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GARRIGUES

Study on EU Implementation of the Minamata Convention on Mercury

Draft Final Report (revised)

30 June 2014

Contract ENV.C.3/FRA/2011/0030/11 under
Framework Contract ENV.C.3/FRA/2011/0030

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A report prepared for DG Environment, European
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Accronyms and abbreviations

ASGM	Artisanal and small-scale gold mining
BAT	Best available techniques
BAU	Business as usual (scenario)
BREF	BAT Reference Document
BMC	Beyond minimal implementation of the Minamata Convention (scenario)
CFL	Compact fluorescent lamp
CLP	Classification, labelling and packaging
COP	Conference of the Parties
GEF	Global Environment Facility
GES	Good Environmental Status
ES(D)	Environmentally sound (disposal)
IED	Industrial Emissions Directive
LoW	List of Wastes
MI	Minimal implementation (scenario)
MC	Minamata Convention on Mercury
ML	Maximum levels
Na	Sodium
NFM	Non-ferrous metals
NMVOC	Non-methane volatile organic compounds
K	Potassium
OECD	Organisation for Economic Cooperation and Development
PPP	Plant protection products
PRTR	Pollutant Release and Transfer Register
SDS	Safety Data Sheet
SVHC	Substances of very high concern
VCM	Vinyl chloride monomer
WSR	Waste Shipment Regulation

1. Preface

Mercury is recognised as a chemical of global concern due to its long-range transport in the atmosphere, its persistence in the environment, its ability to bio-magnify in ecosystems and its significant negative effect on human health and the environment. For many years the EU has been advocating strong international action to address the problems posed by mercury's release into the environment. Since 2003, when mercury was acknowledged as a global pollutant by UNEP's Governing Council, a process has on been underway under the auspices of UNEP to forward global cooperation to reduce the impacts of mercury pollution.

In February 2009 negotiations on a global legally binding instrument on mercury were launched. The negotiation process was concluded in Geneva on 20 January 2013. The new mercury convention opened for signature in Japan, 7-11 October 2013 and was named the "Minamata Convention on Mercury" after the Japanese town where severe mercury pollution happened in the 1950s. The European Commission and many EU Member States were leading advocates for initiation of the negotiations, and have been active participants in the negotiations.

The Commission realised early that reducing mercury releases to the environment in the EU territory itself was not enough to address the observed adverse impacts of mercury in the EU. This is because mercury, due to its physical and chemical characteristics, is capable of being transported globally in the atmosphere and, at a slower rate, with ocean currents. A Community Strategy Concerning Mercury (or the EU Mercury Strategy) was therefore adopted in 2005 targeting mercury reductions in all stages of its life cycle, both internally in the EU with 13 concrete actions, and globally with 7 specific actions on the promotion of international work to reduce mercury's adverse impacts. The strategy was reviewed in 2010, and was found to be in an advanced stage, having delivered on almost all actions. Since then, new pieces of legislation have been adopted on, for example, further restrictions on marketing of mercury-containing measuring instruments to professionals, and on organic mercury catalysts for polyurethane (PU) elastomers. Best available techniques (BAT) and associated emission levels for large point sources are being defined in BAT conclusions developed under the Industrial Emissions Directive.

The European Commission has, under the Framework Contract No ENV.C.3/FRA/2011/0030, contracted ICF with COWI, BiPRO and Garriques Ambiental to perform the current study under the contract title "Assistance to the Commission in view of the European Union (EU) becoming a party to the Minamata Convention on mercury".

The objectives of the study are, according to the Terms of Reference:

- 1 To assist the Commission Services in view of the EU becoming a party to the Minamata Convention on Mercury by identifying measures that would need to be taken at EU level in order to comply with its provisions.
- 2 To assess the impacts of such measures, where needed, in view of internal procedures requiring an impact assessment for proposing new EU legislation, or amendments to existing legislation.
- 3 To maximise synergies in follow-up actions for the implementation of the Convention in view of relevant existing EU legislation by integrating the review of the Mercury Export Ban Regulation in the assessment.

This report was prepared by Jakob Maag, COWI, Ferdinand Zotz and Alexander Potrykus, BiPRO and Andrew Jarvis, ICF International, September 2013 – June 2014.

2. Executive summary

Mercury is recognised as a chemical of global concern due to its long-range transport in the atmosphere, its persistence in the environment, its ability to bio-magnify in ecosystems and its significant negative effect on human health and the environment. For many years the EU has been advocating strong international action to address the problems posed by mercury's release into the environment.

In January 2013 negotiations on a global legally binding instrument on mercury were concluded. The new mercury convention was named the "Minamata Convention on Mercury" after the Japanese town where severe mercury pollution happened in the 1950s.

The EU realised early that reducing mercury releases to the environment in the EU territory itself was not enough to address the observed adverse impacts of mercury in the EU. This is because mercury, due to its physical and chemical characteristics, is capable of being transported globally in the atmosphere and, at a slower rate, with ocean currents. A Community Strategy Concerning Mercury (or the EU Mercury Strategy) was therefore adopted in 2005 targeting mercury reductions in all stages of its life cycle, both internally in the EU and globally.

This study identifies the gaps between the existing EU legislation relevant to mercury and the provisions of the Minamata Convention, and assesses the impacts of relevant options proposed to bridge these gaps.

Legal baseline

This study presents a relatively conservative assessment of the gaps in the EU mercury legislation vis-à-vis the Minamata Convention. Several issues are open for interpretation, and the actual proposals for meeting identified gaps will be subject to the Commission's discretion.

The gap assessment confirmed that most of the Convention provisions are already met or could be met by making minor adjustments to EU law. These adjustments are expected to have minimal impacts. In a few instances, current EU legislation clearly does not meet the obligations of the Minamata Convention. In some instances, there are unresolved questions about the degree of coverage provided by present EU legislation.

Business as usual scenario

A business as usual scenario, meaning that no change to EU law would be done and consequently, the Minamata Convention could not be ratified, would be in conflict with the EU Community Strategy on Mercury and the already agreed intentions of the EU to ratify the Minamata Convention. It would have the direct consequence that the mercury exposure within the EU territory would not be reduced. This is because a significant part of the atmospheric mercury deposition in the EU has origin outside its territories. Additional mercury is transported with ocean currents and rivers to EU waters. The EU's failure to ratify the Convention could reduce the chances of the Convention achieving the global mercury release reductions needed.

Minimal implementation scenario

The economic, social and administrative burdens of a strictly minimal implementation of the Minamata Convention on mercury are minimal to moderate when seen in the overall EU context. Total quantified costs of a strictly minimal implementation of the Minamata Convention are estimated at 2 to 90 million EUR/year¹. Additional costs, not quantified in the assessment, are expected. The single most costly initiative assessed will have substantial impacts on the companies involved: It is the restriction of mercury use in alcoholates production, in which costs for substitution are estimated at 0-160 million EUR in investments plus annual operational costs of some 2-40 million EUR. Annualising the investment costs and adding the annual operational costs gives total annual costs of 2 to 65 million EUR².

The provisions of the Minamata Convention on mercury are very similar to existing EU legislation on mercury, and the overall goals of the Convention are in line with the EU Mercury Strategy. This means that the EU has already realised much of the internal potential for mercury release reductions which the Convention aims for. This was foreseen, and the EU Mercury Strategy identifies the need for international action to lower further the observed impacts to health and environment within the EU territory.

The Minamata Convention is the best available, and most cost-effective, means of realising this goal, while at the same time substantially reducing the harmful impacts of mercury globally.

Enhanced implementation

Significant additional benefits to health and environment can be achieved, especially within the EU territory, by implementing certain measures which go beyond the minimal interpretation of the requirements of the Convention. These go further in fulfilling the intentions of the EU Mercury Strategy and the Minamata Convention and, in addition to their direct benefits within the EU, would send a

¹ The investment costs are annualised using 10 year and 10%. If instead using 4% as discount rate, the total annual costs would be 2 to 85 million EUR.

² The investment costs are annualised using 10 year and 10%. If instead using 4% as discount rate, the total annual costs would be 2 to 60 million EUR.

strong signal of the EU's support of the Convention value to other Parties to the Convention. The measures assessed in this study are:

- › Further reducing the mercury emissions from existing medium-size coal fired combustion plants (at a cost estimated at 17-54 million EUR/y; roughly estimated emission reductions expected: 1-3 t/y).
- › Restricting mercury supply via restrictions on import (0-14 million EUR costs for increased prices or substitution for industry plus some minor distributional effects).
- › A conditional ban on new commercial mercury uses; this measure primarily has a signalling effect (costs cannot be known with complete certainty but are expected to be marginal).
- › Banning mercury use in alcoholates production (costs estimated at 22-65 million EUR/y, of which a part will also be incurred under MI scenario; 0.3-1 tonne Hg/y will be eliminated from circulation in the EU)
- › A ban of dental amalgam with technically justified specific exemptions (300-15,000 million EUR/y); 90-110 t Hg/y will be eliminated from circulation in the EU with associated release reductions).

Other measures going beyond the strictly minimal implementation of the Minamata Convention are available, but either:

- › Cannot be assessed with the evidence currently available (relating to MC Articles 8 and 9); or
- › have been deemed with comparatively moderate impacts, and are therefore not assessed in detail in this study.

Some significant data gaps were identified, which may need further study. These include certain aspects relating to the following issues:

- › Export of mercury-added products.
- › Processes with mercury use (potassium ethylate use and alternatives).
- › Coverage by the IE Directive of major air emission sources targeted by the Minamata Convention.
- › Updated mercury consumption and release inventories for various mercury source categories of relevance for this assessment.
- › Updated mercury supply data from recycling in the EU.

[#If adequate data become available from stakeholders during the consultation process, the assessment may be supplemented on these issues; see detailed data gaps sections.]

3. Gap analysis of EU legislation vis-à-vis the Convention and proposals for options

3.1 Summary of the gap analysis (legal baseline)

3.1.1 Overview of the provisions of the Convention and coverage of EU legislation

Table 3-1 below gives a brief overview of the EU acquis' coverage of the provisions of the Minamata Convention (MC). Important details cannot be captured in this overview and the reader is therefore recommended to review the detailed assessment in the relevant sections of the detailed gap analysis presented in Appendix 1. The section numbers (links) provided in the table can be used to jump to the relevant sections.

As shown in the table, a number of MC provisions are fully met in the EU acquis, while many provisions are partially met but adjustments are necessary. For some provisions, for example as regards the “75% rule” described above, detailed study may be necessary in order to establish if the provisions can be argued to be met already (in a low-ambition scenario on the EU's part). Finally, a number of MC provisions are clearly not met at present.

Table 3-1 Overview of the provisions of the Convention and coverage of EU legislation

Article and para. in MC	Link to relevant section in this report*	Impact of MC provision	Soft or firm? (f/fs/s)**	Potential problems w. interpretation? (y/n)	EU legislation addressing the provision/[obligation]	Summary of assessment	As compared to the MC, EU law delivers
3(3)	7.1.2	Ban on new primary mercury mining	F	n	Regulation (EC) 1102/2008	<i>De facto</i> ban, but not explicit: Mercury extracted from cinnabar ore is considered as waste and subject to waste disposal. Cinnabar ore is the only economically viable mercury ore. Depending on interpretation of MC, this might suffice to demonstrate compliance	<i>De facto</i> compliance or full compliance
3(4)	7.1.3	Ban on existing primary mercury mining	F	n	Regulation (EC) 1102/2008	<i>De facto</i> ban, but not explicit; see above	<i>De facto</i> compliance or full compliance
3(5) lit. (a)	7.1.4	Identification of mercury stocks	S	n	None		Non-compliance
3(5) lit. (b)	7.1.4	Disposal of excess mercury from chlor-alkali facilities as waste	F	y	Regulation (EC) 1102/2008	“Metallic mercury that is no longer used in the chlor-alkali industry” is considered waste and subject to waste disposal	<i>De facto</i> compliance
3(6)	7.1.5	Ban of mercury export	F	n	Regulation (EC) 1102/2008	Export ban for mercury	Full compliance
3(8)	7.1.6	Ban on mercury import	F	n	None		Non-compliance
4(1)	7.2.2	Prohibition of manufacture/import/export of mercury-added products (Annex A, Part I)	F	n	Batteries Directive, RoHS Directive, REACH, Cosmetics Regulation, PPP Regulation, Biocides Regulation	Placing on the market / import of products in which mercury or mercury compounds are in place for all items. Yet, manufacturing and export is not addressed by EU acquis	Non-compliance
4(3)	7.2.3	Measures with respect to mercury-added products (Annex A, Part II)	f	n	None		Non-compliance

Article and para. in MC	Link to relevant section in this report*	Impact of MC provision	Soft or firm? (f/fs/s)**	Potential problems w. interpretation? (y/n)	EU legislation addressing the provision/[obligation]	Summary of assessment	As compared to the MC, EU law delivers
4(5)	7.2.4	Preventing the incorporation of mercury-added products in assembled products	F	n	REACH, RoHS Directive, further market-based product legislation	EU acquis comprises restrictions regarding the placing on the market / import of products to be used in assembled products	Full compliance
4(6)	7.2.5	Obligation to "discourage" manufacture and distribution of new products	Fs	n	None		Non-compliance
5(2)	7.3.2	Prohibition of mercury use in the processes listed in part I of Annex B	F	n	IE Directive	Chlor-alkali production with mercury cell is considered non-BAT within the BAT-conclusion of Draft Final BREF CLK Acetaldehyde production is submitted to the IED regime but mercury use is neither addressed in the Directive nor in BAT conclusions	Non-compliance
5(3)	7.3.3	Obligation to restrict the use of mercury in the processes listed in part II of Annex B	F	n	IE Directive	The three relevant processes (VCM, Na/K-ethylate/methylate process, PUR) are submitted to the IED regime but mercury use is neither addressed in the Directive nor in BAT conclusions	Non-compliance
5(5)	7.3.4	Obligation to take measures to "address" emissions and releases from all processes / to endeavour to identify facilities	fs/s	n	IE Directive	The relevant processes are all covered by IE Directive (see above); the obligation to "address" emissions and releases is complied with. The soft-law commitment as of Article 5(5) lit. (c) MC is not fulfilled by maintaining the register according to PRTR Regulation, since the PRTR Regulation does not require reporting of the used amounts of any substance, as required by Article 5(5) lit. (c) MC.	Full compliance / non-compliance
5(6)	7.3.5	Prohibition of using	F	n	IE Directive	Of the relevant processes, the chlor-alkali process is	Non-compliance

Article and para. in MC	Link to relevant section in this report*	Impact of MC provision	Soft or firm? (f/fs/s)**	Potential problems w. interpretation? (y/n)	EU legislation addressing the provision/[obligation]	Summary of assessment	As compared to the MC, EU law delivers
		mercury in new facilities				the only one where it is currently clear that BAT conclusions will specifically address the Mercury issues which are in the focus of MC.	
5(7)	7.3.6	Discourage "the development of new facilities using any other mercury-based manufacturing process"	Fs	n	None		Non-compliance
7(2)	7.4.2	Reduce/eliminate emissions from Artisanal and small-scale gold mining (ASGM)	F	y	IE Directive	Mercury use in ASGM is not addressed in EU acquis	Non-compliance
7(3)	7.4.3	Determination of significance of ASGM / Developing and implementing a national action plan if applicable	F	y	None		Non-compliance
8(3)	7.5.2	Controlling emissions: Develop a national plan	S	y	None	None	Non-compliance
8(3) / 8(4)	7.5.3	Require BAT/BEP for new sources			IE Directive	<p>The IE Directive's coverage of the five source point categories of Annex D MC is limited in that</p> <ul style="list-style-type: none"> › one of Annex D MC source categories, coal-fired industrial boilers, is currently not covered specifically by the IE Directive; › all other Annex D MC source categories have certain capacity thresholds below which an installation is not subject to IE Directive requirements, with the exception of waste 	Compliance not determined

Article and para. in MC	Link to relevant section in this report*	Impact of MC provision	Soft or firm? (f/fs/s)**	Potential problems w. interpretation? (y/n)	EU legislation addressing the provision/[obligation]	Summary of assessment	As compared to the MC, EU law delivers
						<p>incineration facilities for which some installations are excluded in terms of a substantial demarcation.</p> <p>Further assessment necessary to determine whether EU acquis covers MC obligations (see in detail section 7.5.3.2)</p>	
8(3) / 8(5)	7.5.4	Emission control measures for existing sources	Fs	y	IE Directive	See directly above	Compliance not determined
8(7)	7.5.5	Establish emissions inventory	F	y	PRTR Regulation	PRTR Regulation covers mercury emissions, but only applies to certain facilities, and features certain threshold values below which no reporting obligations exists.	Compliance not determined
9(3)	7.6.2	Identify relevant sources for releases (to water and land)	F	y	IE Directive	It could be claimed that the current IE Directive framework sufficiently identifies significant anthropogenic point source of mercury releases, as required by the MC. Then again, there has been no dedicated identification procedure with a specific view on mercury releases prior to the selection of the installations to be covered by IE Directive.	Compliance not determined
9(4)	7.6.3	Releases control	fs/s	y	IE Directive	IE Directive regime and EU Water Framework Directive approach are considered to cover releases from mercury adequately.	Compliance not determined
9(6)	7.6.4	Establish release inventory	F	y	PRTR Regulation	Given that Annex I to PRTR Regulation covers the most important sources of emitted mercury, and given the discretion that Article 9 MC allows the Parties, it seems that the obligations of that Article are sufficiently covered by EU acquis.	Compliance not determined

