

1 **Minamata Convention on Mercury**

2

3 **DRAFT Report on the work of the ad hoc technical group on effectiveness**
4 **evaluation**

5

6 **Open for comment: 1 August to 5 September 2019**

7 Comments to: mea-minamatasecretariat@un.org

8

9 Enquiries to be sent to: Claudia.tenHave@un.org and Eisaku.Toda@un.org

10

11

Table of Content	
Executive summary	
I Introduction	
II Overall description of the effectiveness evaluation framework	
III Proposed methodology and schedule for the evaluation	
IV Issues for further consideration	
Annex 1: Technical information on monitoring	
Annex 2: Draft terms of reference of the effectiveness evaluation committee	
Annex 3: Draft terms of reference of the global monitoring arrangements	
Annex 4: Description of the reports to be prepared for the Effectiveness Evaluation Committee	

12

13

14 **Executive Summary**

15

16 **Introduction**

17

18 This report proposes a framework for the effectiveness evaluation and monitoring
19 arrangements under the Minamata Convention on Mercury. The report was developed by the
20 ad hoc technical expert group based on mandates provided in decisions MC-1/9 and MC-
21 2/10, and information contained in submissions by Parties, stakeholders and other
22 information. The report represents the outcome of consultations and review performed by
23 experts, including two meetings of the ad hoc group in 2018 and 2019 respectively, with
24 follow-up drafting and reviewing by experts and commentators.

25

26 Building on the identification of elements for the effectiveness evaluation framework and
27 review of monitoring activities included in the first report from the ad hoc group to COP-2,
28 this report proposes a framework setting out arrangements, information flows, and the
29 required reports on which the Effectiveness Evaluation Committee will base its consideration
30 of the effectiveness of the Convention for presentation to the Conference of the Parties.

31

32 **Effectiveness evaluation framework**

33

34 In sections II and III, the report elaborates on the proposed organization of the effectiveness
35 evaluation framework.

36

37 The effectiveness evaluation is based on four policy questions that will allow the Conference
38 of the Parties to consider whether the Convention will achieve its objective of protecting
39 human health and the environment from the anthropogenic emissions and releases of mercury
40 and mercury compounds. The policy questions are:

- 41 1. Have the Parties taken actions to implement the Minamata Convention?
- 42 2. Have the actions resulted in changes in emission and releases of mercury to the
43 environment?
- 44 3. Have these changes in emission and releases resulted in changes in levels of
45 mercury in the environment, biota and humans attributable to the Convention?
- 46 4. Will existing measures under the Minamata Convention be sufficient to meet its
47 objectives of promoting human health and environment from mercury?

48

49 The framework relies on evaluating evidence along the causal pathway linking actions to
50 implement the Convention, associated changes in emissions and releases, and resulting
51 changes in levels and trends in the global environment, biota, and humans. The ad hoc group
52 proposes sets of indicators on process, outcome and monitoring to inform these policy
53 questions. The proposed indicators draw on previous work on elements of the effectiveness
54 evaluation framework and the review of monitoring capacities and abilities.

55

56 Numerous indicators, developed following an article-by-article review, are clustered to
57 enable synthesized analysis for an integrated picture. Specific articles of central or
58 crosscutting importance to the overall provisions are not clustered (such as Art 1 and 16). The
59 following articles and indicators are clustered:

- 60 ▪ **Supply cluster:** supply, storage and waste (Art 3, 10, 11);
- 61 ▪ **Demand cluster:** products, processes and ASGM (Art 4,5,7);
- 62 ▪ **Pressures cluster:** emissions, releases and contaminated sites (Art 8, 9, and 12),
- 63 ▪ **Support cluster:** financial and technical assistance (Art 13 and 14), and
- 64 ▪ **Information and research cluster:** information exchange, public information,
- 65 research (Art 17, 18 and 19).

66

67 Article 22, paragraph 3 indicates that the evaluation shall be conducted using available
68 scientific, environmental, technical, financial and economic information. Two streams of
69 information are referred to in this regard: (i) information provided by Parties based on Article
70 21 reporting, and (ii) information and knowledge that is scientific, peer-reviewed and
71 publicly available.

72

73 Based on such information the framework foresees five reports to be produced (see
74 description in Section III and Annex 4). The following four synthesis reports are to be
75 prepared:

- 76 1. The state of global mercury levels in the environment, biota and humans, as well
77 as trends over time, that is a **Global Monitoring Report**;
- 78 2. **Emissions and Releases** – modelled after the *Global Mercury Assessment (2018)*
- 79 3. **Trade, Supply and Demand** – modelled after the report on *Global Mercury:*
80 *Supply, Trade and Demand (2017)*;
- 81 4. **Waste Management** – building on the *Global Mercury Waste Assessment (2018)*.

82

83 The framework presents a flow of information from level 1 to level 6, namely starting from
84 collecting information, to compiling information, to analysing and synthesizing information
85 (levels 1 to 3). The framework then foresees an integrating function (level 4) before reaching
86 the Effectiveness Evaluation Committee (level 5) and the Conference of the Parties (level 6).

87

88 The framework identifies different entities that have different roles in the process. While
89 some entities already exist (i.e. those for administrative and programme support, compilation
90 of data for synthesis reports, etc.) there are others who are to perform vital scientific and
91 technical analyses to implement the framework, but they are not in place yet.

92

93 The framework foresees two scientific and technical functions to perform analysis, synthesis
94 and interpretation at levels 3 and 4: The first function (level 3) is to synthesise mercury
95 information collected and compiled. This function foresees a role for the secretariat, for
96 scientists and experts, and for organisations. The second function (level 4) is to interpret the
97 information and knowledge collected and synthesised, to interpret the linkages between
98 policy actions, emission reductions and resulting mercury levels, using available data sources,
99 modelling techniques and analytical tools drawn from natural and social sciences. The
100 function foresees the production of the **Integrated Assessment Report** for the Effectiveness
101 Evaluation Committee. This report is to be science-based but should be accessible to non-
102 technical readers.

103

104 The Effectiveness Evaluation Committee (see its Terms of Reference in Annex II of the
105 report) will consider all the reports produced to consider the policy questions outlined above

106 and derive conclusions about the effectiveness of the Convention for its report to the
107 Conference of the Parties.

108

109 Thereafter, the Conference of the Parties receives and reviews the report of the Effectiveness
110 Evaluation Committee, and considers the conclusions and recommendations for the
111 Convention.

112

113 The framework is submitted to the third meeting of the Conference of the Parties for
114 adoption, and foresees a timeline for the first cycle of the effectiveness evaluation where the
115 fourth meeting of the Conference of the Parties establishes the Effectiveness Evaluation
116 Committee, and the fifth meeting of the Conference of the Parties considers the findings of
117 that Committee.

118

119 The report also outlines in Section IV further issues for the Conference of the Parties to
120 consider at its third meeting, including a proposed draft decision.

121

122 **Monitoring arrangements**

123

124 The report addresses the task outlined in decisions MC-1/9 and MC-2/10 in relation to
125 monitoring, by reviewing available monitoring data, identifying gaps, examining modelling
126 capabilities, and outlining global monitoring arrangements.

127

128 In considering monitoring information data, the ad hoc group considered matrices mentioned
129 in MC-2/10: air, humans, biota and water. The ad hoc group concluded that data on levels of
130 mercury in air, biota and humans either are available or would be able to be obtained and
131 comparable on a global basis.

132

133 Levels of mercury and mercury compounds in water are collected in relation to water quality
134 issues in a number of countries. These data may be useful in tracking mercury resulting from
135 local activities which release mercury; however, it will not provide overall trends on a global
136 basis. Levels of mercury in ocean water could be comparable on a global basis and collected
137 by existing networks and ad hoc research programmes, but currently such work is done
138 through research-based activities and not dedicated long-term monitoring programmes

139

140 The global modelling capabilities have been reviewed in order to understand availability of
141 tools for the use in the effectiveness evaluation. The models complement monitoring data
142 with estimation based on scientific understanding of mechanisms affecting mercury
143 behaviour. Models for different media (air, water, land, biota) vary in their ability and state of
144 development. Atmospheric models have been extensively evaluated and can be applied to
145 assess spatial gradients in atmospheric mercury concentrations and deposition, as well as
146 temporal changes. By contrast, models for other media such as land are still mainly used in
147 research applications. Integrated models that work across media drawing on expertise that
148 bridges natural science, social science, and engineering, are undergoing rapid development in
149 the scientific and academic community and are expected to be available by 2023 for policy-
150 relevant analyses.

151

152 In the consideration of the monitoring arrangements, the following key elements were
153 identified:

- 154 ▪ Mercury data and their availability from human health and environmental
155 monitoring programmes that achieve global coverage and contain at least core
156 representative data from all regions,
- 157 ▪ Tools supporting data harmonization such as standard operating procedures
158 and monitoring guidance document,
- 159 ▪ Expertise necessary for gathering and consolidating harmonized information
160 that ensures comparability and consistency in monitoring data over the long-
161 term,
- 162 ▪ Modelling capabilities, and
- 163 ▪ Development of a global periodic report to support the effectiveness
164 evaluation.

165
166 In line with the proposal to perform scientific functions and to carry out tasks related to work
167 with monitoring indicators identified in the effectiveness evaluation framework, scientific
168 expertise and qualifications are required to oversee the gathering and consolidation of
169 monitoring data. It is proposed that this task should be overseen by an expert body whose
170 terms of reference are proposed in Annex 3.

171
172 **NOTE:** In addition to this report, the ad hoc group developed a complementing information
173 document. Part 1 of that document provides a more detailed review of available monitoring
174 data and background on the proposal for monitoring activities with further scientific and
175 technical details. Part 2 of the information document contains a proposal for elements of the
176 guidance document for mercury monitoring that will be developed under the monitoring
177 arrangements to be established by the Conference of the Parties.

178
179

180 I. Introduction

- 181
- 182 1. At the first and second meetings, the Conference of the Parties tasked an ad hoc
183 expert group to consider the arrangements to be put in place to provide the
184 Conference of the Parties with the required information to conduct an effectiveness
185 evaluation of the Minamata Convention on Mercury.¹ The effectiveness evaluation is
186 to be conducted at regular intervals, with the first taking place within six years after
187 the entry into force of the Convention.² This report is the outcome of the consultation
188 and deliberations of the ad hoc expert group to put in place arrangements to conduct
189 an effectiveness evaluation.
- 190 2. Article 22 of the Minamata Convention in paragraph 2 stipulates that the Conference
191 of the Parties, shall initiate the establishment of arrangements for providing itself with
192 comparable monitoring data on the presence and movement of mercury and mercury
193 compounds in the environment, as well as the trends in the levels of mercury and
194 mercury compounds as observed in biotic media and vulnerable populations.
195 Paragraph 3 of that article further stipulates that the evaluation shall be conducted
196 based on available scientific, environmental, technical, financial and economic
197 information, including:
- 198 (a) Reports and other monitoring information provided to the Conference of
199 the Parties pursuant to paragraph 2;
- 200 (b) Reports submitted pursuant to Article 21;
- 201 (c) Information and recommendations provided pursuant to Article 15; and
- 202 (d) Reports and other relevant information on the operation of the financial
203 assistance, technology transfer and capacity building arrangements put in place
204 under this Convention.
- 205 3. The first meeting of the Conference of the Parties recognised the urgent need for a
206 framework for the effectiveness evaluation that includes a strategic, cost-effective
207 approach that provides appropriate and sufficient data, and further acknowledged
208 publications such as UNEP's global mercury assessments, as well as the GEF-funded
209 Minamata Initial Assessments, as important sources of information. The Conference
210 of the Parties set out a roadmap which included the establishment of the ad hoc group

¹ MC-1/9 on the Establishment of arrangements in regard to effectiveness evaluation established the ad hoc group of experts on the arrangements for providing the Conference of the Parties with comparable monitoring data, and elements of an effectiveness evaluation framework under article 22 of the Minamata Convention (hereafter referred to as the ad hoc expert group). The decision also laid out a roadmap for establishing arrangements for providing the Conference of the Parties with comparable monitoring data, and elements of an effectiveness evaluation framework under article 22 of the Minamata Convention. The ad hoc expert group produced a report which was presented to the second meeting of the Conference of the Parties (See UNEP/MC/COP.2/13 and UNEP/MC/COP.INF/8).

Subsequently, MC-2/10 extended the terms of reference of the ad hoc technical expert group, adopted a roadmap for the subsequent work, requested the ad hoc expert group to develop the terms of reference for global monitoring arrangements, and requested the ad hoc expert group to report its progress to the third meeting of the Conference of the Parties.

² While the first effectiveness evaluation of the Minamata Convention on Mercury is to take place within six years of the entry into force of the Convention, the Conference of the Parties is to decide on the future interval of the effectiveness evaluations.

211 of experts on the arrangement for providing the Conference of the Parties with
 212 comparable monitoring data, and the elements of an effectiveness evaluation
 213 framework (see MC-1/9 Establishment of arrangement in regard to effectiveness
 214 evaluation).

215 4. For deliberation of these matters and based on the roadmap and terms of reference
 216 outlined in MC-1/9, the ad hoc group of experts began its work at its first meeting in
 217 Ottawa, Canada (5-9 March 2018). The outcome of the work of this first round of
 218 deliberations, reflecting comments received during the subsequent open comment
 219 period, was presented to the second meeting of the Conference of the Parties in
 220 Geneva in November 2018 (see UNEP/MC/COP.2/13 and UNEP/MC/COP.2/INF/8).

221 5. The second meeting of the Conference of Parties deliberated on the outcome of the ad
 222 hoc group of experts and decided to revise the Group's mandate and identify
 223 additional expertise needed to enable it to complete its work for presentation to the
 224 third meeting of the Conference of the Parties in November 2019. The Conference of
 225 the Parties in its decision 2/10 also requested the ad hoc expert group to undertake the
 226 following tasks:

227 (a) Using the objective of the Minamata Convention, review and assess the
 228 detailed article-by-article process and outcome indicators presented in
 229 UNEP/MC/COP.2/INF/8, and elaborate on the sources of information and
 230 baselines for those indicators, considering cost-effectiveness, practicality,
 231 feasibility and sustainability, and, on that basis, provide detailed rationales for
 232 the recommended indicators;

233 (b) Identify which recommended indicators require monitoring data, in particular
 234 in relation to the control measures and objectives set out in the articles of the
 235 Convention;

236 (c) Develop a methodology for integrating the recommended indicators with a
 237 view to providing an integrative picture of the general effectiveness of the
 238 Convention, (e.g., by use of cross-cutting indicators); and

239 (d) Amend the recommended draft terms of reference of the effectiveness
 240 evaluation committee and the schedule for the first effectiveness evaluation, if
 241 needed, on the basis of the outcome of the above.

242 6. Following its revised mandate, the re-named ad hoc technical working group met in
 243 Geneva in April 2019 to deliberate specifically on the requested report to be presented
 244 to the third meeting of the Conference of the Parties. The present report is the
 245 outcome of the work begun at that meeting³ and completed in the subsequent months
 246 that included an open comment period from 1 August to 5 September 2019.

247 7. Following the guidance of MC-2/10, this report is presented in four sections: Section I
 248 gives an introduction on the mandate of the work of the ad hoc technical expert group,
 249 and the report on its work on the arrangements the group proposes be put in place to
 250 provide the Conference of the Parties with the required information to conduct an

³ At this meeting, the ad hoc technical group had before it a compilation of comments on the effectiveness evaluation framework (UNEP/MC/EE.2/5), submitted information (UNEP/MC/EE.2/3) and the compilation of comments on the report of the group submitted to the Conference of the Parties at its second session (UNEP/MC/EE.2/4).

