2-7. Mercury compounds identified in the U.S. Harmonized Tariff Schedule∗

<table>
<thead>
<tr>
<th>Heading/subheading</th>
<th>Statistical suffix</th>
<th>Commodity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2852</td>
<td></td>
<td><strong>Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams:</strong></td>
</tr>
<tr>
<td>2852.10</td>
<td></td>
<td>Chemically defined:</td>
</tr>
<tr>
<td>2852.10.10</td>
<td>00</td>
<td>Mercuric oxide, mercuric cyanide, mercuric oxycyanide and mercuric potassium cyanide</td>
</tr>
<tr>
<td>2852.10.90</td>
<td>00</td>
<td>Other</td>
</tr>
<tr>
<td>2852.90</td>
<td></td>
<td>Other:</td>
</tr>
<tr>
<td>2852.90.05</td>
<td>00</td>
<td>Albuminates, tannates and phosphides of mercury</td>
</tr>
<tr>
<td>2852.90.90</td>
<td>00</td>
<td>Other</td>
</tr>
<tr>
<td>3815</td>
<td></td>
<td><strong>Reaction initiators, reaction accelerators and catalytic preparations, not elsewhere specified or included:</strong></td>
</tr>
<tr>
<td>3815.90</td>
<td></td>
<td>Other:</td>
</tr>
<tr>
<td>3815.90.20</td>
<td>00</td>
<td>Of mercury or of molybdenum</td>
</tr>
</tbody>
</table>


2.2.2.3. Data sources

An analysis of the UN Comtrade data corresponding to the above codes does not permit an adequate understanding of trade movements. Key data problems – many similar to mercury trade issues – include:

- The difficulty of differentiating between commercial mercury compounds and mercury compound wastes, while keeping in mind that some “waste” compounds may be reused in skin-lightening products or other uses
- Multiple names for the same compound
- Mistakes on shipping manifests
- Difficulty identifying the real origin and/or the ultimate destination of shipments that may be in transit
- Mirror trade issues, in which there are discrepancies between the data reported by the exporting country and the partner country of import
- Possible mistakes when data are submitted to or entered in UNSD Comtrade

It is evident from the value of the mercury compound trades (e.g., USD/kg) that much, though probably not all, of HS 2852.10 data represents specific commercial mercury compounds, while much of the HS 2852.90 data (often large quantities as well as low value) concerns waste mercury compounds. Therefore, the discussion below focuses only on HS 2852.10 data, although this refinement still does not help to explain which mercury compounds are being traded.

A thorough analysis of alternative data sources was beyond the scope of this report. Nevertheless, possible alternative data sources include:
• Other global databases such as PubChem, CEPII (Centre d’études prospectives et d’informations internationals) databases
• National trade databases such as U.S. International Trade Commission DataWeb, Canadian International Merchandise Trade Web Application, Mexico’s SIAVI database, Argentina’s INDEC database
• Regional databases such as Mercosur, Eurostat, Asean
• Specialized and subscription databases such as Panjiva, OEC World, IHS/S&P Global

In the absence of more reliable datasets, some databases such as the OEC World and the Chatham House Resource Trade Database, have developed algorithms that employ a data validation process to analyse the UN Comtrade data. Such a process cannot correct inaccurate trade data, but it can improve the quality of the data by treating asymmetrical data or discarding extreme data points, for example, ostensibly resulting in data that are more accurate. While still far from perfect, examples of trade data processed with the OEC World algorithm are presented below.

Moving forward, the most reliable data will come from closer scrutiny and periodic reporting by Parties to the Secretariat. The observations in this report strongly support the need for further work and better appreciation of trade in mercury compounds, as suggested in Chapter 8.

2.2.2.3. Import of mercury compounds

Keeping in mind previous comments about Comtrade data reliability, after processing the Comtrade import data, OEC World reported that in 2019 there were USD 16 million of imports of HS 2852.10 - Inorganic or organic compounds of mercury, excluding amalgams, chemically defined. The top importers were Germany ($2.02M), France ($1.97M), Vietnam ($1.32M), the United States ($1.23M) and Italy ($0.96M), as shown in Figure 2-10.
Figure 2.10. Top importers of HS 2852.10 mercury compounds, excluding amalgams, in 2019. The percentage sign in the figure represents the share of global trade. Source: OEC World.\(^{24}\)

---

2.2.2.4. Exports of mercury compounds

Likewise, after processing the Comtrade export data, OEC World reported that in 2019 there were USD 16 million of exports of HS 2852.10 - Inorganic or organic compounds of mercury, excluding amalgams, chemically defined. The top exporters were Argentina ($2.37M), Germany ($2.33M), India ($2.19M), Belgium ($1.53M), and Thailand ($1.24M), as seen in Figure 2-11.

![Figure 2-11. Top exporters of HS 2852.10 mercury compounds, excluding amalgams, in 2019. The percent sign in the figure represents the share of global trade. Source: OEC World.](image)

---

Ibid.
2.2.2.5. Export trends

Finally, according to OEC World, from 2012-2021 there have been encouraging trends in gradually declining exports of HS 2852.10 - Inorganic or organic compounds of mercury, excluding amalgams, chemically defined. Exports of nearly USD 29 million in 2012 have declined to USD 14 million in 2021, as shown in Figure 2-12.

Figure 2-12. Trend of global export of HS 2852.10 mercury compounds, excluding amalgams, for the past 10 years. Source: OEC World.²⁶

2.3. Mercury trade that is not compliant with the Convention or with national legislation

**What the Convention says**

Mercury trade is addressed primarily under Article 3 of the Convention. Paragraph 6 provides that each Party shall not allow the export of mercury except: (a) to a Party that has provided the exporting Party with its written consent, and only for the purpose of a use allowed to the importing Party under this Convention or environmentally sound interim storage as set out in Article 10, or (b) to a non-Party that has provided the exporting Party with its written consent, including certification demonstrating that (i) the non-Party has measures in place to ensure the protection of human health and the environment and to ensure its compliance with the provisions of Articles 10 and 11; and (ii) such mercury will be

²⁶ Ibid.
used only for a use allowed to a Party under this Convention or for environmentally sound interim storage as set out in Article 10.

An exporting Party may rely on a general notification to the Secretariat issued by the importing Party or non-Party as the written consent required by paragraph 6.

Paragraph 8 sets out that each Party shall not allow the import of mercury from a non-Party unless the non-Party has provided certification that the mercury is not from sources identified as not allowed under paragraph 3 or paragraph 5 (b), namely from primary mercury mining and excess mercury from the decommissioning of chlor-alkali facilities.

In addition to Article 3, two other articles of the Convention contain provisions that are related to mercury trade. Paragraph 4 of Article 17 states that each Party shall designate a national focal point for the exchange of information under the Convention, including with regard to the consent of importing Parties under Article 3. Furthermore, Article 21 provides that each Party shall report to the Conference of the Parties on the measures it has taken to implement the provisions of this Convention and include in its reporting the information as called for in Article 3.

Article 3 of the Minamata Convention specifically addresses the trade of mercury and imposes restrictions on its import and export. The term “trade that is not compliant with Convention” has sometimes been used to refer to trade that fails to meet the import and export restrictions outlined in Article 3 of the Convention. This section will utilize the term “undocumented or illegal” trade (or UI trade) to encompass all types of mercury exports or imports that contravene national legislation. Examples of such trade could include:

- Trade without an export or import permit
- Legal export of mercury mined without a mining permit
- Export of mercury in a form that is prohibited from export
- Export or import without any formal documentation or reporting in trade statistics
- Export or import with falsified documents
- Hiding mercury among other goods
- Mislabelling the contents of the transport containers
- Smuggling mercury into a country outside the normal ports of entry
- Shipping commercial quality mercury as low-value mercury or waste

In addition, there are cases where otherwise legally traded mercury happens to be shipped in flasks that do not meet the United Nations Hazardous Material Shipping Requirements or equivalent transport safety standards. In correspondence with the Secretariat, one Party has highlighted issues such as poor communication with authorities and focal points for exchange of information to check the accuracy of the shipping documents and the final recipient.

Mercury trade that is not compliant with the requirements of Article 3 has been raised as an issue by some Parties in parts C or E in their short (2019) and full (2021) national reports pursuant to Article 21. Some Parties shared their concerns and reported on measures taken to address trade that is not in compliance with the requirements of Article 3, and other Parties are encouraged to follow suit. The current reporting format does not have a direct question on
such trade, and it may be helpful to consider how to best utilize the space provided in the relevant reporting question to facilitate sharing information by Parties on challenges and measures to manage and/or curtail trade that is not in compliance with the requirements of Article 3.

For example, in their short national report (2019) one Party had concerns on falsified or incomplete consent forms, while another Party provided a recommendation for optimizing the written consent procedure for the import of mercury, including the provision of information on transit countries, re-export points and the role of free-trade zones, and the establishment of a deadline for receipt of a response from Parties concerned. The Party also raised the need to improve identification of intended uses of traded mercury, strengthening of capacities of border control agents along with the development of protocols to identify, seize, transport, handle, and label mercury.

In its full report (2021), one Party noted illegal mercury trade to be occurring within its national territory, and also regionally. The Party called for enhanced cooperation among Parties “to create innovative solutions in preventing illegal mercury trading.” Furthermore, some Parties in another region noted that there were known informal flows of mercury also in their region, and illegal imports into their national territories.

In its full national report submitted in 2021, Canada provided information on exports of 50.27 metric tons in 2017 and 91.03 metric tons in 2018, which were deemed illegal under its national law. Canada also reported on the measures it took in response to the illegal exports and further reported on another possible illegal export, which is currently under analysis. Information on measures taken by certain Parties to prevent trade that is not in compliance with the requirements of Article 3 provides a good example for other Parties facing similar challenges.

Finally, it important to recall that while the restrictions on import and export according to Article 3 of the Minamata Convention focus exclusively on elemental mercury, some countries or regions such as the U.S. and EU have justified passing legislation that also regulates certain mercury compounds, as discussed in chapter 2.

Table 2-8 lists some examples of UI mercury trade officially reported by some countries. These examples should be considered as the tip of the iceberg as most UI mercury trade is not identified or seized.
Table 2-8. Examples of reported cases of undocumented or illegal trade of mercury

<table>
<thead>
<tr>
<th>Country</th>
<th>Case of undocumented or illegal trade of mercury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>On 26 May 2023, the Brazilian Federal Highway Police seized more than 328 kilos of mercury during an inspection in the municipality of Altamira, in the Amazonian State of Para. The person in possession of the apprehended mercury had allegedly contrabanded the mercury in Bolivia. In 2018, agents from the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) seized 430 kilos of mercury and suspended the activities of a chemical company responsible for the irregular importation of the product. Those responsible were fined BRL 1.5 million for the illegal sale and for providing false information. The company sold 6.8 metric tons of the substance in the previous three years. (Translated from Portuguese).</td>
</tr>
<tr>
<td>China</td>
<td>In 2018, Hong Kong Customs seized about 630 kilograms of suspected pangolin scales and 2660kg of suspected smuggled mercury from a container with an estimated market value of about $1.4 million at the Tsing Yi Customs Cargo Examination Compound.</td>
</tr>
</tbody>
</table>

Widespread evidence of UI trade of mercury has already been documented (IUCN 2020) and it has been reported (UNEP and GRID-Arendal 2020) that much of it goes to the significant ongoing demand for mercury in the ASGM sector. A recent report from UNEP and GRID-Arendal (2020) estimated that about 50% of all mercury used in ASGM is traded informally, and that number is closer to 100% for many of the countries with significant ASGM activity. Even mercury imports that are documented at a customs port of entry often then follow informal pathways to arrive at the mining areas where the mercury is used. Discrepancies were observed between the total registered net import of mercury and estimated mercury consumption in ASGM sectors in several countries (Cheng et al., 2022).

Article 7 of the Minamata Convention puts various obligations on the Parties to reduce and where feasible eliminate the use of mercury and mercury compounds in ASGM. On the occasion of COP4.2 held in Bali, Indonesia, the Bali Declaration on Combatting Global Illegal Trade of Mercury was finalized. It is a non-binding political declaration with the aim to enhance international cooperation, develop practical tools to monitor and share information, and exchange experiences and practices to combat the illegal trade of mercury.


In a presentation by UNEP, recommendations to combat the UI trade of mercury for use in ASGM included the following measures:

- Reduce demand for mercury by promoting mercury-free ASGM.
- Improve the monitoring and reporting of mercury movements from source to end use and disposal so that the organizations charged with enforcing trade regulations are better informed.
- Conduct further research into the nexus of gold mining, the trade in mercury and transnational organized crime.
- Increase enforcement capacity, for example by:
  - Criminal and civil liabilities or penalties along the entire illegal supply chain
  - Seizures of property or equipment used to conduct illegal activities.

Quantification of the amount of mercury traded for use in ASGM through UI trade is not attempted in this report due to unavailability of reliable data.