Article and para. in MC	Link to relevant section in this report*	Impact of MC provision	Soft or firm? (f/fs/s)**	Potential problems w. interpretation? (y/n)	EU legislation addressing the provision/[obligation]	Summary of assessment	As compared to the MC, EU law delivers
10(2)	7.7.2	Storage of non waste mercury	F	n	IE Directive, Seveso Directive, Waste Framework Directive	<p>Regarding storage of hazardous material that is not considered as waste under EU law, interim storage of mercury is deemed not sufficiently covered by the EU acquis.</p> <p>In contrast, in terms of material considered waste in the EU but not under MC, EU waste law covers the requirements of Article 10(2) MC regarding interim storage.</p> <p>Possible shortcoming of EU acquis needs to be revised against the requirements of (final) guidelines under Basel Convention or MC (the latter are not currently not adopted).</p>	Compliance not determined
11(3)	7.8.2	Mercury waste	f	n	Waste Framework Directive, Waste Shipment Regulation	<p>Fit of EU acquis to MC needs to be assessed against the requirements of (final) guidelines under Basel Convention or MC which currently are not adopted.</p> <p>With regard to MC11(3b), other “mercury wastes” under MC than those addressed in Article 2 of Regulation (EC) 1102/2008 are not explicitly covered by EU law.</p>	Compliance not determined
12(1)	7.9.2	Contaminated sites	S	n	None		Non-compliance
16(1)	7.11.2	Health aspects	S	n	<p>Diverse legal acts in the following policy fields:</p> <ul style="list-style-type: none"> • Water, • Drinking Water, • Food Safety, • Cosmetics, • Toys, 	<p>Since the obligations of Article 16(1) MC are of soft-law nature, there is no need to amend the EU acquis in order to comply with those provisions.</p> <p>The aspect of exposure of population and vulnerable groups, and occupational exposure are addressed at EU level to an extent which - in our understanding - does not make it necessary to take further action.</p>	Full compliance

Article and para. in MC	Link to relevant section in this report*	Impact of MC provision	Soft or firm? (f/fs/s)**	Potential problems w. interpretation? (y/n)	EU legislation addressing the provision/[obligation]	Summary of assessment	As compared to the MC, EU law delivers
					<ul style="list-style-type: none"> OHS aiming at protecting general public, vulnerable groups, and workers 		

Notes: * Place cursor on section number and Ctrl + click to follow link (in MS Word only). ** Soft or firm? (f/fs/s): f = firm, fs = firm, but gives the choice between several measures and (s) = soft.

3.1.2 Overview of proposed options and preliminary comparative assessment (policy options)

This section gives an overview of the policy options proposed to meet the gaps identified in the EU legislation vis-à-vis the requirements of the Minamata Convention.

Table 3-2 gives a summarised overview in order to better show the overall pattern of the options proposed, whereas Table 3-3 provides short descriptions of the options. To understand the full context of the proposal, it is advisable to read the relevant sections of the gap assessment (use hyperlinks in Table 3-3 to jump to sections). Table 3-4 lists the options which go beyond the provisions of the Minamata Convention for convenience.

As can be seen in Table 3-2, there are two overall routes for MC implementation by the EU:

- 1 Implementing as many obligations as possible in the existing relevant thematic legislation, with a few obligations implemented in a new regulation and a few obligations implemented as Commission studies or communications/strategies.
- 2 The “mercury regulation” approach: assembling as many MC obligations as relevant in a single legal instrument with a few obligations implemented in other instruments and a few as Commission studies or communications/strategies.

A “hybrid” approach is also possible.

Which approach is preferable depends in part on the overall strategy for the EU acquis and the view taken on the administrative and legislative burden of compliance with the MC.

Comparative assessment

The proposed options have been subject to a preliminary evaluation. The comparative assessment is based on expert judgment taking the following aspects into consideration:

- Socio-economic costs/impacts (“C”); investments in BAT, substitution costs, etc. as relevant, on a societal basis: 0 = minimal, -1 = moderate, -2 = potentially significant costs.
- Administrative/political efforts (“A”) needed (by EU and MS authorities) to implement the option: 0 = minimal, -1 = moderate, -2 = potentially significant efforts.
- Environmental benefits (“E”) from implemented option: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.
- Signal effect (“S”) towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambitious implementation of the MC, -1 = signalling low-ambition implementation of the MC.

- › The sum (“Σ”) of the indicators gives an overall (imprecise) score of the option with a slight overweight on the burdens/costs. The higher the total score, the more cost-effective is the measure.
- › “?” means uncertain score due to unavailable data.

In addition, options that could have large costs are marked in **red bold text**.

As shown in the Table 3-3, closing many of the gaps identified in EU legislation is a matter of adjusting the text of the provisions to ensure legal conformity with the Minamata Convention.

Nine options are identified as potentially having major socio-economic effects (with score “C-2”). These options are listed below by reference to the relevant MC article:

- 1 Article 3(8) on mercury import (only high-ambition Option MC3(8)-2 suggesting a total import ban from all countries outside the EU)
- 2 Article 4(3) on mercury-added products - dental amalgam (only high-ambition Option 4(3)-2 suggesting a general ban on dental amalgam use – with specified exemptions; options on dental amalgam are exempted from the study contract)
- 3 Article 4(6) on obligation to "discourage" manufacture and distribution of new mercury-added products (all proposed options) + Option MC5(7) on discouragement of new process uses of mercury (all proposed options)
- 4 Article 5(3) on obligation to restrict the use of mercury in VCM, Na/K-methylate/ethylate and polyurethane production (all proposed options)
- 5 Article 5(6) on prohibition of using mercury in new Annex B facilities using mercury (all proposed options)
- 6 Article 8(3+4) on (air) emission controls; requirement for BAT/BEP for new sources (all proposed options; but with a possibility for low-ambition options in case certain conditions are fulfilled)
- 7 Article 8(3+5) on (air) emission control; emission control measures for existing sources (all proposed options; but with a possibility for low-ambition options in case certain conditions are fulfilled)
- 8 Article 9(4+5): Take measures to control releases (water + land) from identified sources (Only high-ambition Option MC 9(4)-3 suggesting a gap analysis and development measures targeting any gaps identified by a survey to identify sources (survey mentioned as Option 9(3)-1). The scoring as potential high-cost/impact option is uncertain as it depends on which gaps are identified.
- 9 Article 11(3) on mercury waste (only Option MC11(3)-1 suggesting a high-ambition total ban on recycling/recovery of mercury in the EU)

Table 3-2 Overview of distribution of options among the key routes for MC implementation

Article and paragraph in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
3(3) Ban on new primary mercury mining	Option MC3(3)-1			Options MC3(3)-2: Pursue interpretation of MC where de facto compliance is sufficient for compliance
3(4) Ban on existing primary mercury mining	Option MC3(4)-1			Options MC3(4)-2: Pursue interpretation of MC where de facto compliance is sufficient for compliance
3(5) lit. (a) Identify mercury stocks (soft law)	Option MC3(5a)-1			Option MC3(5a)-2: COM study on mercury stocks
3(5) lit. (b) Ensure coherence with definition of “excess mercury”	Options MC3(5b)-1 to MC3(5b)-3			Options MC3(5b)-4: EU to ensure MC wording to be interpreted as in line with Reg. 1102/2008
3(8) Mercury import	Option MC3(8)-1 Option MC3(8)-2			
4(1) Mercury-added products (Annex A, Part I)	Option MC4(1)-1 Option MC4(1)-3	Option MC4(1)-2		See Option MC4(1)-3 to the left. Option MC4(1)-4 (Batteries Dir., RoHS Dir., Cosmetics Reg., REACH, etc.)
4(3) Mercury-added products (Annex A, Part II: Dental amalgam)	Option 4(3)-2			Option 4(3)-1: Encouragement/studies/promotion (soft law)
4(6) "Discourage" manufacture + distribution of new products	Option MC4(6)-23	Option MC4(6)-1		
5(2) Prohibition of mercury use in Annex B part I processes (chlor-alk. + acetaldehyde)	Option MC5(2)-2		Option MC5(2)-1	
5(3) Restrict mercury use in Annex B part II processes (VCM, Na/K-methylate/ethylate + PUR)	Option MC5(3)-2	Option MC5(3)-1b	Option MC5(3)-1a	
5(5c) Identify facilities + quantify amounts (soft law)				Option MC5(5c)-1: Study
5(6) Prohibition of using mercury in new facilities	Option MC5(6)-2 (identical to Option MC5(3)-2)		Option MC5(6)-1: (identical to Option MC5(3)-1a)	
5(7) “Discourage” development of new mercury-based manufacturing facilities	Option MC5(7)-3 (potentially = Option MC4(6)-3)	Option MC5(7)-1 (=Option MC4(6)-1)	Option MC5(7)-2	

Article and paragraph in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
7(2) Artisanal and small-scale gold mining	Option MC7(2)-2		Option MC7(2)-1	
7(3) Determination of significance of ASGM / Potentially develop + implement action plan				Option MC7(3)-1: No action Option MC7(3)-2 Specify significance concept + possible action plan
8(3+4) (Air) emiss. BAT/BEP for <u>new sources</u>	Option MC8(4)-2		Option MC8(4)-1	
8(3+5) (Air) emission control. Emission control measures for <u>existing sources</u>	Option MC8(5)-2 (potentially= Option MC8(4)-2)		Option MC8(5)-1 (potentially = Option MC8(4)-1)	Option MC8(5)-3 Proposed Directive on MCP. Option MC8(5)-4: multi-pollutant strategy already in place.
8(7) Establish emissions inventory	Option MC8(7)-2			Option MC8(7)-1: Expand PRTR Reg. Option MC8(7)-3: UNECE CLRTAP approach
9(3) Identify sources of releases (water + land)				Option MC9(3)-1: Study: Identify sources
9(4+5): Take measures to control releases (water + land) from identified sources				Option MC9(4)-1: No legislative action; pursue an interpretation for “relevant sources” which secures that these are already covered by the EU acquis. Option MC9(4)-2: No legislative action; cite the EU’s existing multi-pollutant strategy is sufficient. Option MC9(4)-3: Undertake, as follow-up of the survey mentioned as Option 9(3)-1, a gap analysis and develop measures targeting any gaps identified.
9(6) release inventory				Option MC9(6)-1 Interpret “relevant sources” such that these are covered by EU acquis (PRTR Regulation). Option MC9(6)-2: Identify relevant sources, make a gap analysis, and if necessary adjust the PRTR Regulation.
10(2) Storage of non-waste mercury	Option MC10(2)-1			Option MC10(2)-2: Amend Seveso Dir.
11(3) Mercury waste	Option MC11(3)-1 Option MC11(3)-2			See Option MC11(3)-2: Waste Shipment Regulation
12(1) Contaminated sites (soft law)	Option MC12(1)-2 Option MC12(1)-4			Option MC12(1)-1: No action. Option MC12(1)-3: Thematic Strategy on Soil Protection

Article and paragraph in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
16(1c,d) Health aspects (soft law): Promote health-care + capacities	Option MC16(1)-1			Option MC16(1)-2: Commission communication

Table 3-3 Overview and preliminary, comparative assessment of proposed options for additional legal measures for the EU to meet the Provisions of the Minamata Convention

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
3(3) Ban on new primary mercury mining	Option MC3(3)-1: Adjust text to explicitly ban mercury mining (already de facto banned)			Options MC3(3)-2: Interpret MC such that <i>de facto</i> compliance is sufficient for compliance
	C0,A0,E0,S0, Σ 0			C0,A0,E0,S0, Σ 0
3(4) Ban on existing primary mercury mining	Option MC3(4)-1: Adjust text to explicitly ban mercury mining (already de facto banned)			Options MC3(4)-2: Interpret MC such that <i>de facto</i> compliance is sufficient for compliance
	C0,A0,E0,S0, Σ 0			C0,A0,E0,S0, Σ 0
3(5) lit. (a) Identification of mercury stocks (soft law)	Option MC3(5a)-1: MS to provide estimates on individual stocks of mercury			Option 3(5a)-2: COM launch study on mercury stocks
	C-1,A-1,E0,S0, Σ -2			C-1,A-1,E0,S0, Σ -2
3(5) lit. (b) Ensure coherence with definition of “excess mercury”	Options MC3(5b)-1 to 3(5b)-3: Adjust existing wording			Options 3(5b)-4: EU work to ensure MC wording to be interpreted as in line with similar wording in Reg. 1102/2008
	C0,A0,E0,S0, Σ 0			C0,A-1,E0,S0, Σ -1
3(8) Mercury import	Option MC3(8)-1: Introduce wording on import reflecting the concept and wording of the MC related to “Non-Parties” to the MC. Option MC3(8)-2: Apply an import ban generally to all countries outside the EU.			
	C-1,A-1,E1,S0, Σ -1 // C-2,A-2,E2,S1, Σ -1			
4(1) Mercury-added products (Annex A, Part I)	With a view to cover also export and manufacture: Option MC4(1)-1: Restriction package in full line with Annex A, Part I MC, covering import, export and manufacture. Modify/repeal existing specific legislation accordingly.	With a view to cover also export and manufacture: Option MC4(1)-2: Restriction package in full line with Annex A,		With a view to cover also export and manufacture: See Option MC4(1)-3 to the left.

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
	Option MC4(1)-3: Restriction package covering all product gaps covering manufacture and, where necessary, export. Align various existing legislation in terms of import/placing on the market of the products.	Part I MC, into REACH Annex XVII (i.e. covering import, export and manufacture), with the exception of placing on the market of measuring devices which is already addressed within Annex XVII REACH.		Option MC4(1)-4: Introduce provisions restricting export / manufacturing of the mercury-added products of Annex A Part I into the various relevant existing EU legislation (Batteries Directive, ROHS RoHS Directive, Cosmetics Regulation, REACH, etc.; i.e., expand the obligations for economic actors to also include export and manufacturing within those legal documents specifically for the mentioned mercury-added products).
	C-1,A-1,E1,S1,Σ0 // C-1,A-1,E1,S1,Σ0	C-1,A-2,E1,S1,Σ-1		C-1,A-2,E1,S1,Σ-1
4(3) Mercury-added products (Annex A, Part II: Dental amalgam)	Option 4(3)-2: Implementation of law (e.g. by amending Reg. (EC) 1002/2008, going beyond the requirements of MC. For example a Union-wide ban on dental amalgam with exemptions for specified cases (for example inspired by the current review of the Danish mercury ban; see COWI, 2014).			Option 4(3)-1: A minimum option demanding no legal changes, but relying only on encouragement/studies/promotion; that is, at least two of the (MC Annex A, Part II) measures iii, v and ix, of which the latter are assumed to demand the minimal effort. If any action is necessary, the two measures could be implemented as for example as parts of a Commission communication on a dental amalgam strategy (or a revised EU mercury strategy).
	C-2,A-2,E2,S1,Σ-1			C0,A1,E0,S-1,Σ0
4(6) Obligation to "discourage" manufacture and distribution of new products	<u>Option MC4(6)-2 (identical to Option MC5(7)-3):</u> A general (soft) discouragement could be given within a further developed Regulation (EC) 1102/2008. Such discouragement could be expressed as a statement towards the institutions and agencies at EU level, or towards the Member	<u>Option MC4(6)-1 (identical to Option MC5(7)-1):</u> Mercury could be added to the Candidate List and later into Annex XIV of REACH and thus be		

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
	States, or to both. See also <u>Option MC4(6)-1.</u>	made subject to authorisation. Other options could be to use Article 68(2) of REACH, a restriction under REACH, or a conditional ban could be expressed in a further developed Regulation (EC) 1102/2008.		
	C-2?,A0,E2?,S1,Σ1?	C-2?,A-2,E2?,S1,Σ-1?		
5(2) Prohibition of mercury use in the processes listed in part I of Annex B (chlor-alkali and acetaldehyde production)	Option MC5(2)-2 Ban acetaldehyde production with mercury use as part of the revised Reg. 1102/2008.		Option MC5(2)-1 Specify acetaldehyde production with mercury use as non-BAT, within the currently ongoing review of the LVOC BREF.	
	C0,A0,E0,S0,Σ0		C0,A-0,E0,S0,Σ-1	
5(3) Obligation to restrict the use of mercury in the processes listed in part II of Annex B (VCM, methylete/ethylate and polyurethane production)	Option MC5(3)-2: Implement these restrictions as part of the revised Reg. 1102/2008.	Option MC5(3)-1b: As Option MC5(3)-1a, but with polyurethane regulated under REACH by expanding the current ban of five mercury-catalyst to a general ban of mercury catalysts for this use, as already recommended in the ECHA RAC opinion on the issue.	Option MC5(3)-1a: The restrictions as stipulated by Article 5(3) MC which are related to facilities' processes could be implemented by amendments of the BAT conclusions in the relevant BREFs, if applicable in a specific section within the BAT conclusions.	