251 effectiveness evaluation of the Minamata Convention on Mercury. Section II provides
252 an overview description of the proposed effectiveness evaluation framework
253 including laying out four key policy question identified to be used to evaluate the
254 effectiveness of the Convention. Section III lays out the constituent elements of the
255 framework in detail by describing the proposed methodology to conduct the
256 effectiveness evaluation. This section also puts forward the proposed schedule.
257 Section IV outlines further issues for the consideration by the Conference of the
258 Parties, including as suggested action a draft decision to operationalise the proposed
259 framework.

260 8. The report further contains four annexes. The first annex outlines technical
261 information related to monitoring. The second annex presents the terms of reference
262 of the Effectiveness Evaluation Committee. The third annex outlines the terms of
263 reference of the global monitoring arrangements. And the fourth annex gives a
264 description of the reports that are to be prepared for the Effectiveness Evaluation
265 Committee.

266 9. The ad hoc technical expert group proposes that the Conference of the Parties at its
267 third meeting adopts the framework, adopts the proposed timeline for the first cycle of
268 the effectiveness evaluation, and at its fourth meeting establishes the Effectiveness
269 Evaluation Committee. This will enable the fifth meeting of the Conference of the
270 Parties to consider the findings and conclusions of the Effectiveness Evaluation
271 Committee. A draft decision has been prepared for consideration in this regard.

272

273 II. Overview description of the effectiveness evaluation framework

274

275 10. The objective of the Minamata Convention, per Article 1, is “*to protect the human*
276 *health and the environment from anthropogenic emissions and releases of mercury*
277 *and mercury compounds.*”

278 11. The goal of an effectiveness evaluation is to consider the extent to which the
279 Convention is achieving this objective. To analyse its effectiveness is to consider
280 whether measures taken by Parties in response to the Convention have resulted in
281 reductions in emissions and releases that have, in turn, led to lower risks to human
282 health and the environment (compared with what would have occurred if the
283 Convention would not have been implemented).

284 12. The framework for the effectiveness evaluation of the Minamata Convention, as
285 proposed by the ad hoc technical expert group, relies on evaluating evidence along the
286 causal pathways linking actions to implement the Convention, associated changes in
287 emissions and releases, and resulting changes in levels and trends in the global
288 environment, biota, and humans.⁴

289 13. Based on the information collated, and through proposed indicators on process,
290 outcome and monitoring, an assessment will be made of whether changes in mercury
291 levels attributable to the Convention are significant and sufficient in relations to four
292 policy questions.

293

294 Policy Questions

295 14. **First Policy Question: Have the Parties taken actions to implement the**
296 **Minamata Convention?** The framework contains a succinct set of “process”
297 indicators intended to reflect the level of implementation of the Convention by
298 Parties. These indicators can be used to evaluate whether implementation of
299 Convention measures can be credibly linked to changes in emissions and releases.
300 They can also be used to identify common challenges in implementation that may
301 undermine the Convention effectiveness. The process indicators are based primarily
302 on reporting mandated by the Convention, supplemented by other available scientific,
303 environmental, technical, financial and economic information as per Article 22,
304 paragraph 3.

305

306 15. **Second Policy Question: Have these actions resulted in changes in emissions and**
307 **releases of mercury to the environment?** The framework also contains a set of
308 “outcome” indicators that reflect estimated changes in supply, demand and emissions
309 and releases of Hg due to Convention measures, as reported by Parties under the
310 Convention. The framework suggests supplementing these data with context provided
311 by comprehensive estimates of global mercury supply, demand, emissions and
312 releases.

313

314 16. **Third Policy Question: Have these changes in emissions and releases resulted in**
315 **changes in levels of mercury in the environment, biota and humans attributable**
316 **to the Convention?** Article 22 of the Convention specifies that monitoring data on

317 “the presence and movement of mercury and mercury compounds in the environment
318 as well as trends in levels of mercury and mercury compounds observed in biotic
319 media and vulnerable populations,” should be used in the effectiveness evaluation.
320 Attributing changes in human and environmental levels of mercury to Convention
321 measures is challenging, but possible. Past and present emissions from human
322 activities combine with natural sources and other factors affecting mercury cycling,
323 such as atmospheric and ecosystem characteristics, which may evolve, inter alia, due
324 to climate change. The framework outlines how global mercury measurements can be
325 used to assist in the assessment of how successful the implementation measures of the
326 Convention have been.

327
328 17. This complex system results in the observed levels of mercury in the environment,
329 biota and humans. As scientific knowledge is still developing to better directly link
330 sources to these receptors, integrated modelling approaches are needed to estimate
331 how changes of emissions and releases from sources covered by the Convention
332 contribute to changes in levels in the environment, biota and humans. The ongoing
333 development and validation of such integrated models relies on monitoring data as
334 well as scientific knowledge of environmental processes and will assist in attributing
335 mercury changes in the environment, to change in mercury emissions and releases.
336

337 **18. Fourth Policy Question: Will existing measures under the Minamata Convention**
338 **be sufficient to meet its objectives of protecting human health and the**
339 **environment from mercury?** The response to the third policy question will tell us to
340 what extent the Convention is affecting levels and trends of mercury in the
341 environment, biota and humans. The fourth policy question will look at whether the
342 measures under the Convention is significant and sufficient. Is the Convention
343 delivering reduced emissions and releases to its full potential? If not, why? Would
344 delivering at full potential prevent the majority or only a small part of anthropogenic
345 emissions and releases of mercury? Furthermore, are management measures to
346 address residual risk adequate and sufficient in addressing the exposure of people to
347 mercury?

348

349 **Expert-led integrated assessment for consideration by the Effectiveness Evaluation**
350 **Committee**

351 19. The proposed framework envisions the synthesis of information and knowledge in
352 **synthesis reports**, and based on these reports and additional information, the
353 preparation of an **integrated assessment report** that provides a scientific and
354 technical perspective on the four policy questions articulated above. The integrated
355 assessment report will interpret the linkages between policy actions, emissions
356 reductions and resulting mercury levels, using available data sources, modelling
357 techniques, and analytical tools drawn from natural and social sciences, and other
358 relevant knowledge.

359 20. Present science has not yet developed reliable models for forecasting long-term
360 changes in mercury levels resulting from emissions reductions that take into account
361 the full complexities of mercury in the environment. Pending the availability of
362 suitable confirmed multi-media models, the integrated assessment report for the first
363 evaluation may or may not include the use of forecasting models. Therefore, earlier
364 evaluations on the effectiveness of the Minamata Convention may have greater

365 uncertainty than later evaluations when improvements to such forecasting models
366 become available.

367 21. The Effectiveness Evaluation Committee will use the expert-led scientific and
368 technical integrated assessment report, and supplemented as necessary by the other
369 synthesis reports, to consider the policy questions and to draw conclusions about the
370 effectiveness of the Convention. Based on this evaluation, the Effectiveness
371 Evaluation Committee is to make recommendations to the Conference of the Parties
372 as required.

373 22. Table 1 below gives an overview of the construction of the overall effectiveness
374 evaluation framework from the above-mentioned four policy questions, to indicators
375 proposed for evaluation, to the required synthesis reports and the integrated
376 assessment report that will be prepared for the Effectiveness Evaluation Committee,
377 for its consideration and report to the Conference of the Parties. The constituent
378 elements of the framework are explained in detail in Section II.

379
380

Table 1: Construction of the effectiveness evaluation framework from policy questions, to indicators and to required reports for consideration by the Effectiveness Evaluation Committee				
Policy Questions	First Policy Question: Have the Parties taken actions to implement the Minamata Convention?	Second Policy Question: Have these actions resulted in changes in emissions and releases of mercury to the environment?	Third Policy Question: Have these changes in emissions and releases resulted in changes in levels of mercury in the environment, biota and humans attributable to the Convention?	Fourth Policy Question: Will existing measures under the Minamata Convention be sufficient to meet its objectives of protecting human health and the environment from mercury?
Indicators	Process indicators (<i>para 46</i>)	Outcome indicators (<i>para 46</i>) Monitoring indicators (<i>para 46</i>)	Monitoring indicators (<i>para 52</i>)	Level 5
Indicator Clusters	1. Supply Cluster 2. Demand Cluster 3. Pressure Cluster ---- 4. Support Cluster 5. Info and Research Cluster	1. Supply Cluster 2. Demand Cluster 3. Pressure Cluster ---- 4. Support Cluster 5. Info and Research Cluster	1. Pressure Cluster	The Effectiveness Evaluation Committee will use the Integrated Assessment Report supplemented by the synthesis reports * to consider the policy questions posed in the framework, and from that derive conclusions about the effectiveness of the Convention. * Synthesis reports: 1. Emissions and Releases 2. Trade, Supply and Demand 3. Waste Management 4. Global Monitoring Report
Information Sources	Parties: Article 21 reports (<i>main source</i>)	Parties: Article 21 reports (<i>main source</i>)	- Parties: Article 21 reports - Existing/proposed monitoring networks and models	
Secretariat documents to COP, according to Article 22	- ICC reports - Financial mechanism reports - Report on Capacity-building and technical assistance	n/a	n/a	
Reports prepared for the Effectiveness Evaluation Committee	Level 1 – 3		Level 3	
	1. Emissions and Releases (Pressure Cluster) “ <i>Mercury to the environment</i> ” 2. Trade, Supply and Demand (<i>Supply and Demand Clusters</i>) “ <i>Intended/economic movement of mercury</i> ” 3. Waste Management (Supply, Demand and Pressure Clusters)		4. Global Monitoring Report	
			Level 4	
			5. Integrated assessment Report	
	Level 6			
	Report of the Effectiveness Evaluation Committee is considered by the Conference of the Parties			

382 **III. Proposed methodology and schedule for the evaluation**

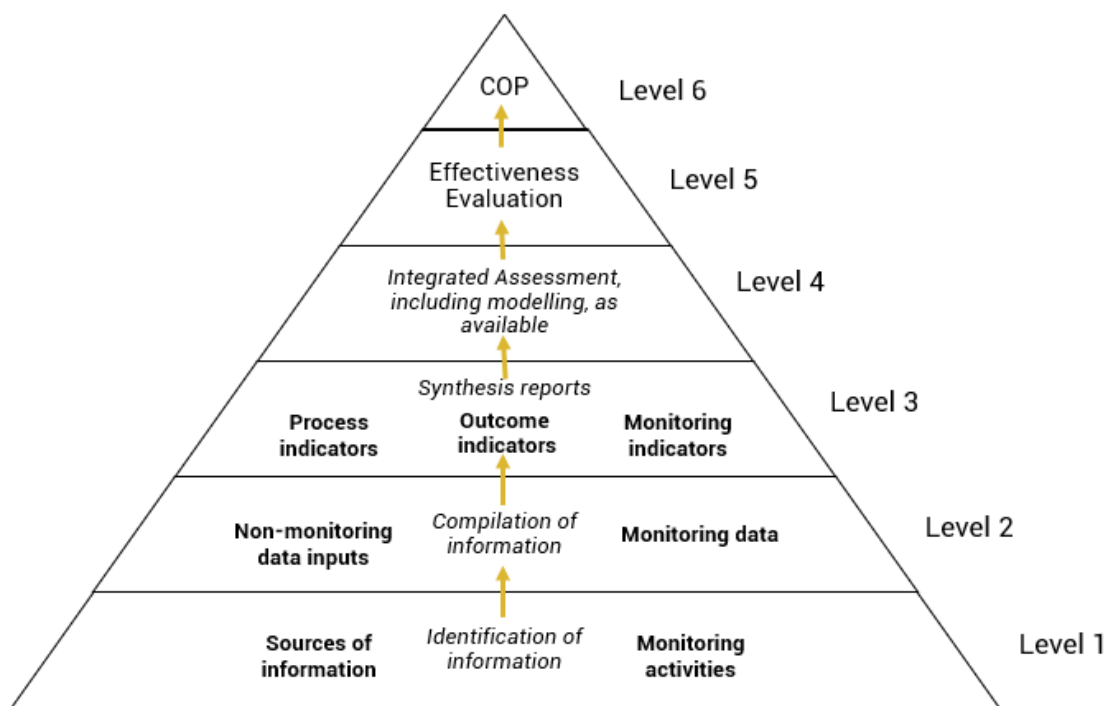
383

384 **1. Information and analysis flow for the proposed effectiveness evaluation**

385

386 23. The effectiveness evaluation will be carried out through a series of sequential steps of
387 data identification and collection, compilation of information, assessment, analysis and
388 synthesis. The framework presents the flow of information, beginning with identifying
389 and collecting information, to compiling information, to synthesises information (levels 1
390 to 3). The framework then foresees an integration function (level 4), before reaching the
391 Effectiveness Evaluation Committee (level 5) and the Conference of the Parties (level 6).

392 24. The flow of information and analysis is represented in Diagram 1 below, and explained in
393 more detail thereafter:



394

395

396

397 25. **Level 1 – Information:** As a first step, information resources available to support the
398 effectiveness evaluation will be identified and amassed. This will include information
399 from reports mandated by the Convention (e.g., implementation reports per Article 21;
400 compliance information and recommendations per Article 15; reports on effectiveness of
401 financial mechanisms per Article 13; emission inventories under Article 8 and release
402 inventories under Article 9; ASGM National Action Plans (NAP) progress reports under
403 Article 7), as well as the Secretariat’s Capacity Building and Technical Assistance report.

404 26. Such reporting may be incomplete, and thus these reports will be supplemented by other
405 available scientific, environmental, technical, financial and economic information per
406 Article 22 paragraph 3 and Article 19.

- 407 27. Clear criteria for this data collection should be established (e.g. including peer-reviewed
408 research articles and official publications such as national reports). The monitoring
409 arrangements are specified in Annex 3 and will determine which monitoring resources
410 will be included in the effectiveness evaluation.
- 411 28. **Level 2 – Compilation:** Relevant data for the effectiveness evaluation will be extracted
412 from the selected resources and compiled into a format that will enable their use in the
413 subsequent assessment and evaluation stages. Quality control of data should be conducted
414 at this stage. For monitoring data, this may include the compilation of monitoring data
415 into a global/central database with a consistent format, common quality control/quality
416 assurance procedures, assessment of confidence, and other relevant elements.
417
- 418 29. **Level 3 – Synthesis reports:** The amassed and compiled data will be used to create a set
419 of reports that synthesize the information. These reports are to inform the four policy
420 questions. Responding to the request from the Conference of the Parties that the
421 evaluation is to provide for an integrative picture of the general effectiveness of the
422 Convention, the ad hoc technical expert group lays out that the following synthesis
423 reports will be required (see Annex 4 for descriptions of the synthesis reports):
- 424 1. The state of global mercury levels in the environment, biota and humans, as well
425 as trends over time – **Global Monitoring Report**;
 - 426 2. **Emissions and Releases Report** – modelled after the *Global Mercury*
427 *Assessment* (2018);
 - 428 3. **Trade, Supply and Demand Report** – modelled after *Global Mercury: Supply,*
429 *Trade and Demand* (2017);
 - 430 4. **Waste Management Report** – building on *Global Mercury Waste Assessment*
431 (2018).
- 432 30. The reports will inform on the process, outcome and monitoring indicators, to facilitate
433 the Effectiveness Evaluation Committee’s consideration of the four policy questions.
434 These reports will include scientific and technical background, as well as accessible
435 visual presentations.
- 436 31. **Level 4 – Integrated Assessment Report:** The synthesis reports (and, where needed, the
437 underlying and/or additional data) on Convention actions, emissions and releases, and
438 monitoring data, etc. will be used for the fifth, the **Integrated Assessment Report**. This
439 integrated assessment report will distinguish between the process, outcome and
440 monitoring indicators to facilitate the Effectiveness Evaluation Committee’s efforts to
441 address the four policy questions. The report will take into account other information
442 (information such as socio-economic information, technology innovation, climate data,
443 key global policies, etc.) as necessary. (See annex 4 for a further description of the
444 Integrated Assessment Report).
- 445 32. The analyses will likely also include modelling to estimate how changes in emissions and
446 releases due to Convention measures have contributed to changes in mercury levels in the
447 environment, humans and biota.