### 2.3.1. Lessons from other contexts

Other MEAs are also concerned with the issue of illegal trade. Although their focus goes beyond mercury UI trade, these MEAs can provide valuable references for the Minamata Convention. Examples of initiatives taken under the Basel Convention and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to combat illegal trade are provided in Table 2-9 for reference.

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30 The Basel convention targets illegal trade of hazardous waste through measures such as the establishment of a comprehensive regulatory framework, strict documentation requirements and implementation of control procedures. Prior informed consent (PIC) is emphasized to ensure that all parties involved are aware of the nature of the waste being shipped.

31 CITES targets illegal trade in endangered species. To tackle the issue of illegal trade, the convention requires member countries to establish strict controls such as permitting systems and facilitates information sharing to enhance enforcement efforts and to detect illegal activities.
## Table 2-9. Example of initiatives to curb illegal trade in other multilateral environmental agreements

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)</strong></td>
<td></td>
</tr>
<tr>
<td>Facilitation of channelling information(^{32})</td>
<td>To combat illegal trade in CITES-listed species, the public and non-governmental organizations can report information to national law enforcement agencies in the respective countries where the illegal trade is occurring. The contact details of national CITES Authorities can be found on the CITES website. The Secretariat also assists in addressing illegal wildlife trade by offering guidance on how to submit information to them when they are considered the appropriate recipient. They can then pass on this information to the relevant authorities and organizations involved in combating illegal trade.</td>
</tr>
<tr>
<td>Reporting from Parties(^{33})</td>
<td>Parties must submit an annual illegal trade report for all CITES-listed species violations, regardless of where the seizure occurred, and guidelines have been created to assist Parties in preparing and submitting these reports.</td>
</tr>
<tr>
<td>E-learning and training materials</td>
<td>A series of PPT slides for trainings are available on the CITES website and free to use. The initiative named “Virtual college” also offers e-learning courses targeting prosecutors, the judiciary and customs.</td>
</tr>
<tr>
<td>Capacity development for national agencies by ICCWC</td>
<td>The ICCWC (International Consortium on Combating Wildlife Crime) is a collaborative effort between five inter-governmental organizations (CITES Secretariat, INTERPOL, UNODC, World Bank, WCO) with the mission to combat wildlife and forest crime by strengthening criminal justice systems and providing coordinated support at all levels, focusing on capacity-building of national agencies for effective enforcement.</td>
</tr>
<tr>
<td><strong>Basel Convention</strong></td>
<td></td>
</tr>
<tr>
<td>ENFORCE(^{34})</td>
<td>The Environmental Network for Optimizing Regulatory Compliance on Illegal Traffic (ENFORCE) was established by COP-11 of the Basel Convention. It has a mandate to deliver capacity-building activities and training on preventing and combating illegal traffic. Its mission is achieved by initiatives such as:</td>
</tr>
<tr>
<td></td>
<td>· Promoting dialogue between its partners to develop a vision for preventing and combating illegal traffic;</td>
</tr>
<tr>
<td></td>
<td>· Improving understanding of the issues, the role of the various stakeholders, their challenges and needs, and how best to address them;</td>
</tr>
<tr>
<td></td>
<td>· Promoting cooperation between partners and a coordinated approach to capacity building activities, for instance through joint activities, in order to avoid duplication or gaps in the activities, to ensure a broader geographical distribution of such activities, and to prevent competition over resources;</td>
</tr>
<tr>
<td></td>
<td>· Increasing the visibility of and support for efforts aimed at preventing and combating illegal traffic.</td>
</tr>
</tbody>
</table>


\(^{33}\) [https://cites.org/eng/resources/reports/Annual_illegal_trade_report](https://cites.org/eng/resources/reports/Annual_illegal_trade_report).

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Description</th>
</tr>
</thead>
</table>
| Coordination with INTERPOL³⁵          | The Secretariat of the Basel, Rotterdam and Stockholm Conventions cooperates with INTERPOL on activities aiming at preventing and combating the illegal traffic in hazardous chemicals and wastes under the BRS conventions. Areas of cooperation include:  
  • The Green Customs Initiative³⁶ and other existing enforcement networks;  
  • Development of a joint e-learning module for law enforcement officers on hazardous chemicals and wastes under the BRS conventions. INTERPOL is an observer in ENFORCE. |
| Coordination with WCO³⁷                | The Secretariat of the Basel, Rotterdam and Stockholm Conventions cooperates with the WCO on identification of HS codes for several waste streams covered by the Basel Convention. They also cooperate on activities aiming at preventing and combating the illegal traffic in hazardous chemicals, e.g., through the Green Customs Initiative and other existing enforcement networks. |
| Development of manuals                 | The Basel Convention has developed a “Training Manual on Illegal Traffic” for Customs and Enforcement Agencies. The convention has also developed an “Instruction manual on the prosecution of illegal traffic of hazardous wastes or other wastes.” It is intended to provide guidance for those involved in the prosecution of cases of illegal traffic in hazardous and other wastes.³⁸ |
| Take-back provision³⁹                  | Article 9 paragraph 2 of the Basel Convention has a take-back provision for waste deemed to be illegal traffic, and the convention has developed a guidance document on the implementation of the Basel Convention illegal traffic take-back provision. |
| Reporting on illegal traffic⁴⁰         | Article 9 of the Basel Convention includes a definition of what is deemed to be illegal traffic. The COP has requested Parties to bring any cases or alleged cases of illegal traffic to the attention of the Secretariat and to provide the Secretariat with all necessary information to enable it to take any appropriate action. A designated format and procedures for providing such information is established. |

³⁶ The Green Customs Initiative (GCI), launched in 2004, enhances the capacity of customs and border control officers to enforce and foster compliance with trade-related conventions, MEAs, and corresponding national legislation. GCI focuses on commodities such as ozone-depleting substances, toxic chemicals, hazardous wastes, endangered species, and living-modified organisms. (Source: [https://www.greencustoms.org/who-we-are](https://www.greencustoms.org/who-we-are)).
³⁷ [https://www.basel.int/Partners/IGOs/WCO/tabid/3888/Default.aspx](https://www.basel.int/Partners/IGOs/WCO/tabid/3888/Default.aspx).
2.3.2. Challenges and opportunities

Undocumented or illegal trade of mercury is a complex and challenging issue. At the heart of the problem is the strong demand for gold and resulting high price of gold, which can drive artisanal and small-scale gold mining (ASGM) and related mercury use. The high value of gold has increased the urgency to address the prevalent use of mercury in the ASGM sector. While this issue extends beyond the boundaries of international conventions, it also presents opportunities for collaboration among stakeholders including governments, industry and local communities to promote more sustainable and responsible mining practices, invest in alternative technologies, and support the development of responsible supply chains.

Further, customs and other law enforcement officers are often not adequately trained and equipped to detect and recognize illicit chemicals, counterfeit containers, and other aspects of UI trade (UNEP and GRID-Arendal 2020). This hinders their ability to effectively control and combat undocumented or illegal trade of mercury. However, this also presents an opportunity to implement capacity-building activities aimed at empowering law enforcement officers and customs officials. The Stronger Training and Increased Knowledge for Better Enforcement Against Waste and Mercury (STRiKE) project41, which worked to further enhance operational activities and capacities of authorities involved in addressing illegal trade & management of problematic waste streams (e.g., e-waste, end-of-life vehicles, batteries & waste mercury), as well as illegal production & trade of mercury-added products, can be a valuable reference.

Any strategy to reduce UI mercury trade must be multi-faceted and focused on basic but critical objectives. All other strategic measures should be aligned with one or more such objectives. The basic objectives are:

(a) Reducing demand for mercury, especially the demand that is driven by ASGM;
(b) Improving traceability, transparency and enforcement throughout the gold supply chain; and
(c) Improving the monitoring and reporting of mercury flows, from source to end-use and disposal.

Furthermore, reducing the demand for mercury in ASGM will depend on such key measures as:

(a) The willingness and ability of each ASGM country government (at national, provincial, and local levels) to be vigilant with regard to mercury trade in general, and especially UI mercury trade;
(b) Capacity building and financial resources to promote mercury-free mining practices, keeping in mind the need for a transition period;
(c) Improved transparency and due diligence in the gold supply chain, coupled with efforts to 1) reduce the demand for newly mined gold, such as improving recycling

of gold and raising consumer awareness, and 2) develop alternative sustainable livelihoods for the miners;
(d) Improved monitoring and control of organized crime or other armed groups involved in the gold trade.

2.4. Trends and concluding notes on trade

Previous reports have noted a decrease in the reported amount of mercury traded globally in 2015 as compared to 2010 (UNEP 2017). Namely, the reported global imports of mercury in 2010 were about 2600 metric tons, which decreased to about 1200 metric tons in 2015. For the 2018-2020 period, global annual imports as reported to UN Comtrade were less than 900 metric tons, with the amount reported for 2020 to be less than 700 metric tons. The decrease in the amount of reported trade of mercury does not account for the UI trade of mercury, and it is possible that part of this reported decrease may be attributed to an increase in UI trade.

With regard to country specific trade during 2018-2020, India has also appeared to be one of the prominent trading hubs for mercury, not only for domestic consumption, but also for export to other countries. Russia continues to be a major exporter of mercury with export to countries like India, UAE, Tajikistan, Türkiye and others. Similarly, mercury trade from Tajikistan to other countries is also prevalent. UAE continues to report both import and export of mercury and continues to act as a trading hub. A similar trend is also evident for Türkiye.

In the South American region, a large flow of mercury to Bolivia not only from Mexico, but also from countries including India, UAE and Türkiye was seen. It has been noted in previous reports that large quantities of mercury imported by Bolivia are transferred informally to neighbouring countries such as Peru, primarily for use in ASGM (UNEP 2017). Literature sources such as WWF/Gaia Amazonas (2020) have indicated that Bolivia is an important transit country for UI mercury trade in Latin America.

An analysis of Comtrade data from 2018 to 2020 confirms that Bolivia has routinely imported far more elemental mercury than it consumed domestically, and it suggests that a portion of this mercury was implicated in UI trade with neighbouring countries in Latin America.

The trend described above corroborates the general trends noted by UNEP (2017). Nevertheless, while Comtrade is populated by data furnished by national statistical agencies, it does not fully reflect the global mercury trade. For example, issues like inaccuracies in HS codes, inconsistencies in various aspects of reporting, and the lack of information on UI trade are some of the issues that add a level of uncertainty. Furthermore, the data obtained from UN Comtrade sometimes includes both waste mercury intended for disposal (recall the previous example of mercury imports by Switzerland) and commercial mercury intended for further (legal) use. UN Comtrade does not differentiate between these two categories of mercury, which can only be determined from reports of the countries that handled the trade.
Chapter 3. Mercury Supply Sources

Mercury can be supplied from multiple sources such as primary mercury mining, by-product mercury recovery, mercury stocks, decommissioning of manufacturing facilities using mercury (e.g., chlor-alkali facilities, vinyl chloride monomer production), or recycling of mercury-added products and other types of waste. In this section, an estimation is provided for the amount of mercury available from these sources, serving as a supply of mercury that may be used in various products and processes, or that may be destined for disposal. Estimation of stocks of mercury is addressed in chapter 6.

3.1. Primary mercury mining

What the Convention says

The Convention, in Article 2, subpara. (i), defines “primary mercury mining” as “mining in which the principal material sought is mercury”. The Convention does not differentiate between formal and informal mining. Pursuant to paragraphs 3 and 4 of Article 3, primary mining is not allowed unless such mining was being conducted within the territory of a party at the date of entry into force of the Convention for it.

In this case, primary mining is only allowed for fifteen years after the date of entry into force: during this period, mercury from such mining shall only be used in manufacturing of mercury-added products in accordance with Article 4, in manufacturing processes in accordance with Article 5, or be disposed in accordance with Article 11, using operations which do not lead to recovery, recycling, reclamation, direct re-use or alternative uses. Mercury from primary mining shall not be used for ASGM.

Previously China, Mexico, Indonesia and the Kyrgyz Republic were the main countries with reported ongoing mining of mercury (UNEP 2017). In its full national report (2021) pursuant to Article 21 of the Convention, China reported the amount of extracted mercury ore for the

42 The term “by-product mercury”, in this document, is defined as mercury that is a naturally occurring component of an ore or other natural resource from which it is separated through an industrial or chemical process. “By-product mercury recovery,” in this document, refers to removal and collection of by-product mercury from sources such as non-ferrous ores or from crude oil and natural gas.

43 Recycling operations usually involve the reprocessing of waste into products, materials, or substances, though not necessarily for the original purpose. In this section, recycling refers to processing of waste (products or other waste containing mercury) to recover mercury that can be used as a mercury supply source, or that may be destined for disposal.
period of 2017 to 2020, with an anticipated closure date set for August 2032. According to the data from China Statistical Annals on Ecological Environment, China’s primary mercury mining output was about 250 metric tons in 2020.