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
	C-2,A-2,E2,S1,Σ-1	C-2,A-2,E2,S1,Σ-1	C-2,A-2,E2,S1,Σ-1	C0,A0,E0,S-1,Σ-1
5(5c) Identify Annex B facilities within its territory and quantify amounts used (soft law)			Option MC5(5c)-1: EU Commission could launch an investigation with MS authorities, or a study, on the presence of Annex B facilities in the EU, possibly in the framework of discussion on relevant BREF reviews.	
			C0,A-1,E0,S1,Σ0	
5(6) Prohibition of using mercury in new Annex B facilities	Option MC5(6)-2 (identical to Option MC5(3)-2) Implement this ban as part of the revised Reg. 1102/2008		Option MC5(6)-1: (identical to Option MC5(3)-1a) To adequately address the MC obligations, it would be possible to implement a ban on the other Annex B processes by amending the relevant BREF documents with explicit BAT-conclusions on these processes.	
	C-2,A-2,E2,S1,Σ-1		C-2,A-2,E2,S1,Σ-1	
5(7) “Discourage” the development of new facilities using any other mercury-based manufacturing process	Option MC5(7)-3 (identical to Option MC4(6)-2): A general (soft) discouragement could be given within a further developed Regulation (EC) 1102/2008. Such discouragement could be expressed as a statement towards the institutions and agencies at EU level, or	Option MC5(7)-1 (identical to Option MC4(6)-1): Mercury could be added to the Candidate List and later into Annex XIV of REACH and thus	Option MC5(7)-2 A second option would be to modify the IE Directive, given the challenges described above presumably in a specific article related to	

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
	<p>towards the Member States, or to both.</p> <p>See also <u>Option MC5(7)-1.</u></p>	<p>be made subject to authorisation. Other options could be to use Article 68(2) of REACH, a restriction under REACH, or a conditional ban could be expressed in a further developed Regulation (EC) 1102/2008.</p>	<p>use of mercury and its compounds. This <u>would however introduce a new dimension into the Directive</u> (substance-specific).</p>	
	C-2?,A0,E2?,S1,Σ1?	C-2?,A-2,E2?,S1,Σ-1?	C-2?,A-2+,E2?,S1,Σ-1?(+)	
<p>7(2)</p> <p>Artisanal and small-scale gold mining</p>	<p>Option MC7(2)-2:</p> <p>Introduce binding legislation, restricting the use of mercury in ASGM, in a revised Regulation 1102/2008.</p>		<p>Option MC7(2)-1:</p> <p>As a review of the BREF for the Non-ferrous metal industry is in progress, another option is making the use of mercury in gold extraction non-BAT in a BAT conclusion on the issue, or alternatively address possible other restrictions and release reduction techniques (retorts, fume hoods) in order to substantially reduce gold mining with the use of mercury amalgamation and associated releases.</p>	
	C-1,A-1,E1,S1,Σ0		C-1,A-1,E1,S1,Σ0	

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
7(3) Determination of significance of ASGM / Developing and implementing a national action plan if applicable				<p>Option MC7(3)-1: Since MC does not prescribe criteria for determining “significance”, a first option would be note that only one Member State has ASGM activities, and determine that ASGM is not significant on this basis. No further obligation from Article 7(3) MC would apply in this case.</p> <p>Option MC7(3)-2 Another option would be to determine the concept of significance which the EU would like to use under Article 7(3) MC. This might result in the EU affirming the “significance” of ASGM for its territory and subsequently establishing an action plan in accordance with Annex C MC.</p>
				C0,A0,E0,S-1,Σ-1 // C-1,A-1,E1,S1,Σ0
8(3+4) (Air) emission control. Require BAT/BEP for <u>new sources</u>	<p>(Options for source categories for which the 75% rule does not apply:)</p> <p>Option MC8(4)-2: The revised Reg. 1102/2008 could be used to implement the remaining obligations of Article 8(4) MC.</p>		<p>(Options for source categories for which the 75% rule does not apply:)</p> <p>Option MC8(4)-1: Legal measures to control mercury emissions from the source categories not already covered could be introduced either via BAT conclusions, or via amendment of the actual IE Directive or its Annexes (setting emission</p>	Determine that a multi-pollutant approach is sufficient for controlling mercury emissions.

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
			limit values as is the case for waste incineration plants).	
	C-2,A-2,E2,S1,Σ-1		C-2,A-2,E2,S1,Σ-1	
8(3+5) (Air) emission control. Emission control measures for <u>existing sources</u>	(Options for source categories for which the 75% rule does not apply:) Option MC8(5)-2 (potentially identical to Option MC8(4)-2): Revised Regulation (EC) 1102/2008 could be used to implement the remaining obligations of Article 8(4) MC.		(Options for source categories for which the 75% rule does not apply:) Option MC8(5)-1 (potentially identical to Option MC8(4)-1): Legal measures to control mercury emissions could be introduced either via BAT conclusions, or via a formal amendment of the actual IE Directive text.	Option MC8(5)-3: Specifically regarding industrial boilers: integrate mercury emissions in the new proposed Directive on MCP. Option MC8(5)-4: Pursue an interpretation of Article 8(5) lit. (d) MC that when implementing a multi-pollutant strategy as described in that para, not all relevant specific sources need to be addressed, and state that the EU's existing multi-pollutant strategy is sufficient.
	C-2,A-2,E2,S1,Σ-1		C-2,A-2,E2,S1,Σ-1	C-1,A-1,E2,S1,Σ1 // C0,A0,E0,S-1,Σ-1
8(7) Establish emissions inventory	(Options for source categories for which the 75% rule does not apply:) Option MC8(7)-2: Revised Regulation (EC) 1102/2008 could be used to implement the remaining obligations of Article 8(7) MC.			(Options for source categories for which the 75% rule does not apply:) Option MC8(7)-1: For measures applying to existing sources, an option is to use the PRTR Regulation to implement the MC requirements not already covered by the EU acquis (industrial boilers, lower reporting thresholds). Option MC8(7)-3 Check and, if needed, develop the emission

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
				inventory activities under the UNECE CLRTAP Heavy Metals Protocol in order to ensure alignment with MC requirements (review in progress).
	C-1,A-1,E0,S1,Σ-1			C-1,A-1,E0,S1,Σ-1 // C0,A0,E0,S-1,Σ-1
9(3) Identify relevant sources for releases (to water and land)				Option MC9(3)-1: Explicitly identify relevant anthropogenic point sources in a survey repeated every three years, possibly just based on PRTR reporting.
				C-1,A-1,E0,S1,Σ-1
9(4+5): Take measures to control releases (water + land) from identified sources				Option MC9(4)-1: No legislative action; adopt an interpretation of “relevant sources” which means these are already covered by the EU acquis. Option MC9(4)-2: No legislative action; state that EU’s existing multi-pollutant strategy is sufficient. Option MC9(4)-3: Undertake, as follow-up of the survey mentioned as Option 9(3)-1, a gap analysis and develop measures targeting any gaps identified.
				// C0,A0,E0,S-1,Σ-1 // C-2?,A-2?,E2?,S1,Σ-1
9(6) release inventory				Option MC9(6)-1 Adopt an interpretation of “relevant sources” which ensure that these are covered by EU acquis (PRTR Regulation). Option MC9(6)-2. As follow-up of the survey on identification

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
				of relevant sources mentioned as Option 9(3)-1 make a revised gap analysis, and if necessary adjust the PRTR Regulation as necessary to meet the MC obligations.
				C0,A0,E0,S-1,Σ-1 // C-1,A-1,E1,S1,Σ0
10(2) Storage of non-waste mercury	Option MC10(2)-1: Standards for environmentally sound storage of non-waste mercury could be laid down in a revised Regulation (EC) 1102/2008.			Option MC10(2)-2: Amend the Seveso Directive to cover the MC requirements for interim storage of mercury and its compounds (lower thresholds and perhaps include additional wording to expand “safety” to “environmental sound storage”).
	C-1,A0,E1,S1,Σ1			C-1,A-1,E1,S1,Σ0
11(3) Mercury waste	<p>Option MC11(3)-1: As regards MC 11(3b) (recovery, recycling, reclamation or directly re-used), it can be ensured that other waste types, not currently covered by Reg. 1102/2008 are covered (meaning that recycling/recovery will be fully prohibited) by adding such waste types to Reg. 1102/2008.</p> <p>Option MC11(3)-2 Another option in terms of complying with MC 11(3b) would be to insert a new provision into Regulation (EC) 1102/2008, specifically allowing the re-use, recycling or recovery of specified mercury waste streams, for allowed use under the MC only, while in other cases leaving the obligation for final disposal.</p> <p>Option MC11(3)-3 As regards MC 11(3c) (shipment), for reasons of</p>			See Option MC11(3)-3

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
	legal certainty, it may in addition to options MC11(3)-1 and -2 be a possibility to impose an explicit export ban for disposal on “mercury waste” in the sense of MC, either in the revised Regulation (EC) 1102/2008 or in the Waste Shipment Regulation. Similarly, restrictions on the export of mercury waste for recovery (addressing MC 11(3b)) could be introduced there.			
	C-2,A-2,E2,S1,Σ-1 // C-1,A-1,E1,S1,Σ0 // C-1,A0,E1,S1,Σ1			C-1,A0,E1,S1,Σ1
12(1) Contaminated sites (soft law)	Option MC12(1)-2: EU could consider encouraging Member States to produce an inventory, and broadly describe methods of assessment, of such sites within a revised Regulation (EC) 1102/2008. Option MC12(1)-4: EU could take the way of a binding obligation for Member States to draw up an inventory, and prescribe measures of assessment, within a legal document, for example a revised Regulation (EC) 1102/2008.			Option MC12(1)-1: No action. Option MC12(1)-3: The soft law obligation could also be communicated via the ongoing further work in the context of the Thematic Strategy on Soil Protection.
	C0,A-1,E0,S1,Σ0 // C0,A-2,E0,S1,Σ-1			C0,A0,E0,S-1,Σ-1 // C0,A-1,E0,S1,Σ0
16(1c,d) Health aspects (soft law): (C) Promote health-care services for prevention, treatment and care for populations affected; (d) Establish and strengthen,	Option MC16(1)-1: It may be an option emphasizing what is required by these provisions within the revised Regulation (EC) 1102/2008.			Option MC16(1)-2: Emphasise these aspects in a Commission communication, for example an updated mercury strategy.

Article in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Use or amend REACH	Use of BAT conclusions and IE Dir.	Other legal acts or initiatives
institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to mercury				
	C0,A-1,E1,S1,Σ1			C0,A-1,E1,S1,Σ1

Table 3-4 Options going beyond the obligations of the Minamata Convention only

Article and paragraph in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Other legal acts or initiatives
3(8) Mercury import	Option MC3(8)-2 (substitutes for option for 3(8)-1 in Scenario 2): Apply an import ban generally to all countries outside the EU.	
	C-2,A-2,E2,S1, Σ -1	
4(3) Mercury-added products (Annex A, Part II: Dental amalgam)	Option MC 4(3)-2 (substitutes for option for 4(3)-1 in Scenario 2): Implementation of law (e.g. by amending Reg. (EC) 1002/2008, going beyond the requirements of MC. For example a Union-wide ban on dental amalgam with exemptions for specified cases (noting the current review of the Danish mercury ban).	
	C-2,A-2,E2,S1, Σ -1	
4(6) Obligation to "discourage" manufacture and distribution of new mercury-added products	<u>Option MC4(6)-2 (identical to Option MC5(7)-3))</u>: A general (soft) discouragement could be given within a revised Regulation (EC) 1102/2008. This could be expressed as a statement addressed to the institutions and agencies at EU level, or towards the Member States, or to both. See also <u>Option MC4(6)-1.</u>	<u>Option MC4(6)-1 (identical to Option MC5(7)-1)</u>: Mercury could be added to the Candidate List and later into Annex XIV of REACH and thus be made subject to authorisation. Other options are to use Article 68(2) of REACH, a restriction under REACH, or a conditional ban could be expressed in a revised Regulation (EC) 1102/2008.
	C-2?,A0,E2?,S1, Σ 1?	C-2?,A-2,E2?,S1, Σ -1?
5(7) Obligation to "discourage" new process uses	<u>Option MC5(7)-3 (identical to Option MC4(6)-2)</u>: A general (soft) discouragement could be given within a further developed Regulation (EC) 1102/2008. Such discouragement could be expressed as a statement towards the institutions and agencies at EU level, or towards the Member States, or to both. See also <u>Option MC5(7)-1.</u>	<u>Option MC5(7)-1 (identical to Option MC4(6)-1)</u>: Mercury could be added to the Candidate List and later into Annex XIV of REACH and thus be made subject to authorisation. Other options could be to use Article 68(2) of REACH, a restriction under REACH, or a conditional ban could be expressed in a further developed Regulation (EC) 1102/2008.
	C-2?,A0,E2?,S1, Σ 1?	C-2?,A-2,E2?,S1, Σ -1?
7(3) Determination of significance of		Option MC7(3)-2 Another option would be to specify the concept of significance which

Article and paragraph in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Other legal acts or initiatives
ASGM / Developing and implementing a national action plan if applicable		the EU would like to use under Article 7(3) MC, with the - at least in theory - possible result the EU might affirm “significance” of ASGM for its territory and subsequently establish an action plan in accordance with Annex C MC.
		C-1,A-1,E1,S1,Σ0
8(3+4) (Air) emission control. Require BAT/BEP for <u>new sources</u>	(Options for source categories for which the 75% rule does not apply:) Option MC8(4)-2: The revised Reg. 1102/2008 could be used to implement the remaining obligations of Article 8(4) MC.	(Options for source categories for which the 75% rule does not apply:) Option MC8(4)-1: Legal measures to control mercury emissions from the source categories not already covered could be introduced either via BAT conclusions, or via amendment of the actual IE Directive or its Annexes (setting emission limit values as is the case for waste incineration plants).
	C-2,A-2,E2,S1,Σ-1	C-2,A-2,E2,S1,Σ-1
8(3+5) (Air) emission control. Emission control measures for <u>existing sources</u>	(Options for source categories for which the 75% rule does not apply:) Option MC8(5)-2 (potentially identical to Option MC8(4)-2): Revised Regulation (EC) 1102/2008 could be used to implement the remaining obligations of Article 8(4) MC.	(Options for source categories for which the 75% rule does not apply:) Option MC8(5)-1 (potentially identical to Option MC8(4)-1): Legal measures to control mercury emissions could be introduced either via BAT conclusions, or via a formal amendment of the actual IE Directive text.
	C-2,A-2,E2,S1,Σ-1	C-2,A-2,E2,S1,Σ-1
9(4+5): Take measures to control releases (water + land) from identified sources		Option MC9(4)-3: Undertake, as follow-up of the survey mentioned as Option 9(3)-1, a gap analysis and develop measures targeting any gaps identified.
		C-2?,A-2?,E2?,S1,Σ-1
11(3) Mercury waste	Option MC11(3)-1 (substitutes for option for 11(3)-2 in Scenario 2): to provide compliance with MC 11(3b) (recovery, recycling, reclamation or directly re-used), waste types not currently covered by Reg. 1102/2008 can be added to Reg. 1102/2008	

Article and paragraph in MC text; MC provision	Amend Reg. 1102/2008 (or new regulation)	Other legal acts or initiatives
	(meaning that recycling/recovery will be fully prohibited).	
	C-2,A-2,E2,S1,Σ-1	
12(1) Contaminated sites (soft law)	(Substituting for Options MC12(1)-1 or -3) Option MC12(1)-2: Encourage Member States to produce an inventory, and broadly describe methods of assessment, of such sites within a revised Regulation (EC) 1102/2008. Option MC12(1)-4: Impose binding obligation on Member States to draw up an inventory, and prescribe measures of assessment, within a legal document, for example a revised Regulation (EC) 1102/2008.	
	C0,A-1,E0,S1,Σ0 // C0,A-2,E0,S1,Σ-1	
16(1c,d) Health aspects (soft law): (C) Promote health-care services for prevention, treatment and care for populations affected; (d) Establish and strengthen, institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to mercury	(Instead of no action) Option MC16(1)-1: Highlight the requirements of these provisions in the revised Regulation (EC) 1102/2008.	Option MC16(1)-2: Emphasise the requirements in a Commission communication, for example an updated mercury strategy.
	C0,A-1,E1,S1,Σ1	C0,A-1,E1,S1,Σ1

4. Analysis of impacts

4.1 Basis of the impact assessment

This impact assessment focuses on the societal implications of the implementation of the obligations of the Minamata Convention which go beyond the current EU legislation. It focuses more on the individual steps in the mercury lifecycle addressed in the Minamata Convention, organised by its articles, than on the details of how the obligations can be implemented in EU law. In selected cases the impact assessment includes options that go beyond the obligations of the Minamata Convention. The impact assessment includes analysis of economic, social and environmental impacts (point 8.3 of the Commission IA Guideline), administrative burdens (point 8.4 of the IA Guideline), but not simplification (point 8.5 of the IA Guideline), transposition or compliance.