- 448 33. The integrated assessment will also seek to evaluate long-term trends to interpret the
449 relevance of social, technical and economic data in the context of effectiveness the
450 Convention vis-à-vis its objective.
- 451 34. While the Integrated Assessment Report is to be an evidence-based science and technical
452 report, it is also to be accessible to non-technical readers and include visual
453 representations.
- 454 35. **Level 5 – Effectiveness Evaluation:** The Integrated Assessment Report supplemented,
455 as necessary, by the above-mentioned synthesis reports, will be submitted to the
456 Effectiveness Evaluation Committee. The Committee will use this information to
457 consider the four policy questions to derive conclusions about the effectiveness of the
458 Convention. The Committee may include in its report suggestions for improving the
459 effectiveness evaluation framework. The Committee may also highlight areas that the
460 Conference may wish to consider for the effectiveness of the Convention.
- 461 36. **Level 6 – Conference of the Parties:** The Conference of the Parties receives and reviews
462 the report of the Effectiveness Evaluation Committee and considers the conclusions and
463 recommendations of the Committee. The Conference makes its determinations regarding
464 actions or mechanisms to improve the effectiveness of the Convention.
465

466 2. Development of indicators

- 467 37. The Minamata Convention includes a number of measures that seek to control, reduce or
468 eliminate the major sources and uses of mercury, as well as a set of further stipulations
469 that oblige Parties to work together to support each other in the overall endeavour to
470 protecting people and the environment from the adverse effects of mercury.
- 471 38. To provide an integrative picture of the general effectiveness of the measures and
472 provisions of the Convention, the ad hoc technical expert group used an integrative
473 approach to identify indicators.
- 474 39. A set of indicators on process, outcome and monitoring to inform the policy questions are
475 proposed. The proposed indicators draw on previous work on elements for the
476 effectiveness evaluation framework, and the review of monitoring capacities and abilities.
- 477 40. Numerous indicators, developed following an article-by-article review, are clustering to
478 enable synthesised analysis in the proposed reports. The following articles and indicators
479 are clustered for evaluative purposes:
- 480 (a) **Supply cluster:** supply, storage and waste (Art 3, 10, 11);
 - 481 (b) **Demand cluster:** products, processes and ASGM (Art 4,5,7);
 - 482 (c) **Pressures cluster:** emissions, releases and contaminated sites (Art 8, 9, and 12),
 - 483 (d) **Support cluster:** financial and technical assistance (Art 13 and 14), and
 - 484 (e) **Information and research cluster:** information exchange, public information,
485 research (Art 17, 18 and 19).
- 486 41. Furthermore, recognising the central nature of some articles, such as Article 1 (setting out
487 the objective of the Convention) or the crosscutting nature, such as Article 16 (on the

- 488 health aspects) key articles were not clustered but kept separate for the purposes of
489 identifying indicators.
- 490 42. The rationale underlying the proposed indicators is as follows: (a) Process indicators are
491 required to answer the first policy question (Have the Parties taken actions to implement
492 the Minamata Convention?). (b) Outcome indicators are required to address the second
493 policy question (Have the actions resulted in changes in emission and releases of mercury
494 to the environment?). For each cluster of articles, the ad hoc expert group followed the
495 formulation of identification of how many parties are taking action on a key policy
496 measure, and what is the outcome of those actions. (c) Monitoring indicators are needed
497 to provide validated, scientific information to inform and support policy and decision-
498 making.
- 499 43. The indicators were largely developed keeping in mind data and reports required by the
500 Convention's reporting requirements or related bodies (including, for example, reports of
501 the Global Environment Facility). These reports will be supplemented by other available
502 and compiled data in the synthesis reports, and in the Integrated Assessment Report. By
503 using the data available, the indicators are therefore cost effective. Further, the data will
504 be produced on a recurrent basis for the life of the Convention, and thus are sustainable.
- 505 44. The indicators are formulated in a way that can be practical and feasible. The indicators
506 are designed to be easily counted and calculated, and to be easily understood (they do not
507 represent complex functions). If Article 21 reporting data is submitted electronically to
508 the Secretariat, their calculation should be especially straight forward.
- 509 45. Baselines are considered fundamental to undertake an effectiveness evaluation, so that
510 indicators can be evaluated over time. There is no formal process under the Convention
511 to establish baselines. There are two approaches to establish baselines. One is a "before-
512 after" baseline, another is "with-without" baseline. The former is suitable for the
513 indicators that are relatively stable, so that a time value from before the Convention can
514 be used throughout the evaluation process. The latter type is suitable for indicators that
515 fluctuate over time by some factors other than the interventions made due to the
516 provisions of the Convention. Socio-economic and demographic aspects can play a role,
517 as can climate change, ongoing initiatives, as well as shifts in life style. These will impact
518 baseline value in the medium and longer term.
- 519 46. Table 2 below presented the proposed indicators, that are to be read in compliment to the
520 specific monitoring indicators identified in paragraph 52:
521

Table 2: Proposed indicators to evaluate the effectiveness of the Minamata Convention			
A: Minamata Convention Article 1: (Objective) Protecting human health and the environment **		Source of information on indicator	Baseline for the indicator
A1. Cross-cutting monitoring indicator	Levels of mercury in the environment and in humans due to anthropogenic emissions and releases	- Integrated modelling	Baseline amount in the first evaluation (if models are available)
Notes	<ul style="list-style-type: none"> ▪ Attribution to be estimated using modelling to be developed ▪ In case of non-availability of such information from models, levels of mercury and trend in mercury (changes over time) will be used. ▪ The indicator for Article 1 is to be read with the relevant monitoring indicator indicated in Table 4, paragraph 52. 		

522

B: Supply Cluster of Articles: Mercury supply sources and trade (Article 3), Environmentally sound interim storage of mercury other than waste mercury (Article 10), Mercury waste (Article 11)		Source of information on indicator	Baseline for the indicator
B1. Overall process indicator for Articles 3, 10 and 11	Share of Parties that have implemented key provisions under this cluster (encompassing all process indicators below, i.e. B5, B6, B7, B9 and B12)	- Article 21 reporting	Baseline amount in the first evaluation
B2. Additional Cross-cutting outcome indicator for Articles 3, 10 and 11	Estimated global supply of mercury, in tonnes per year	- Synthesised information from individual indicators for Art 3, 10 and 11	Baseline amount in the first evaluation
Article 3			
B3. Outcome indicator for Article 3	Total amount of Hg mined from primary mercury mines	- Global Mercury Trade, Supply, Demand (2017) - ASGM NAP reports	Baseline amount in the first evaluation
B4 Outcome indicator for Article 3	Amount of Hg traded - broken down for specific purposes	- Article 3 forms	Baseline amount in the first evaluation
B5. Process indicator for Article 3	Number of parties that have developed an inventory of stocks and sources of supply	- Article 21 reporting	Baseline number in the first evaluation
B6. Process indicator for Article 3	Share of parties that have excess Hg from Chlor Alkali that have taken measures that such mercury is subject to final disposal	- World Chlorine Council Reports	Baseline % in the first evaluation
B7. Process indicator for Article 3	Number of parties trading in mercury	- Article 3 forms	Baseline amount in the first evaluation
Article 10			

B9. Process indicator for Article 10	Number of parties that have taken measures to ensure sound interim storage	- Article 21 reporting	Baseline amount in the first evaluation
B10. Outcome indicator for Article 10	Amount of Hg stored in an environmentally sound way as identified in the inventory of stocks	- Article 21 reporting	Baseline amount in the first evaluation
Article 11			
B11. Outcome indicator for Article 11	Amount of mercury/mercury compound waste subjected to final disposal	- Article 21 reporting	Baseline amount in the first evaluation
B12. Process indicator for Article 11	Number of parties that have measures in place to manage mercury waste in an environmentally sound manner	- Article 21 reporting	Baseline amount in the first evaluation
Notes	<ul style="list-style-type: none"> ▪ Data from non-Parties is important too. 		

523

C: Demand Cluster of Articles: Mercury-added products (Article 4), Manufacturing processes in which mercury or mercury compounds are used (Article 5), and Artisanal and small-scale gold mining (Article 7)		Source of information on indicator	Baseline for the indicator
C1. Cross-cutting process indicator for Articles 4, 5 and 7	Share of Parties that have implemented key provisions under this cluster	- Synthesised information from individual indicators for Art 4, 5 and 7	Baseline % in the first evaluation
C2. Cross-cutting outcome indicator for Articles 4, 5 and 7	Global use of Hg product or process in tonnes per application	- Information from industry stakeholders	Baseline amount in the first evaluation
Article 4			
C3. Process indicator for Article 4	Number of parties having appropriate measures to not allow the manufacture, export or import of mercury-added products listed in Part I of Annex A	- Article 21 reporting	Baseline number in the first evaluation
C4. Process indicator for Article 4	Number of exemptions per product category which are still valid	- Registry of exemptions	Baseline number in the first evaluation
C5. Process indicator for Article 4	Number of parties that have taken two or more measures for the mercury-added products listed in Part II of Annex A	- Article 21 reporting	Baseline number in the first evaluation
C6. Additional outcome indicator for Article 4	Volume tonnes of mercury added products (a) imported and (b) exported, in units per year for each product category in Annex A Part 1	- Trade and customs data	Baseline amount in the first evaluation
Article 5			
C7. Process indicator for Article 5	Number of parties with exemptions for Annex B Part 1 processes, which are still valid	- Registry of exemptions	Baseline number in the first evaluation

C8. Process indicator for Article 5	Number of parties having measures in place to not allow the use of mercury or mercury compounds in manufacturing processes listed in Part I of Annex B	- Article 21 reporting	Baseline number in the first evaluation
C9. Process indicator for Article 5	Share of the parties that have processes subject to Article 5 para 3, that have taken all the measures for the respective processes listed in Annex B, Part II	- Article 21 reporting	Baseline % in the first evaluation
Article 7			
C11. Outcome indicator for Article 7	Total amount of Hg used in ASGM globally, in tonnes per year	- Article 21 reporting - NAPs and its review - Notifications	Baseline amount in the first evaluation
C12. Process indicator for Article 7	Share of parties declaring more than insignificant ASGM that have submitted NAP	- Notifications	Baseline % in the first evaluation
C13. Process indicator for Article 7	Share of parties that have submitted a NAP and have reviewed it	- Article 7 review	Baseline % in the first evaluation
Notes	<ul style="list-style-type: none"> ▪ Some data on products may not be obtainable from public sources. 		

524

D: Pressure Cluster of Articles: Emissions (Article 8), Releases (Article 9) and Contaminated Sites (Article 12)		Source of information on indicator	Baseline for the indicator
D1. Overall process indicator for Articles 8, 9 and 12	Share of Parties that have implemented key provisions under this cluster	- Article 21 reporting	Baseline % in the first evaluation
D2. Cross-cutting outcome indicator for Articles 8, 9 and 12	Total amount of Hg emitted and released	- Global Mercury Assessment - Inventories - MIAs	Baseline amount in the first evaluation
Article 8 **			
D3. Outcome indicator for Article 8	Total amount of Hg emitted from each of point source categories in Annex D (Article 21 report, inventories)	- Article 21 reporting	Baseline number in the first evaluation
D4. Process indicator for Article 8	Number of parties that have enacted appropriate laws and regulations to require BAT/BEP for new sources	- Article 21 reporting	Baseline number in the first evaluation
D5. Process indicator for Article 8	Number of parties that have put in place control measures for existing sources (per each of the measures set out in Article 8, para 5)	- Article 21 reporting	Baseline number in the first evaluation
Article 9 **			

D6. Outcome indicator for Article 9	Total amount of Hg releases in the inventory from relevant sources (Article 21 report, inventories)	- Article 21 reporting	Baseline number in the first evaluation
D7. Process indicator for Article 9	Number of parties that have identified relevant sources	- Article 21 reporting	Baseline number in the first evaluation
D8. Process indicator for Article 9	Number of parties that have established inventory of releases from relevant sources	- Article 21 reporting	Baseline number in the first evaluation
Article 12			
D9. Process indicator for Article 12	Number of parties that have developed strategies for identifying and assessing sites contaminated by mercury or mercury compounds	- Article 21 reporting	Baseline number in the first evaluation
D10. Process indicator for Article 12	Number of parties that have developed the inventory of contaminated sites	- Article 21 reporting	Baseline number in the first evaluation
Notes	<ul style="list-style-type: none"> ▪ The indicators for Article 8 and 9, are to be read with the relevant monitoring indicators indicated in Table 4, paragraph 52. 		

525

E: Support Cluster of Articles: Financial resources and mechanism (Article 13), and Capacity-building, technical assistance and technology transfer (Article 14)		Source of information on indicator	Baseline for the indicator
Article 13			
E1. Process indicator for Article 13	Number of Parties: <ul style="list-style-type: none"> ○ that have contributed to the financial mechanism referred to in paragraph 5 of Article 13 ○ that have received GEF resources ○ that have received SIP resources ○ that have mobilised national resources for implementing the Convention 	- Article 21 reporting	Baseline number in the first evaluation
E2. Process indicator for Article 13	Amount of resources provided by: <ul style="list-style-type: none"> ○ Global Environment Facility ○ Specific International Programme ○ Bilateral support 	- Article 21 reporting	Baseline number in the first evaluation
E3. Additional Process indicator for Article 13	Number of recommendations from the financial review reflected in the GEF/SIP policy documents	- Information from policy documents	Baseline: zero
Article 14			
E4. Process indicator for Article 14	Number of Parties: <ul style="list-style-type: none"> ○ that have cooperated for providing capacity building and technical assistance to another party 	- Article 21 reporting	Baseline number in the first evaluation

	<ul style="list-style-type: none"> ○ that have requested technical assistance ○ that have received capacity building or technical assistance ○ that have promoted or facilitated technology transfer 		
Notes	<ul style="list-style-type: none"> ▪ The cycle of review of the Financial Mechanism may well not align with the effectiveness evaluation cycle. 		

526

F: Minamata Convention Article 15: Implementation and Compliance Committee		Source of information on indicator	Baseline for the indicator
F1. Process indicator	Proportion of issues that the Committee was able to resolve, including indications of systemic issues, if any	- ICC report, as referred to in Art 21	Baseline number in the first evaluation
Notes	<ul style="list-style-type: none"> ▪ The expert group could not complete its deliberations in the indicator, as the ICC had not yet finalised its terms of reference. Their terms of reference are to be considered by COP3. 		

527

G: Minamata Convention Article 16: Health aspects **		Source of information on indicator	Baseline for the indicator
G1. Monitoring indicator	Mercury levels in selected human populations (as defined by the monitoring arrangements)	- Existing monitoring data and activities	Baseline number in the first evaluation
G2. Process indicator	Number of parties that have taken measures, such as fish advisories, to provide information to the public on exposure to mercury in accordance with paragraph 1 of article 16	- Article 21 reporting	Baseline number in the first evaluation
G3. Process indicator	Number of parties that have taken measures to protect human health in accordance with article 16	- Article 21 reporting - Submissions to the secretariat	Baseline number in the first evaluation
Notes	<ul style="list-style-type: none"> ▪ The indicator for Article 16 is to be read with the relevant monitoring indicators indicated in Table 4, paragraph 52. ▪ Mercury levels in biota also to be considered. 		