Mexico reported the amount of mined mercury for the reporting period to be 442 metric tons in 2017, 0.5 metric tons in 2018 and 0 metric tons in 2019 and 2020. Based on export data reported by importing countries in UN Comtrade, however, Mexico exported more than 50t of mercury in 2019 and 2020. In its short report (2019), Mexico reported that 189 concessions were in place and 34 mining permits issued. Of the 34 mining permits, 31 had expired and three were valid in 2019. In its full report (2021), Mexico explained that only two primary mining concessions (corresponding to 4 mines) had valid authorizations to mine until 2020. The status of the mining concessions reported in 2019 not to have valid mining licenses is not clear.

In its full national report (2021), Indonesia stated that the government had never granted any permits for cinnabar mining, either prior to or following the entry into force of the Minamata Convention for Indonesia. Indonesia offered a comment in its short national report (2019) that it had no primary mercury mines operating within its territory during the reporting period, but that there were mining sites in the country that could be sources of mercury and that “required close supervision in order to not be used for illegal mining and other activities.” As cited in a recent report, there is evidence that primary mining activities continue in the country (Biodiversity Research Institute 2022).

The information on the estimated amount of mercury mined during 2017—2020 is summarized in Table 3-1.

44 The reported amount by China refers to the quantity of extracted ore, not the amount of mercury produced. At its fourth meeting, in 2022, the Conference of the Parties to the Minamata Convention clarified, in decision MC-4/8, that the basis for reporting should be the total amount of mercury mined, not the extracted ore. The clarification will guide Parties in their future submissions of national reports.

Table 3.1. Estimated amount of mercury mined during 2017—2020*

<table>
<thead>
<tr>
<th>Country</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>China*</td>
<td>N.A. (85,000)</td>
<td>N.A. (144,500)</td>
<td>N.A. (134,000)</td>
<td>250 (109,100)</td>
</tr>
<tr>
<td>Mexico**</td>
<td>442</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Data not available</td>
<td>Data not available</td>
<td>Data not available</td>
<td>Data not available</td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td>Data not available</td>
<td>Data not available</td>
<td>Data not available</td>
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</tbody>
</table>

* The figures shown for China within parentheses refer to the amount of extracted mercury ore for the period of 2017 to 2020 as reported in its full national report pursuant to Article 21. The estimated amount of mercury mined for 2020 is based on information provided by China to the Secretariat during the review of this report.

** Based on Mexico’s full national report pursuant to Article 21.

3.2. By-product mercury

What the Convention says

With regard to by-product mercury, according to Article 3, subpara. 5(a), of the Convention, Parties must “endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year, that are located within its territory”.

3.2.1. Mercury from non-ferrous ores

In this report, by-product mercury (i.e., a “mercury supply generating stock”) is defined as mercury that is a naturally occurring component of an ore or other natural resource, and that is produced as a secondary product during the extraction, mining or processing of the resource.

By-product mercury can occur as a contaminant or impurity in non-ferrous ores, mainly of zinc, gold, lead and copper. In order to produce the target non-ferrous metal of sufficient purity, mercury is often removed, recovered and could potentially be marketed. It also needs to be noted that mercury that is not recovered could be released to the air and potentially be a significant source of emissions.

Estimating the supply of mercury from non-ferrous ores is a highly challenging task, primarily due to the lack of clarity regarding the disposal, environmental release, and commercial capture of mercury generated during non-ferrous refining operations. Many countries generate by-product mercury but due to restrictions on mercury export (e.g., in the U.S. and the EU), not all generated by-product makes its way to the market (UNEP 2021).
According to previous estimates (UNEP 2017), the marketed amount of by-product mercury recovered from non-ferrous mining and processing operations in 2015 ranged from 440-775 metric tons, accounting for approximately 15% of the global supply. Japan, for example, estimated the amount of mercury recovered from non-ferrous metal smelting sludge to be about 47 metric tons as a three-year average between FY2015-FY2017\textsuperscript{46} (MOEJ 2018). However, there is generally a lack of data to make a reasonable estimation of mercury supply from non-ferrous ore.

The non-ferrous sector is likely to grow considerably over the next 30 years, and better data are needed on:

- mercury content in ores and concentrates, including at plant and country level;
- mercury air emissions test data (e.g., stack testing);
- mercury concentrations in reject material (waste rock, tailings) and mercury distributions between emissions and other releases;
- activity data (amounts of ores and concentrates processed) as well as effects of pollution control technologies and how they may be affecting the distribution of mercury between mercury recovery units and emissions to air;
- the extent of mercury capture in solid and liquid waste streams (UNEP 2021).

The absence of available data and the significant level of uncertainty make it difficult to make a reliable estimation of the supply of mercury recovered from non-ferrous mining and processing operations.

### 3.2.2. Mercury from Oil and Gas

#### (a) Mercury from oil

Heavy metals, including mercury, are known to be contaminants in crude oil and natural gas. Various literature sources indicate that there is a variation in mercury concentration for crude oil and natural gas, depending on the source of the oil or gas deposits. The regions that have higher mercury concentrations in oil tend also to have higher mercury concentrations in natural gas, because in most cases crude oil and natural gas come from the same general deposits (UNEP 2022).

As per the International Petroleum Industry Environmental Conservation Association (IPIECA) data, regional differences in mercury concentration have the Middle East typically showing a lower mercury level, whereas countries in the Pacific and Indian Ocean region tend to have a higher mercury level. Owing to the great difference between the maximum and minimum mercury content of different deposits, regional averages are not good indicators for understanding and making decisions on the impact of mercury during the extraction process at the local level (UNEP 2022).

\textsuperscript{46} In Japan, the fiscal year (FY) goes from 1 April to 31 March.
Table 3-2 presents an overview of industry measurements provided to IPIECA of mercury in crude oil. These measurements were typically taken as part of the crude oil assay at the feed to a refinery crude unit, at which point much of the mercury that had been present upstream in the crude at the wellhead or production platform would have already been released in oil cargo tanks, pipelines, crude storage tanks, production wastes and emissions, etc.

Table 3-2. Regional differences of mercury content in crude oil (IPIECA)*

<table>
<thead>
<tr>
<th>Crude Region</th>
<th>Median Hg Level (ppb)</th>
<th>% of crudes and condensates containing specific ranges of mercury (ppb of mercury)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;2</td>
</tr>
<tr>
<td>Africa</td>
<td>1.0</td>
<td>72%</td>
</tr>
<tr>
<td>Eurasia</td>
<td>1.2</td>
<td>74%</td>
</tr>
<tr>
<td>Middle East</td>
<td>1.0</td>
<td>79%</td>
</tr>
<tr>
<td>North America</td>
<td>1.2</td>
<td>64%</td>
</tr>
<tr>
<td>Pacific and Indian Ocean</td>
<td>3.0</td>
<td>41%</td>
</tr>
<tr>
<td>South America</td>
<td>1.4</td>
<td>69%</td>
</tr>
</tbody>
</table>

*Source: IPIECA (2014)

Alternatively, the UNEP Mercury Toolkit (2019) lists the mercury default concentration in mineral oils (extraction, refining and use) in the wide range of 1-66 mg Hg/t (or micrograms Hg/kg or ppb). The UNEP Toolkit Reference report (UN Environment 2019) gives a weighted average mercury concentration in the range of 3.4-5.7 ppb which, given the 2018 global oil production rate of 94.7 million barrels per day (BP 2019), which roughly translates to an annual production of 4.67 billion metric tons, gives a quantity of mercury mobilized between 16-27 metric tons.

According to Qa³ (2021), on the other hand, the average mercury concentrations in crude measured by their personnel at the wellhead, supplemented where necessary by available literature, are presented in Table 3-3. These data imply the mobilization of nearly 97 metric tons of mercury annually, of which Qa³ has estimated some 30% are emitted to the air.

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47 Includes crude oil, shale oil, oil sands, condensates (both lease condensate and gas plant condensate) and NGLs (natural gas liquids – ethane, LPG and naphtha separated from the production of natural gas). Excludes liquid fuels from other sources such as biomass and derivatives of coal and natural gas.

48 Estimation carried out based on assumption that the density of crude = 0.85 tons/m³, 1 barrel = 15.9873 litres.
Table 3-3. Regional differences of mercury content in crude oil (Qa³)*

<table>
<thead>
<tr>
<th>Region</th>
<th>2019 production (million metric tons)</th>
<th>Ave. Hg concentration (micrograms/kg)</th>
<th>Mercury mobilized (metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>149</td>
<td>12</td>
<td>1.8</td>
</tr>
<tr>
<td>North America</td>
<td>927</td>
<td>15</td>
<td>13.9</td>
</tr>
<tr>
<td>Latin America</td>
<td>289</td>
<td>20</td>
<td>5.8</td>
</tr>
<tr>
<td>CIS</td>
<td>711</td>
<td>10</td>
<td>7.1</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>350</td>
<td>110</td>
<td>38.5</td>
</tr>
<tr>
<td>Africa</td>
<td>394</td>
<td>25</td>
<td>9.9</td>
</tr>
<tr>
<td>Middle East</td>
<td>1321</td>
<td>15</td>
<td>19.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4141</strong></td>
<td><strong>96.7</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Qa3 (2021).

There is relatively little evidence of mercury being recovered from upstream oil wastes, and by the time the crude reaches the refinery, the mercury that may be removed from the process is not very significant in relation to other sources of by-product mercury (UNEP 2017). Overall, based on the limited available information, it is impossible to estimate the amount of mercury actually recovered from the oil sector.

(b) Mercury from gas

Natural gas can contain variable concentrations of mercury, depending on the geological properties of the surrounding minerals, ranging from 0.05 to 9,000 micrograms/Nm³ (UNEP 2022). Typical wellhead mercury levels in natural gas in various regions are summarized below.

Table 3-4. Typical mercury content in natural gas by region*

<table>
<thead>
<tr>
<th>Region or field</th>
<th>Mercury content micrograms/Nm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>50-80</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>1 – 2000</td>
</tr>
<tr>
<td>Far East</td>
<td>0.02 – 193</td>
</tr>
<tr>
<td>Germany (Northern)</td>
<td>15 – 450</td>
</tr>
<tr>
<td>Germany (Southern)</td>
<td>&lt;0.1 – 0.3</td>
</tr>
<tr>
<td>Indonesia (Sumatra)</td>
<td>200 - 300</td>
</tr>
</tbody>
</table>

*The term "normal cubic meter" (Nm³) is a standardized unit of measurement that represents a cubic meter of a gas at a standard temperature and pressure.
### Table 3-5

<table>
<thead>
<tr>
<th>Region or field</th>
<th>Mercury content micrograms/Nm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle East</td>
<td>1 – 9</td>
</tr>
<tr>
<td>Netherlands (Groningen)</td>
<td>180 – 200</td>
</tr>
<tr>
<td>North America</td>
<td>0.005 – 40</td>
</tr>
<tr>
<td>South America</td>
<td>69 - 119</td>
</tr>
</tbody>
</table>

* Source: Lang et al. (2012).

Mercury vapor is generally removed from natural gas prior to processing and distribution due to risk of damage to metal pipes and processing equipment (UNEP 2018).

Based on in-house data generated from a number of studies and the total mass of mercury in natural gas and LPG for each region (BP - Statistical Review of World Energy 2020, 69th edition), Qa³ has estimated (Qa³ 2021) that approximately 300 metric tons of mercury were mobilized as a by-product by the oil and gas sector in 2019, of which roughly 125 metric tons were recovered from the gas sector for either resale or disposal (Maxson 2019).

### 3.2.3. Mercury recovered for commercialization

**What the Convention says**

Pursuant to paragraph 3 of Article 11, each Party shall take appropriate measures so that mercury waste is only recovered, recycled, reclaimed or directly re-used for a use allowed to a Party under this Convention or for environmentally sound disposal.

Based on available information from Article 21 reports, mercury inventories, mercury material flows, data from UN Comtrade and trade consent forms, it is possible to provide a rough estimate of mercury recovered, recycled or reclaimed and subsequently commercialized for resale or reuse. The methodology used here differentiates between:

(a) Mercury recycled or recovered from mercury-added products or processes (shown as “recycled mercury” in the table below), and

(b) Mercury recovered or reclaimed from processes or wastes in which mercury is present as a trace metal or contaminant (shown as “by-product mercury” in the table below).

Table 3-5 provides several examples.
Table 3-5. Examples of recycled and by-product mercury.