The analysis is divided in three parts. First, in Section 4.2 the consequences of following a business as usual path (“No EU action path”) in the baseline scenario are analysed. Secondly, in Sections 4.3 - 4.11, the options with potentially significant societal impacts (options with score C-2 in the preliminary comparative assessment presented in Section 3.1.2) are investigated individually organised in order of the relevant Minamata Convention article numbers. Thirdly, options with lower scores are assessed on a screening level in Section 4.12.

This study works with a business as usual baseline (‘BAU’) scenario that implies no changes in EU law and initiatives beyond what is already implemented or planned. It also has a basic implementation scenario representing a strictly minimal implementation (‘MI’) of the Minamata Convention in EU law, and a third scenario with specific options going beyond the strictly minimal obligations of the Minamata Convention on certain aspects (‘Beyond MC’ or ‘BMC’). As the EU ratification of the Convention has already been agreed by Member States, this distinction is necessary in order to assess the added impacts of implementation of options going beyond the Convention. For the subjects selected for detailed analysis, each of the three scenarios are analysed in Sections 4.3 -4.11.

The impact assessment was performed in March-May 2014 and should be seen as a snapshot of the situation as it was at that time. Any later changes to the EU

legislation, plans or other factors have not been included. The impact assessment is as detailed as the study budget allows and therefore relies primarily on existing aggregated information.

4.2 Baseline scenario

As described in detail in Sections 7.1 - 7.12 and summarised in Section 3.1.1 most obligations of the Minamata Convention are already met in the EU legislation relevant to mercury, yet a number of Convention obligations are not met at present. Options for closing such gaps are proposed in Sections 7.1 - 7.12 (in order of Convention article numbers) and summarised in Section 3.1.2.

For each of the subject areas in the following sections, the specific baseline conditions, that is, expected development in a business as usual (BAU) scenario, are described separately to allow for assessing incremental impacts of the options investigated.

4.2.1 Impacts of a business as usual scenario

Following a business as usual scenario would be in conflict with the EU Community Strategy on Mercury and the already agreed intentions of the EU to ratify the Minamata Convention. It would have the direct consequence that the mercury exposure within the EU territory would not be reduced.

Furthermore, a significant part of the atmospheric mercury deposition in the EU originates outside its territories; transported with air over global distances. Additional mercury is transported with ocean currents and rivers to EU waters. The EU is therefore dependent on the global cooperation on reduction of anthropogenic mercury releases, in order to substantially reduce mercury exposure of humans and the environment in its territories.

The EU has been a driving force in securing a global agreement on mercury and the EU is also for other reasons considered a major player in such global cooperation. Should the EU, in spite of previous commitments, decide not to ratify the Minamata Convention, this could likely have major consequences for the Convention's prospects of being ratified by other parties, and thus on the overall reduction of global releases of mercury.

A lack of success with the global implementation of the Minamata Convention could have significant consequences for populations at risk from mercury exposure all over the world. Most countries lack the level of protection against exposure to mercury and other hazardous chemicals provided in the EU; this applies both to direct exposure from local and internationally traded products and from processes, as from indirect exposure via aquatic and other foods. With its provisions which are rather similar to the EU legislation on mercury, the Minamata Convention is the best prospect seen so far for reducing risks from direct and indirect exposure to mercury and its compounds in the developing countries of the world. Without the Convention, global releases of mercury are expected to rise, or at least not be reduced from its current levels.

From an economic perspective, it should be kept in mind that the experience gained in the last decades in the EU with alternative products and effective pollution abatement technology gives the EU an advantage and carries a potential for increased export, should the Minamata Convention be implemented successfully on a global scale.

4.3 MC Article 3: Mercury supply sources and trade

4.3.1 Problem definition and specific objectives

Article 3(8) of MC introduces a binding obligation for the Parties to restrict the import of mercury from new primary mining and excess mercury of chlor-alkali facilities.

There is no current EU legislation codifying a ban or imposing conditions or restrictions on import of mercury.

Technically, an import ban could be introduced by, for example, amending Regulation (EC) 1102/2008 which already includes a requirement for information exchange on this issue from Member States to the Commission.

Based on the comparative assessment of proposed options and the Commission's criteria for selection of options to be investigated further, the following options relating to this article of the Minamata Convention are assessed in detail.

Table 4-1 Options assessed regarding this article of the Minamata Convention

Scenario	Options to be assessed (keywords)	Preliminary IA score*1
Baseline 1	Business as usual (BAU)	-
Baseline 2: Minimum implementation (MI)	Option MC3(8)-1 : Apply a conditional import ban relating to Non-Parties. Procedure for checking imports from Non-Parties to the MC.	C-1,A-1,E1,S0
Beyond MC (BMC)	Option MC3(8)-2 : Apply a general import ban on import from all countries outside the EU (imports for environmentally sound disposal should remain possible).	C-2,A-2,E2,S1

Notes: *1: According to the comparative assessment presented in Section 3.1.2; societal impacts across all options for this MC article. For details on scores, click [here](#). Scores:

C: Socio-economic costs/impacts: 0 = minimal, -1 = moderate, -2 = potentially significant costs.

A: Administrative/political efforts (by EU and MS authorities): 0 = minimal, -1 = moderate, -2 = potentially significant efforts.

E: Environmental benefits: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.

S: Signal effect towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambition implementation of the MC, -1 = signalling low-ambition implementation of the MC.

4.3.2 Baseline conditions

Mercury supply

In 2007, the EU mercury supply was ensured from two principal sources.(1) The recycling companies in the EU produced around 100 tonnes of mercury from waste from intentional mercury use in the EU. (2) Between 130 and 170 tonnes were produced from recycling of mercury from imported waste and recovery of by-product mercury from natural gas production and non-ferrous smelting (via recyclers). The latter would today be disposed of instead, due to the restrictions on recycling/recovery (Regulation (EC) No 1102/2008). These numbers do not include the re-sale of excess mercury from the chlor-alkali sector.

More recent estimates of mercury supply from recyclers have not been identified. The EU supply from recyclers ranged thus between 230 and 270 tonnes in 2007 (COWI and Concorde East/West, 2008).

According to Regulation (EC) No 1102/2008, the following shall be considered as waste and be disposed of (and may therefore not be recycled/recovered) within the EU:

- › metallic mercury that is no longer used in the chlor-alkali industry;
- › metallic mercury gained from the cleaning of natural gas;
- › metallic mercury gained from non-ferrous mining and smelting operations;

- › metallic mercury extracted from cinnabar ore in the EU as from 15 March 2011.

The following figure illustrates the possible import flows of mercury and mercury waste into the EU and which of these flows are in principle available to satisfy the EU demand for mercury.

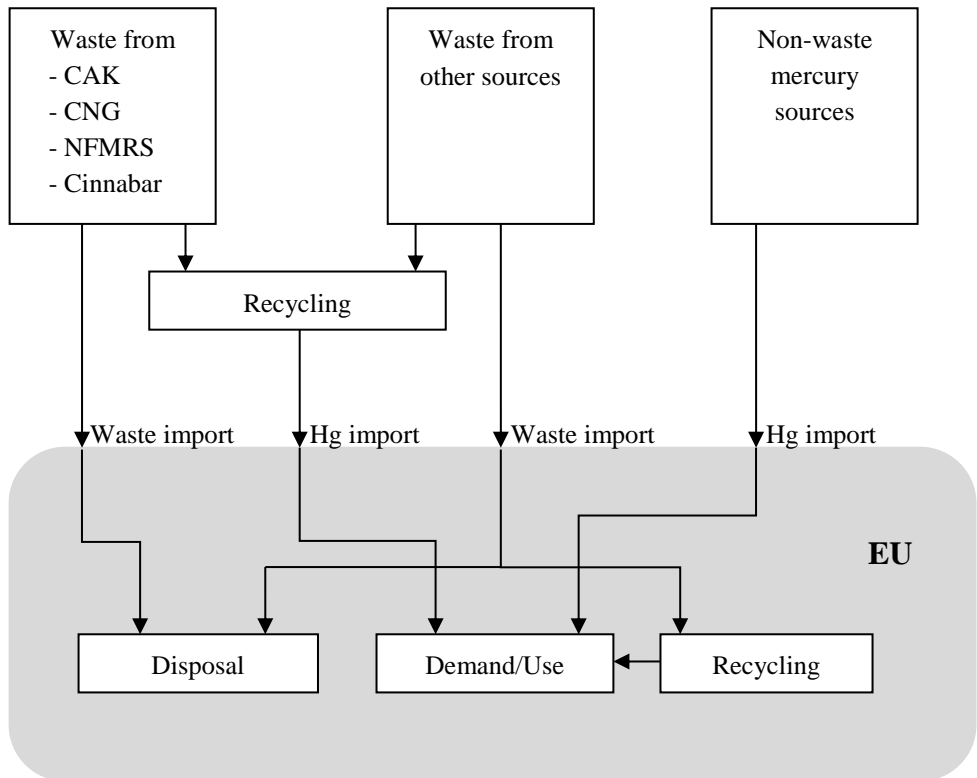


Figure 4-1 Possible import flows of mercury and mercury waste into the EU and their possible fate inside the EU (shaded in grey)
 CAK = from the chlor-alkali industry
 CNG = from the cleaning of natural gas
 NFMRS = from non-ferrous mining and smelting operations
 Cinnabar = from cinnabar ore

According to Article 11(3) MC, transport across borders (which covers import) is only allowed for environmentally sound disposal in the sense of lit. (a) of Article 11(3), i.e. taking into account the definitions of the Basel Convention (the issue may also be dealt with in planned future requirements to be elaborated under MC). “Environmentally sound disposal” here is to be understood as described in the Basel draft technical guidelines for the environmentally sound management of wastes consisting of elemental mercury and wastes containing or contaminated with mercury. Whereas the MC’s requirements are not yet adopted, the draft Basel Guidelines includes recycling of mercury waste (see para 146 ff. of that document). As a consequence it is considered that imported waste can be recycled within the EU except for those wastes specified in Article 2 of Regulation (EC) No 1102/2008.

The annual supply from recycling of waste with origin in the EU from intentional uses (excluding CAK) is assumed to still amount to approximately 100 tonnes.

The current production of mercury from recycling within the EU of imported mercury waste (of other types) is not known. It was part of the estimated 130 and 170 tonnes supplied in 2007, and as no split of between original sources were given, it is here assumed that the mercury production from imported wastes could amount to between 1/3 and 2/3 of this; in other words some 50-100 tonnes/y.

According to EUROSTAT data, current annual imports of mercury and mercury compounds (“whether or not chemically defined”) sum up to 104 tonnes (year 2013, CN categories 28054090, 28521000, 28529000).

In conclusion, the current EU internal consumption is supplied from the following sources:

- › recycling activities within the EU of waste of EU origin (~ 100 t Hg/y);
- › recycling of waste with origin outside the EU (50 to 100 t/y)
- › imports of metallic mercury reported by statistics (~ 100 t/y).

The total supply would thus amount to around 250-300 tonnes per year. It is noted that this is a rough estimate associated with considerable uncertainty.

Mercury demand

A significant decline in mercury demand in the EU has been observed over the last two to three decades. At present (2014), the demand is deemed to be still steadily declining, but possibly at a slower pace than previously. This is because much of the product-related substitution has already taken place. Similarly, mercury consumption for chlor-alkali production, the major use of mercury in the EU, is also gradually declining as facilities are converted or decommissioned. If industry complies with its obligations under the IE Directive, EU consumption for this purpose will vanish by 2017. No aggregated analysis of the mercury demand by sector has been established for the EU since 2008. Table 4-2 summarises mercury consumption in industrial processes and products in the EU in 2007.

Table 4-2 *Mercury consumption in industrial processes and products in the EU (2007)*
(Source: COWI and Concord East/West (2008)).

Application area	Mercury consumption Tonnes Hg/year	Percentage of total
Chlor-alkali production *2	160 - 190	41.2
Light sources	11 - 15	3.1
<i>Fluorescent tubes</i>	<i>3.3 - 4.5</i>	<i>0.9</i>
<i>Compact fluorescent tubes</i>	<i>1.9 - 2.6</i>	<i>0.5</i>
<i>HID lamps</i>	<i>1.1 - 1.5</i>	<i>0.3</i>
<i>Other lamps (non electronics)</i>	<i>1.6 - 2.1</i>	<i>0.4</i>
<i>Lamps in electronics</i>	<i>3.5 - 4.5</i>	<i>0.9</i>
Batteries	7 - 25	3.8

Application area	Mercury consumption Tonnes Hg/year	Percentage of total
<i>Mercury button cells</i>	0.3 - 0.8	0.1
<i>General purpose batteries</i>	5 - 7	1.4
<i>Mercury oxide batteries</i>	2 - 17	2.2
Dental amalgams	90 - 110	23.5
<i>Pre-measured capsules</i>	63 - 77	16.5
<i>Liquid mercury</i>	27 - 33	7.1
Measuring equipment	7 - 17	2.8
<i>Medical thermometers</i>	1 - 3	0.5
<i>Other mercury-in-glass thermometers</i>	0.6 - 1.2	0.2
<i>Thermometers with dial</i>	0.1 - 0.3	0
<i>Manometers</i>	0.03 - 0.3	0.04
<i>Barometers</i>	2 - 5	0.82
<i>Sphygmomanometers</i>	3 - 6	1.1
<i>Hygrometers</i>	0.01 - 0.1	0.01
<i>Tensiometers</i>	0.01 - 0.1	0.01
<i>Gyrocompasses</i>	0.005 - 0.025	0.004
<i>Reference electrodes</i>	0.005 - 0.015	0.002
<i>Hanging drop electrodes</i>	0.1 - 0.5	0.1
<i>Other uses</i>	0.01 - 0.1	0.01
Switches, relays, etc.	0.3 - 0.8	0.1
<i>Tilt switches for all applications</i>	0.3 - 0.5	0.09
<i>Thermoregulators</i>	0.005 - 0.05	0.01
<i>Read relays and switches</i>	0.025 - 0.05	0.01
<i>Other switches and relays</i>	0.01 - 0.15	0.02
Chemicals	28 - 59	10.2
<i>Chemical intermediate and catalyst (excl PU) *1</i>	10 - 20	3.5
<i>Catalyst in polyurethane (PU) production</i>	20 - 35	6.5
<i>Laboratories and pharmaceutical industry</i>	3 - 10	1.5
<i>Preservatives in vaccines and cosmetics</i>	0.1 - 0.5	0.1
<i>Preservatives in paints</i>	4 - 10	1.6
<i>Disinfectant</i>	1 - 2	0.4
<i>Other applications as chemical</i>	0 - 1	0.1
Miscellaneous uses	15 - 114	15.2
<i>Porosimetry and pycnometry</i>	10 - 100	12.9
<i>Conductors in seam welding machines (mainly maintenance)</i>	0.2 - 0.5	0.1
<i>Mercury slip rings</i>	0.1 - 1	0.1
<i>Maintenance of lighthouses</i>	0.8 - 3	0.4
<i>Maintenance of bearings</i>	0.05 - 0.5	0.1
<i>Gold production (illegal)</i>	3 - 6	1.1
<i>Other applications</i>	0.5 - 3	0.4
Total (round)	320 - 530	100

Notes:

- *1 In order to avoid double counting, the mercury used as chemical intermediates and catalysts (excluding PU elastomers) is not included when calculating the total.
- *2 Represents the amount added each year to the cells including mercury recycled internally within the plants.

The key drivers for the development (mainly decreases) in mercury consumption in the business as usual scenario are:

- › for products: Consumer desire for white teeth (instead of amalgam), existing products/chemicals legislation, digitalisation of functions formerly using mercury for measurements etc., energy saving campaigns/strategies, and growth of LED lighting substituting for fluorescent lamps.
- › for processes: Voluntary industry commitment, IE Directive requirements (and OSPAR recommendation) for phase-out of mercury use in the chlor-alkali sector in the EU.

There are no updated estimates for total mercury consumption (= demand) in the EU for the uses allowed under the Minamata Convention. Table 4-3 provides estimates as of 2007. The major remaining uses of metallic mercury in the EU are shown in Table 4-3 in the business as usual scenario for 2014-2015 (representing the baseline). The table also provides an estimate, based on expert judgement, of annual demand in 2025-2030 based on the assumption that the Minamata convention is implemented. Part of this mercury may be imported inside mercury-added products and not as metal mercury or mercury compounds. The potentially major remaining mercury uses are porosimetry and pycnometry (used as metal mercury in the EU), and dental amalgam (likely to be partly imported as dental amalgam capsules). The majority of the future EU demand may thus be used as metal mercury within the EU, and only to a lesser degree be imported inside mercury-added products.