528

H: Information and Research Cluster of Articles: Information exchange (Article 17), Public information, awareness and education (Article 18), Research, development and monitoring (Article 19)		Source of information on indicator	Baseline for the indicator
Article 17			
H1. Process indicator for Article 17	Number of parties with designated national focal points	- Article 21 reporting	Baseline number in the first evaluation
H2. Process indicator for Article 17	Number of parties that have established information exchange mechanisms related to mercury	- Submissions to the secretariat	Baseline number in the first evaluation
Article 18			

H3. Process indicator for Article 18	Number of parties that have taken measures to implement article 18	- Article 21 reporting	Baseline number in the first evaluation
H4. Process indicator for Article 18	Average number of measures under paragraph 1 of Article 18 that are being implemented by parties	- Derived from Article 21 reporting	Baseline number in the first evaluation
H5. Process indicator for Article 18	Number of parties that have public information on mercury levels in air, humans and biota	- Article 21 reporting	Baseline number in the first evaluation
H6. Process indicator for Article 18	Number of parties undertaking risk communication relating to mercury consumption	- Article 21 reporting	Baseline number in the first evaluation
Article 19			
H7. Process indicator for Article 19	Number of parties that have undertaken research, development and monitoring in accordance with paragraph 1 of article 19	- Article 21 reporting	Baseline number in the first evaluation
H8. Process indicator for Article 19	Number of parties contributing data and knowledge to integrated assessments	- Existing monitoring networks, databases, scientific data and literature	Baseline number in the first evaluation
H9. Additional process indicator for Article 19	Number of regions contributing to a regional dataset	- Existing monitoring networks, databases, scientific data and literature	Baseline number in the first evaluation
Notes	<ul style="list-style-type: none"> Submissions to the Secretariat that supplement article 21 reporting. 		

529

I: Minamata Convention Article 20: Implementation Plans		Source of information on indicator	Baseline for the indicator
I1. Process indicator	Number of parties submitting implementation plans	- Secretariat report to the COP submissions	Baseline: zero
Notes	<ul style="list-style-type: none"> Parties do not have the obligation to prepare implementation plans. Some Parties found it useful to prepare such a plan nevertheless, and submit it to the Secretariat. 		

530

J: Minamata Convention Article 21: Reporting		Source of information on indicator	Baseline for the indicator
J1. Process indicator	Proportion of parties reporting on time	- Article 21 reporting	Baseline: % of the first submission on time
J2. Process indicator	Proportion of parties indicating that information is not available for specific questions	- Article 21 reporting	Baseline: % not available in the first reports

Notes	<ul style="list-style-type: none"> ▪ Parties are to report every two years.
--------------	--

531

K: Minamata Convention Article 22: Effectiveness evaluation		Source of information on indicator	Baseline for the indicator
K1. Process indicator	Evidence of implementation of recommendations from effectiveness evaluation through decisions and actions of the Conference of the Parties	- COP report	Baseline: zero
Notes	<ul style="list-style-type: none"> ▪ This article will not be evaluated in the first evaluation. 		

532

533

534

535 **3. Data sources**

536 47. The availability of information sources from which to derive these indicators, as well as
 537 supplementary relevant and comparable scientific, environmental, technical, financial and
 538 economic information on which to base the effectiveness evaluation, is driven by a
 539 number of factors.

540
 541 48. First, different articles of the Convention have different time lines for implementation.
 542 Some of these deadlines fall within the first cycle of effectiveness evaluation (2017-
 543 2023), but some do not. Moreover, even if a measure is implemented within the deadline,
 544 evidence of its impact and therefore effectiveness may not be available for some time or
 545 not directly measurable. This presents some challenges on how to attribute effect. Table 3
 546 below gives a short overview of phase-out dates and time-bound articles of the Minamata
 547 Convention and their time lines.
 548

Table 3: Minamata Convention Timelines		
Date	Article	Description
2018	Art 5, para 2, Annex B	Acetaldehyde production in which mercury or mercury compounds are used as a catalyst to be phased out
2020	Art 4, para 1, Annex A	Manufacture, import or export of various mercury-added products shall not be allowed (including of batteries, switches and relays, compact and linear fluorescent lamps, high pressure mercury vapour lamps, cold cathode fluorescent lamps and external electrode fluorescent lamps for electronic displays, cosmetics, pesticides and topical antiseptics, as well as barometers, hygrometers, manometers, thermometers and sphygmomanometers)
	Art 5, para 3, Annex B	In vinyl chloride monomer production, reduce the use of mercury in terms of per unit production by 50 per cent by the 2020 against 2010 use. For sodium or potassium methylate or ethylate reduce emissions and releases in terms of per unit production by 50 per cent by 2020 compared to 2010
2025	Art 5, para 2, Annex B	Chlor-alkali production to be phased out
2027	Art 5, para 3, Annex B	For sodium or potassium methylate or ethylate, reduce the use of mercury aiming at phase-out of its use as fast as possible and within 10 years of entry into force of the Convention
2035	Art 3, para 4	Primary mining of mercury that was conducted within a Party's territory at the date of entry, is to cease 15 years after that date
2020	Art 5	Submit to the secretariat information on the number and types of facilities covered under Annex B, and the amount of mercury or mercury compounds used
	Art 7	Submit NAP to secretariat if developed
	Art 9	Identify relevant point source categories
2021	Art 8 and 9	Submit National Implementation Plan if one has been developed

2022	Art 8	Require BAT/BEP for new facilities
	Art 8	Develop and maintain an inventory of emissions sources
	Art 9	Develop and maintain an inventory of release sources
2017	Art 8	Require measures for control on existing facilities

549

550 49. Second, various important identified data sets and information sources that have been
551 produced in the past are not required under the Convention, and thus the production of
552 similar reports in the future is not assured or governed by Convention requirements.
553 These include Minamata Initial Assessment, as well as the Global Mercury Assessment
554 (produced 2002, 2008, 2013 and 2018), and the reports on Global Mercury: Supply,
555 Demand and Trade (2006 and 2017).

556 50. Third, some information sources differ in frequency. The ASGM National Action Plans
557 due 3 years after the entry into force of the Convention for that party (or three years after
558 its declaration to the Secretariat that it has more than insignificant ASGM) and must be
559 reviewed every three years thereafter. The regular reports under Article 21 are to be
560 completed every two years for specified questions, with the first short reports due at the
561 end of 2019, and the first full reports that respond to all reporting requirements due at the
562 end of 2021.

563 51. Last, is the consideration of the availability of relevant and comparable scientific and
564 environmental monitoring data. On the one hand, mercury is one of the longest studied
565 chemicals. On the other hand, in considering the available monitoring information and
566 available data on mercury and mercury compounds, the ad hoc technical expert group
567 noted that not all data and matrices are suitable for direct comparison or analysis at the
568 global level, and modelling will be critical to shape our fuller understanding of the
569 presence of mercury and its trends in our environment, as well as to attribute changes in
570 mercury levels to Convention measures.

571
572 52. The current mercury monitoring arrangements and modelling frameworks are outlined in
573 more detail in Annex I on Technical Information on Monitoring and Annex 3 on the
574 Global Monitoring Arrangements. Table 4 below given an indicative overview of
575 selected monitoring indicators and how they can contribute to the overall effectiveness
576 evaluation. They are to be read in complement with the indicators presented in Table 2 in
577 paragraph 46:
578
579

Table 4: Monitoring indicators by media		
Overall media	Indicator	Source of info
1. Air	M1. Total gaseous mercury/gaseous elemental mercury in the ambient air	Existing/expanded monitoring activities and networks

	M2. Mercury level in precipitation	Existing/expanded monitoring activities and networks
2. Human	M3. Mercury level in hair as primary matrix	Epidemiological studies by Parties
	M4. Mercury level in blood as alternative	International and national biomonitoring programme Longitudinal birth cohort and cross-sectional studies
3. Biota	M6. Mercury levels in biota	Continental network
	M7. Mercury levels in biota	Oceanic framework
<i>Water as a separate media is included to inform modelling (attribution).</i>		
4. Water	M8. Mercury levels in sea water covering horizontal and vertical distribution	Existing/expanded monitoring activities and networks

580

581 **4. Use of modelling in the effectiveness evaluation**

582 53. Models provide for the integration of mechanisms and observations and use that to assess
583 projections for future source apportionment. It can be said, that models therefore
584 formalise the scientific understanding of mechanisms affecting mercury behaviour. One
585 critical source of models is to provide a tool for linking and spatially/temporally
586 extrapolating monitoring data collected globally as part of ongoing research programmes,
587 policy activities and data provided by civil society, in order to provide a comprehensive
588 picture of the state of mercury pollution globally. Moreover, integrating modelling
589 frameworks provide a tool to work across media, i.e. for linking releases of mercury to
590 the atmosphere, land and water to methylmercury in fish and wildlife, as well as exposure
591 of human populations.

592 54. Another critical use of models in effectiveness evaluation is to attribute changes to levels
593 in mercury to Convention measures.

594 55. Models for different media (air, human, biota, water, and soil) vary in their ability and
595 state of development. For example, for air and atmosphere, many monitoring groups have
596 developed global modelling tools that can be used to assess the impact of changes in
597 anthropogenic mercury emissions and releases on global atmosphere concentrations, and
598 mercury inputs to terrestrial ecosystems and the ocean. Atmospheric models have been
599 extensively evaluated and can be applied to assess spatial gradients in atmospheric
600 mercury concentrations and deposition, as well as temporal changes. By contrast, models
601 for other media such as land, are still mainly used in research applications.
602

603 56. To bridge linkages across different media, integrated model frameworks seek to link
604 various models used for different media. In this way integrated modelling frameworks

605 provide a tool for linking emissions of mercury to the atmosphere and releases to land
606 and water, to methylmercury in fish and wildlife, and to exposure of some fish-
607 consuming human populations. It is to be noted that a difficult link in integrated
608 modelling frameworks is to human exposure and health outcomes due to the diversity of
609 dietary preferences, food consumption patterns and individual variability in
610 toxicokinetics affecting methylmercury uptake and elimination.

611 57. In addition to models that describe behaviour of mercury in the environment and
612 receptors, a variety of models and quantitative techniques can simulate socio-economic
613 systems to forecast where mercury is present in society and where it might eventually
614 enter the environment. In this way models can be used to develop scenarios that represent
615 baseline and different policy alternatives. Inputs to these models include commercial data
616 (e.g. amount of mercury in products), technological performance, economic information,
617 energy data, demographic information, policy specifications, and institutional analysis.
618 Outputs can include emissions and releases of mercury, and socio-economic parameters.
619 Other types of models that are relevant to understanding socio-economic systems of
620 relevance to mercury include life-cycle analysis, materials flow analysis, input-output,
621 and economic models.

622 58. Developing and evaluating integrated models draws on expertise that bridges natural
623 science, social science, and engineering. The components for an integrated modelling
624 framework are currently undergoing rapid development in the scientific and academic
625 community and should be available for our greater understanding of mercury cycling and
626 its impacts in the near future. It is expected such models will available by 2023 for
627 policy-relevant analyses.
628

629 5. Scientific and technical functions

630
631 59. The framework foresees two scientific and technical functions to performed for the
632 effectiveness evaluation, namely a synthesis function, and an integration function. These
633 function at different levels of the framework.

634 a. **Synthesis function:** The first function is to synthesise mercury information
635 collected and compiled by the level 1 to 3 activities. Two streams of information
636 are referred to in this regard: (i) information provided by Parties based on Article
637 21 reporting, and (ii) information and knowledge that is scientific, peer-reviewed
638 and publicly available. The information is used to respond to the first three policy
639 questions, and the indicators identified, to prepare the four synthesis reports. This
640 function foresees a role for the secretariat, for scientists and experts, and for
641 organisations. This function foresees the production of four synthesis reports, one
642 of which is the Global Monitoring Report, for which a specific expert group is
643 foreseen.

644 b. **Integration function:** The second function, which occurs at level 4, is to interpret
645 the information and knowledge collected, compiled and synthesised by the level 1
646 to 3 activities to interpret the linkages between policy actions, emission reductions
647 and resulting mercury levels, using available data sources, modelling techniques
648 and analytical tools drawn from natural and social sciences. Further this function

649 included also the collection of additional non-mercury information for further
650 analysis that will include, but is not limited to, data on socio-economic and
651 demographic information such as global population trends, trade and industry
652 trends, mitigation and adaptation policies, or on technological innovation
653 information such as alternative products, communication and transport
654 technologies. The intent of this function is to provide an integrative picture
655 through the contextualisation of information for that evaluation cycle of the
656 Convention. The function foresees the production of the Integrated Assessment
657 Report, and the establishment of a specific integrated assessment group of
658 expertise.

659 60. The framework also differentiates between input from the following two:

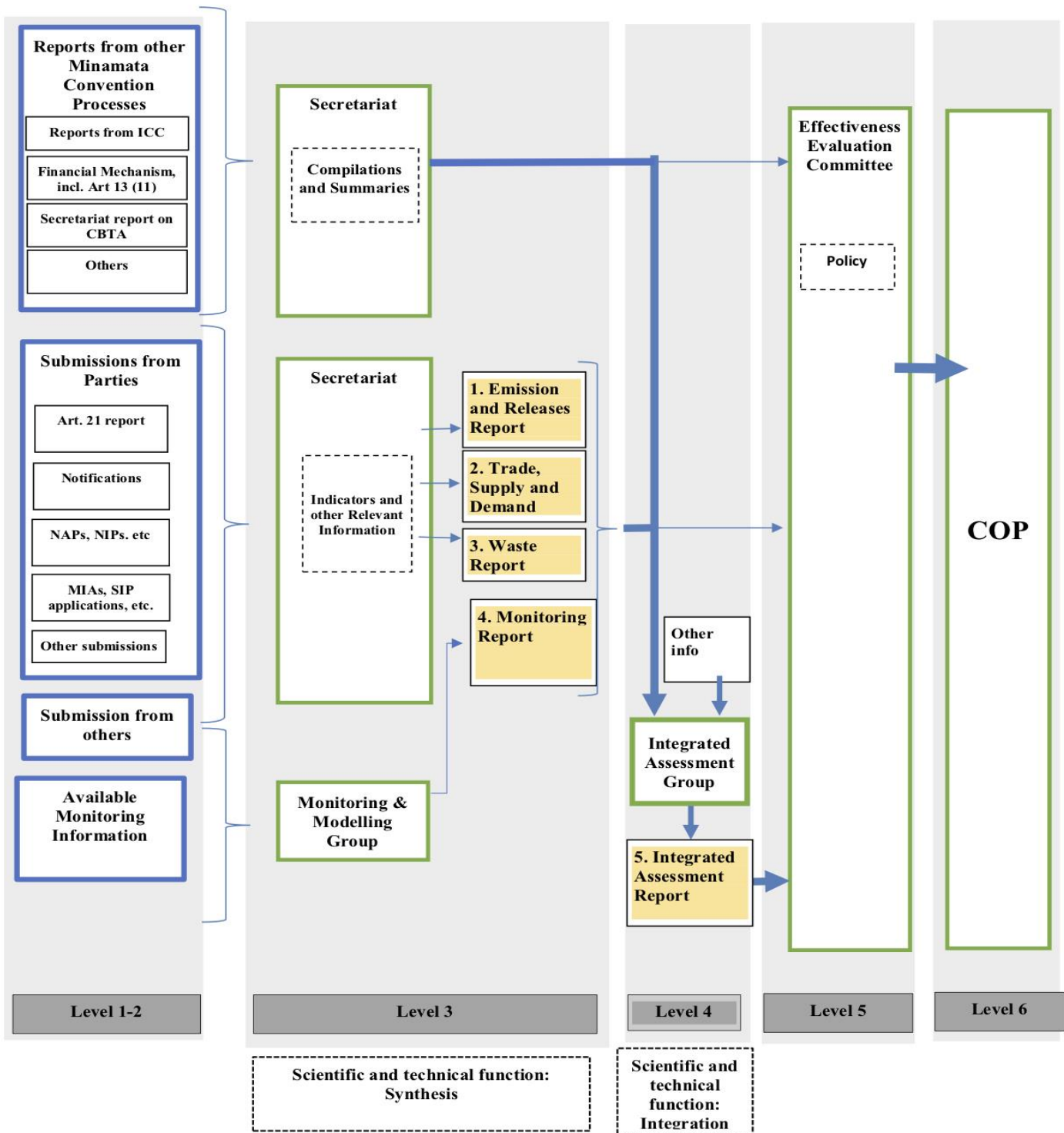
660 a. **Monitoring:** Compiling, assessing and summarizing available monitoring data,
661 per the monitoring arrangements in Annex III, to describe the current state of
662 mercury concentrations, as well as trends in the environment, humans and biota,
663 and working with modelling experts as appropriate. The global monitoring report
664 developed at level 3 will be the input to the integrated assessment at level 4, and
665 also submitted to the Effectiveness Evaluation Committee.