<table>
<thead>
<tr>
<th>Mercury source</th>
<th>Recycled mercury</th>
<th>By-product mercury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury-added products, such as lamps, batteries, dental amalgam, etc.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mercury-using products and applications, such as porosimeters, pycnometers and mercury used in lighthouses, typically to support the main lamp</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Sludges and wastes from chlor-alkali, sodium or potassium methylate or ethylate, alkali metal, etc. production (in which mercury or mercury compounds are used as an electrode)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Catalysts and wastes from VCM, acetaldehyde, vinyl acetate, etc. production (in which mercury or mercury compounds are used as a catalyst)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Activated carbon filters from crematoria and municipal waste incinerators (where the mercury typically comes from mercury-added products)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Oil &amp; gas industry wastes</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Large-scale gold mining and other non-ferrous metals processing</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mine tailings from ASGM (where mercury was added to recover precious metals)</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Analysis of UN Comtrade data carried out for this report indicated that the global mercury import for 2019 was about 900 metric tons. Some countries neither produce nor recover mercury for use in commerce but are simply involved as traders in the buying and selling of mercury as it moves to its final destination. The United Arab Emirates, for example, has become one of the more prominent of these trading hubs, exporting 170 metric tons of mercury in 2019, according to UAE reporting to the UNSD for UN Comtrade.

In most exporting countries, however, the source of the exported mercury is domestic recycling or recovery. For example, in trade consent forms submitted to the Secretariat, Japan reported that it exported over 24 metric tons of mercury in 2019. Based on Japan’s mercury material flow (MMF) for 2016 (MOEJ, 2016), it is likely that the majority of the exported mercury in 2019 was by-product mercury recovered from the non-ferrous metals smelting process.

In addition to the export data, it is important to consider the amount of recycled or recovered mercury that is reused within the same country. This information is typically documented in mercury inventories. For instance, the U.S. inventory (USEPA 2020, as updated December 2020) reported the production (“manufacture”) of 45 metric tons of mercury within the country in 2018, of which about 33 metric tons were sold in the U.S. While specific data for 2019 are not available, it is assumed that a similar quantity holds true for that year.

Finally, a significant quantity of mercury is recovered, especially during the processing of non-ferrous ores, and then removed from the supply chain via long-term storage or final disposal.
For example, Switzerland reported to the Secretariat that in 2019 it imported about 290 metric tons of mercury from Belgium, Argentina, Italy, Slovenia, Peru and Afghanistan, and exported only about 9 metric tons. Virtually all of the mercury imported by Switzerland was “waste” mercury destined for environmentally sound disposal.\(^5^0\)

While acknowledging the uncertainties in the available data, Table 3-6 provides estimated ranges of the quantities of mercury recovered and commercialized globally in 2019. The methodology consists of the following steps:

(a) Drawing on the sources mentioned above, assume reasonably reliable data on the mercury exports from individual countries.

(b) Based on the same sources and UNEP (2017), estimate the sources (recycled, by-product, or primary mining) of these exports, and identify which were mostly mercury in transit.

(c) Add up the quantities of recycled and recovered mercury and ignore the primary mercury and mercury in transit.

(d) Separately identify the countries that consumed their own recycled or recovered mercury, and estimate the quantities involved.

(e) For each exporting country, combine the quantities of mercury from sources c) and d) above, to give separate totals for recycled and recovered mercury.

(f) Estimate the quantities of recycled and recovered mercury that were sent to final disposal.

(g) Subtract the quantities in f) from the quantities in e) to arrive at estimates of the total quantities of recycled and recovered mercury commercialized.

More precise assessments may be made in the future as Parties’ reports to the Secretariat become more comprehensive and inclusive of these data.

\(^5^0\) The main sources were recycled mercury from the chlor-alkali industry and mercury-added products, and recovered mercury from natural gas production and from non-ferrous metals mining and smelting.
Table 3-6. Mercury recovered globally for commercialization in 2019*

<table>
<thead>
<tr>
<th></th>
<th>From mercury-added products or processes</th>
<th>From processes or wastes in which mercury is present as a trace metal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury recovered and exported</td>
<td>50-150</td>
<td>700-1000</td>
</tr>
<tr>
<td>Mercury recovered for domestic use</td>
<td>600-900</td>
<td>400-650</td>
</tr>
<tr>
<td>Less recovered mercury destined for disposal or long-term storage</td>
<td>(100-50)</td>
<td>(350-250)</td>
</tr>
<tr>
<td>Total mercury recovered and commercialized</td>
<td>550-1000</td>
<td>750-1400</td>
</tr>
</tbody>
</table>

* In metric tons.
Chapter 4. Sectoral Demand for Mercury

This chapter covers the demand of mercury in various products and processes and includes ASGM, VCM production, chlor-alkali production and mercury added products. Effort was made to use data officially provided by countries, such as Article 21 reporting by Parties, NAPs, etc., as much as possible. Data sources such as the Global Mercury Assessment (GMA) are also referenced in many cases. MIA data are used sometimes when other data sources are not available.

For mercury added products, reliable data on the “demand” of mercury used for the manufacture of mercury-added products have proven to be scarce, and publicly available data on the manufactured number of mercury-added products are not available. Due to these data limitations, the term "consumption" is defined here based on the end use of mercury-added products, rather than the general “demand” for mercury. The summary of the estimation is provided in Table 7-1.

4.1. Artisanal and small-scale gold mining

**What the Convention says**

In Article 2, the Minamata Convention states that “artisanal and small-scale gold mining” means gold mining conducted by individual miners or small enterprises with limited capital investment and production. Pursuant to paragraphs 2 and 3 of Article 7, each Party that has artisanal and small-scale gold mining and processing within its territory shall take steps to reduce, and where feasible eliminate, the use of mercury and mercury compounds in, and the emissions and releases to the environment of mercury from, such mining and processing. Each Party shall notify the Secretariat if at any time the Party determines that artisanal and small-scale gold mining and processing in its territory is more than insignificant. If it so determines the Party shall: (a) Develop and implement a national action plan in accordance with Annex C; (b) Submit its national action plan to the Secretariat no later than three years after entry into force of the Convention for it or three years after the notification to the Secretariat, whichever is later; and (c) Thereafter, provide a review every three years of the progress made in meeting its obligations under this Article and include such reviews in its reports submitted pursuant to Article 21.
Artisanal and small-scale gold mining and processing (ASGM) often involves the use of mercury to extract gold from ore or sediments. ASGM is reported to be carried out in over 80 countries with 15 million miners reported to be working in the sector globally (PlanetGOLD 2023). Among all the sectors where mercury is intentionally used, ASGM is the sector with the largest demand for mercury. The Global Mercury Assessment 2018 (UNEP 2018) has estimated the total amount of mercury used in ASGM sector to be in the range of 985 - 3032 metric tons annually (mean value 2059 metric tons). Mercury releases to air, water and land from ASGM were estimated to be over 2000 metric tons each year (UNEP 2018).

The Minamata Convention requires any Party that determines that ASGM using mercury within its territory is more than insignificant, to prepare and submit to the Secretariat a National Action Plan (NAP) within a determined time. NAPs include estimates of mercury use in the ASGM sector and can be expected to be more reliable than other estimates that may have been carried out. As of 31 April 2023, 23 Parties had prepared and submitted their NAPs to the Secretariat, whereas another 16 are preparing and/or validating their NAPs. A summary of mercury uses in ASGM based on NAPs (for 23 Parties that have submitted their NAPs) is shown below. Comparison is also made with data estimated by the GMA, where available.

Figure 4-1. Mercury use in artisanal and small-scale gold mining. Based on data from National Action Plans and UNEP (2018). Amounts shown in metric tons.
Cheng et. al. (2023) have estimated that globally 380–870 metric tons of gold are produced by ASGM each year, with a median value of 520 metric tons, and the Hg use in the ASGM sector is estimated to be 640–1000 metric tons each year, with a median value of 892 metric tons. The study also notes that significant discrepancies were found in the data calculated using different approaches.

In this report, an estimation of mercury usage in the ASGM sector was conducted by utilizing multiple data sources. Data from countries that have submitted their NAP were utilized, while for countries that have not yet prepared their NAP, the GMA data (mean value) were applied. In the case of four countries, MIA data were substituted instead of the outdated GMA data. Additionally, data from the MIA were obtained for one country not covered by GMA.

This report concludes that the estimated mercury usage in the ASGM sector amounted to approximately 2094 metric tons (range of 1389–2800 metric tons) in 81 countries.\(^51\)

### 4.2. Vinyl chloride monomer production

**What the Convention says**

Pursuant to paragraph 3 of Article 5, each Party shall take measures to restrict the use of mercury or mercury compounds in the processes listed in Part II of Annex B in accordance with the provisions set out therein. Vinyl chloride monomer production is a process listed in Part II of Annex B, with the following provisions:

Measures to be taken by the Parties shall include but not be limited to: (i) Reduce the use of mercury in terms of per unit production by 50 per cent by the year 2020 against 2010 use; (ii) Promoting measures to reduce the reliance on mercury from primary mining; (iii) Taking measures to reduce emissions and releases of mercury to the environment; (iv) Supporting research and development in respect of mercury-free catalysts and processes; (v) Not allowing the use of mercury five years after the Conference of the Parties has established that mercury-free catalysts based on existing processes have become technically and economically feasible; (vi) Reporting to the Conference of the Parties on its efforts to develop and/or identify alternatives and phase out mercury use in accordance with Article 21.

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\(^{51}\) Estimate should be regarded as an annual estimate and not for a specific year.
Vinyl chloride monomer (VCM) is a colorless chemical intermediate used for the production of PVC resins. Production of vinyl chloride monomer (VCM) with mercuric chloride involves a process whereby acetylene is combined with hydrogen chloride in the presence of a mercuric chloride catalyst. Acetylene is produced from coal-based calcium carbide. Many acetylene reliant VCM factories were replaced during the 1960s by a more efficient technology, as part of a broad economic shift from carbide to petroleum or natural gas as a source of carbon for synthesis of organic materials.52

The carbide-based process to produce VCM has been phased out in most countries, but still dominates in China, and limited production remains in Russia and India as well (UNEP 2017).

China has reported (China 2020) that during 2017-2018 there were 69 VCM production factories using the calcium carbide-based process in China and the estimated annual amount of mercury (i.e., the mercury content of the mercuric chloride catalyst) used was 700-820 metric tons. Further, in the full national report (2021), the estimated average annual use of mercury in vinyl chloride monomer production facilities in 2019-2020 was reported to be 670-790 metric tons. China also reported that, in 2020, the mercury consumption per unit product of vinyl chloride monomer had been reduced by 50% compared with 2010, in line with the requirements set out in Annex B, Part II of the Convention. A project entitled “Demonstration of Mercury Reduction and Minimization in the Production of Vinyl Chloride Monomer in China”, funded by the Global Environment Facility, is underway to promote best available technology and best environmental practice to reduce mercury use in VCM production.

India reported in the full national report (2021) that one facility was using a mercury catalyst with annual mercury consumption of 3.74 metric tons. India also reported that mercury use in VCM production has been reduced by 50% as compared with the level of 2010.

No new estimates for mercury use in other countries were available. A previous estimate of mercury use in Russia was 7.5 metric tons for 2001-2002 (A.V. Romanov 2017).

4.3. Chlor-alkali production

What the Convention says

Pursuant to paragraph 2 of Article 5, each Party shall not allow the use of mercury or mercury compounds in the manufacturing processes listed in Part I of Annex B after the phase-out date specified in that Annex for the individual processes, except where the Party has a registered exemption pursuant to Article 6. Chlor-alkali production is a process listed in Part I of Annex B, with phase-out date of 2025.

The chlor-alkali sector employs three manufacturing processes, including the mercury-cell process, to produce chlorine and sodium hydroxide (caustic soda).

There are significant variations – not only between countries but even between companies – in mercury emissions and releases generated during the chlor-alkali production process, depending on a range of design and operational factors. When mercury is emitted and released from the process, new mercury has to be added to the cells. The substantial difference between the worst and best performing plants is reflected in the Mercury Inventory Toolkit’s default values of annual mercury consumption of between 10g and 200g Hg per metric ton of chlorine production capacity. The fact that many facilities are unable to balance known mercury consumption with reported emissions and releases further complicates the work of quantifying mercury consumption in this industry.

The Minamata Convention requires that mercury-based chlor-alkali production be phased out by 2025 and that no new facilities utilizing mercury will be established for Parties to the Convention. In 2015, prior to entry into force of the Convention, there were 75 plants in 43 countries operating with the mercury-cell process (UNEP 2017). Chlor-alkali production with mercury cells has been prohibited in the EU from 11 December 2017 (Regulation (EU) 2017/852 on mercury). Of the 21 mercury-cell plants that were operating at the start of 2017 in the EU, seven have been closed and 14 have been converted, or are about to be converted, to membrane technology.53

The World Chlorine Council (WCC) reported to the Global Mercury Partnership the mercury consumption for the 12 plants in its member countries, as shown in Table 4-1, with the consumption for 2019 and 2020 being 47 and 50 metric tons, respectively.