Table 4-3 Estimated EU mercury consumption (previous consumption in 2007), 2014-2015 (current consumption = baseline) and expected trends for allowed uses by 2025-2030 (projected consumption).

Intentional mercury use	Hg consumption in 2007*1; EU ₂₅ , t/y	Roughly estimated Hg consumption (2014-2015) corrected for existing changes in legislation, etc.*2	Expert estimate of EU Hg demand by 2025-2030
Batteries	7-25	“0” by year 2015	0
Switches and relays	0.3-0.8	0.3-0.8	0.3-0.8
Lamps	11-15	11-15(? perhaps higher)	11-15(? perhaps higher due to higher consumption)
Barometers, hygrometers, manometers, thermometers, sphygmomanometers	7-17	“0” a little in exempted products	“0” a little in exempted products
Preservatives in vaccines and cosmetics + disinfectants (including cosmetics, pesticides, biocides, topical antiseptics)	1.1-2.5	1.1-2.5	1.1-2.5
Dental amalgam	90-110	90-110	0-100
Chlor-alkali production with Hg cells (CAP-Hg)	160-190	160-190 (? perhaps lower)	0
Acetaldehyde production with mercury catalysts	?	0	0
“Chemical intermediates and catalysts except PUR” (may include VCM production with mercury catalysts)	10-20	10-20 VCM part unknown, but likely minor	0-10
Alcoholates (sodium or potassium methylate or ethylate)	? (perhaps part of CAP-Hg consumption above)	0.3-1	0.3-1
Polyurethane production using mercury catalysts	20-35	Likely below 20-35	0-10
ASGM (illegal)	3-6	3-6	3-6
Hg compounds in laboratories and pharmaceutical industry	3-10	3-10	3-10
Preservatives in paints	4-10	4-10	4-10
Porosimetry, pycnometry and hanging drop electrodes	10-100	10-100	10-100
Other miscellaneous uses	1-14	1-14	1-14
Total (rounded and adjusted for double counting of intermediates)	320-530	~310-490	~40-280

Notes: *1: Data source COWI and Concorde East/West (2008). *2: Legislation (see Table 8-1) in combination with expert assessment.

Much of the projected fall in EU mercury demand is due to elimination of mercury cell technology in the chlor-alkali sector. This change is independent of the implementation of the Minamata Convention as the EU industry has long committed to a phase-out of this technology by 2020 and the technology becomes non-BAT in 2017 (under the IE Directive).

Mercury trade

The following tables and Figure 4-2 give an overview of the EU's external trade for relevant mercury products for 2000 to 2013 based on current EUROSTAT data. According to Article 1 of Regulation (EC) No 1102/2008, an EU export ban for mercury has been in place since 15 March 2011.

Table 4-4 EU 27 external trade for relevant mercury products – average annual quantities of import and export from 2000 to 2013 (source: EUROSTAT 2014; last update 15.01.2014, data extracted 17.4.2014)

CN code	Customs code text (product group)	Import (average, t/y)		Export (t/y)	
		2000 to 2011	2012 to 2013	2000 to 2011	2012 to 2013
28054010	MERCURY IN FLASKS OF A NET CONTENT OF 34,5 KG "STANDARD WEIGHT", OF A FOB VALUE PER FLASK OF ≤ EURO 224	52.7	n.d.	459.7	34.9
28054090	MERCURY (EXCL. IN FLASKS OF A NET CONTENT OF 34,5 KG "STANDARD WEIGHT", OF A FOB VALUE PER FLASK OF ≤ EURO 224)	186.3	39.3	307.2	19.0
28521000	COMPOUNDS, INORGANIC OR ORGANIC, OF MERCURY, CHEMICALLY DEFINED (EXCL. AMALGAMS)	n.d.	11.4	n.d.	102.0
28529000	COMPOUNDS, INORGANIC OR ORGANIC, OF MERCURY, NOT CHEMICALLY DEFINED (EXCL. AMALGAMS)	n.d.	34.8	n.d.	84.2

Table 4-5 gives an overview of EU 27 external trade for relevant mercury products in 2011, 2012 and 2013. Most relevant exports concern inorganic or organic compounds of mercury – not chemically defined (CN 28521000; exports 123.2 t/y; increasing trend). It is noteworthy that exports of mercury in flasks (CN 28054010) was almost zero in 2012 (0.9 t/y), but is reported to have significantly increased in 2013 (68.9 t/y), in spite of the EU mercury export ban.

Table 4-5 EU 27 extra trade for relevant mercury products – annual quantities of imports and exports in 2011, 2012 and 2013 (source: EUROSTAT 2014; last update 15.01.2014, data extracted 17.4.2014)

CN code	Customs code text (product group)	Import (t/y)			Export (t/y)		
		2011	2012	2013	2011	2012	2013
28054010	MERCURY IN FLASKS OF A NET CONTENT OF 34,5 KG "STANDARD WEIGHT", OF A FOB VALUE PER FLASK OF <= EURO 224	7.8	n.a.	n.a.	66.2	0.9	68.9
28054090	MERCURY (EXCL. IN FLASKS OF A NET CONTENT OF 34,5 KG "STANDARD WEIGHT", OF A FOB VALUE PER FLASK OF <= EURO 224)	31.7	28.7	49.9	242.4	20.3	17.7
28521000	COMPOUNDS, INORGANIC OR ORGANIC, OF MERCURY, CHEMICALLY DEFINED (EXCL. AMALGAMS)	n.a.	3.1	19.6	n.a.	114.3	89.6
28529000	COMPOUNDS, INORGANIC OR ORGANIC, OF MERCURY, NOT CHEMICALLY DEFINED (EXCL. AMALGAMS)	n.a.	35.5	34.1	n.a.	45.2	123.2

Figure 4-2 shows the development of imports and exports and the balance of 'mercury - in flasks' (CN code 28054010) and 'mercury – other' (CN code 28054090) from 2000 to 2013. The figure shows that these imports and exports have generally decreased but remain sometimes at significant levels (see also Table 5-5).

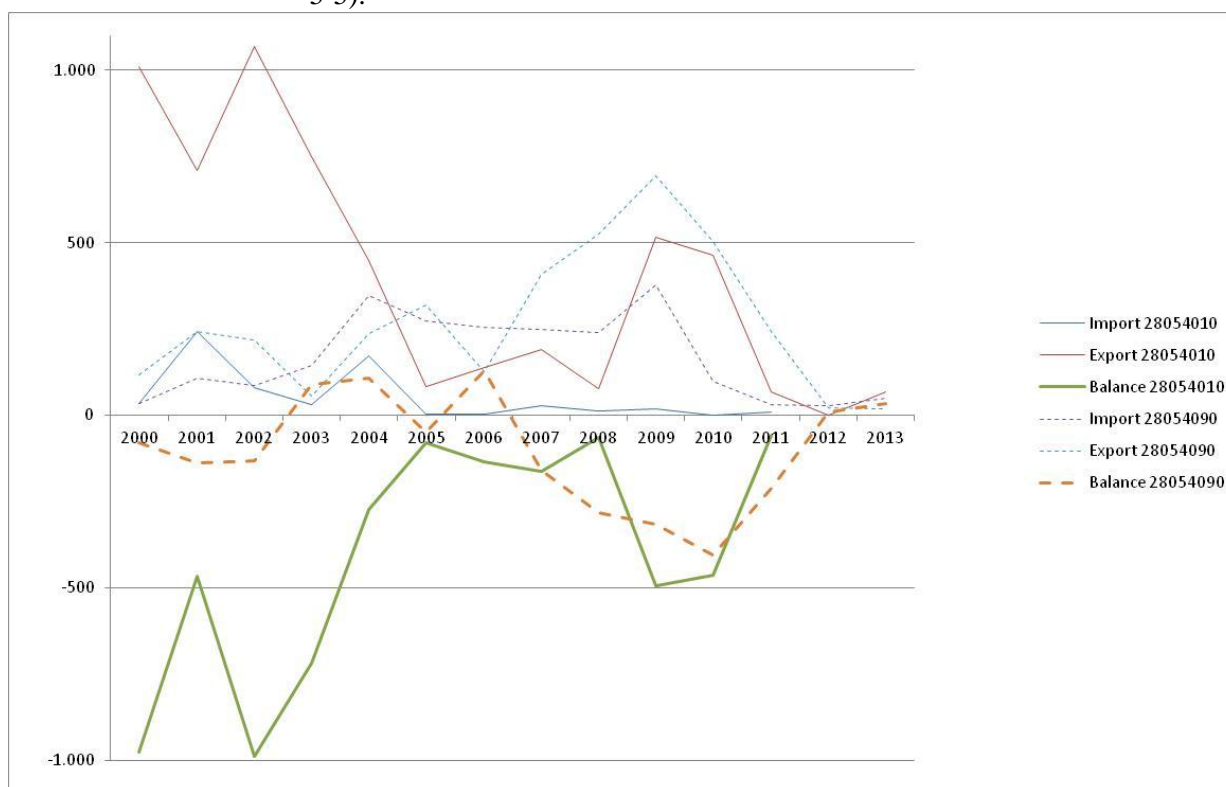


Figure 4-2 Imports, exports and trade balance of mercury - In flasks (CN code 28054010) and mercury – other (CN code 28054090) from 2000 to 2013

(quantities in t/y); negative numbers **in the balance** signify **that export s exceed imports**

Reducing the supply and trade of mercury is of particular importance to achieving the objectives of the Minamata Convention. Therefore a certain share of available mercury have to be disposed of. Environmentally sound disposal is not possible in all countries (globally) and all Member States (at EU level). As a consequence, trade in mercury for environmentally sound disposal should remain possible (at least at EU level) under an import ban or import restrictions. Parties to the Basel Convention are allowed to transport mercury waste across international borders only for the purpose of environmentally sound disposal (see Article 11(3) MC).

4.3.3 Impacts assessment

In the following table, the stakeholders affected and the impact relevance are summarised.

Table 4-6: Stakeholders affected by options in question, and impacts in summary

Options assessed	Stakeholders affected	Impacts
Option MC3(8)-1	Importers in the EU	COSTS of extra administration to secure the written consent of import country and certification that the mercury is not from sources identified as not allowed under paragraph 3 (new mercury mines) or paragraph 5 (b) (decommissioned chlor-alkali facilities) Foregone revenues of mercury import from Non-Parties
	Competent authorities	COSTS for control of the import restriction
	Global and EU population and environment	BENEFITS of reduced mercury releases from mining and from the lifecycle of newly extracted mercury
Option MC3(8)-2	Industry	COSTS of increased mercury prices due to lower supply (distributional effect only)
		COSTS of mercury substitution (perhaps even for uses allowed under the MC) in case of insufficient mercury supply from recycling within the EU, this being the only remaining mercury source in the EU under this option
	Importers in the EU	Foregone revenues of mercury import from all countries
	Competent	COSTS for control of the import ban

Options assessed	Stakeholders affected	Impacts
	authorities	
	Global suppliers of mercury	Foregone revenues of mercury export from all countries
	Global and EU population and environment	BENEFITS of reduced mercury releases from mining and lifecycle of mercury from all extra-EU sources

4.3.3.1 Technical considerations

Table 4-3 shows the estimated current (2014/2015) annual mercury consumption for uses allowed under the Minamata Convention in the EU (310 to 490 tonnes/y) and an estimate for the annual demand by 2025 to 2030 (40 to 280 tonnes/y).

As outlined in section 4.3.3.3, the related annual value of EU mercury consumption ranges from 12 to 19 million EUR/year (current consumption) and 1 to 22 million EUR/year in about 15 years (2025 to 2030).

As outlined above, the EU internal consumption is basically supplied from recycling activities within the EU (~ 150 – 200 t/y) and imports of metallic mercury reported by statistics as ~ 100 tonnes/y. The total supply is deemed to amount to around 250-300 tonnes per year.

Depending on the market development both sources of supply are elastic. If required it will be possible to (1) increase the amount of recycled mercury within the EU (at least temporarily) as well as (2) increase the imports for allowed uses. Primary mercury mining is still possible under specific conditions for a certain period of time under the MC and mercury can be imported from the global market into the EU where it can be used under specific conditions (see MC Article 3(4)). Currently (2014) global mercury supply amounts to about 3,300 t/y (see COWI 2012). Production of mercury as by-product is still allowed under the MC. However, in the EU, metallic mercury gained from the cleaning of natural gas or from non-ferrous mining and smelting operations shall be considered as waste and be disposed of (according to Regulation (EC) no 1102/2008). Hence, once the MC is in place, such by-products may provide continued mercury supply outside the EU and can be imported to the EU in case no restrictions are implemented. To conclude, it can be considered that the mercury market will be flexible and that the global and EU mercury demand will be satisfied according to requirements and in the light of changing prices. Even if imports will generally be banned, the amount recycled within the EU will be flexible, at least temporarily.

Due to its health and environmental risks in particular, mercury is being phased out in most of its former uses in commercial products and manufacturing processes and is replaced by suitable alternatives. Alternatives are expected to be available for most uses if supply falls below the desired demand. Alternatives will first be used

where alternatives are most economically available (unless restrictions or consumer demand require their use).

Technically, an import restriction could be implemented by (1) introducing a procedure requiring the written consent of the import country and certification that the mercury is only from allowed sources from Non-Parties to the MC (MI scenario) or (2) by establishing a general ban of import from all countries (beyond MC). In both options effort would be required to enforce the import restriction.

A procedure of written consent and certification provides assurance that imports originate from uses allowed under the MC. To this end:

- › mercury from allowed sources needs to be kept separated (by exporting countries) from mercury from sources that are not allowed; and
- › each single import of mercury needs to be checked to determine or whether it originates from an allowed source.

Under both options, measures to control the implementation of the import restriction (MI) or import ban (beyond MC) would be required in order to ensure proper enforcement.

4.3.3.2 Social impacts

For implementing an import restriction (MI), some additional labour capacity would be needed at importers of mercury and national competent authorities to handle the additional administration associated with introduction and operation of a procedure of written consent and certification (see section 4.3.3.3). For a general ban (beyond MC) a corresponding procedure will not be required.

For both options it will be necessary to implement procedures to oversee the import restriction (MI) or the import ban (beyond MC). The additional administrative effort to implement corresponding controls within existing import control procedures at competent authorities is expected to be limited and would not lead to significant increase in workload at competent authorities.

Under both options, imports will be reduced. As a consequence, EU importers will face loss of profit as revenues fall, in this realistic scenario, by approximately 0.39 million EUR for the MI option and approximately 3.9 million EUR for the beyond MC option (see section 4.3.3.3). This may lead to some (modest) loss of employment at EU importers. Corresponding job losses may occur at global level at suppliers exporting mercury into the EU.

Possible job losses at importers may be outweighed by job gains due to increased administrative work at importers and authorities. As outlined above, the administrative effort for implementing an import restriction (MI) is considered slightly higher than for implementing an import ban (beyond MC).

Incremental costs of up to 14 million EUR/y, in a high mercury demand scenario, may occur for the ‘beyond MC’ option (see section 4.3.3.3). This could lead to impacts on employment. However, if supply and demand change at the expected

rate, no significant cost impacts on industry and thus no employment impacts are foreseen.

In case of a total ban of mercury recycling in the EU (see [Option MC11\(3\)-1](#)) being combined with a general ban of imports (beyond MC option), the supply of mercury in the EU would be eliminated. This would potentially have additional (negative) effects on the employment in the sectors affected.

4.3.3.3 Economic impacts

Administrative costs

Under the MI scenario, the origin of mercury import could be verified by establishing a certificate of origin for each quantity of mercury imported to the EU from Non-MC-Parties. Specific information on related administrative burden is not available. Additional efforts would consist of increased administration at mercury suppliers/importers (in order to document the origin of traded mercury) and at competent authorities within countries (in order to check whether imported mercury originates only from allowed uses and to control the documentation). The administrative burden will particularly depend on (1) the number of actors involved in the supply chain of mercury and (2) the diversity of mercury import sources to the EU. Both factors are limited compared to other economic sectors.

Corresponding systems for international trade in certain hazardous compounds/products are already established under the Basel Convention and the Rotterdam Convention (notification procedure and prior informed consent respectively) it can be assumed that the effort to run in parallel a similar procedure for international mercury trade (which is far less complex compared to other international trade) is comparatively low.

The additional administrative effort for the MI option is higher than that of the BMC option. For both options, control systems need to be implemented. For the MI option additional administrative effort will be required to establish and operate a system of certification and consent and a system to control the import restriction. A quantification of the additional administrative effort is not possible on the basis of available data.