666 b. **Modelling:** Analysing the contribution of emissions and releases covered by the
667 Convention to overall mercury concentrations in the environment, and where
668 possible, in humans and biota. Modelling conducted during level 4 will estimate
669 future mercury concentrations that reflect the overall impacts of mercury
670 emissions and releases, from legacy emissions and releases to those predicted in
671 the future under various scenarios, based on the reports made available in the
672 effectiveness evaluation process, as well as available relevant socio-economic
673 information.

674

675 **6. Institutional Arrangements for the Effectiveness Evaluation**

676 61. To implement the effectiveness evaluation process described thus far, the framework
677 identifies different entities that may deliver the tasks to compile, summarize and integrate
678 data and knowledge, and to perform relevant scientific and technical analyses. Diagram 2
679 below displays the activities, outputs and flow of information and knowledge among
680 entities potentially responsible for these tasks.



682 **Minamata Convention Secretariat**

- 683 62. The Secretariat will play a role in collecting, compiling, summarizing and synthesizing
684 available data. The Secretariat already has a role, prescribed by the Convention, to act as
685 the mechanism through which Parties submit reports under Article 21, which in turn will
686 contain references to progress reports on the NAPs, under Article 7, to inventories under
687 Articles 8 and 9; and voluntary NIPs under Article 20. The Secretariat may, as
688 appropriate, be assisted by groups of experts or hired experts, conduct literature reviews,
689 produce datasets for further analysis or organize synthesis and peer review.
- 690 63. These datasets will be processed at level 3 for calculating/ tabulating process and
691 outcome indicators. The Secretariat will also become responsible for facilitating synthesis
692 reports that combine these indicators with other relevant information, including
693 commissioning external expertise where necessary, as UNEP has done in previous efforts
694 – for example, under the Global Mercury Assessment (2018), the report on Global
695 Mercury Supply, Trade and Demand (2017) and the Global Mercury Waste Assessment
696 (2018).
- 697 64. The Secretariat will also compile summaries and synthesis reports resulting from other
698 processes mandated by the Convention, such as reports from the Implementation and
699 Compliance Committee under Article 15, reports from bodies implementing the financial
700 mechanism, the report on the effectiveness of the finance mechanism, required under
701 Article 13, paragraph 11 (which will draw inter alia on reports such as GEF report and
702 the SIP report) and the Secretariat’s report on Capacity Building and Technical
703 Assistance. All synthesis reports and summary documents will be eventually submitted to
704 the Effectiveness Evaluation Committee as supplementary information for their
705 consideration at level 5. These reports (and underlying data where needed) will be
706 transmitted for integrated assessment at level 4.

707 **Delivery of the scientific and technical functions**

- 708 65. The framework puts forward that the scientific and technical functions can be delivered
709 as follows:
- 710 a. **Scientific and Technical Expertise:** A scientific and technical grouping
711 comprising of individuals with extended expertise on monitoring, scientific and
712 technical assessment, and natural and social sciences and research relevant to
713 mercury, is to deliver the activities of level 1 to 3, to produce the four synthesis
714 reports. For this purpose, there are roles for the secretariat, for scientists and
715 experts, and for organisations. This group will include a specific group of
716 monitoring and modelling experts to coordinate monitoring and modelling
717 activities that produces the Global Monitoring Report (a synthesis report).
- 718 b. **Integration Assessment Group:** A small separate group is required, at level 4, to
719 produce the Integrated Assessment Report for the Effectiveness Evaluation
720 Committee. Specific chapter and section authors led by a chief author will be
721 identified to comprise this group. The group will necessarily be multi-disciplinary
722 in nature, and authors will be identified according to their most suitable expertise.
723 For attribution functions, the group will include modellers. Additionally, this
724 group will also be supported by communication expertise to ensure the results of

725 this integrated assessment are summarised and presented in visual forms (e.g. a
726 dashboard type score table summarising progress).

727 **Effectiveness Evaluation Committee**

728 66. The Effectiveness Evaluation Committee at level 5 will use the Integrated Assessment
729 Report supplemented by the four synthesis reports to consider the policy questions posed
730 in the framework, and from that derive conclusions about the effectiveness of the
731 Convention. The Effectiveness Evaluation Committee will formulate recommendations
732 aiming at improving the effectiveness of the Convention. The Committee may include in
733 its report suggestions for improving the effectiveness evaluation framework. Terms of
734 reference for the Committee are found in Annex II.

735 **Conference of the Parties**

736 67. The ultimate responsibility for evaluating the effectiveness lies with the Conference of
737 the Parties at Level 6. In this framework, the intention is for the Conference to consider
738 the recommendations of the Committee, and then make determinations about any needed
739 changes to or strengthening of Convention measures. The Conference may also choose to
740 mandate changes in the procedures for future effectiveness evaluation cycles.

741

742 **Additional proposal to deliver scientific and expert functions**

743

744 68. The implementing structure for the scientific and expert functions can also be delivered
745 by an external entity following a bidding process. In this case, the Secretariat could be
746 asked to call for proposals that include, but is not limited to, the approach to complete
747 necessary tasks, structure to implement these tasks, associated costs, etc. Should an entity
748 for delivery of this function be selected through a bidding process, full information on the
749 process will be reported to the Conference of the Parties.

750

751 **7. Schedule and timetable**

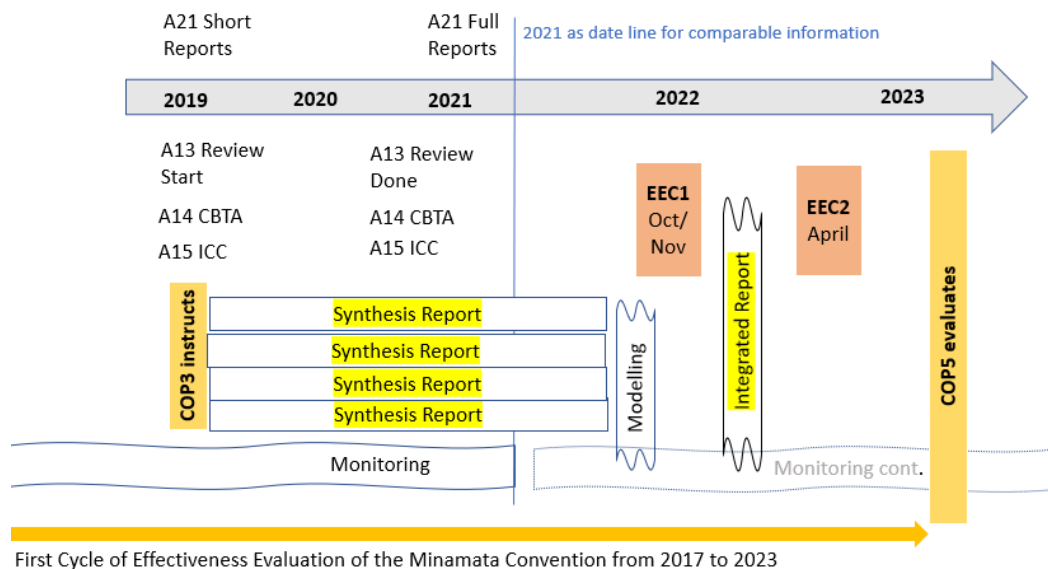
752 69. Paragraph 1 of Article 12, Effectiveness Evaluation, holds that the Conference of the
 753 Parties shall evaluate the effectiveness of the Convention no later than six years after the
 754 entry into force of the Convention, and periodically thereafter at intervals to be decided
 755 on.

756 70. As the Convention entered into force on 16 August 2017, the outcome of the first cycle of
 757 evaluation it to be submitted in 2023. The fifth meeting of the Conference of the Parties
 758 will convene in that year.

759 71. Taking into account the four-year cycle of reports under Article 21 (Reporting), the
 760 regular reports due to the Conference of the Parties on Article 13 (Financial resources and
 761 mechanism) and Article 14 (Capacity-building, technical assistance and technology
 762 transfer), as well as the monitoring data available, the date line for comparable
 763 information for this first cycle of evaluation is recommended to be set as 2021.

764 72. This allows 2022 and 2023 to be utilised by the Effectiveness Evaluation Committee for
 765 its review and analysis to be finalised to be presented to the fifth meeting of the
 766 Conference of the Parties.

767 73. The timeline for the first cycle of the effectiveness evaluation of the Convention is set out
 768 in Diagram 3 below:



771 74. As the Conference of the Parties from its fourth meeting onwards, is to convene every
 772 two years, the future effectiveness evaluations would follow this six-year cycle.
 773
 774
 775

776 **IV. Issues for further considerations**

777

778

779 75. The ad hoc technical expert group proposes a framework for effectiveness evaluation that
780 follows a flow of information from level 1 to level 6, and identifies different entities that
781 fulfil different functions and roles in the process. While some of these entities already
782 exist (i.e. those for administrative and programme support, compilation of data for
783 synthesis reports, etc), there are others who are to perform vital scientific and technical
784 functions to implement the framework, that are not in place yet.

785 76. The framework foresees two scientific and technical functions: (i) to produce four
786 synthesis reports (one of which is the Global Monitoring Report), and thereafter, (ii) to
787 produce the integrative picture (the Integrated Assessment Report). These reports are to
788 inform the deliberations of the Effectiveness Evaluation Committee, which in turn reports
789 the outcome of its evaluation to the Conference of the Parties.

790 77. To operationalise the all constituent elements of the framework, the Conference of the
791 Parties will need put a number of entities into place. Most entities conducting the
792 activities at the different levels are identifiable. They include, the Monitoring and
793 Modelling Group (which is to produce the Global Monitoring Report), the Integration
794 Assessment Group (which is to produce the Integrated Assessment report), and the
795 Effectiveness Evaluation Committee (which is to present its evaluation report to the
796 Conference of Parties). These can be put into place by the Conference of the Parties.

797 78. What is still to be clarified by the Conference of the Parties is which entities will produce
798 the following reports: (i) Emissions and Releases Report, (ii) Trade, Supply and Demand
799 Report, and (iii) Waste Management Report.

800

801

802

Suggested action by the Conference of the Parties

803

79. The Conference of the Parties may wish to consider the recommendations of the ad hoc expert group on the proposed framework for the effectiveness evaluation, and may wish

804

to adopt a decision along the following lines:

805

The Conference of the Parties,

Welcoming the report on the proposed effectiveness evaluation framework and monitoring arrangements under the Minamata Convention on Mercury, and complementing information developed by the ad hoc technical expert group on the basis of mandates provided in decision MC-1/9 and decision MC-2/10;

Welcoming monitoring activities already in place and efforts of Parties and others to support the provision of monitoring data on mercury and their availability in the future;

Acknowledging the available modelling capacities for the use in the effectiveness evaluation;

1. *Adopts* the framework for the effectiveness evaluation proposed for the Minamata Convention, including its methodology, indicators, reports, schedule and timeline;
2. *Adopts* the terms of reference and mandate of the Effectiveness Evaluation Committee to perform the evaluation;
3. *Decides* to establish the committee at its fourth meeting;
4. *Establishes* a [scientific and technical group] [monitoring and modelling group] to perform the scientific and technical functions that enable the timely production of the required synthesis reports by its fourth meeting, to enable the integrative work to be done for the Effectiveness Evaluation Committee to convene ahead of its fifth meeting to complete the first evaluation of the Minamata Convention;
5. *Requests the Secretariat* to support the work of the effectiveness evaluation, and to continue to collect information relevant to the effectiveness evaluation including for the development of synthesis reports, working with relevant experts and organizations;
6. *Requests* the group on monitoring and modelling to work in line with its terms of reference including the finalization of monitoring guidance and develop a global monitoring report by COP4 to support the first effectiveness evaluation;
7. *Encourages* Parties to engage actively in the implementation of the effectiveness evaluation framework, in particular, to:
 - a) Continue to monitor mercury and to share the resulting monitoring data through the group established pursuant to paragraph 3;

- b) Collaborate to develop and improve modelling as needed, and carry on geographically representative monitoring of mercury in the environment, in humans, and in biota;
- c) Use tools supporting data harmonization identified such as standard operating procedures (SOPs), methodologies and techniques identified by the ad hoc expert group; and
- d) Support the further development and long-term implementation of the global monitoring arrangements, if in a position to do so.

806

807

808 **Annex 1: Technical information on monitoring**

809

810 **1. Introduction**

- 811 1. This annex summarizes the work done by the ad hoc group with regard to global
812 monitoring arrangements at its two meetings in March 2018 and April 2019, and through
813 electronic communication.
- 814 2. It starts in Section 2 with the identification of categories of the available comparable
815 monitoring data most effective in providing information on global trends, monitoring data
816 in air, water, biota, and humans that could be used to assess the impact on levels and
817 trends of mercury, and the potential and limitations of the data identified. Section 3
818 further assesses the extent to which the information reviewed meets the needs for
819 effectiveness evaluation, identifies major gaps, outlines options to enhance the
820 comparability and completeness of the information, and compares these options for their
821 cost-effectiveness, practicality, feasibility and sustainability, global coverage, and
822 regional capabilities to identify opportunities for future enhancements to monitoring.
823 Section 4 identifies available modelling capabilities to assess changes in global mercury
824 levels within and across different media. Section 5 examines options and identifies
825 sources of data that can be used for establishing a baseline for monitoring data. Further
826 discussion on the development of guidance for monitoring and proposed monitoring
827 arrangements is included in Annex 3 on terms of reference for global monitoring
828 arrangements.
- 829 3. A large amount of other relevant technical information on monitoring complementing the
830 proposal in this annex including an overview of available monitoring information, is
831 available in a reference document as UNEP/MC/COP.3/INF/xx.

832

833 **2. Identification of monitoring information/data**

834 **How monitoring activities may contribute to the development of the effectiveness** 835 **evaluation framework**

- 836 4. In considering monitoring information and data, the ad hoc group considered matrices
837 outlined in MC-2/9: air, biota, humans and water. The ad hoc group concluded that data
838 on levels of mercury and mercury compounds in air, biota and humans either are available
839 or would be able to be obtained, and would be comparable on a global basis. Some experts
840 were of the opinion that data on water are available on a global basis to some extent. The
841 availability and comparability of monitoring data for each matrix are discussed below.
- 842 5. Mercury levels in the atmosphere is directly linked to the emissions from the
843 anthropogenic sources identified by the Convention. The atmospheric monitoring
844 activities will contribute to the evaluation of the effectiveness of the Convention by
845 determining whether the levels of mercury are increasing or decreasing in the atmosphere
846 as per changes in the emissions of mercury and enable the modelling results to define
847 source-receptor relationships. Also, this data will contribute to the predictive capabilities
848 of regional and global models of mercury impacting the environment, which may also be
849 affected by other atmospheric chemistry issues.

- 850 6. Human biomonitoring has the following advantage in contributing to the effectiveness
851 evaluation of the Convention: provides information on exposure to mercury from all types
852 of sources; integrates the results of the different types of risk reduction measures, and
853 provides information on geographical distribution enabling identification of areas and
854 population groups requiring urgent support in terms of risk reduction measures.
- 855 7. Biota monitoring has an advantage in contributing to the effectiveness evaluation of the
856 Convention by tracking changes of environmental mercury levels at regional and global
857 levels to determine protection of human health and the environment.