Table 4-1. Chlor-alkali mercury consumption in selected countries (kilograms per year)*

<table>
<thead>
<tr>
<th>Country/Area</th>
<th>No. of plants</th>
<th>Capacity (1000 t Cl₂/y)</th>
<th>Purchases/Sales (kg Hg/y)</th>
<th>Consumption/Use (kg Hg/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S., Mexico, Brazil, Argentina, Uruguay</td>
<td>9</td>
<td>8</td>
<td>561</td>
<td>508</td>
</tr>
<tr>
<td>Russia</td>
<td>3</td>
<td>3</td>
<td>432</td>
<td>432</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>11</td>
<td>993</td>
<td>940</td>
</tr>
</tbody>
</table>

* “Consumption/Use” refers to mercury added to the production cells and circuits to keep the amount of mercury contained in the cells and circuits at the same constant level. “Purchases/Sales” refers to the quantity of mercury coming in or leaving (negative value) the production site (from or to other sites of the same company, other companies, traders, suppliers, etc). Source: World Chlorine Council (2020).

In the full national reports under Article 21 (2021), 10 Parties reported on chlor-alkali facilities using mercury, with total annual mercury consumption around 46 metric tons (Table 4-2). Out of the 43 countries identified as having mercury-cell plants in the 2017 UNEP report (UNEP 2017), 21 countries no longer had operating plants as of 2021, eight countries reported on their plants in their Article 21 reports, one country (Russia) reported to the WCC, two countries reported that there is no chlor-alkali facility using mercury in their MIA report, and no new information was available for 13 countries.54

Based on the production capacity of the plants in these 13 countries (414 metric tons of chlorine per year) and the historic ranges of mercury consumption (i.e., grams Hg per metric ton of chlorine capacity), this report estimates that they consume 35—45 metric tons of mercury per year. The total global mercury consumption for 2019 is therefore approximately 94 metric tons. This is a decrease from the estimated mercury consumption for 2015 in the range of 233—320 metric tons (UNEP 2017), and this is expected to further decrease with the 2025 phase-out deadline.

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54 Algeria, Angola, Bosnia & Herzegovina, Iraq, Israel, Libya, Morocco, Myanmar, Democratic Republic of Korea, Syria and Turkmenistan.
### Table 4-2. Mercury consumption in chlor-alkali plants based on 2021 national reports submitted

<table>
<thead>
<tr>
<th>Party</th>
<th>Number of facilities</th>
<th>Amount of mercury reported</th>
<th>Status of facility / Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process: Chlor-alkali (mercury-cell)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>1 facility</td>
<td>10 tons/year</td>
<td>Operational</td>
</tr>
<tr>
<td>Brazil</td>
<td>4 facilities</td>
<td>17 tons/year</td>
<td>Operational</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1 facility</td>
<td>No mercury used.</td>
<td>Operational – no mercury added to closed loop system.</td>
</tr>
<tr>
<td>Iran</td>
<td>1 facility</td>
<td>7000 kg of mercury annually</td>
<td>Operational – 1 facility Shut down – 2 facilities*</td>
</tr>
<tr>
<td>Mexico</td>
<td>2 facilities in 2015</td>
<td>9,093 kg of mercury annually</td>
<td>Shut down - 1 facility in 2016*</td>
</tr>
<tr>
<td>Peru</td>
<td>2 facilities: 1 facility (Oquendo Plant) and 1 facility (Paramonga Plant)</td>
<td>Oquendo Plant / 1,449 kg/year 2019 - Paramonga Plant / 1,242 kg/year 2019</td>
<td>Operational</td>
</tr>
<tr>
<td>United States</td>
<td>2 facilities</td>
<td>700 pounds (300 kg) per year approximately</td>
<td>Converted - 1 facility to mercury-free operation Feb. 2020 1 facility operating using mercury</td>
</tr>
<tr>
<td>Uruguay</td>
<td>1 facility</td>
<td>350 kg/year</td>
<td>Operational</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16 facilities</td>
<td>Approx. 46 metric tons / year</td>
<td>2 facilities shut down and 1 conversion to mercury-free during reporting period</td>
</tr>
</tbody>
</table>

### 4.4. Mercury-added products

**What the Convention says**

Article 4 of the Convention focuses on mercury-added products.

In accordance with paragraph 1, each Party shall not allow the manufacture, import or export of mercury-added products listed in Part I of Annex A after the phase-out date specified for those products, except where an exclusion is specified in Annex A or the Party has a registered exemption pursuant to Article 6.

As an alternative to paragraph 1, paragraph 2 establishes that a Party may indicate that it will implement different measures or strategies to address products listed in Part I of Annex A. Such an indication must be made at the time of ratification or upon entry into force of an amendment to Annex A for the concerned Party. At the time of writing this document, the only Party to have made an indication pursuant to paragraph 2 of Article 4 was the U.S. for various mercury-added products listed in Part I of Annex A.
Paragraph 3 states that each Party shall take measures for the mercury-added products listed in Part II of Annex A in accordance with the provisions set out therein. Dental amalgam is the only mercury-added product listed in Part II of Annex A.

This section aims to estimate the “demand” for mercury used in the production of mercury-added products. However, it is essential to highlight that obtaining reliable data on the “demand” for mercury used for the manufacture of mercury-added products has proven to be challenging. Additionally, publicly available data on manufactured mercury-added products are not available. Reliable data can only be acquired through collaboration with the producers involved.

Estimates have been developed, as possible, for the year 2019. The rationale is that while the study encompasses the period of 2018-2020, the availability of data from UN Comtrade for 2020 was limited compared to 2019. Therefore, 2019 was selected as the most recent year within the scope of this report.

4.4.1. Batteries

What the Convention says

Batteries (except for button zinc silver oxide batteries with a mercury content < 2% and button zinc air batteries with a mercury content < 2%) are mercury-added products listed in Part I of Annex A, with a phase-out date of 2020 for manufacture, import or export. The fifth meeting of the Conference of the Parties is to consider phase-out dates for button zinc silver oxide batteries with a mercury content < 2% and button zinc air batteries with a mercury content < 2% to be included in annex A part I.

The use of mercury in batteries continues a long decreasing trend. To estimate the use of mercury in batteries, an initial effort involved seeking data from UN Comtrade.

While now replaced in most applications by mercury-free batteries, according to the USEPA,55 “mercuric oxide batteries still are produced for military and medical equipment that need a stable current and long life. Federal law requires the manufacturer to have a system for collecting the used batteries and ensuring that the mercury is not released into the environment.” According to Comtrade data on mercuric oxide batteries (HS code 850630), global imports amounted to approximately 3.1 thousand metric tons, while global exports amounted to over 5 thousand metric tons. When assessed against known applications and previous data from 2015, this report concluded that there are serious concerns regarding the

55 https://www.epa.gov/mercury/mercury-batteries.
quality and accuracy of these Comtrade data, and the quantity of mercury cannot be estimated accurately.

Manganese dioxide (alkaline) batteries are used in toys, calculators, remote controls, cameras, etc. These batteries are the most commonly used type of button battery. At this writing (2023), mercury is likely only still used in button-cell manganese dioxide cells, although in 2019 it was still used somewhat more widely. According to the Comtrade data for manganese dioxide batteries (HS code 850610), exports for 2019 amounted to 351.1 thousand metric tons. However, the data do not separate the mercury-added manganese dioxide batteries from those that don’t contain mercury. Moreover, as submitted in comments by Canada to the Secretariat during the preparation of this report, “in reviewing data provided by Canadian customs officials, it was clear that there were errors in reporting that accounted for at least half of the entries for years 2018 and 2019.”

A different approach, therefore, is taken for the estimation of mercury consumption. According to Growth Market Report, the global coin-cell battery market was valued at USD 4.2 billion in 2019. Assuming that the manganese dioxide batteries comprised about 30% of that market, the average battery price of $0.60, the average button cell weight of 2.3 g, and the mercury content of 2 - 3 kg/metric ton, total mercury content is estimated to be in the range of 10 to 15 metric tons of mercury.

2019 Comtrade data for HS code 850640 (cells and batteries, primary, silver oxide) and for HS code 850660 (cells and batteries, primary, air-zinc) appeared equally unreliable. Meanwhile, four battery industry associations (Battery Association of Japan (BAJ), European Portable Battery Association (EPBA), National Electrical Manufacturers Association (NEMA) and Asociacion Latinoamericana de Pilas y Baterias AC (ALPiBA)), in their submission to the Minamata Convention Secretariat, have reported that they represent 90% of the global market for button zinc silver oxide and button zinc air batteries and claimed in 2020 that they had ceased manufacturing mercury-added button batteries. While there were evidently still some of these button cells manufactured with added mercury in 2019, this report concludes that the quantities of mercury in 2019 were, and especially now are low enough to be disregarded in this report.

Table 4-3 summarizes the estimated amount of mercury used in mercury-added batteries.

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated Mercury Content (metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>10 - 15</td>
</tr>
</tbody>
</table>

56 Data from https://growthmarketreports.com/report/coin-cell-batteries-market-global-industry-analysis.
Table 4.3. Amount of mercury in mercury-added batteries in 2019

<table>
<thead>
<tr>
<th>Battery type</th>
<th>Hg content (metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercuric oxide</td>
<td>Not estimated</td>
</tr>
<tr>
<td>Manganese oxide</td>
<td>10-15</td>
</tr>
<tr>
<td>Zinc-air</td>
<td>minimal</td>
</tr>
<tr>
<td>Silver-oxide</td>
<td>minimal</td>
</tr>
</tbody>
</table>

4.4.2. Dental Amalgam

What the Convention says

Part II of Annex A provides a list of nine measures to phase down the use of dental amalgam, of which parties are required to take two or more. The Annex was amended by the Conference of the Parties in its decision MC-4/3 at its fourth meeting to add two mandatory measures.

Using the UNEP Toolkit default method for estimating mercury consumption, yet with updated increased national numbers from WHO on dentists per 10,000 inhabitants, as an expression of the dental care level, generates an estimated mercury consumption in dental amalgam at 580 t/y. This number is based on the number of inhabitants nationally, in combination with the national “dentist density” and the pre-entered Toolkit input factor of 0.2 g Hg/inhabitant*y. The pre-entered input factor is in turn based on data from detailed studies for around year 2000 in countries where substantial substitution with other dental filling materials had already taken place, specifically Denmark (61% reduction at that time), Norway (>39%), Sweden (>94%) and the U.S. (see details in the Toolkit Reference Report). Taking also into account the observed increased dentist density, it therefore cannot be ruled out that the real global mercury consumption in dental amalgam could be even higher.

On the other hand, as mentioned above, some regions have made progress towards reducing the use of dental amalgam in the last decade and this is likely to have balanced to some extent the observed rise in dental care levels in developing countries. Using the full range of default factors provided in the Toolkit (0.05-0.2 g Hg/inhabitant*y), the resulting range of mercury consumption is 150-580 t/y. Independent data from the EU give the possibility for calibrating the estimate. For 2018, the estimated mercury input with dental amalgam in the EU28 was 27-58t/y, whereas earlier studies estimated an input of 55-95t/y around 2008. In comparison, the total estimated range for the EU28 (before 2020) using the Toolkit standard method is 25-99

metric tons Hg/y, which indicates that the Toolkit range may be too wide when seen in a global perspective. Consequently, a reasonable global estimate for mercury use in dental care could be 200-500 metric tons Hg/y.

The regional distribution of mercury consumption, based on this method of estimation, is shown in Table 4-4.

<table>
<thead>
<tr>
<th>Region</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia, New Zealand and Oceania</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Central America and the Caribbean</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>CIS and other European Countries</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>East and Southeast Asia</td>
<td>74</td>
<td>181</td>
</tr>
<tr>
<td>European Union</td>
<td>27</td>
<td>76</td>
</tr>
<tr>
<td>Middle East</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>North Africa</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>North America</td>
<td>19</td>
<td>47</td>
</tr>
<tr>
<td>South America</td>
<td>24</td>
<td>58</td>
</tr>
<tr>
<td>South Asia</td>
<td>22</td>
<td>55</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

* Analysis made by using UNEP Toolkit default method.

It is worthwhile to note that COP-4 of the Minamata Convention in 2022 amended part II of Annex A of the Convention by including additional measures to phase down the use of dental amalgam. The amendment entered into force on 28 September 2023 and should result in accelerating the phase down of dental amalgam globally.

4.4.3. Other mercury-added products listed in Annex A

As part of the work to develop this report, estimation of consumption of mercury for lamps, measuring devices, electrical and electronic devices was carried out, using the data from (UNEP 2017) as a basis and considering the impact of the Minamata Convention on mercury uses. However, the result of this estimation did not match well with other estimations such as the U.S. inventory (USEPA 2020, as updated December 2020) and the European Commission’s estimates on the impact of the ban of fluorescent lamps in the EU.