Foregone revenues of mercury import

The effects on mercury prices of reductions in supply are not well described. COWI (2012) illustrate that the world market price for mercury has varied extensively over the last decades. Based on EU trade statistics, from the period 2002-2010 annual average import prices ranged from 67 to 687 EUR/flask³ with an average price for the period of 221 EUR/flask, whereas the annual average export prices ranged from 207 to 739 EUR/flask with an average export price for the period of 457 EUR/flask. Average prices based on US data in 2009-2011 were 13-43 EUR/kg mercury.

³ 1 flask = 34.5 kg mercury

Table 4-7 World market prices for mercury 2006-2013, USD/Hg flask (USGS, 2011, 2012, 2014) citing Platts Metals Week).

Year	2006	2007	2008	2009	2010	2011	2012	2013* 1
Average price, USD/flask	670	530	600	600	1076	1850	1850	1850
Calculated price in EUR/t*2	14,100	11,200	12,600	12,600	22,600	38,900	38,900	38,900

Notes *1: Estimated by USGS (2014). *2: Based in exchange rate of 1.377 USD/EUR 9 Apr 2014 and 34.5 kg/flask.

Prices calculated on the basis of EUROSTAT data on export quantities and related values show large variations. Taking 2012 and 2013 export data for all CN categories listed in Table 5 5 as a basis, the calculation indicates, as a rough estimate, an average value of approximately 35,000 EUR/tonne of the listed mercury products. This is rather close to the market value of 38,900 EUR/tonne for mercury in flasks. As there is no better information available on the value of mercury products, the market value of 38,900 EUR is used to assess the value of traded mercury products (metal and compounds).

Section 4.3.2 noted that around 100 tonnes/year of mercury supply comes from mercury imports. The corresponding value of imports from all countries which would be banned in the beyond MC option would amount to approximately 3.89 million EUR.

The total value of the best available estimate of mercury consumption in 2014/15 of some 310-490 tonnes of mercury/year (part of this is based on import inside products, and not on mercury metal supply in the EU) is, based on prices reported by the USGS (2014), about 12-19 million EUR/year.

Predicting the changes in the mercury price in the EU due to the implementation of the Minamata Convention is not easy. Significant stocks of mercury are expected to be available on the world market, among others from earlier decommissioning and conversion of chlor-alkali plants. The changes in price during 2009-2013 could indicate that much of the price increase associated with expectations of a decline in supply has already happened. In the period until 2025-2030, both demand and supply are expected to decrease as the effects of the global implementation of the Minamata Convention, factors that point in opposite directions for the development of the mercury price. By 2025-2030 much of the current global demand would be eliminated if the Minamata Convention was successfully implemented, while mercury would still be supplied by recyclers and from by-product virgin mercury production (the latter from outside the EU). Prices around 2025-2030 in the range of -50 to +100 percent of the 2012 price level are however not deemed un-realistic based on the recent price fluctuations shown above. The value of the 2025-2030 supply of mercury to the EU in this scenario is around 1-22 million EUR as shown in Table 4-8. Note the minor caveat that parts of the mercury demand is actually

imported as mercury-added products and would thus not be affected by restrictions on import of mercury metal.

Table 4-8 EU Hg sales value calculation in a current and a 2025-2030 scenario.

	Low	High
Consumption around 2014-2015 t/y	310	490
Hg price in 2014-2015 (assumed equal to 2011-2014 price), EUR/t Hg	38,900	38,900
Total value of 2014-2015 consumption, EUR/y	12,059,000	19,061,000
Expected consumption around 2025-2030, t/y	40	280
Hg prices in scenario of -50 to +100% of 2012 price, EUR/t Hg (rounded)	19,000	78,000
Total value of 2025-2030 consumption in scenario, EUR/y	760,000	21,840,000

The MI option would only restrict imports from Non-MC parties. Data facilitating a disaggregation of current imports by MC parties and non-parties are not available. As a descriptive scenario, the authors assume that the major share (90%) of imports to the EU originates from future parties to the MC and that only a minor share (10%) originates from countries who will not become party to the convention. The corresponding value of imports from non-parties in this scenario would thus amount to approximately 0.39 million EUR.

According to this scenario, foregone revenues losses for EU importers would be about 0.39 million EUR/y for the MI option and about 3.89 million EUR/y for the beyond MC option. Depending on the development of the mercury demand, imports from allowed sources and for allowed uses may increase and outweigh or even overcompensate the possible losses of revenues under the MI option. Further down in the supply chain these effects may be partly outweighed by compensation measures (particularly substitution) in the corresponding use areas.

Corresponding revenues losses related to the same market value will occur at global level for suppliers exporting mercury into the EU depending on the development of mercury demand.

Costs to industry due to changed mercury prices and to lower supply

Both options will potentially lead to a lower supply of mercury. The MI option could lead to an insignificant decrease in mercury supply (under an assumption that import restrictions from non-parties will reduce supply imports from 100 to 90 t/y; and the remaining supply will be a range of 240 to 290 t/y). The BMC scenario could lead to a significant decrease in mercury supply (under an assumption that a general import ban will completely cut mercury metal imports; the remaining supply would be ~150 to 200 t/y). On the other hand mercury demand is expected to decrease as an effect of the implementation of the MC (expected demand is 40 to 280 t/y).

Decreasing supply and decreasing demand have reverse effects on the price development of mercury. Prices for mercury around 2025-2030 in a range between -50 to +100 percent of the 2012 level are deemed realistic (see above).

The expected future EU demand for mercury ranges between 40 and 280 tonnes/y (2025 to 2030), of which a (minor) part will be imported inside products manufactured outside the EU. Possible supply sources are recycling from intentional use within the EU, amounting to an expected 150 - 200 t/y, and in addition 0 t/y of mercury supply from import under a general import ban (beyond MC option) and import as needed (no quantitative restrictions) under the MI option. Ergo, compared to the demand estimate of roughly 40-280 tonnes/y around year 2025-2030 (see Table 4-3; including some mercury imported inside allowed products), no mercury shortage is expected under the MI option, while some shortage may occur under a general import ban (beyond MC option) and if demand for mercury will remain high (see following table).

Table 4-9 Expected supply, demand and balance of supply and demand for the business as usual, MI and beyond MI scenario.

	BAU	MI scenario	beyond MI scenario
Supply (t/y)	250 to 300	240 to 290	150 to 200
Demand (t/y)	40 to 280	40 to 280	40 to 280
Balance (t/y)	+260 to +20	+200 to +10	+160 to –80

If demand for EU consumption remains high (up to 280 tonnes/y) the mercury price may increase. Up to 100% price increase compared to the 2012 level expected to about 78,000 EUR/t is deemed not unrealistic based on previous experience. Consequently, additional costs for industry will arise either for paying the higher price for mercury, or for the use/development of mercury free alternatives.

In the case that the mercury demand in the EU will be low (down to 40 tonnes/y) the prices for mercury may decrease (for example down to -50% price decrease compared to the 2012 level is realistic to about 19,000 EUR/t) and cost savings for industry will occur due to the lower price for mercury. Additional costs for substitution will not incur since mercury supply will exceed mercury demand.

If prices increase, substitution will first occur in those areas where substitution is most economically feasible and costs for mercury free alternatives are not significantly above the costs for the mercury use. The corresponding costs cannot be quantified as they depend on the development of supply and the specific costs for substitution. But realistic price increases shown below indicate the level of costs.

If the Minamata Convention will be successfully implemented globally, it is expected that the demand for mercury will further decline and that additional costs for substitution due to import restrictions will not become relevant. Based on these considerations, the costs for substitution which will in practice occur will be similar to the costs for the mercury use, unless the alternatives feature added functional benefits (which represent an added value).

In the BAU scenario industry needs to purchase between 40 and 280 mercury/year at an average price (value ~ 1.6 to 10.9 million €; best estimate 6.2 million €).

In the BMC scenario a possible shortage of up to 80 t/y might occur in a high demand scenario (demand 280 t/y). In this case it is not unrealistic that prices could increase to 78,000 EUR/t (see above). The value of the required supply (280 t/y) would amount to 15.6 million EUR (for 280 t at high price). As a consequence, possible cost increases compared to the BAU scenario range between 4.7 million EUR/y (10.9 - 15.6 million EUR) and 14.0 million EUR /y (1.6 - 15.6 million EUR).

In the MI scenario it is expected that supply exceeds demand and there will be no additional costs for industry. In a low demand scenario, it is not unrealistic that prices could fall to 19,000 EUR/t (see above) and cost savings for mercury using industry could occur (value of supply 0.8 million/EUR/y for 40 tonnes at low price).

In conclusion, realistic cost impacts for the BMC option range between 0 and 14 million EUR/y. If demand develops at a low level, cost savings for industry are possible.

Under the MI option no cost impacts are expected.

The project specific questionnaire contains a question related to the export ban of mercury laid down in Regulation 1102/2008. 2 out of 15 Member States that replied, reported that market effects had been observed. In one country (CZ) exports of dental mercury beyond the EU stopped (i.e. to Turkey in 2011). Specific economic impacts are not reported. In another country (ES) dedicated mercury mining has ceased,; social and economic impacts occurred in the region concerned. The same Member State reported economic impacts, as excess mercury from chlor-alkali facilities cannot now be placed on the market. These examples demonstrate the economic impacts that can arise from trade restrictions. Generally such impacts may occur if trade is reduced by import or export restrictions.

Significant costs for environmentally sound disposal of mercury waste could occur if imports of mercury (including waste imports) was completely banned. The impact would be influenced by the availability of domestic disposal facilities. Waste would have to be disposed of in each country individually and as a consequence costs for the establishment of disposal facilities would arise in each country. As in the EU disposal facilities are available and could generate extra income, it is proposed that imports from outside (and inside) the EU for environmentally sound disposal should remain possible.

4.3.3.4 Environmental impacts

It is expected that the EU imports of mercury will not necessarily be reduced under the MI option, whereas they will fall from 100 to 0 t/y under the BMC option (general import ban). EU supply may thus be reduced under a general import ban and price increases may occur. As a consequence less mercury may be used and be available for release through its life cycle within the EU. In the global context, an

EU import ban could potentially result in lower production of mercury with reduced releases as a consequence, or – perhaps more likely – it could reduce mercury prices outside the EU and potentially result in increased (or maintained) mercury consumption in regions and activities with less environmental management (for example ASGM), with a potential for giving rise to increased releases.

Depending on the availability of disposal facilities within a country, adverse effects on environment and health could occur if imports of waste mercury for environmentally sound disposal would be banned. As in the EU disposal facilities are available, imports from outside /and inside) the EU for environmentally sound disposal is proposed here to remain possible.

4.3.4 Identified data gaps

- › Specific administrative burden (the burden is considered comparatively low).

4.3.5 Conclusions

Both the MI option, to apply a conditional import ban relating to Non-Parties (by establishing a procedure for checking that imports from Non-Parties to the MC live up to MC standards), and the BMC option applying a general import ban to all countries outside the EU are expected to contribute to a global reduction of mercury releases and related environmental and health benefits.

Extra costs for importers and competent authorities in administration would arise but are considered to be low. For both options control systems need to be implemented with similar effort. The MI option also requires a procedure for checking imports from Non-parties to the MC. The administrative burden for the MI option is therefore higher than the BMC option.

Social impacts are difficult to assess in detail but are however deemed minimal based on the relatively low cost. A very rough estimate under the BMC is 0-100 jobs lost due to reduced imports and higher mercury prices for industry.

Foregone revenues for EU importers are projected to about 0.39 million EUR for the MI option and to about 3.89 million for the BMC option. Depending on the development of the mercury demand, imports from allowed sources and for allowed uses may increase and outweigh or even overcompensate the possible loss of revenues under the MI option.

In conclusion, realistic cost impacts for the BMC option range between 0 and 14 million EUR/y. If demand develops at a low level, cost savings for industry are possible. Under the MI option no significant cost impacts are expected.

If the Minamata Convention will be successfully implemented, it is expected that the demand for mercury will further decline and that additional costs for substitution due to import restrictions will not become relevant.

The general objective of the MC – to reduce mercury supply and use – will be better achieved within the EU by restricting import of mercury from all countries (beyond MC option). In the global context, an EU import ban could ideally result in lower production of mercury with reduced releases as a consequence. On the other hand, if global production would not be reduced, it could reduce mercury prices outside the EU and potentially result in increased (or sustained) mercury consumption in regions and activities with less environmental management (for example ASGM), where supply restrictions are most needed.

It is recommended that imports for environmentally sound disposal of mercury should remain possible in order to use the available capacity to assist other countries with environmentally sound disposal.

Reducing the supply of mercury to the EU will contribute to a reduction of releases in the life cycle of mercury in the EU. This reduction can be achieved either by restricting mercury imports, or by placing further restrictions on mercury recycling within the EU. Assuming an equal supply reduction in both cases, reducing imports may have smaller negative economic impacts within the EU than reducing recycling, but may also be less environmentally effective (achieve less reduction of releases) in the global context. Application of both supply reduction measures is likely feasible if adequate substitution time is given (especially for some of the analysis applications with significant remaining consumption) but it would be at a higher cost.

4.4 MC Article 4(1): Prohibition of manufacture/import/export of mercury-added products of Annex A, Part I

4.4.1 Problem definition and specific objectives

Article 4(1) MC addresses the prohibition of manufacture, import and export of the following mercury-added products listed in Annex A, Part I MC, all with phase-out date 2020:

Mercury-added Products targeted by the MC
<i>Batteries (with specifications)</i>
<i>Switches and relays (with specifications)</i>
<i>Compact fluorescent lamps (CFLs) (with specifications)</i>
<i>Linear fluorescent lamps (LFLs) for general lighting purposes (with specifications)</i>
<i>High pressure mercury vapour lamps (HPMV) for general lighting purposes</i>
<i>Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays (with specifications)</i>
<i>Cosmetics (with specifications)</i>
<i>Pesticides, biocides and topical antiseptics</i>

Mercury-added Products targeted by the MC
<i>(a) barometers; (b) hygrometers; (c) manometers; (d) thermometers; (e) sphygmomanometers (with specifications)</i>

As described in Appendix 1, section 7.2.2, the current EU legislation covers placing on the market (sales and import), but for most of the products not manufacture and export. This section explores the possible impacts of including a ban on export of these product types in EU legislation (and thereby, in combination with existing EU legislation, in effect also manufacture).

Based on the comparative assessment of proposed options and the Commission's criteria for selection of options to be investigated further, the following options relating to this article of the Minamata Convention are assessed in detail.

Table 5 3 Options assessed regarding this article of the Minamata Convention

Scenario	Options to be assessed (keywords)	Preliminary IA score*1
Baseline 1	Business as usual (BAU)	-
Baseline 2: Minimum implementation (MI)	Option 4(1)-1a : Restrict the export of mercury-added products listed in Annex A, Part I MC ("MC standard")	C-1,A-1,E1,S1
Beyond MC (BMC)	New option 4(1)-1b: Restrict the export of mercury-added products for which placing on the market within the EU is already restricted ("EU standard")	-

Notes: *1: According to comparative assessment presented in Section 3.1.2; societal impacts across all options for this MC article. For details on scores, click [here](#). Scores:

C: Socio-economic costs/impacts: 0 = minimal, -1 = moderate, -2 = potentially significant costs.

A: Administrative/political efforts (by EU and MS authorities): 0 = minimal, -1 = moderate, -2 = potentially significant efforts.

E: Environmental benefits: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.

S: Signal effect towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambition implementation of the MC, -1 = signalling low-ambition implementation of the MC.

4.4.2 Baseline conditions

The following Table 4-10 lists:

- › the product types targeted by MC requirements,
- › the existing EU legislation relating to the same product types, and

- › the specific product types affected under the BMC scenario (export restricted to current EU standard), but not under the MI scenario (export restricted to MC standard).

No aggregated data are available on the current export of mercury-added products for which placing on the market is restricted in the EU.

Table 4-10 Mercury-added products targeted by the MC, current EU regulation, and such for which EU regulation targets broader than the MC that would be affected in the BMC scenario.