858 **Ambient air**

- 859 8. Mercury levels in ambient air have been measured in some locations for a very long
860 period. These data have contributed to the discussion on the global nature of the mercury
861 issue. The current available data is collected by various national and global network
862 owners using different sampling methods. It was recognized that none of the currently
863 available data had global coverage, but that there are potential suitable methods to obtain
864 such global data (as identified in GMA 2018). Overview of existing networks is available
865 in the resource document (UNEP/MC/COP.3/INF/XX).
- 866 9. A number of suitable methods are available, and the available sampling techniques
867 considered suitable to obtain globally comparable data were identified and reviewed.
868 These include:
- 869 ▪ Total Gaseous Mercury (TGM) or Gaseous Elemental Mercury (GEM)
870 concentrations in air at background and impacted sites;
 - 871 ▪ Wet deposition.
- 872 9. TGM/GEM can be measured adopting active continuous monitoring, manual active air
873 sampling and passive air sampling techniques. Active continuous techniques are in use at
874 several sites of existing regional and global monitoring networks and provide continuous
875 TGM/GEM concentrations, whereas manual active and passive sampling are used in
876 locations where no monitoring infrastructure is available and provide average TGM
877 concentrations as monthly (or at lower frequency) average.
- 878 10. The atmospheric deposition flux of mercury is considered the combination of wet and dry
879 deposition of mercury to the surface. Measurements of wet deposition are done through
880 the collection of rain samples and dry deposition either mathematically inferred or
881 measured through tree debris. Several existing long-term networks collect wet deposition
882 samples but, due to a lack of comparable standard procedures, dry deposition is not always
883 measured. The amount of total mercury measured in atmospheric deposition samples is
884 used as basis to calculate the total atmospheric deposition flux associated to a precipitation
885 (rain or snow) event.
- 886 11. Validated atmospheric mercury models are needed to assess source-receptor relationships
887 and evaluate the relative importance of each anthropogenic source and/or emission source-
888 region in the global mass balance of mercury with changing mercury emission regime,
889 meteorological conditions and climate forcing. Good global coverage of monitoring data
890 of mercury in ambient air and deposition samples are also of fundamental importance to
891 validate these atmospheric models. Further details are provided in
892 UNEP/MC/COP.3/INF/XX.

893 **Human exposure**

- 894 12. All people are exposed to some amount of mercury. For many communities worldwide,
895 dietary consumption of fish, shellfish, marine mammals, and other foods is arguably the
896 most important source of methylmercury exposure. Exposures to elemental and inorganic
897 mercury mainly occur in occupational settings (including artisanal and small-scale gold
898 mining) or via contact with products containing mercury. There remains high concern for
899 vulnerable groups including various indigenous populations with high dietary or
900 occupational exposure to mercury.
- 901 13. Human biomonitoring to assess general population exposure to mercury (i.e. background
902 level rather than “hot spots”) provides information on global trends. In the general
903 population, assessment of prenatal exposure is recommended because the fetus is the most
904 vulnerable to methyl mercury exposure.
- 905 14. There are two main biomarkers:
- 906 ▪ Total mercury in maternal scalp hair (3 cm hair strand from the scalp, to measure
907 exposure during the 3rd trimester).
 - 908 ▪ Total mercury in cord blood.
- 909 15. Scalp hair is a preferable biological matrix. It is easily available, a non-invasive method,
910 and there are no specific requirements for transportation and storage.
- 911 16. Cord blood can be alternative matrix to hair. Inclusion of cord blood in a survey provides
912 several additional advantages such as: demonstration of pre-natal exposure to mercury
913 (cord blood analysis characterizes both exposure of a mother and a child to mercury
914 during pregnancy); possibility to get more reliable results and exclude influence of
915 external factors (e.g. external contamination of hair by mercury, permanent hair treatment
916 decreasing mercury in hair); being an alternative biological matrix to hair in locations
917 where hair sampling is difficult due to cultural, ethical, religious specificities.
- 918 17. There are reliable, although variable, coefficients allowing comparability of results from
919 the mercury measurements in hair and blood/cord blood.
- 920 18. Assessment of total mercury is sufficient for characterizing exposure, unless external
921 exposure of scalp hair needs to be evaluated.
- 922 19. In addition to general population exposure, parties may conduct biomonitoring in other
923 vulnerable populations including the occupationally exposed and in hot spot areas. These
924 data may provide additional information of use for effectiveness evaluation, for example
925 when repeated over time in the same populations.
- 926 20. The Global Mercury Assessment 2018 has identified currently available data on mercury
927 exposure in regional and national human biomonitoring programmes, longitudinal birth
928 cohort studies and cross-sectional information in specific populations including high
929 exposure groups.
- 930 ▪ In regional and national human biomonitoring programmes, some information may be
931 comparable (depending on the ability to disaggregate data by sex and age within the
932 programme). Such studies are only available in a very small number of countries,

- 933 primarily in the northern hemisphere. Such studies are expensive and therefore not
934 feasible for the sole purpose of monitoring global mercury exposure.
- 935 ▪ Comparable and high-quality data exists from a number of longitudinal birth cohort
936 studies, including in groups consuming large amounts of seafood, freshwater fish
937 and/or marine mammals. These are available only in a small number of locations,
938 and are not globally representative.
- 939 ▪ The GEF-funded project “Development of a Plan for Global Monitoring of Human
940 Exposure to and Environmental Concentrations of Mercury” has generated
941 comparable data in a small number of additional countries, using the WHO protocol.⁵
- 942 21. Total mercury in urine is relevant for populations with high exposure to elemental and
943 inorganic mercury, and is not appropriate for assessment of methylmercury exposure. It
944 may be useful for monitoring the impact of control actions taken by parties on mercury
945 exposure in mining communities.
- 946 22. Human biomonitoring has a number of advantages for informing an assessment of the
947 effectiveness evaluation of the Minamata Convention, including:
- 948 ▪ Directly addressing the fundamental question as to whether enough is being done to
949 protect human health (Article 1 of the Convention);
- 950 ▪ Integrating information on exposure to mercury from different sources;
- 951 ▪ Integrating the effects of the range of risk reduction measures taken.
- 952 23. In using human biomonitoring data, it should be noted that human mercury level is
953 affected by many confounding factors such as fish consumption habit (species and
954 amount), age, gender, alcoholic consumption, health condition, economic level, etc.
- 955 **Biota**
- 956 24. Biota samples can provide information for different outcomes. Three types of outcomes,
957 namely human exposures, environmental health, and temporal trends are identified in
958 relation to biota monitoring. There is enough biotic mercury data available regionally and
959 globally to assess environmental exposure for spatial and temporal trends for many, but
960 not all, ecosystems and biomes of geographic interest. Human exposure to dietary
961 methylmercury can originate from fish, birds and marine mammals (with fish forming a
962 major contribution, birds forming either a minor or a major component, depending on
963 diets, and marine mammals which can form a major contribution in certain diets).
- 964 25. The following samples from four major biomarker groups (taxa) are considered the most
965 relevant and are most frequently used for methyl mercury monitoring:
- 966 ▪ Fish: muscle fillet, muscle biopsy, fin clips, blood
- 967 ▪ Sea turtles: scutes, blood, muscle
- 968 ▪ Birds: blood, feather, eggs, muscle, eggshells and membranes, liver and kidney

⁵ Assessment of prenatal exposure to mercury: human biomonitoring survey (2018) - the first survey protocol
<http://www.euro.who.int/en/health-topics/environment-and-health/chemical-safety/publications/2018/assessment-of-prenatal-exposure-to-mercury-human-biomonitoring-survey-2018>

- 969 ▪ Mammals: skin, fur or hair, muscle, liver and kidney
- 970 26. In assessing samples, it is recommended to assess muscle tissues for fish and marine
971 mammals. For birds, blood should be used for short term data, muscle or eggs should be
972 used for medium term and feathers can be used for long term results. It is considered to be
973 sufficient to assess total mercury for all tissues (assuming greater than 80 per cent
974 methylmercury mean level) using either wet weight or dry weight. Samples should be
975 georeferenced, with the level of detail varying according to the objective of the sampling.
976 Standard operating procedures are available for example through national /regional
977 monitoring programs, however additional more universal protocols may need to be agreed
978 on for other sampling which is not covered by this process. Inter-tissue conversions are
979 generally feasible to help provide a way to have standardized, and therefore comparable,
980 tissue mercury concentrations.
- 981 27. Biodiversity Research Institute (BRI) has compiled mercury data from published
982 literature into a single database, the Global Biotic Mercury Synthesis (GBMS) Database.
983 This database includes details about each organism sampled, its sampling location, and its
984 basic ecological data. From each reference, mercury concentrations are averaged (using
985 weighted arithmetic means) for each species at each location. Data have been compiled
986 from 1,095 different references, representing 119 countries, 2,781 unique locations, and
987 458,840 mercury samples from 375,677 total individual organisms (See
988 UNEP/MC/COP.3/INF/XX⁶).
- 989 28. GBMS database was also the basis for the UN Environment’s Global Mercury Assessment
990 – 2018. Examples featured within the GBMS database include datasets for some
991 geographic areas with extensive temporal and spatial information, including areas for
992 freshwater lakes in the northern United States, much of Canada, and Scandinavia. These
993 areas represent over 500,000 fish mercury concentrations over the past 50 years of data
994 collection – sometimes with standard species. In order to potentially explain how the
995 temporal trends of fish mercury concentrations change under influence of different drivers,
996 including environmental/climate change in addition to deposition change, a set of
997 minimum target information should be developed. For each location this should include
998 lake (or river, estuary, sea etc.) catchment morphology, pollution deposition patterns, and
999 local pollution history. For each biota species (here exemplified by fish) minimum data
1000 must include length, weight, sex, and sexual maturity. Samples (i.e. fish muscle) for
1001 determination of total mercury concentrations, may also be analysed for stable isotopes (at
1002 least nitrogen and potentially also carbon) for a better understanding of the food web
1003 processes. Many of these parameters are lacking from current databases. As an example,
1004 inter-annual and intra-annual variability is often much larger than long-term trends,
1005 making it difficult to relate temporal trend changes to large environmental drivers
1006 (including deposition). The spatial variation within the temporal trend must be considered
1007 when investigating convention effectiveness in years to come. To be able to document
1008 potential temporal trends changes, one need to lower the within-year variability, by

⁶ For more information, see also
http://www.briloon.org/uploads/BRI_Documents/Mercury_Center/Publications/For%20Web%20GBMS%20Booklet%202018%20.pdf

1009 improving the data adjustment, include more lake data and information, and collect data
1010 from the same lake over time.

1011 **Water and soil**

1012 29. Levels of mercury and mercury compounds in water are collected in relation to water
1013 quality issues in a number of countries. These data may be useful in tracking mercury
1014 resulting from local activities which release mercury; however, will not provide overall
1015 trends on a global basis. Levels of mercury in ocean water could be comparable on a
1016 global basis and collected by existing networks and ad hoc research programmes, but
1017 currently such work is done through research-based activities and not dedicated long term
1018 monitoring programmes.

1019 30. Soil samples may be very useful in assessing the state of contamination of a particular site,
1020 but global comparability may not be feasible, given differences in soil types etc. Data on
1021 the levels of mercury in sediments are very relevant for the associated levels of mercury in
1022 biota; however sampling of sediment was considered not as widespread, nor as easily
1023 comparable on a global basis, at this time. Currently, this work is done through research-
1024 based activities and not dedicated long term monitoring programmes.

1025

1026 **3. Comparability, gaps and options for filling gaps**

1027 **Air**

1028 31. Figure 1 shows the current monitoring efforts for TGM/GEM. From this figure it can be
1029 seen that the gaps of TGM/GEM information could be filled by enhancing the current
1030 networks that are conducting atmospheric mercury monitoring. Such expansions would
1031 include areas within South America, Africa, the Caribbean, parts of Asia, Russia, and
1032 Oceania.

1033

1034

1035

1036

1037

1038

1039

1040

1041

1042

1043

1044

1045

1046

1047

1048

1049

1050

1051

1052

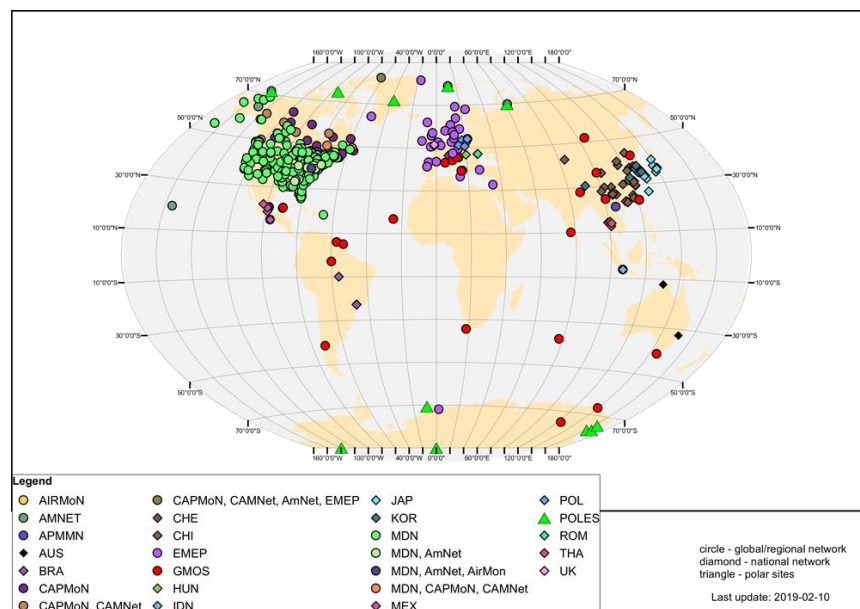


Figure 1 – Existing monitoring networks measuring Hg concentrations in air.

- 1053 32. The following are recommended:
- 1054 ▪ Couple current monitoring of TGM/GEM with new technologies (including passive
 - 1055 and active mercury sampling);
 - 1056 ▪ Expand current monitoring networks, where possible, to fill in data gaps;
 - 1057 ▪ Employ currently-used standard procedures for data collection and treatments, where
 - 1058 possible;
 - 1059 ▪ Conduct intercomparisons of measurement technologies and data treatment among
 - 1060 networks;
 - 1061 ▪ Fill geographical data gaps of information using manual active or passive sampling
 - 1062 methods;
 - 1063 ▪ If feasible, couple manual active or passive air measurements with active and wet/dry
 - 1064 deposition measurements;
 - 1065 ▪ Conduct sampling at least on a quarterly basis (either averaged with active sampling
 - 1066 data or integrate over 3 months with passive sampling) to assess seasonal variation;
 - 1067 ▪ Prioritize gaps identified in the global mercury assessment and other literature for the
 - 1068 establishment of new site locations.

1069 33. In elaborating future strategies aiming to fill geographical gaps of atmospheric mercury
1070 monitoring data it is recommended to ensure the operation of about 30 monitoring sites
1071 with manual active or passive air sampling in large geographical areas such as Africa,
1072 Latin America and Russia placed in locations that may provide information on regional /
1073 local background Hg concentrations. The suggested number of sites is only indicative: a
1074 larger number of sites using manual active or passive air sampling in these areas would
1075 certainly allow to have a better geographical distribution and representativeness of the
1076 regional/local emission regimes, meteorology and transport/deposition patterns. A cost
1077 analysis for air monitoring including the proposed sampling can be found in
1078 UNEP/MC/COP.3/INF/XX Part I Section 4.