Another approach to aggregate the data on mercury use obtained from Minamata Initial Assessments (MIA) reports was also attempted, but since estimations were not available from many of the countries where mercury-added products are manufactured, meaningful global estimation could not be obtained.
For **lamps**, estimation for 2015 was in the range of 112–173 metric tons (UNEP 2017). Parties have taken measures to phase out fluorescent lamps containing mercury above certain amount by the deadline of 2020 or extended deadline. High pressure mercury vapor lamps for general lighting purposes are also to be phased out by the same deadline, but there are other types of lamps containing mercury, such as metal halide and high-pressure sodium lamps. Although there are market studies on the production of fluorescent lamps58, reliable data on the production of different kinds of mercury-containing lamps and their mercury content were not identified.

For **measuring devices**, estimation for 2015 was in the range of 267–392 metric tons (UNEP 2017). Parties have taken measures to phase out the use of mercury in barometers, hydrometers, manometers, thermometers and sphygmomanometers by the deadline of 2020 or extended deadline. During the commenting on an earlier draft of this report, one party observed that mercury-containing measuring devices almost disappeared from the global market. However, reliable data on mercury-containing measuring devices could not be identified.

For **electrical and electronic devices**, estimation for 2015 was in the range of 109–185 metric tons (UNEP 2017). Reliable data to estimate the use of mercury for these products could not be identified.

The use of mercury in many **cosmetic products**, including skin-lightening products, is of particular concern since this may be a significant path of exposure for individual users. Cosmetic products with mercury content above 1 ppm (with some exclusions) are listed in Annex A, part I of the Minamata Convention with a phase out date of 2020.

Many Parties have already prohibited the use of mercury in cosmetics, with specific regulations in place. Japan, for instance, has established a standard for "mercury-free" cosmetics, effectively banning mercury in these products (World Health Organization 2021). In the European Union, the marketing of cosmetics containing mercury has been prohibited under EU cosmetics regulations. In the United States, the Food and Drug Administration (FDA) has a limit of 1 ppm for mercury in skin-lightening products. China’s Hygienic Standards for Cosmetics (GB 7916–1987) and Safety Technical Specifications for Cosmetics (2015 edition) both specify a limit of 1 mg/kg of mercury in cosmetics, excluding eye cosmetics containing organic mercury preservatives.

However, despite such prohibitions, mercury is still added to skin-lightening products which are widely used, especially in Asia, Africa and the Caribbean. Even in the U.S., with a limit of 1 ppm, it has been reported that cosmetic products sold online sometimes contain as much as 8,500 ppm mercury (Zero Mercury Working Group 2023). Similarly, a study conducted in

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58 For example, commercial market report “Global Fluorescent Lighting Market Research Report by Market Research Future”.
Jamaica found mercury in a wide range of cosmetic products, ranging from 0.05 ppm to 17,547 ppm (Ricketts et al. 2020).

Parties were to phase out the use of mercury in cosmetics by 2020 or an extended deadline. However, the WHO report "Mercury in Skin Lightening Products" from 2019 revealed that mercury-containing skin lightening products were being manufactured in various countries, including Bangladesh, China, Dominican Republic, Hong Kong SAR (China), Jamaica, Lebanon, Malaysia, Mexico, Pakistan, Philippines, Republic of Korea, Thailand, and the United States of America. An online catalogue59 of skin-lightening products with added mercury has been prepared by the Zero Mercury Working Group.

Despite its continued usage, the lack of reliable data sources makes it challenging to estimate the exact amount of mercury used in cosmetic products. While the global total is likely not more than a few tens of metric tons, the potential health risks associated with mercury exposure from cosmetics emphasize the need for close monitoring and scrutiny of this usage.

4.5. Other products, processes, and applications

What the Convention says
Pursuant to paragraph 3 of Article 5, each Party shall take measures to restrict the use of mercury or mercury compounds in the processes listed in Part II of Annex B, including vinyl chloride monomer production, sodium or potassium methylate or ethylate, and the production of polyurethane using mercury containing catalysts, in accordance with the provisions set out therein.

In their full national reports (2021), Parties reported on the use of mercury or mercury compounds in other manufacturing processes as shown in table 4-5.

Mercury or mercury compounds are also used in various other sectors, such as gold plating of statues, certain traditional and religious practices, manufacture of Ayurvedic medicine, rotational balancing devices, nanotechnology manufacturing processes and applications, etc. However, estimating the mercury usage in these sectors has not been attempted due to insufficient data.

Table 4-5. Use of mercury or mercury compounds in manufacturing processes as per Parties national reports (2021)

<table>
<thead>
<tr>
<th>Party</th>
<th>Number of facilities</th>
<th>Amount of mercury reported</th>
<th>Status of facility / Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process: Sodium or potassium methylate or ethylate</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. European Union</td>
<td>Referred to member state report for details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Germany</td>
<td>Did not report amount of Hg citing confidentiality</td>
<td>Confirmed existence of facility</td>
<td></td>
</tr>
<tr>
<td><strong>Process: Polyurethane</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Uganda</td>
<td>Reported on measure, but not able to provide information on number of facilities</td>
<td>approx. 197.64 kg annually</td>
<td>No data</td>
</tr>
</tbody>
</table>
What the Convention says

Article 11 sets out measures that each Party shall take in relation to mercury wastes. Paragraph 2 of Article 11 defines mercury waste as substances or object (a) consisting of, (b) containing or (c) contaminated with mercury or mercury compounds that are disposed of, intended to be disposed of or required to be disposed of.

The mercury waste definition, as contained in article 11, excludes overburden, waste rock and tailings from mining, except from primary mercury mining, unless they contain mercury or mercury compounds above thresholds defined by the Conference of the Parties.

Paragraph 3 of Article 11 requires parties to take measures so that mercury waste is (a) managed in environmentally sound manner, (b) only recovered, recycled, reclaimed or reused for allowed uses, and (c) not transported across international boundaries except for the purpose of environmentally sound disposal.

In decision MC-3/5, the COP decided that no threshold needs to be established for mercury waste falling under category (a) or (b) mentioned above, providing the list of waste falling under category (a) and also stating that end-of-life mercury-added products are to be regarded as falling under category (b). At its fifth meeting, COP is expected to consider thresholds for mercury waste falling under category (c).

5.1. Flow of mercury waste

5.1.1. Flow of waste on a subnational level

This section covers the flow of mercury waste within a country for the purpose of disposal or other means of environmentally sound management (ESM).

Mercury waste originates from various sources because mercury is used in a wide range of products and processes, and removed from certain ores, gas, oil, etc., as an unwelcome contaminant. Obtaining accurate data on the amount of mercury waste generation is challenging and such data are often limited. According to Minamata Initial Assessment reports, many developing countries recognize that the management of mercury waste is one of the most prominent challenges to be prioritized for action (UNEP GMP n.d.). The lack of waste management facilities capable of treating mercury waste in an environmentally sound manner is a significant concern, particularly in many developing countries.

In question 11.2 of their full national reports (2021) pursuant to Article 21 (Are there facilities for final disposal of waste consisting of mercury or mercury compounds in the party’s territory?), only 19 Parties responded “yes” while 90 Parties responded “no” (5 Parties responded “do not know”). It should be noted, however, that lacking a national facility for final disposal of mercury waste is not necessarily a barrier to ESM of mercury waste, as the Minamata Convention does allow export for the purposes of environmentally sound disposal in another country. The Global Mercury Partnership (Waste
Management Area) has compiled a comprehensive catalogue of Technologies and Services on Mercury Waste Management, which is accessible online.\textsuperscript{60}

In their full national reports (2021), a number of Parties reported the amount of waste consisting mainly of metallic mercury, while others also reported the amounts of other types of mercury waste. A few Parties have provided data on mercury from the decommissioning of a chlor-alkali facility. The information provided is summarized in Table 5-1.

Table 5-1. Generation of mercury waste, as reported by Parties to the Convention

<table>
<thead>
<tr>
<th>Country</th>
<th>Waste Generation Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuba</td>
<td>7,946 metric tons of mercury sludge, 1 metric ton of “virgin” mercury and 13 metric tons of recovered mercury (currently being stored by a chlor-alkali plant in a sealed container)</td>
</tr>
</tbody>
</table>
| Canada  | 123.712 metric tons of waste consisting of mercury or mercury compounds through physiochemical treatment (D9), specially engineered landfill (D5), or a combination of both operations.  
[2017]: 24.936 metric tons  
[2018]: 31.274 metric tons  
[2019]: 24.462 metric tons  
[2020]: 43.030 metric tons |
| Croatia | [2017-2020]: 14.8668 metric tons (D9 Recovery of sorted materials) |
| Ecuador | Encapsulation and final disposal in security cells of metallic mercury  
[2015]: 1073.2 kg  
(Sum of November (998.50 kg) and December (74.7 kg)) |
| Finland | [2020]: 4.45 metric tons (mercury form chlor-alkali facility sent for disposal) |
| Greece  | 36 metric tons stored (generated from the decommissioning of former operating chlor-alkali plant). |
| Hungary | Treatment amount (of mercury from chlor-alkali facility)  
[2018]: 197.446 metric tons  
[2021]: 17.107 metric tons  
(about 3 metric tons of metallic mercury from chlor-alkali facility remaining) |
| Japan   | 7.8 t-Hg [final disposal from processing/industrial use of raw materials for FY2016 is 7.8t-Hg and from mercury recovery process is 0.029t-Hg], as per the Mercury Material Flow in Japan (FY2016) |
| Jordan  | 22 kg of mercury and 150 kg of waste containing mercury stored at a hazardous waste storage facility for potential ESM in the future. |
| Norway  | [2018]: 385 metric tons  
[2019]: 725 metric tons  
[2020]: 293 metric tons  
[2021]: 217 metric tons |

\textsuperscript{60} Accessible at https://wedocs.unep.org/bitstream/handle/20.500.11822/27819/WMA_catalog.pdf?sequence=1&isAllowed=y.
<table>
<thead>
<tr>
<th>Country</th>
<th>Waste Generation Amount</th>
</tr>
</thead>
</table>
| Qatar   | Method of final disposal: Treatment by solidification followed by disposal in a hazardous waste landfill.  
[2020]: 32.293 metric tons  
[2021]: 29.796 metric tons |
| Uruguay | 245 metric tons |

A large quantity of waste is also expected to be generated by VCM operations, but data are not available.

In terms of waste generated from mercury-added products, forecasts of the waste mercury generated worldwide were developed by the Sustainable Cycles (SCYCLE) Programme of UNU.\textsuperscript{61} As per the study (Baldé 2018), in 2017, 6.2 million metric tons (Mt) of mercury-added product waste were generated worldwide, of which around 1,300 metric tons were waste mercury (i.e., the mercury content of the mercury-added product waste). The global quantity of waste of mercury-added electrical and electronic equipment (EEE) plus non-electronic measuring devices was 4.1 Mt in 2010. As a general trend, it gradually increased by an average of 7\% per year until 2018, reaching a 2018–2025 plateau of around 6.4 Mt. The study also predicted that the amount of mercury contained in waste products is expected to slowly grow until 2025 up to a maximum of about 1550 metric tons of mercury content and then decrease rapidly in response to the Convention’s implementation. The study further estimated the mercury content of waste products to be around 190 metric tons in 2035.

In terms of excess mercury from the dismantling of chlor-alkali facilities (not including the liquid mercury previously removed from the electrolytic cells), this report estimates that for 19 facilities which have closed since 2015 (this only includes data for which chlorine production capacity information is available), an estimated amount of 150–169 metric tons of excess mercury are expected to be generated, which would need to be disposed of in an environmentally sound manner.

As highlighted previously, many countries do not have adequate data on the generation and subnational flow of mercury waste. Japan’s Mercury Material Flow (see figure below), which was also used for Article 21 reporting, is an example of how to better understand not only the generation and flow of mercury in waste within a country, but also to gather data regarding other products and processes.

\textsuperscript{61} In this study ‘waste mercury’ only refers to mercury-added products, both electric and electronic equipment (EEE) (lamps, screens and small IT) and non-EEE (thermometers, barometers, hygrometers).
Figure 5.1. Example of simplified mercury material flow in Japan. Relative to fiscal year 2016. Source: Full national report pursuant to Article 21 from Japan.

5.1.2. Transboundary movement of mercury waste

Waste having mercury as a constituent is listed in Annex I of the Basel Convention on control of transboundary movements of hazardous waste and their disposal, and subject to the various requirements of the Convention (Annex I of the Convention lists wastes containing mercury or its compounds as Y29). Pursuant to Article 13, paragraph 3 of the Basel Convention, Parties to the Convention are required to transmit their national reports to the Secretariat. The Electronic Reporting system of the Basel Convention (accessible by clicking through national reports of the respective country) lists answers to 7 questions submitted by the Parties. Table 4 of the reporting system includes information on “Export of hazardous wastes and other wastes” and Table 5 includes information on “Import of hazardous wastes and other wastes.” Annex I and VIII to the Basel Convention include the following entries that either have direct reference to mercury or are related to wastes which may contain or be contaminated with mercury. This information is summarized in Table 5-2 below.