	MC entry	EU legislation banning placing on the market	Products for which EU marketing restrictions go beyond MC restrictions; affected under BMC scenario only																			
1	Batteries, except for button zinc silver oxide batteries with a mercury content < 2%, button zinc air batteries with a mercury content < 2%	EU Batteries Directive 2006/66/EC prohibits placing on the market of all batteries that contain more than 0.0005% by weight of mercury except button cells with 2% by weight. Button cell exception expires in October 2015. The 0.0005% limit is intended to cover all intentional mercury (but allow trace concentrations).	Button zinc silver oxide batteries with a mercury content between 0.0005 and 2% Button zinc air batteries with a mercury content between 0.0005 and 2%,																			
2	Switches and relays, except very high accuracy capacitance and loss measurement bridges and high frequency radio frequency switches and relays in monitoring and control instruments with a maximum mercury content of 20 mg per bridge, switch or relay	RoHS Directive 2011/65/EU restricts the use of mercury in concentrations over 1 % w/w. Annex IV to that does contain the following exemption to the restriction: Mercury in very high accuracy capacitance and loss measurement bridges and in high frequency RF switches and relays in monitoring and control instruments not exceeding 20 mg of mercury per switch or relay.	None.																			
3	Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤ 30 watts with a mercury content exceeding 5 mg per lamp burner	RoHS Directive 2011/65/EU introduces in its Annex III, point 1 (a), the following exemptions of the restriction, valid after 31 December 2012: 2.5 mg Hg for general lighting purpose in single capped (compact) fluorescent lamps < 30 W	Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤ 30 watts with a mercury content exceeding between 2.5 and 5 mg per lamp burner																			
4	Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Triband phosphor < 60 watts with a mercury content exceeding 5 mg per lamp; (b) Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp	RoHS Directive 2011/65/EU restricts the use of Hg in relevant lamps as follows (current coverage after specified expiration dates of previous limits/restrictions): <table><tr><td>2(a)</td><td>Mercury in double-capped linear fluorescent lamps for general lighting purposes not exceeding (per lamp):</td></tr><tr><td>2(a)(1)</td><td>Tri-band phosphor with normal lifetime and a tube diameter < 9 mm (e.g. T2): 4 mg</td></tr><tr><td>2(a)(2)</td><td>Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5): 3 mg</td></tr><tr><td>2(a)(3)</td><td>Tri-band phosphor with normal lifetime and a tube diameter > 17 mm and ≤ 28 mm (e.g. T8): 3.5 mg</td></tr><tr><td>2(a)(4)</td><td>Tri-band phosphor with normal lifetime and a tube diameter > 28 mm (e.g. T12): 3.5 mg</td></tr><tr><td>2(a)(5)</td><td>Tri-band phosphor with long lifetime (≥ 25 000 h): 5 mg</td></tr><tr><td>2(b)(1)</td><td>Linear halophosphate lamps with tube > 28 mm (e.g. T10 and T12): 10 mg (Expired on 13 April 2012)</td></tr></table>	2(a)	Mercury in double-capped linear fluorescent lamps for general lighting purposes not exceeding (per lamp):	2(a)(1)	Tri-band phosphor with normal lifetime and a tube diameter < 9 mm (e.g. T2): 4 mg	2(a)(2)	Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5): 3 mg	2(a)(3)	Tri-band phosphor with normal lifetime and a tube diameter > 17 mm and ≤ 28 mm (e.g. T8): 3.5 mg	2(a)(4)	Tri-band phosphor with normal lifetime and a tube diameter > 28 mm (e.g. T12): 3.5 mg	2(a)(5)	Tri-band phosphor with long lifetime (≥ 25 000 h): 5 mg	2(b)(1)	Linear halophosphate lamps with tube > 28 mm (e.g. T10 and T12): 10 mg (Expired on 13 April 2012)	<table><tr><td>Tri-band phosphor with normal lifetime and a tube diameter < 9 mm (e.g. T2) with a mercury content between 4 mg and 5 mg</td></tr><tr><td>Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5) with a mercury content between 3 mg and 5 mg</td></tr><tr><td>Tri-band phosphor with normal lifetime and a tube diameter > 17 mm and ≤ 28 mm (e.g. T8): with a mercury content between 3.5 mg and 5 mg</td></tr><tr><td>Tri-band phosphor with normal lifetime and a tube diameter > 28 mm (e.g. T12) with a mercury content between 3.5 mg and 5 mg</td></tr><tr><td>Linear halophosphate lamps with tube > 28 mm (e.g. T10 and T12)</td></tr></table>	Tri-band phosphor with normal lifetime and a tube diameter < 9 mm (e.g. T2) with a mercury content between 4 mg and 5 mg	Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5) with a mercury content between 3 mg and 5 mg	Tri-band phosphor with normal lifetime and a tube diameter > 17 mm and ≤ 28 mm (e.g. T8): with a mercury content between 3.5 mg and 5 mg	Tri-band phosphor with normal lifetime and a tube diameter > 28 mm (e.g. T12) with a mercury content between 3.5 mg and 5 mg	Linear halophosphate lamps with tube > 28 mm (e.g. T10 and T12)
2(a)	Mercury in double-capped linear fluorescent lamps for general lighting purposes not exceeding (per lamp):																					
2(a)(1)	Tri-band phosphor with normal lifetime and a tube diameter < 9 mm (e.g. T2): 4 mg																					
2(a)(2)	Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5): 3 mg																					
2(a)(3)	Tri-band phosphor with normal lifetime and a tube diameter > 17 mm and ≤ 28 mm (e.g. T8): 3.5 mg																					
2(a)(4)	Tri-band phosphor with normal lifetime and a tube diameter > 28 mm (e.g. T12): 3.5 mg																					
2(a)(5)	Tri-band phosphor with long lifetime (≥ 25 000 h): 5 mg																					
2(b)(1)	Linear halophosphate lamps with tube > 28 mm (e.g. T10 and T12): 10 mg (Expired on 13 April 2012)																					
Tri-band phosphor with normal lifetime and a tube diameter < 9 mm (e.g. T2) with a mercury content between 4 mg and 5 mg																						
Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5) with a mercury content between 3 mg and 5 mg																						
Tri-band phosphor with normal lifetime and a tube diameter > 17 mm and ≤ 28 mm (e.g. T8): with a mercury content between 3.5 mg and 5 mg																						
Tri-band phosphor with normal lifetime and a tube diameter > 28 mm (e.g. T12) with a mercury content between 3.5 mg and 5 mg																						
Linear halophosphate lamps with tube > 28 mm (e.g. T10 and T12)																						

	MC entry	EU legislation banning placing on the market	Products for which EU marketing restrictions go beyond MC restrictions; affected under BMC scenario only
5	<i>High pressure mercury vapour lamps (HPMV) for general lighting purposes</i>	RoHS Directive 2011/65/EU currently includes an exemption for this product type, but the exemption expires by 13 April 2015; after that date, the general restriction of 0.1 % of Hg w/w (Article 4, Annex II RoHS) applies	High pressure mercury vapour lamps (HPMV) for general lighting purposes with a mercury content above 0.1 % w/w
6	<i>Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays: (a) short length (≤ 500 mm) with mercury content exceeding 3.5mg per lamp (b) medium length (> 500 mm and $\leq 1\,500$ mm) with mercury content exceeding 5 mg per lamp (c) long length ($> 1\,500$ mm) with mercury content exceeding 13 mg per lamp</i>	These lamps are exempted in the RoHS Directive 2011/65/EU but with thresholds for exempted lamps matching exactly the thresholds in of the MC.	None.
7	<i>Cosmetics (with mercury content above 1ppm), including skin lightening soaps and creams, and not including eye area cosmetics where mercury is used as a preservative and no effective and safe substitute preservatives are available</i>	“Mercury and it compounds” is included in the list of prohibited substances (Annex II, entry 221 in Regulation 1223/2009 on cosmetic products), with the exception of two mercury compounds which are allowed to be used in eye cosmetics, with threshold concentrations of 0.007 % w/w Phenyl Mercuric Acetate and Thimerosal. The MC provision is deemed covered.	Presuming that the further conditions of the MC entry (<i>mercury is used as a preservative and no effective and safe substitute preservatives are available</i>) apply for the EU exemption for eye cosmetics, there are no products for which EU marketing restrictions go beyond MC restrictions.
8	<i>Pesticides, biocides and topical antiseptics</i>	Mercury and mercury compounds are not approved as active substances for plant protection products or biocides under EU legislation. Topical antiseptics are subject to EU legislation on medicals (Directive 2001/83/EC; Regulation (EC) 2004/726). It cannot be ruled out that authorisations may exist at MS level.	None.
9	<i>The following non-electronic measuring devices except non-electronic measuring devices installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available: (a) barometers; (b) hygrometers; (c) manometers; (d) thermometers; (e) sphygmomanometers</i>	Annex XVII of REACH, entry 18a is related to “Mercury (CAS No 7439-97-6)” and restricts the use in fever thermometers and other non-electronic measuring devices. Note that this entry is modified by Regulation (EU) No 847/2012 amending Annex XVII to Regulation (EC) No 1907/2006 with effect of April 2014. The entry reads in full: <i>5. The following mercury-containing measuring devices intended for industrial and professional uses shall not be placed on the market after 10 April 2014: (a) barometers; (b) hygrometers; (c) manometers; (d) sphygmomanometers; (e) [...]; (g) thermometers and other non-electrical thermometric applications.</i> <i>The restriction shall also apply to measuring devices under points (a) to (g) which are placed on the market empty if intended to be filled with mercury.</i> <i>6. The restriction in paragraph 5 shall not apply to: (a) sphygmomanometers to be used: (i) in epidemiological studies which are ongoing on 10 October 2012; (ii) as reference standards in clinical validation studies of mercury-free sphygmomanometers</i>	Wording of EU restriction differs from MC (e.g. it is no precondition in the EU that <i>no suitable mercury-free alternative is available</i>). On the other hand, EU restriction contains exemptions (in point 6). Overall, it is assumed in essence there are no products for which EU marketing restrictions go beyond MC restrictions.

	MC entry	EU legislation banning placing on the market	Products for which EU marketing restrictions go beyond MC restrictions; affected under BMC scenario only
		<p><i>(b) thermometers exclusively intended to perform tests according to standards that require the use of mercury thermometers until 10 October 2017;</i></p> <p><i>(c) mercury triple point cells which are used for the calibration of platinum resistance thermometers.</i></p> <p><i>[...] 8. The restrictions in paragraphs 5 and 7 shall not apply to: (a) measuring devices more than 50 years old on 3 October 2007; (b) measuring devices which are to be displayed in public exhibitions for cultural and historical purposes.</i></p>	

4.4.3 Impacts assessment

In the following table, the stakeholders affected and the impact relevance are summarised. The types of impacts are the same for the MI and the BMC scenarios, but the degree of the impacts will be higher under the BMC for the stakeholders involved in production and export of products which are targeted by EU marketing restrictions but not by MC marketing restrictions. This subject is further discussed below the table.

Table 4-11 Stakeholders affected by options in question and impacts in summary

Options assessed	Stakeholders affected	Impacts
Option 4(1)-1a (MI) and New option 4(1)-1b (BMC)	Industry and exporters	COSTS: Loss of revenues from export of targeted EU-produced products SOCIAL: Loss of jobs with cessation of production and export of targeted EU-produced products
	Competent authorities	ADMINISTRATIVE efforts of enforcement; as control programmes are already conducted for diverse restrictions of manufacture and products, incremental efforts are deemed minimal
	Environment and consumers globally	ENVIRONMENTAL: Reduction of releases of mercury from the life cycle of the targeted products (from manufacture in EU; from use and disposal outside the EU).

4.4.3.1 Economic and social impacts

For products targeted under the BMC by EU marketing restrictions (“EU standard”), but not by MC restrictions, the manufacture, import and export will still be allowed outside the EU. Therefore any production currently done in the EU may simply be moved outside the EU (by EU based global companies and to companies places outside EU), with consequent losses of revenues and jobs within the EU.

Available production and trade statistics are not significantly detailed to enable a reasonable quantification of impacts.

4.4.3.2 Environmental impacts

Under the MI scenario mercury releases, mercury input and emissions/releases will be reduced both within the EU and globally.

If under the BMC production is simply moved out of the EU to countries with lower environment and health standards than in the EU, the global environment

and health impacts of mercury emissions/releases may increase for products only targeted by the BMC scenario (“EU standard” restrictions).

Quantification of impacts is not possible based on available aggregate information.

4.4.4 Identified data gaps

- › Data on the volumes and values of the export of product types targeted by EU marketing restrictions and MC restrictions, respectively.
- › Data on number of jobs associated with export of product types targeted by EU marketing restrictions and MC restrictions, respectively.
- › Mercury emissions/releases associated with the production of targeted exported product types within the EU.

[#Should stakeholders have any of these types of data available, they would be welcome during the stakeholder workshop process.]

4.4.5 Conclusions

With the observed lack of detailed data about export the targeted product types, a quantitative assessment is not possible.

For products targeted under the BMC by EU marketing restrictions (“EU standard”), but not by MC restrictions, the manufacture, import and export will still be allowed outside the EU. Therefore any production currently done in the EU may simply be moved outside the EU (by EU based global companies and to companies places outside EU), with consequent losses of revenues and jobs within the EU, but unchanged or increased environment and health impacts globally.

4.5 MC Article 4(3): Dental amalgam life cycle

4.5.1 Problem definition and specific objectives

The issue of dental amalgam use is explicitly excluded from the Terms of Reference of this study, and is therefore only described on a summary level here. An overview of the key impacts of the proposed options for meeting Minamata Convention requirements as regards dental amalgam is given in the table below.

Table 4-12 Options assessed regarding this article of the Minamata Convention.

Scenario	Options to be assessed (keywords)	Preliminary IA score*1
Baseline 1	Business as usual (BAU)	-
Baseline 2: Minimum implementation (MI)	<p>Option MC4(3)-1: No legal changes, rely only on encouragement/studies/promotion (that is, at least two of the MC Annex A, Part II measures ii, v and ix). Here, measures MC Annex A, Part II v and ix are deemed the minimal implementation measures:</p> <p>(v) <i>Encouraging representative professional organizations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices;</i></p> <p>(ix) <i>Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.</i></p> <p>Measure (ix) can be claimed to be addressed already as EU waste regulation require collection and separate treatment of mercury amalgam waste. Key elements in best environmental practice for dentistry are the use of amalgam separators in the facilities sewage system and separate collection of amalgam waste.</p>	C0,A1,E0,S-1
Beyond MC (BMC)	Option MC4(3)-2 : Implementation of law going beyond the requirements of MC: Union-wide ban on dental amalgam with exemptions for specified cases.	C-2,A-2,E2,S1

Notes: *1: According to comparative assessment presented in Section 3.1.2; societal impacts across all options for this MC article. For details on scores, click [here](#). Scores:

C: Socio-economic costs/impacts: 0 = minimal, -1 = moderate, -2 = potentially significant costs.

A: Administrative/political efforts (by EU and MS authorities): 0 = minimal, -1 = moderate, -2 = potentially significant efforts.

E: Environmental benefits: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.

S: Signal effect towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambition implementation of the MC, -1 = signalling low-ambition implementation of the MC.

4.5.2 Baseline conditions

Dental amalgam is, and is likely to remain, the major consumer use of mercury in the EU. Amalgam fillings are less costly (on average) to consumers, though prices of the alternatives are expected to be decreasing over time. Many dentists have been sceptic to full substitution, as the durability of the alternatives is lower, as some of them (composite fillings) do not reduce secondary caries, and likely also because using amalgam fillings is well established technique. On the other hand, consumers and dentists are increasingly aware of the toxic properties of mercury and some consumers favour tooth-coloured filling material for aesthetic reasons. In some countries with regulation of dental amalgam that goes beyond the EU acquis

(for example Denmark and Sweden), amalgam use has already dropped to very low levels. If no measures are taken, a gradual continued substitution is expected elsewhere in the EU, but perhaps not to the same level.

4.5.3 Impacts assessment

The stakeholders affected and the impacts arising are summarised in the following table:

Table 4-13 Stakeholders affected by options in question, and impacts in summary

Options assessed	Stakeholders affected	Impacts
Option MC4(3)-1	Dental schools (private and public)	No major impacts: However some efforts of gradually adjusting dental training towards the use of non-amalgam filling materials; a process which is already in progress in many Member States due to already established environmental priorities and a growing wish for filling materials with tooth colour.
	Supply chain of dental filling materials	<p>COSTS of substitution of dental amalgam with mercury-free alternatives, a process which is already in progress. If no legal goals are defined, the change is likely to occur gradually and partially, and incremental costs due to this option are expected to be minimal.</p> <p>BENEFITS: Substitution is already ongoing, with economic benefits for EU based producers/suppliers of mercury-free filling materials; the incremental benefits from this soft option are however deemed minimal.</p>
Option MC4(3)-2	Manufacturers of dental filling materials	<p>BENEFITS: As most suppliers of dental fillings materials market both amalgam fillings and the slightly more expensive alternative filling materials, most suppliers will benefit from a forced substitution (amalgam ban). A global movement towards mercury-free filling materials will benefit EU based producers of filling materials.</p> <p>COSTS (distributional effect only): If some suppliers only supply amalgam fillings, they will have costs of substitution, or their market share (and associated jobs) will shift to other suppliers.</p>
	Consumers	COSTS: For small and non-complex fillings, fillings made from the alternative materials are not necessarily more expensive than amalgam fillings. For larger or more complex fillings, the alternative filling materials take longer time for the dentist to apply, and therefore filling prices are so far higher than for amalgam fillings (unless public subsidy or insurance policies promote the use of alternatives over amalgam, which is the case

Options assessed	Stakeholders affected	Impacts
		<p>in some countries). Also, for some filling types, the fillings made from alternative filling materials are somewhat less durable than amalgam fillings, which could result in a higher restoration frequency and associated costs.</p> <p>BENEFITS: Dental amalgam is the key source of direct consumer exposure to metallic mercury, and eliminating this exposure may lead to reduced health effects from this exposure.</p>
	Global and EU population and environment	BENEFITS of reduced mercury releases from the life cycle of mercury in dental amalgam fillings.