1079 **Humans**

- 1080 34. Studies using the WHO protocol for assessment of prenatal exposure to methylmercury
1081 are recommended to fill the data gaps in order to obtain a global picture necessary for
1082 effectiveness evaluation. The protocol enables collection of comparable data (e.g. hair
1083 samples from 250 people per study location with minimum diversity recommended). The
1084 studies are country-driven. Local ethical (Institutional Review Board) clearance is
1085 required and the studies are conducted within the health system, therefore country
1086 approval is a given. Each country owns its data and submission of results is voluntary.
- 1087 35. Article 17 of the Minamata Convention on Mercury specifies in paragraph 1(d) that each
1088 party shall facilitate the exchange of epidemiological information concerning health
1089 impacts associated with exposure to mercury and mercury compounds, in close
1090 cooperation with the World Health Organization and other relevant organizations, as
1091 appropriate. The compilation and exchange of data on mercury levels obtained through
1092 human biomonitoring should be undertaken in line with this article of the Convention.
- 1093 36. To facilitate the generation of globally representative data and trend information on human
1094 biomonitoring, which will be most relevant for effectiveness evaluation, an oversight body
1095 should be kept informed of the studies planned and carried out.

- 1096 37. Data quality issues are covered by the WHO protocol. Results of the measurements must
1097 be analytically comparable between laboratories/different studies. To ensure
1098 comparability, each national survey would need to follow the WHO harmonized SOPs for
1099 sampling and analytical methods, and develop procedures for quality assurance and
1100 quality control that cover the pre-analytical phase. The availability of appropriate
1101 reference materials (samples with a certain level of mercury)⁷ supports internal quality
1102 assurance. External quality assurance should be done through international inter-
1103 laboratory comparison investigations. Coordination of the studies will contribute to ensure
1104 appropriate quality control measures.
- 1105 38. The WHO protocol also covers data management, analysis and evaluation issues,
1106 including whether this should be done at the national and/or international level. It
1107 recommends that participating countries conduct statistical analyses at the national level
1108 and submit anonymized data for statistical analysis to a central database. The aim of a
1109 statistical analysis at the international level is to assess associations between biomarker
1110 values and predictors such as age, gender, fish consumption habits, etc. (collected via
1111 questionnaire) in a pooled dataset. Data communication issues are also addressed in the
1112 WHO protocol and particularly for indigenous peoples in AMAP Human Health
1113 Assessments. These communication issues include communication of the results within
1114 the country, to the individuals participating in the study and to policy makers. It should be
1115 noted that, in some countries, national guidelines relating to communication of results may
1116 already exist.
- 1117 39. The UNEP/WHO GEF Global Monitoring Project demonstrated generation of data using
1118 the WHO Protocol in developing countries to be cost-effective, practical and feasible. The
1119 project built local capacities to conduct such studies, which can therefore be repeated over
1120 time and in a range of locations to fill gaps, as described in paragraph 20.

1121 **Biota**

- 1122 40. It has been recognized that there is a large amount of published data available, as well as
1123 unpublished data collected for commercial and governmental purposes. However, it is not
1124 clear to what extent published and other data reflect background information on mercury
1125 concentrations, or whether existing data emphasizes areas where high mercury
1126 concentrations are expected. As previously described, the large , biotic mercury
1127 concentration datasets from the northern United States, Canada and Scandinavia revealed
1128 that levels in freshwater fish from lakes with local mercury sources responded to
1129 regulation and management. Further evaluation work on existing data is required to gather
1130 all currently available globally representative biotic mercury data, to assess what data are
1131 relevant, comparable and able to be harmonized. This process has been started with the
1132 partly UNEP funded GBMS dataset, which will allow a clearer identification of data gaps,
1133 which may be geographic or taxonomic.
- 1134 41. The Arctic Monitoring and Assessment Programme (AMAP) is one of the best examples
1135 of how to operate a long-term Hg biomonitoring field program for the benefit of both
1136 human and ecological health (AMAP 2011, 2015). Whereas, the WHO Global
1137 Environment Monitoring System - Food Contamination Monitoring and Assessment

⁷ A list of existing reference materials can be found in UNEP/MC/COP.3/INF/XX Part II.

1138 Programme, commonly known as GEMS/Food, has one of the best global systems for
1139 collecting fish Hg data through their network of collaborating centers and recognized
1140 national institutions (WHO 2018).

1141 **Cost analysis**

1142 42. A table summarizing the cost, practicality, feasibility, sustainability, comparability and
1143 coverage of currently-used monitoring methods for air, humans, biota and water is
1144 included in UNEP/MC/COP.3/INF/XX.

1145

1146 **4. Available modelling capabilities to assess changes in global mercury levels within and**
1147 **across different media**

1148 43. Table 1 summarizes the capabilities of models to assess changes in global mercury levels
1149 within and across different media. Models for different media (air, water, land, biota) vary
1150 in their ability and state of development. Atmospheric models have been extensively
1151 evaluated and can be applied to assess spatial gradients in atmospheric mercury
1152 concentrations and deposition, as well as temporal changes. By contrast, models for other
1153 media such as land are still mainly used in research applications. Further explanation
1154 including reference to specific available models and example geographic presentation of
1155 calculations from existing models can be found in UNEP/MC/COP.3/INF/XX.

1156 44. Integrated modeling frameworks can illustrate pathways by which primary releases of
1157 mercury to the atmosphere, land and water reach methylmercury in fish and wildlife as
1158 well as exposure of some fish consuming human populations. At present, integrated
1159 modeling frameworks are under development and available as a research product.
1160 Integrated models have not previously been applied or compared in global assessment
1161 efforts. Coupled atmosphere-ocean and atmosphere-terrestrial have been published in the
1162 peer-reviewed literature by a few research groups. With additional model evaluation,
1163 updates should be available to begin policy-relevant analyses by 2023. Models for food
1164 web bioaccumulation of methylmercury are also available from selected groups and can be
1165 used to describe accumulation patterns at the ecosystem scale (lakes, wetlands, estuaries,
1166 contaminated sites) and for global marine food webs. The most difficult link in integrated
1167 modeling frameworks is to human exposure and health outcomes due to the diversity of
1168 dietary preferences, food consumption patterns and individual variability in toxicokinetics
1169 affecting methylmercury uptake and elimination. All these components of integrated
1170 modeling frameworks are rapidly developing in the scientific community.

1171

1172

1173
1174

Table 1. Summary of available modeling capabilities for individual media.

Media/Availability	Indicators needed for model input	Output provided	Gaps still to be filled
<p><i>Socio-Economic Modeling: Some Availability</i></p> <p>Global emission models (forecasting up to 2050)</p>	<p>Inputs: socio-economic activity data (production, population, GDP), material flow and policy specifications</p> <p>Evaluation: intercomparison and past performance, Anthropogenic material flow</p>	<p>Global demands, Emission and release scenarios</p>	<p>Mercury emission factors to be refined(regional, site, etc.), data on mercury content of commodities to be collected, consistency across sectors and non-mercury policies to be explored (e.g. energy)</p>
<p><i>Air: Widely Available</i></p>	<p>Inputs: Global emissions</p> <p>Evaluation: Atmospheric measurements; Wet and dry deposition data</p>	<p>Atmospheric concentration; deposition; temporal changes; attribution by source region</p>	<p>Harmonized emissions inventories to be established</p>
<p><i>Water: Research Product; Some Availability</i></p> <p><i>Global Oceans</i> Global ocean models (MITgcm, NEMO model)</p> <p><i>Estuaries (site specific); Freshwater/rivers (site specific)</i></p>	<p>Inputs: Spatially resolved global atmospheric Hg inputs (wet + dry) – Concentrations of Hg and MeHg in rivers (globally)</p> <p>Evaluation: Measured seawater total and methylmercury, and Hg⁰ concentrations; These are being collected through networks (GEOTRACES/CLIVAR)</p>	<p>Seawater MeHg in global oceans</p> <p>Total Hg concentrations in seawater globally for surface/deep ocean</p> <p>Temporal changes</p>	<p>Seawater Hg species data somewhat sparse but improving</p> <p>Data on Hg and MeHg in global rivers largely lacking</p>
<p><i>Soils/Land: Research Product – Some Availability</i></p> <p><i>Global soils</i> Global terrestrial mercury model (GTMM)</p>	<p>Inputs: Atmospheric deposition (model input) Emissions releases to land/water (very preliminary and coarse spatial resolution)</p> <p>Few data on runoff from contaminated sites</p>	<p>Soil Hg concentrations globally</p> <p>Hg in global rivers</p>	<p>MeHg simulation for terrestrial environments other than site specific assessments still to be done.</p>

<p>ASGM/Contaminated sites (not yet integrated into global models but would be useful)</p>	<p>Global land cover data and atmospheric inputs</p> <p>Evaluation: Soil Hg data (good data for North America, parts of Europe)</p>	<p>“Hot spots” most sensitive to Hg inputs and likely to affect biota/human populations</p>	<p>Ground truthing global “hot spot” analysis is needed. Data on locations of ASGM and releases/contaminated sites to be collected.</p>
<p><i>Biota: Research Product – Some Availability</i> Food web bioaccumulation model for marine ecosystems (global models for plankton exist/fish under development)</p> <p>Food web model for freshwater ecosystems (site specific)</p>	<p>Inputs: MeHg seawater (model); Fisheries biomass production from primary productivity globally, trophic interactions (available through collaboration with NOAA/GFDL and UBC Nereus projects)</p> <p>Evaluation: Biotic mercury database</p> <p>Trophic level 3 for temporal trend, 4 for spatial gradient analysis</p>	<p>Concentrations of MeHg in fish consumed by human populations; Marine origin of MeHg and Attribution of Hg sources in fish (marine mammals?) by region;</p> <p>Changes due to emissions and climate</p>	<p>Global fish model under development; could link to marine mammals/birds</p> <p>Trophic level 4 data in Asia and Africa to be collected</p>
<p><i>Humans</i> Exposures of marine fish consumers (globally)</p> <p><i>Toxicokinetic model linking MeHg ingestion and blood/hair concentrations/outcomes</i></p> <p>Freshwater fish and rice consumers (site specific data, if applicable) – these may be highest risk populations</p>	<p>Inputs: Biomass and MeHg concentrations in fish consumed by different subsistence populations globally (model); Dietary intake data for different human populations</p> <p>National biomonitoring data (model evaluation)</p>	<p>Goal: Attribution of Hg source contributions to human populations</p>	<p>Mechanisms affecting relationships between external MeHg exposure and blood concentrations/outcomes for different populations are uncertain (research evolving)</p>

Occupational exposures at ASGM sites (site specific)			
--	--	--	--

1175
1176
1177

5. Establishing a baseline for monitoring data

1178 45. In the “before-after” approach where the mercury levels before and after the
1179 implementation of the Convention, monitoring data close to the beginning and the end of
1180 the evaluation period can be used. For the first effectiveness evaluation, monitoring data
1181 before the entry into force of the Convention may be used as baseline.

1182 46. For air, historical monitoring data exist for some part of northern hemisphere. For human
1183 biomonitoring, data from a limited number of regional and national biomonitoring
1184 programmes and longitudinal studies may be used. For biota, historical data on mercury
1185 levels in freshwater fish in limited geographical areas are available. Work is underway to
1186 analyze available data on ocean fish species.

1187 47. In the “with-without” approach to assess the change in mercury levels attributable to the
1188 measures taken to implement the Convention, mercury levels for the business-as-usual
1189 scenario need to be estimated using integrated modelling framework described above.

1190

1191 **Annex 2: Draft terms of reference of the Effectiveness Evaluation Committee**

1192

1193 **A. Mandate**

1194 1. An Effectiveness Evaluation Committee (hereinafter, “the Committee”) is
1195 established to perform the functions assigned to it by the Conference of the Parties.

1196 **B. Membership**

1197 2. The members of the Committee shall be appointed on the basis of equitable
1198 geographical distribution, taking into account gender and the need for a balance
1199 between types of expertise.

1200 3. The Committee shall consist of twelve experts, as follows:

1201 (a) Ten experts designated by parties representing the five United Nations
1202 regions, and confirmed by the Conference of the Parties;

1203 (b) One expert representing the monitoring arrangement;

1204 (c) One expert representing the implementation and compliance committee.

1205 4. Experts designated by parties and confirmed by the Conference of the Parties
1206 shall have expertise in evaluation, reporting and national implementation, financial
1207 or technical assistance, or other expertise relevant to the evaluation.

1208 5. Experts from the implementation and compliance committee shall be selected
1209 by and from among the members of its committee.

1210 5a The expert representing the monitoring arrangement shall be selected from the
1211 members that take part in these arrangements.

1212 5b Members shall provide their expertise in a neutral and impartial manner, and
1213 stand to the evidence presented to the committee.

1214 6. The terms of office shall coincide with a cycle of evaluation as determined by
1215 the Conference of the Parties.

1216 7. If a member is unable to complete his or her term of office, the region
1217 nominating that member shall nominate another person to complete the term.

1218 **C. Invited experts and observers**

1219 8. The Secretariat shall select two internationally recognized experts in
1220 effectiveness evaluation with due consideration to available expertise on the
1221 measures.

1222 9. The Secretariat shall invite one representative of the World Health
1223 Organization as an observer.

1224 10. The committee will invite the participation of up to five experts from civil
1225 society, indigenous organizations, intergovernmental organizations, industry and the
1226 UNEP Global Mercury Partnership as observers. The participation of observers will
1227 be balanced among the above-mentioned groups and gender.

1228 11. The committee may allow additional observers within reasonable limits.

1229 12. Observers shall provide their technical expertise that helps the committee
1230 members interpret the information provided.

1231 **D. Officers**

1232 13. The committee shall elect, from among its members, a chair and a vice-chair.

1233 **E. Administrative and procedural matters**

1234 14. The committee shall apply, mutatis mutandis, the rules of procedure of the
1235 Conference of the Parties, unless otherwise provided in these terms of reference.

1236 15. The committee may establish such arrangements as are necessary to facilitate
1237 its work in line with the present terms of reference.

1238 16. The committee members shall seek to reach agreement by consensus. Should
1239 consensus not be reached by members, the range of their views shall be reflected in
1240 any report to be submitted to the Conference of the Parties.

1241 **F. Meetings**

1242 17. The committee shall hold two face-to-face meeting, to review the information
1243 available for each evaluation cycle and to develop a report to the Conference of the
1244 Parties, subject to the availability of funds and work requirements. Based on the
1245 decisions of the Conference of the Parties, the frequency of committee meetings
1246 may be amended as necessary.

1247 18. Documents to be transmitted to the Conference of the Parties shall be
1248 finalized by the committee at least four months before the meeting of the
1249 Conference of the Parties.

1250 **G. Language of meetings**

1251 19. The working language of the committee shall be English.

1252 **H. Budget**

1253 20. Except for members from developed country parties referred to in paragraph 4
1254 of the present terms of reference, financial support for travel and daily subsistence
1255 allowance shall be made available to committee members, and invited experts and
1256 observers for participation in meetings of the committee according to United
1257 Nations rules and practice.

1258

1259 **Annex 3: Draft terms of reference of the global monitoring arrangements**

1260

1261 **Introduction**

1262 1. This annex contains a proposal for global monitoring arrangements building on existing
1263 monitoring activities, knowledge, expertise and proposes the terms of reference for an
1264 expert group to [prepare a synthesis report on monitoring as identified in Section III of
1265 the report] [carry out tasks related to monitoring indicators identified in the effectiveness
1266 evaluation framework in Section III] in this Annex.

1267 2. In the consideration of the monitoring arrangements, the following key elements were
1268 identified:

1269 a. Mercury data and their availability from human health and environmental
1270 monitoring programmes that achieve global coverage and contain at least core
1271 representative data from all regions,

1272 b. Tools supporting data harmonization such as standard operating procedures and
1273 monitoring guidance document,

1274 c. Expertise necessary for gathering and consolidating harmonized information that
1275 ensures comparability and consistency in mercury monitoring data over the long-
1276 term,

1277 d. Modelling capabilities, and

1278 e. Development of a global periodic report on levels and trends of mercury to support
1279 the effectiveness evaluation.