Table 5-2. Mercury waste listed in Annexes I and VIII to the Basel Convention*

<table>
<thead>
<tr>
<th>Entries with direct reference to mercury</th>
<th>Other entries related to wastes which may contain or be contaminated with mercury</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Y29</strong></td>
<td>Wastes having as constituents: <em>Mercury, mercury compounds</em></td>
</tr>
<tr>
<td><strong>A1010</strong></td>
<td>Metal wastes and waste consisting of alloys of any of the following: Antimony,</td>
</tr>
<tr>
<td></td>
<td>Arsenic, Beryllium, Cadmium, Lead, <em>Mercury</em>, Selenium, Tellurium, Thallium, but</td>
</tr>
<tr>
<td></td>
<td>excluding such wastes specifically listed on list B</td>
</tr>
<tr>
<td><strong>A1180</strong></td>
<td>Waste electrical and electronic assemblies or scrap containing components such</td>
</tr>
<tr>
<td></td>
<td>as accumulators and other batteries included on list A, <em>mercury-switches</em>,</td>
</tr>
<tr>
<td></td>
<td>glass from cathode-ray tubes and other activated glass and PCB-capacitors, or</td>
</tr>
<tr>
<td></td>
<td>contaminated with Annex I constituents (e.g., cadmium, <em>mercury</em>, lead,</td>
</tr>
<tr>
<td></td>
<td>polychlorinated biphenyl) to an extent that they possess any of the characteristics</td>
</tr>
<tr>
<td></td>
<td>contained in Annex III</td>
</tr>
<tr>
<td><strong>Other entries related to wastes which may contain or be contaminated with mercury</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Y1</strong></td>
<td>Clinical wastes from medical care in hospitals, medical centres and clinics</td>
</tr>
<tr>
<td><strong>Y2</strong></td>
<td>Wastes from the production and preparation of pharmaceutical products</td>
</tr>
<tr>
<td><strong>Y3</strong></td>
<td>Waste pharmaceuticals, drugs and medicines</td>
</tr>
<tr>
<td><strong>Y4</strong></td>
<td>Wastes from the production, formulation and use of biocides and phytopharmaceuticals</td>
</tr>
<tr>
<td><strong>Y11</strong></td>
<td>Waste tarry residues arising from refining, distillation and any pyrolytic</td>
</tr>
<tr>
<td></td>
<td>treatment</td>
</tr>
<tr>
<td><strong>Y12</strong></td>
<td>Wastes from production, formulation and use of inks, dyes, pigments, paints,</td>
</tr>
<tr>
<td></td>
<td>lacquers, varnish</td>
</tr>
<tr>
<td><strong>Y46</strong></td>
<td>Wastes collected from households</td>
</tr>
<tr>
<td><strong>Y47</strong></td>
<td>Residues arising from the incineration of household wastes</td>
</tr>
<tr>
<td><strong>Y48</strong></td>
<td>Plastic waste, including mixtures of such waste, with the exception of ...63</td>
</tr>
<tr>
<td><strong>A1170</strong></td>
<td>Unsorted waste batteries excluding mixtures of only list B batteries. Waste</td>
</tr>
<tr>
<td></td>
<td>batteries not specified on list B containing Annex I constituents to an extent</td>
</tr>
<tr>
<td></td>
<td>to render them hazardous</td>
</tr>
<tr>
<td><strong>A2030</strong></td>
<td>Waste catalysts but excluding such wastes specified on list B</td>
</tr>
<tr>
<td><strong>A2060</strong></td>
<td>Coal-fired power plant fly-ash containing Annex I substances in concentrations</td>
</tr>
<tr>
<td></td>
<td>sufficient to exhibit Annex III characteristics (note the related entry on list B B2050)</td>
</tr>
<tr>
<td><strong>A3170</strong></td>
<td>Wastes arising from the production of aliphatic halogenated hydrocarbons (such</td>
</tr>
<tr>
<td></td>
<td>as chloromethane, dichloro-ethane, vinyl chloride, vinylidene chloride, allyl</td>
</tr>
<tr>
<td></td>
<td>chloride and epichlorohydrin)</td>
</tr>
<tr>
<td><strong>A3210</strong></td>
<td>Plastic waste, including mixtures of such waste, containing or contaminated</td>
</tr>
<tr>
<td></td>
<td>with Annex I constituents, to an extent that it exhibits an Annex III</td>
</tr>
<tr>
<td></td>
<td>characteristic (note the related entries Y48 in Annex II and on list B B3011)</td>
</tr>
<tr>
<td><strong>A4010</strong></td>
<td>Wastes from the production, preparation and use of pharmaceutical products but</td>
</tr>
<tr>
<td></td>
<td>excluding such wastes specified on list B</td>
</tr>
</tbody>
</table>

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63 See full text of Y48 in the Convention.
A4020 | Clinical and related wastes; that is wastes arising from medical, nursing, dental, veterinary, or similar practices, and wastes generated in hospitals or other facilities during the investigation or treatment of patients, or research projects

A4030 | Wastes from the production, formulation and use of biocides and phytopharmaceuticals, including waste pesticides and herbicides which are off-specification, outdated, or unfit for their originally intended use

A4070 | Wastes from the production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish excluding any such waste specified on list B (note the related entry on list B B4010)

A4080 | Wastes of an explosive nature (but excluding such wastes specified on list B)

A4100 | Wastes from industrial pollution control devices for cleaning of industrial off-gases but excluding such wastes specified on list B

A4130 | Waste packages and containers containing Annex I substances in concentrations sufficient to exhibit Annex III hazard characteristics

A4140 | Waste consisting of or containing off specification or outdated64 chemicals corresponding to Annex I categories and exhibiting Annex III hazard characteristics

A4160 | Spent activated carbon not included on list B (note the related entry on list B B2060)

* Source: Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with mercury or mercury compounds65

Analysing data reported as Y29 can be a valuable source of information on the transboundary movement of mercury waste.66 However, there are several limitations to this data source.

(a) In some cases, various types of waste products (Y29 along with waste materials with other codes) are grouped together and hence it is not possible to distinguish mercury waste from other waste types.

(b) Reporting is not uniform, and not all countries may report the amount for a particular year, resulting in many data gaps.

(c) The reported data do not include information on mercury content, making it impossible to estimate the amount of mercury present.

Despite these limitations, analysing the Basel Convention reporting data can still be useful in understanding the trends of transboundary movement of waste, particularly in the absence of other usable data sources.

5.1.2.1. Analysis based on export data

An analysis of export data for Y29 (Mercury; Mercury Compounds), as reported by the Parties for 2018-2020 to the Basel Convention, is shown in Figure 5-2. Exports from the top 10 countries, as reported to

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64 “Outdated” means unused within the period recommended by the manufacturer.


66 Basel Convention has 190 Parties as of January 2023.
the Basel Convention, are shown in Figure 5-3. It should be noted that some countries may have reported multiple codes for the same type of waste in the Basel Convention reporting system, and the amount of mercury contained may be very small. Despite this limitation, a general trend in the transboundary movement of mercury waste can still be observed.

The data show that for the years 2018–2020, Indonesia, Trinidad and Tobago, Denmark, Thailand, France, the UK, Sweden, Norway, the Netherlands, and Poland were the top 10 countries exporting waste classified as Y29. This analysis is based on the data reported by Parties to the Basel Convention, and it should be noted that there may be other transboundary movements of mercury waste that have not been reported and are therefore not reflected in this analysis.

Figure 5-2. Export of mercury waste from the top 20 countries. Based on Basel Convention reporting (as Y29 waste).
Based on the data presented, several observations can be made regarding the transboundary movement of mercury waste (Y29) from the top 10 exporting countries, as follows:

(a) Indonesia: Indonesia has reported that nearly all of their exported waste classified as A1030, which includes waste having mercury as a constituent or contaminant, is sent to Japan for recycling purposes. The waste type is primarily reported as "waste containing mercury," "liquid waste containing mercury," and "spent catalyst contaminated by mercury." A small quantity of waste electrical and electronic equipment (WEEE) assemblies is also exported to Korea, China, and Singapore.

(b) Trinidad and Tobago: Trinidad and Tobago reported exporting waste classified as Y9/Y29/Y36, which is described as "Waste end-of-life vehicle: Ultra-Deepwater Drillship."
The waste is primarily exported to Türkiye for recycling (R4/R12/R13) and disposal purposes. However, it is unclear from the reported data how much of the exported waste is classified as Y29.

(c) Denmark: For 2019, the majority of waste exported from Denmark is classified as A1180 (waste electrical and electronic assemblies of scrap) and is exported to Sweden for recycling (R12). For 2020, the majority of export is for A1080 (waste zinc residue containing lead or cadmium) and it is not clear how much mercury is contained, although it is reported to include Y29. Small amounts of waste containing mercury are also exported to Germany for disposal and recovery, recycling, or reclamation.

(d) Thailand: Includes export of mainly electronics parts to Korea, Japan, and Singapore for R-operation.

(e) France: France has reported (in 2019) the export of waste classified as A1030 (waste having mercury as constituent or contaminant) to Belgium for the purpose of recycling/reclamation (R5).

(f) UK: The largest export in 2019 is the export of waste reported as a “vessel” to Türkiye for recycling/recovery (R4 operation). Other reported export is to Germany of waste consisting or containing mercury for the purpose of final disposal or recycling (R4 operation). In 2020, reported export includes export of gas field installation equipment to the Netherlands for decommissioning.

(g) Sweden: Export mainly includes export of hazardous components from discarded equipment to Poland and a variety of waste types (laboratory chemicals, batteries, amalgam waste, fluorescent tubes, etc.) to Germany for disposal and recycling.

(h) Norway: Major export includes export of unspecified mercury waste (2018) and waste electrical and electronic assemblies or scraps (2019, 2020) to Sweden for recycling (R4 operation).

(i) Netherlands: Major export includes the export of A1030 (waste having mercury or mercury compound as constituent or contaminant) to Germany for disposal and to Belgium for recycling/recovery (R4 operation).

(j) Poland: Poland has reported the export, mainly of A1030 (waste having mercury as its constituent or contaminant) to Germany.

(k) Argentina: In its communication to the Minamata Convention Secretariat in July 2023, Argentina reported that it exported 100.7 tons of elemental mercury waste to Switzerland in 2021, most of it likely a by-product of large-scale mining operations.

5.1.2.2. Analysis based on import data

An analysis of transboundary movement of import data for Y29 (mercury; mercury compounds), as reported by the Parties to the Basel Convention for 2018-2020, is presented below. In Figure 5-4, the top

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67 R4: Recycling/reclamation of metals and metal compounds. R12: Exchange of wastes for submission to any of the operations numbered R1-R12, R13: Accumulation of material intended for any operation in section B.
10 countries are shown ranked by their reported import of mercury waste (Y29). Figure 5-5 provides a detailed breakdown of the countries of origin for the top importing countries.

Figure 5-4. Transboundary movements of mercury waste for 2018—2020. Based on Basel Convention reporting by the countries of import (reported as Y29 waste).
Based on the data presented, several observations can be made regarding the transboundary movement of mercury waste from the top 15 importing countries, as follows:

(a) Canada has reported an import of a large amount of A1030 from the U.S. for the purpose of D9 and D13 operations\(^\text{68}\).

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\(^{68}\) Annex IV of the Basel convention defines D9 operation as “Physico chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations in Section A, (e.g., evaporation, drying, calcination, neutralization, precipitation, etc.),” and D13 operation as “Blending or mixing prior to submission to any of the operations in Section A”.

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Figure 5-5. Transboundary movements of mercury waste as reported by the top 15 importing countries for 2018—2020. Based on Basel Convention reporting (as Y29 waste).
(b) Import to Sweden is mainly of A1180 (discarded electrical and electronic equipment) from Denmark and Norway.

(c) The main import to South Africa is a large amount of waste CFL containing mercury from Eswatini and a smaller amount from Botswana and Lesotho.

(d) In 2020, the UK reported import of about 40,000 metric tons of “platforms-redundant topsides, jackets, bridges & flares,” classified as Y29/Y36/Y9 from Canada. Judging by the description, the mercury content is likely to be small.

(e) Import to Germany is from European countries mainly of A1010 (some of which is reported as amalgam waste) and A1030 (waste having mercury as contaminant or constituent).

(f) Import to Germany is mainly of A1030 (waste having mercury as contaminant or constituent) from France, Netherlands, Denmark and other European countries.

(g) All the reported import to Poland is A1180 (discarded electrical and electronic equipment) from Sweden, Norway and the Netherlands.

(h) Import to Spain is mainly of batteries and accumulators from France.

(i) Thailand has reported import of A1030 (waste having mercury as constituent or contaminant) from Australia, New Zealand and Pakistan.

(j) Major import to Australia includes mercury contaminated sludge from Indonesia and E-waste from New Zealand.

(k) Import to Estonia is only of A1180 (discarded electrical and electronic equipment) from Sweden and Finland.

(l) Reported import by Japan is mainly of A1030 (waste contaminated by mercury) from Indonesia, the Philippines and Thailand.

(m) Import to Italy is mainly of A1030 (waste having mercury as constituent or contaminant) from France, with a small amount from other European countries.
Chapter 6. Mercury Stocks

What the Convention says

Pursuant to paragraph 5 (a) of Article 3, each Party shall endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year, that are located within its territory.

The term “stock” mentioned in this chapter refers to individual stock of mercury or mercury compounds as mentioned in Article 3(5)(a) of the Minamata Convention and excludes mercury accumulated in the society such as mercury in mercury-added products and in waste disposal sites.

6.1. Reported stocks of mercury

In the full national report (2021), 56 Parties indicated that they had made efforts to comply with this requirement, while some countries also reported their stocks. The total reported stocks of mercury have been compiled in Table 6-1 using data from the full national reports (2021) as well as other publicly available sources.

Table 6-1. Reported stocks of mercury.

<table>
<thead>
<tr>
<th>Country</th>
<th>Amount (metric tons)</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>70(^{69})</td>
<td>Full national report (2021)</td>
</tr>
<tr>
<td>Japan</td>
<td>47.915</td>
<td>Full national report (2021)</td>
</tr>
<tr>
<td>USA</td>
<td>5600</td>
<td>Full national report (2021)</td>
</tr>
<tr>
<td>Italy</td>
<td>52.622</td>
<td>Short national report (2019; EU)(^{70})</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>422</td>
<td>MIA (2019)(^{71})</td>
</tr>
<tr>
<td>Mongolia</td>
<td>0.3</td>
<td>MIA (2019)</td>
</tr>
</tbody>
</table>

\(^{69}\) Argentina, in its communication to the Minamata Convention Secretariat in July 2023, has reported that this amount is derived as a by-product from the gold mining industry and is exported as waste.

\(^{70}\) Accessible at https://www.mercuryconvention.org/sites/default/files/2021-06/EU_Art3_Q3.pdf.

<table>
<thead>
<tr>
<th>Country</th>
<th>Amount (metric tons)</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nepal</td>
<td>0.04</td>
<td>MIA (2019)&lt;sup&gt;72&lt;/sup&gt;</td>
</tr>
<tr>
<td>Peru</td>
<td>294.76</td>
<td>Full National Report (2021)&lt;sup&gt;73&lt;/sup&gt;</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>0.204</td>
<td>MIA (2018)&lt;sup&gt;74&lt;/sup&gt;</td>
</tr>
</tbody>
</table>


<sup>73</sup> Accessible at [https://mercuryconvention.org/sites/default/files/2022-08/PER_3.3.pdf](https://mercuryconvention.org/sites/default/files/2022-08/PER_3.3.pdf).

Chapter 7. Summary

Overall estimates of mercury trade, supply, and demand are summarized in Table 7-1. Alongside the data for 2019, a comparison with the estimates for 2015 (UNEP 2017) is also provided.

Analysis of the trade of mercury, based on data provided by the Parties, in their national reports, was not possible due to lack of sufficient data. However, the reported amount of import and export for 2019, based on UN Comtrade, is in the range of 500-900 metric tons, indicating a downward trend compared to the 2015 figure, which itself was lower than previous years. However, it is important to note that these data do not encompass the undocumented and illegal (UI) trade of mercury, which is still prevalent in the ASGM sector, and may be substantial as mentioned elsewhere in this report.

Regarding the supply of mercury from primary mining, as shown in the table, the reported amount for 2019 is much lower than the amount estimated for 2015. However, from all Parties that submitted their national reports, only two have reported official mining and related data. Moreover, some Parties have reported the presence of illegal/informal primary mining, without providing any amounts. Together with the fact that there are also non-Parties where mining is thought to take place, for which no information is available on the amounts of mercury produced, the amount of mercury estimated through the study underlying this report is expected to be an underestimation of the actual amount of global mercury supply from primary mining.

Data on by-product mercury recovered from non-ferrous metal smelting were unavailable, and no estimation has been made. The amount of by-product mercury recovered during oil and gas production is believed to be at least 125 metric tons, but this figure includes mercury that is disposed of or resold.

Estimations of recovered and commercialized mercury from products, processes, and waste is estimated to be in the range of 1300—2400 metric tons. It should be noted that these figures are based on a range of assumptions, and more data are required to obtain a more accurate representation.

The median value in the range of mercury consumption in the ASGM sector is around 2100 metric tons, some 20% higher than the 2015 figure of about 1740 metric tons.

The estimated mercury consumption for VCM is approximately 800 metric tons. No new information on mercury use in VCM in Russia was available when this report was drafted.

In the chlor-alkali sector, mercury consumption was estimated to be about 94 metric tons in 2019, marking a significant decrease compared to the range of 233—320 metric tons reported in 2015. This decrease can largely be attributed to the 2017 ban on mercury use in chlor-alkali processes within the European Union, when the Minamata Convention entered into force, and the closure of some facilities in other countries.

Regarding mercury-added products, the estimation for 2019 assumes a decrease in mercury consumption compared to 2015, mainly due to the 2020 phase-out date set for most of these...
products. However, data on the actual demand for mercury in production are necessary for a more accurate estimation.

Quantitative estimation of mercury in waste is not feasible due to data unavailability.
| Table 7-1. Summary estimates of trade, supply and demand of mercury (in metric tons) |
|--------------------------------------|----------------|----------------|----------------|
| **Trade**                           | 2015           | 2019           | Notes                      |
| Import                              | About 1200     | 660-780 (a)    | (a) Based on UN Comtrade Database |
| Export                              | About 1400     | 500-830 (a)    |                            |
| **Supply**                          |                |                |                            |
| Primary mining                      |                |                |                            |
| By-product mercury                  |                |                |                            |
| Non-ferrous ores                    | 1630 - 2150    | > 250 (b)      | (b) Data for some countries not available |
| Oil and gas                         | 440-775        | Data needed    |                            |
| Recovered and commercialized        |                |                |                            |
| From mercury-added products         | 1040 – 1410 (d) | 550-1000      | (d) Includes mercury from VCM catalyst, products, waste and chlor-alkali (non-cell) |
| From processes and wastes           |                | 750-1400       |                            |
| **Demand**                          |                |                |                            |
| ASGM                                | 1740           | 1389-2800      |                            |
| VCM                                 | 1210 – 1240    | > 800 t (e)    | (e) Latest data from Russia are not available |
| Chlor-alkali                        | 233-320        | 94             |                            |
| Mercury-added products              |                |                |                            |
| Batteries                           | 195            | 10-15          | Manganese oxide batteries |
| Dental amalgam                      | 226 - 322      | 200-500*       | Due to unavailability of data on demand for use in these products, estimation has been carried out for the consumption of end products |
| Lamps                               | 112 -173       | Data needed    |                            |
| Measuring devices                   | 267 – 392      | Data needed    |                            |
| Electrical and electronic devices   | 109 – 185      | Data needed    |                            |
| **Stocks**                          |                |                |                            |
| 580(f)                              | 5700**         |                | (f) Estimate of drawdown of stocks to supply |
| Waste                               | Not covered    | Data needed    |                            |

* Estimation using the UNEP Toolkit method
** Only the sum total of stock reported by the Parties in Article 21 reporting has been included. Other sources have not been included and this can be expected to be an underestimation.
Chapter 8. Way Forward to Address Data Gaps

In light of the findings and limitations of this report, a number of observations may serve to address the data gaps with regard to trade, demand and supply of mercury:

(a) Firstly, it is crucial to prioritize efforts in improving the availability and reliability of data by encouraging Parties to collect and share information to the Secretariat through appropriate means. This will help mitigate the lack of data, and the reliance on questionable sources and minimize the need for assumptions and estimations. Additionally, special attention should be given to supporting developing countries in identifying and establishing reliable data sources, as they may face unique challenges in this regard.

(b) However, it is important to recognize that this process will not be straightforward even with possibly improved data and will require substantial time and effort. Therefore, countries may wish to take the initiative to identify areas where data on the use/demand/consumption of mercury are lacking, and determine the priorities for more concentrated efforts. These priorities can be tailored to specific countries and regions, taking into account their specific needs and capacities.

(c) High-quality data are fundamental for carrying out an effectiveness evaluation of the Minamata Convention. Insufficient data leads to estimates using sources that may contain uncertainties, which should be minimized as much as possible. Therefore, it is imperative for all Parties to the Convention to furnish country-specific data. However, it is also important to note that even officially provided data may sometimes be problematic. Consequently, it becomes vital for different ministries or agencies within a country to collaborate and coordinate their efforts. By doing so, a more accurate and clear picture of the country’s situation can be presented, ensuring that the official data are indeed representative of reality.

(d) To effectively differentiate products that contain mercury from those that do not, it is recommended that countries voluntarily establish appropriate customs codes. These customs codes would provide a specific classification system to identify and track mercury-added products within the Comtrade database. By implementing such codes, countries can streamline data collection processes and reduce the need for individual data generation. This approach not only facilitates accurate monitoring of the flow of mercury-added products but also relieves the pressure on countries to independently gather and report data. The Conference of the Parties, at its fourth meeting, invited Parties to use such customs codes when implementing trade provisions of the convention.

(e) Data availability regarding mercury waste is uncertain, with most countries lacking systems to track the quantity and movement of such waste internally. Encouraging countries

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75 Canada has noted, in its communication to the Secretariat, that Canada has found it useful to have companies report to the government directly on their import, export and manufacture of products containing mercury.

76 See document UNEP/MC/COP.4/27 - Customs codes.
to implement electronic manifest systems to track waste would greatly enhance data generation on the flow of mercury-containing waste. Developing countries can benefit by adopting electronic manifest systems, as they streamline data collection and facilitate easier gathering of relevant information.

(f) Mercury Material Flow (MMF) analysis visually presents the life-cycle flow of mercury in a country by integrating relevant country specific information. If updated and upgraded periodically, the MMF may also be used to examine the impact and effectiveness of domestic policy measures (Ministry of the Environment, Japan n.d.). Countries could be encouraged and supported to develop Mercury Material Flow (MMF) reports to effectively gather data, prioritize data collection efforts, and better fulfil Article 21 reporting obligations. This comprehensive framework will enhance understanding of mercury flows and facilitate informed decision-making based on reliable data. Japanese MMF provides a good example.

(g) While only a minority of the products and processes listed in Annexes A and B of the Convention involve mercury compounds, some of these (e.g., skin lightening creams) may present uniquely challenging enforcement circumstances and/or adverse health consequences. A mercury compound inventory would help to better understand the global situation. This trade is not currently subject to the reporting and restriction provisions applicable to elemental mercury under the Convention. Beyond the use of compounds in certain products, there remains the possibility that mercury compounds such as cinnabar or calomel may be traded for the purpose of recovering the elemental mercury content. As some have already done, other Parties may wish to define appropriate customs codes to track some of the key mercury compounds of interest.

(h) The national reporting format could be revised to incorporate more questions to encourage the reporting of quantitative information to support any assessment of the effectiveness of the Convention. While providing quantitative information may be challenging for some Parties, this information would be very helpful in making more accurate quantitative estimations of the trade, supply, and demand of mercury. Implementing these changes in the reporting format would yield long-term benefits by improving data quality and enhancing Parties’ understanding of the subject matter.
References


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Annex 1: Geographic regions defined for this study

**East and Southeast Asia**
Brunei Darussalam, Cambodia, China, Indonesia, Japan, Korea (DPR of), Korea (Republic of), Lao People’s DR, Malaysia, Mongolia, Myanmar, Papua New Guinea, Philippines, Singapore, Thailand, Timor-Leste, Vietnam

**South Asia**
Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka

**European Union**
Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom

**CIS and other European countries**
Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Gibraltar, Iceland, Kazakhstan, Kosovo, Kyrgyz Republic, Liechtenstein, Macedonia (FYR), Moldova (Republic of), Montenegro, Norway, Russian Federation, Serbia, Switzerland, Tajikistan, Turkmenistan, Ukraine, Uzbekistan

**Middle East**
Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Türkiye, United Arab Emirates, West Bank and Gaza, Yemen

**North Africa**
Algeria, Egypt, Libya, Morocco, Tunisia

**Sub-Saharan Africa**

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77 The United Kingdom withdrew from the EU on 31 January 2020. However, because the analysis in this report has focused on the period of 2018-2020, it is being shown here as part of the European Union.
North America
Canada, Greenland, United States of America

Central America and the Caribbean
Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Montserrat, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Is., Virgin Islands (US)

South America
Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Falkland Is. (Malvinas), Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela

Australia, New Zealand, and Oceania
Australia, Cook Islands, Fiji, French Polynesia, Kiribati, Marshall Islands, Micronesia (Fed. States of), Northern Mariana Islands, Nauru, New Caledonia, New Zealand, Niue, Palau, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis and Futuna Islands