1280 3. The text below further elaborates on the key elements identified, but a large amount of
1281 other relevant technical information on monitoring and background complementing the
1282 proposal below is available in a reference document as UNEP/MC/COP.3/INF.xx.
1283 Existing modelling capabilities are reviewed in detail in that INF document as well.

1284 **1. Mercury data and their availability from human health and environmental monitoring** 1285 **programmes**

1286 4. Regarding mercury data availability, a review presented in Annex I shows that even if
1287 mercury has one of the largest available collective data sets of recognized environmental
1288 contaminants, data gaps remain. These gaps could be efficiently covered with support of
1289 scientific activities and use of already developed materials.

1290 5. By continuing existing mercury monitoring activities in a harmonized manner (see Tools
1291 supporting data harmonization below), supplementing them with actions to fill the
1292 geographical gaps, data on levels of mercury and mercury compounds in air, biota and
1293 humans either are available or would be able to be obtained, and would be comparable on
1294 a global basis.

1295 6. Below is the proposal for mercury monitoring activities building on existing monitoring
1296 activities and knowledge organized by media. This information should be part of global
1297 mercury monitoring report.

1298 **Air**

1299 7. For air monitoring, it is proposed to continue monitoring activities by existing networks
1300 by active continuous monitoring and manual active and passive air sampling techniques
1301 and collect:

1302 ▪ Total Gaseous Mercury (TGM) concentrations in air at background and
1303 impacted sites, and

1304 ▪ Atmospheric deposition fluxes.

1305 for assessing spatial and temporal patterns of mercury concentrations in ambient air and
1306 deposition fluxes to terrestrial and aquatic ecosystems. Standard Operating Procedures
1307 (SOPs) suggest to monitor mercury deposition fluxes with samplers that are “Wet only”
1308 or Bulk.

1309 8. To fill the geographical gaps in continents, samples should be collected to provide
1310 average TGM concentrations as monthly (or at lower frequency) average to cover Africa,
1311 Latin America and Russia and provide regional/local background TGM concentrations.

1312 **Human**

1313 9. For human biomonitoring for prenatal exposure in the general population the following
1314 biomarkers are recommended:

1315 ▪ Total mercury in maternal scalp hair (3 cm hair strand from the scalp, to
1316 measure exposure during the 3rd trimester), and

1317 ▪ Total mercury in cord blood – recent exposure to methyl mercury.

1318 10. Maternal scalp hair is a preferable biological matrix to assess prenatal exposure. Cord
1319 blood can be an alternative matrix to hair. Human samples collected in approximately 5-
1320 year intervals are feasible for human biomonitoring surveys considering the aim to
1321 identify statistically significant differences as well as the time such studies take to
1322 implement (including adaptation of the master protocol to local circumstances, local
1323 ethical approval, training of staff etc.). Human samples should be accompanied by a
1324 series of attributes, e.g. age, gender as well as social/habitual information e.g. fish
1325 consumption pattern, economic level, etc.

1326 11. It might be useful to coordinate the sample collection with the survey activities under the
1327 Stockholm Convention as the one ethical approval could be used.

1328 12. The Global Mercury Assessment 2018 identified currently available data on mercury
1329 exposure in national human biomonitoring programmes, longitudinal birth cohort studies
1330 and cross-sectional information in specific populations including high exposure groups.
1331 These activities should be continued to provide a long-term information for subsequent
1332 effectiveness evaluation.

1333 **Biota**

- 1334 13. For biota monitoring, an important aspect in combining monitoring efforts for
1335 documentation of convention effectiveness would be to define biological species and
1336 proper tissue types for monitoring, to minimize the effects of species-specific
1337 physiological differences. Species that accumulate significant amounts of mercury pose a
1338 potential risk for human health, that are widely distributed over specific geographically
1339 areas, and that exist in numerous historical studies should be prioritized. Additionally,
1340 there is a need to normalize or account for mercury concentrations in biota by size, age
1341 and sex, and these data should be included in the data collection process. The choice of
1342 fish species for sampling should be based on the trophic level, with trophic level 4
1343 (carnivores that eat other carnivores) being most appropriate for decisions related to
1344 human and ecological health assessments.
- 1345 14. It is proposed that biotic monitoring be separated into two major approaches to account
1346 for major differences in exposure pathways: continental and oceanic frameworks. A large
1347 amount of relevant technical information on the frameworks is available in a reference
1348 document as UNEP/MC/COP.3/INF.xx. Continental framework aims at identifying
1349 ecosystem sensitivity spots that are able to methylate mercury and make it available in
1350 the food web. Oceanic Framework for mercury monitoring in biota covers oceanic areas.
1351 The outcome combines ocean basin, matrix of interest for human consumption that have
1352 global ranges to define spatial gradients (trends) of mercury level in biota.

1353

1354 **2. Tools supporting data harmonisation**

- 1355 15. Tools supporting data harmonization regarding comparability represent in particular
1356 standard operating procedures, guidance on global monitoring document, and inter-
1357 calibration studies.
- 1358 16. Document UNEP/MC/COP.3/INF/XX contains a more detailed information on standard
1359 operation procedures (SOPs) already available and their use is encouraged. Review of
1360 data availability therein also comprises information on other available tools for
1361 maintaining data comparability including inter-calibration studies.
- 1362 17. Further, to maintain harmonized information on mercury levels in environment, existence
1363 of a global mercury monitoring guidance document would be very useful. While
1364 development of such a document is included in the ad-hoc expert group`s mandate, the
1365 group felt that such document can only be prepared once monitoring arrangements for
1366 mercury are agreed. Guidance document could then be prepared swiftly on the basis of
1367 core matrices and available knowledge.
- 1368 18. Nevertheless, experts prepared elements for the guidance on global monitoring (available
1369 monitoring activities organized per matrix, state of science for monitoring, procedures on
1370 sampling, sample handling, chemical analyses of samples) that is contained in
1371 UNEP/MC/COP.3/INF/XX part two that presents a draft structure of the guidance
1372 document and other relevant information.

1373

1374 **3. Development of a global periodic report**

- 1375 19. It is proposed that a global mercury monitoring report on status of the environment and
1376 occurrence of mercury is developed in regular and suitable intervals to support the
1377 effectiveness evaluation.
- 1378 20. Available globally representative monitoring data would be compiled, assessed and
1379 summarized by relevant experts performing scientific function in this field (see below).
- 1380 21. Global report would be organized by media and show available monitoring data and
1381 trends in the environment, humans and biota. Global monitoring report would also use
1382 models to predict further trend development.
- 1383 22. Information from the global report would then be also used for contextualization of
1384 information in a multi compartment model to capture the socio-economic scenario,
1385 baseline and different policy alternatives.
- 1386 23. The first global report on monitoring and modelling to the effectiveness evaluation
1387 committee on state of the environment needs to become available for the first meeting of
1388 the effectiveness evaluation committee.

1389

1390 **4. Expertise necessary for synthesizing monitoring data**

- 1391 24. During the discussions of the effectiveness evaluation framework`s science and technical
1392 functions, it became clear that information on the status of the environment and
1393 occurrence of mercury is to be synthesized by an expert body with extended research
1394 expertise to oversee the gathering and consolidation of monitoring data.
- 1395 25. The group would be assigned to gather information from existing monitoring activities
1396 and compile them into a global synthesis report and assess mercury levels and trends
1397 through the use of models, and thus prepare a global monitoring report as referred to in
1398 Section II of this report. Proposed terms of reference of the group are shown below.

1399

1400 **Draft ToR of the monitoring and modelling group**

1401 **Mandate**

1402 A monitoring and modelling [task] group (hereinafter, “the group”) is established to perform
1403 the functions assigned to it by the Conference of the Parties in support of the effectiveness
1404 evaluation including:

- 1405 a. Gathering of information from mercury monitoring activities and compilation of the
1406 relevant information including national and scientific data on changes in levels of
1407 mercury in core media taking into account the work already achieved and drawing on
1408 experience from existing monitoring networks on mercury. Changes include spatial and
1409 temporal trends including contextualization through use of models.
- 1410 b. Preparation of a global monitoring report on mercury for effectiveness evaluation
1411 committee meetings.

1412 c. Development of a monitoring guidance document to provide the COP with
1413 comparable monitoring data on the presence and movements of mercury and mercury
1414 compounds in the environment as well as trends in levels of mercury and mercury
1415 compounds observed in biotic media and vulnerable populations, organize data gathering
1416 and visualization of information. The group should start its work on this task immediately
1417 so that the documents is available for COP4.

1418 d. Update of a monitoring guidance document in line with the latest scientific
1419 knowledge, modelling capabilities and ongoing monitoring activities.

1420 e. Identification of gaps in information/knowledge and development of proposals for
1421 bridging the gaps as a part of the report prepared for consideration by the effectiveness
1422 evaluation committee.

1423 **Membership**

1424 The group members shall be appointed on the basis of equitable geographical distribution,
1425 taking into account gender and the need for a balance between types of expertise.

1426 Each region should nominate four experts for monitoring and modelling (up to three
1427 representatives with expertise on mercury monitoring in core media or participating in
1428 existing monitoring networks on mercury and at least one representative with expertise on
1429 modelling environmental trends/multicompartment models)

1430 The group will invite the participation of up to 10 experts from civil society, indigenous
1431 communities, intergovernmental organizations, industry and “global modelling” experts. The
1432 participation of these experts as observers will be balanced among the above-mentioned
1433 groups.

1434 The group will invite relevant experts from research communities, Global Mercury
1435 Partnership and existing monitoring networks to assist them in their work and supplement the
1436 most up to date information and scientific knowledge to produce a global report.

1437 The terms of office shall coincide with a cycle of the effectiveness evaluation as determined
1438 by the Conference of the Parties. To maintain continuity, the COP may renew terms of office
1439 of the members for subsequent evaluations. If a member is unable to complete his or her term
1440 of office, the region/sector nominating that member shall nominate another person to
1441 complete the term.

1442 **Officers**

1443 Two co-chairs will be elected by the group to facilitate its meetings.

1444 **Secretariat**

1445 The secretariat will provide administrative and programmatic support to the group of experts.

1446 **Meetings**

1447 The group on monitoring and modelling will meet face-to-face at least three times during an
1448 effectiveness evaluation cycle to coordinate monitoring activities on mercury and to deliver a

1449 global report on monitoring and modelling to the effectiveness evaluation committee on state
1450 of the environment.

1451 **Language**

1452 English will be the working language of the group.

1453 **Annex 4: Description of the reports to be prepared for the Effectiveness**
1454 **Evaluation Committee**

1455
1456

- 1457 1. The framework foresees five reports being prepared for consideration by the
1458 Effectiveness Evaluation Committee (see Section III of the Report).

1459 **Synthesis Reports**

- 1460 2. Four synthesis reports are to be prepared (level 1 to 3) to respond to the first three policy
1461 questions. Two streams of information feed into these reports: (i) information provided
1462 by Parties based on Article 21 reporting, and (ii) information and knowledge that is
1463 scientific, peer-reviewed and publicly available.

- 1464 3. The content envisaged under each synthesis report is set out below, as are the tasks that
1465 need to be completed, and the expertise required.

- 1466 i. The **Emissions and Releases Report** is to gather, analyse and synthesise relevant
1467 information on emissions and releases inventories from relevant sources, as
1468 specified in Article 8 and 9, as well as information on the measures taken by
1469 Parties to control mercury emissions and releases, and relevant changes in
1470 emissions and releases. The expertise required for this task includes
1471 emissions/releases inventories, developing or implementing measures to control
1472 mercury emissions and releases from relevant sources, including best available
1473 techniques and best environmental practices, modelling and inventories on
1474 temporal and spatial trends and variability.

- 1475 ii. The **Trade, Supply and Demand Report** is to gather, analyse and synthesise
1476 relevant information on the mercury flows and social stocks, on trends in trade,
1477 supply and demand for mercury, and on regulatory frameworks and
1478 implementation. The expertise required for this task includes: trade analytics,
1479 sectoral analysis, ASGM expertise, use, changes and alternatives to mercury in
1480 products and processes.

- 1481 iii. The **Waste Management Report** is to gather, analyse and synthesise relevant
1482 information on mercury waste flows and stocks, track mercury waste management
1483 practices and recycling, and on regulatory frameworks and implementation, as
1484 well as gaps. The expertise required for this task include: inter-industry relation
1485 analysis, waste management policy and practices, and waste disposal engineering.

- 1486 iv. The **Global Monitoring Report** is to gather information from mercury monitoring
1487 activities and compile relevant information including national and scientific data
1488 on changes in levels of mercury, taking into account the work already achieved,
1489 and drawing on the experience of existing networks on mercury, trends and
1490 models. (See Annex III for detailed information).

1491 **Integrated Assessment Report**

- 1492 4. Based on the synthesis reports and other information linkages need to be made between
1493 policy actions, emission reductions and resulting mercury levels, using available data
1494 sources, modelling techniques and analytical tools drawn from natural and social
1495 sciences. This will be done in the **Integrated Assessment Report**.
- 1496 5. It is to be noted that the integrated assessment function will evolve as our understanding
1497 of mercury improves over time. For the first round of the effectiveness evaluation, when
1498 no previous assessment is available, several ground studies to provide the basis of the
1499 evaluation, will need to be conducted.
- 1500 6. With this as background, the content of the integrated assessment report is expected to
1501 contain:
- 1502 a. The examination of time lags between actions and outcomes observed by the
1503 subsequent evaluations: Significant time lags for years or even decades due to the
1504 slow pace of change in socio-economic systems, and in the physical and
1505 biological dynamics of the Earth system will need to be discussed.
- 1506 b. The examination of the baseline scenario, which draws on a hypothetical
1507 ‘business as usual’ setting for when the Convention had not been implemented:
1508 The hypothesis will employ assumptions and interpretations that could go beyond
1509 the factual presentation. As far as practical, different scenarios will be developed
1510 for future forecasting, given that it is expected that population growth, economic
1511 development, and global warming will alter the mercury baseline due to the
1512 changes in consumption patterns and global material flows.
- 1513 c. The assessment of the four policy questions, that could go as far as forecasting
1514 based on appropriate extrapolation: Several types of modelling can help such an
1515 assessment. (It has to be noted, however, that present science has not yet
1516 developed reliable models to forecast long-term changes in mercury levels
1517 resulting from emissions reductions that take into account the full complexities of
1518 mercury in the environment.) Therefore, earlier evaluations on the effectiveness
1519 of the Minamata Convention must rely on simpler forecasting methods and will
1520 have greater uncertainty than later evaluations when improvements to such
1521 forecasting models become available.
- 1522 d. The comprehensive analysis of the interaction between different indicators for
1523 identifying important synergies and trade-offs: Understanding the relationship
1524 between indicators is important for improving implementation efficiency.
- 1525 7. The following chapters are suggested for the Integrated Assessment Report:
- 1526 **Assumptions and baseline scenario setting for the integrated assessment**
1527 **Assessment of the policy questions**
1528 *Policy question 1: Have the Parties taken actions to implement the Minamata*
1529 *Convention?*
1530 *Policy question 2: Have these actions resulted in changes in emissions and releases of*
1531 *mercury to the environment?*
1532 *Policy question 3: Have these changes in emissions and releases resulted in changes in*
1533 *levels of mercury in the environment, biota and humans attributable to the Convention?*
1534 *Policy question 4: Will existing measures under the Minamata Convention be sufficient*
1535 *to meet its objectives of protecting human health and environment from mercury?*

1536	Synergies and trade-offs between indicators for improving implementation
1537	efficiency
1538	Time lags between actions and outcomes
1539	Conclusions
1540	Appendix: Result “Dashboard” - progress of the indicators in the evaluation
1541	framework
1542	