The societal costs of substitution of dental amalgam were estimated roughly by COWI and Concord East/West (2008) to range from 1,000 to 10,000 million EUR/year for the EU. It should be noted that the estimate was based on very few data, primarily from high-salary Member States. BIOIS (2012) estimated a cost range of 322 to 14,593 million EUR/year for a dental amalgam ban was estimated, considering also gains for manufacturers and suppliers and costs for dental patients. Price levels are not considered stabilised yet and actual incremental costs are therefore expected to be in the low end of the 0.3-15 billion EUR interval. Specifically for 2016, figure 2 in (BIOIS, 2012) shows that annual costs related to dental patients in that year were estimated at about 650 million EUR for a dental amalgam ban.

Studies of the mechanical durability of filling and the occurrence of secondary caries with non-amalgam fillings have indicated that for small and non-complex fillings, the differences between amalgam fillings and the alternatives are minimal, while with larger and more complex fillings, the alternative filling materials have somewhat lower durability ([COWI substitution info report, 2010]). The newest alternative filling material, so-called compomer fillings, seem to have the best functionality among the alternatives to amalgam. With technically based exemptions to the ban for the following particularly demanding cases of dental restoration, the dental health impacts of substitution are deemed to be moderate. Exemption could for example be those recently proposed for a revision of the Danish mercury ban (Danish EPA, 2013):

Dental amalgam can be used in staying molars in cases where it is clear that this material will last longer. These cases are limited to restorations where:

- › the cavity cannot be dried
- › the access to the cavity is difficult
- › the cavity is particularly large, or
- › there is a large distance to the next tooth.

The health and environmental impacts of both dental amalgam and its alternatives are currently under renewed review in the Scientific Committee for Emerging and Newly Identified Health Risks (SCENIHR), as well as the Scientific Committee for Health and Environmental Risks (SCHER). The Commission awaits the revised opinions of advisory committees and has therefore excluded the dental amalgam issue from the Terms of Reference of this study.

COWI and Concorde East/West (2008) estimated the mass balance for dental amalgam in the EU as shown in Figure 4-3. The uncertainty range for the consumption of mercury for dental amalgam was 90-110 t/year. All mercury not recovered or ending up in municipal solid waste (MSW) is indicated as “other disposal”, this means including releases to the sewer system, emissions from cremations, releases from fillings during use, and losses directly to the environment with broken fillings and un-recovered teeth. While not directly estimated, the releases from the sector may be considerable.

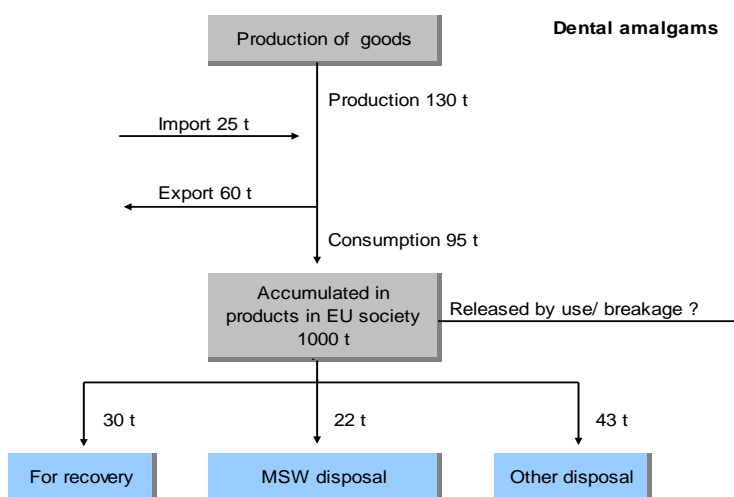


Figure 4-3 Estimated mass balance of dental amalgam in the EU (from COWI and Concorde East/West, 2008).

4.5.4 Identified data gaps

An identification of data gaps has not been attempted in this study for dental amalgam for the above mentioned reasons.

4.5.5 Conclusions

An option for a minimal implementation of the Minamata convention as regards dental amalgam is available. It is expected to have marginal incremental impacts beyond the established trend in the EU (business as usual scenario); both with regard to costs and benefits.

If a more effective and speedy measure for reduction of releases and adverse effects from dental amalgam is desired, an EU wide ban on dental amalgam, with exemptions for specified demanding filling situations, would achieve that. This option goes beyond the obligations of the Minamata Convention. The option will in the short to medium terms have both higher benefits (for industry and consumers) and higher costs (for consumers) than a minimal implementation scenario.

The societal costs of substitution of dental amalgam have been roughly estimated at 0.3-15 billion EUR/y.

By introducing a ban on dental amalgam, a large part of the remaining consumption of mercury in the EU- around 90-110 tonnes/year - would be eliminated from circulation in the EU. No precise data are available for the actual releases of mercury from this activity, but the potential for releases is significant.

No further comparisons and conclusions were made for this subject as the Commission has excluded the dental amalgam issue from the Terms of Reference of this study.

4.6 MC Articles 4(6) and 5(7): Discouragement of new products and processes with intentional mercury use

4.6.1 Problem definition and specific objectives

Article 4(6) and Article 5(7) MC introduce firm law obligations for the Parties to take appropriate measures to discourage mercury-added products or manufacturing processes in which mercury or mercury compounds are intentionally used.

The term “discourage” is not defined in the MC, and there is scope for interpretation in how firm implementing measures need to be, in order to provide “discouragement”.

This is reflected in specific options aiming at a “soft discouragement” (options MC 4(6)-2 and MC 5(7)-3 which are appropriate for the minimum implementation of the Convention, and specific options aiming at a “firm discouragement” (options MC 4(6)-1 and MC 5(7)-1 or MC 5(7)-2 going beyond the obligations of the MC. These latter options propose a conditional ban of relevant products and processes: (1) products may be used under the condition that a product demonstrates significant environmental or human health benefits; (2) manufacturing processes can be carried out under the condition that a manufacturing process provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits.

Based on the comparative assessment of proposed options and the Commission’s criteria for selection of options to be investigated further, the options listed in the table below relating to this article of the Minamata Convention are assessed in detail.

“Discouragement” could be provided by measures of varying severity, such as:

- › stating that new marketing and commercial use should be discouraged in a communication to Member States or stakeholders;
- › placing obstacles to the marketing and commercial use of such products; such as through introducing assessment requirements, environmental charges, or other similar measures; or
- › an explicit (conditional) ban of new mercury uses.

The interpretation of “discouragement” could have much influence on the severity of all the impacts types listed below, depending on whether they involve a ‘soft’ discouragement, which would not stop of innovation in mercury-using products, or an actual ban which would have exclusions only for products and processes fulfilling the specific conditions mentioned in the Minamata Convention.

It should be noted that R&D activities are exempted from the MC, as well as in existing EU law relevant to mercury, and would thus still be possible.

Table 4-14 Options assessed regarding this article of the Minamata Convention.

Scenario	Options to be assessed (keywords)	Preliminary IA score*1
Baseline 1	Business as usual (BAU)	-
Baseline 2: Minimum implementation (MI)	Option MC4(6)-2 (identical to Option MC5(7)-3): A general (soft) discouragement could be given within a further developed Regulation (EC) 1102/2008. Such discouragement could be expressed as a statement towards the institutions and agencies at EU level, or towards the Member States, or to both.	C-2?,A0,E2?,S1
Beyond MC (BMC)	Option MC4(6)-1 (identical to Option MC5(7)-1): Mercury could be added to the Candidate List and later into Annex XIV of REACH and thus be made subject to authorisation. Another option could be to use Article 68(2) of REACH that allows the ban of articles for consumer uses containing mercury on the basis of its classification as CMR cat 1 b. Otherwise a general restriction under REACH could be introduced, or a conditional ban could be expressed in a further developed Regulation (EC) 1102/2008.	C-2?,A0,E2?,S1 or C-2?,A-2,E2?,S1 depending on implementation mode (the latter score via REACH)

Notes: *1: According to comparative assessment presented in Section 3.1.2; societal impacts across all options for this MC article. For details on scores, click [here](#). Scores:

C: Socio-economic costs/impacts: 0 = minimal, -1 = moderate, -2 = potentially significant costs.

A: Administrative/political efforts (by EU and MS authorities): 0 = minimal, -1 = moderate, -2 = potentially significant efforts.

E: Environmental benefits: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.

S: Signal effect towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambition implementation of the MC, -1 = signalling low-ambition implementation of the MC.

4.6.2 Baseline conditions

Due to its properties mercury is and has been used in a number of relevant products and processes. In COWI and Concorde East/West (2008) more than 60 mercury applications were assessed. A detailed split of EU mercury consumption among 41 product groups taken from that study is shown in Table 4-2 above.

The past and ongoing use of mercury in products and processes causes serious health and environmental problems. To avoid possible adverse environmental and health effects, many of the historic applications have been phased out and were substituted by appropriate alternatives whereas mercury consumption for other major application areas, e.g. dental amalgams and chlor-alkali production with mercury cells (scheduled for substitution by 2017) is still ongoing. Table 4-3 above shows the estimated consumption for ongoing allowed applications in the EU.

Ongoing and past uses of mercury are all related to inventions which enabled the commercial manufacturing and distribution of mercury-added products or manufacturing processes in which mercury or mercury compounds were intentionally used. Table 4-15 gives an overview on when inventions of relevant products or manufacturing processes were made.

Table 4-15: The year of invention of various mercury applications

Product/Process	Year of invention	Remarks	Reference
Mercury galvanic cell batteries	1884	1884: Charles L. Clarke, Commercial use since the 1940ies until the 1990ies	US Pat (1884)
Mercury switches	1946	1950s: John Schilling Lorell	US Pat (1951)
Mercury relays	1961/62	Various applications	DE Pat (1965)
Mercury fluorescent lamps	1902	Commercial use since the 1930s	US Pat (1907)
Mercury HPMV lamps	1900	Commercial use since the 1930s	US Pat (1901)
Mercury barometers	17 th century	17 th century: Evangelista Torricelli	Knowles Middleton (1963)
Mercury thermometers	1714	Early 18 th century (1714): Daniel Gabriel Fahrenheit	Achilles (1989)
Mercury Sphygmomanometers	1881	Late 19 th century (1881): Samuel Siegfried Karl Ritter von Basch	Booth (1977)
Dental amalgam fillings	1820	Commercial use since the 1820s: inventor unknown	Bates (2006)
Chlor-alkali process (mercury cell)	1890	1890s: Hamilton Castner, Karl Keller	Kiefer (2014)
Mercury for acetaldehyd production	1937	1937: Friedrich Lieseberg	US Pat (1939)
Mercury for VCM production	1913	1913: Fritz Klatte	US Pat (1914)
Mercury for PU production	1965	1965: Joseph T. Willett	US Pat (1968)
Mercury for gold extraction; “ASGM”		Roman age or earlier	

The following illustration gives an overview of years at which inventions for relevant products and processes were made (based on Table 4-15).

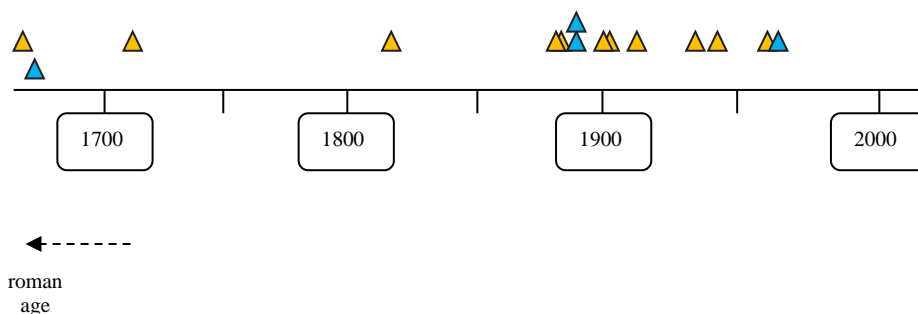


Figure 4-4 Year of invention of relevant mercury-added products (yellow triangles) or manufacturing processes (blue triangles) in which mercury or mercury compounds are intentionally used

The illustration demonstrates that the first relevant inventions were made millennia ago (amalgamation for gold extraction) and that the bulk of inventions were made around the year 1900, with the last of the listed inventions around the 1950s (mercury switches and relays and finally the use of mercury as a catalyst for PU production). Some new variations of former inventions were launched later (such as for example CFLs), but to our knowledge no basic invention related to a new mercury-added product, or manufacturing process in which mercury or mercury compounds are intentionally used, was made within the last 50 years. Mercury has primarily been used due to its mechanical and electrical characteristics, and many of such uses have now been substituted for by electronics, which have enhanced functionalities.

In the field of research and laboratory uses more recent inventions may have occurred. Research and laboratory uses are not covered by Article 4(6) or Article 5(7) MC. Except for mercury's use as a spallation neutron source in particle research and similar, we have no background data on new developments of laboratory and research applications of mercury. Mercury use as a spallation neutron source in particle research takes place in a very specialised research environment which is not widespread in the world and it will likely not become part of a neither a product, nor a manufacturing process and would thus not be covered by the Minamata Convention obligations. We have not found conclusive evidence of the age of this mercury use.

Mercury is being phased out in most of its former uses in commercial products and manufacturing processes and is replaced by suitable alternatives. All evidence indicates that mercury is also being substituted to a large extent in research and laboratory activities, primarily due to digitalisation and environmental concerns.

4.6.3 Impacts assessment

In the following table, the stakeholders affected and the impact relevance are summarised.

As these provisions of the Minamata Convention relate to future products and processes which are unknown today, it is impossible to make a specific impact assessment. The following overview can therefore only outline the type of impacts that may be at play. The principal difference between products and processes here, is that the products are marketed to downstream users and possibly consumers, and and therefore involves the risks of exposure of larger population groups.

Table 4-16 Stakeholders affected by options in question and impacts in summary

Options assessed	Stakeholders affected	Impacts
Baseline 2; Minimum implementation (MI) Option MC4(6)-2 and Option MC5(7)-3	Researchers and developers of new products and processes	Possible stimulation to develop mercury free alternatives. Possible jobs and profits related to inventions for mercury-free alternatives. Possible loss of profit and jobs for researchers and developers related to mercury related inventions which will not be developed.
	Industry	Possible loss of jobs and profit in industry related to products which will not be placed on the market and manufacturing processes which will not be used. Possible gain of jobs and profit related to mercury free products and processes which will be placed on the market or used instead of mercury related products and processes.
	Competent authorities	Administration efforts for implementaion may vary quite heavily depending on the implementation mode. Particularly, implementation via REACH may take much effort due to the procedures in place. Possible costs at competent authorities in order to manage increased administrative efforts. Possible gain of jobs for managing increased administrative efforts
	Consumers	Possible cost impacts (positive or negative) due to changed manufacturing costs Reduced risk of exposure due to avoidance of new mercury uses

Options assessed	Stakeholders affected	Impacts
	Workers	Reduced risk of exposure due to avoidance of new mercury uses
	Environment	Reduced risk of exposure due to avoidance of new mercury uses
Beyond MC (BMC) Option MC4(6)-1 and Option MC5(7)-1	Researchers and Developers of new products and processes	Generally the same as above for the MI option
	Industry	Generally the same as above for the MI option. Moreover, possible additional (authorisation) costs for (1) the assessment of the risks and benefits of mercury related products to demonstrate (or not) environmental or human health benefits and/or (2) for the assessment whether a manufacturing process provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits.
	Competent authorities	Generally the same as above for the MI option.
	Consumers	Generally the same as above for the MI option.
	Workers	Generally the same as above for the MI option.
	Environment	Generally the same as above for the MI option.

4.6.3.1 Technical considerations

As outlined above relevant inventions for mercury related commercial products and manufacturing processes were particularly made around the year 1900 with the endmost inventions around the 1950. Some new variations of former inventions were launched later (such as for example CFLs), but to our knowledge no basic invention related to a new marketable mercury-added product or manufacturing process, in which mercury or mercury compounds are intentionally used, was made within the last 50 years in the EU or globally.

There are no indications on the current development of relevant products/processes involving mercury. The probability that one or several mercury related commercial products and manufacturing processes will be developed in the near future or at all is considered to be low.

Mercury is being phased out in most of its former uses in commercial products and manufacturing processes, and is replaced by suitable alternatives. It can be concluded that probably there will be non-mercury techniques available for possible new products and manufacturing processes where mercury could otherwise be used. For example the mercury cell process was commonly used in Europe in chlor-alkali production and the process is still used today. Also outside Europe, chlor-alkali production is ongoing since decades, however, it is to a higher degree than in the EU based on mercury free processes. If the mercury cell process would not have been available in Europe, also here mercury free and competitive manufacturing processes would have been developed and applied.

There is a hypothetical risk for industry of not being able to use the solution technically and economically most feasible (if that one involves mercury), and thereby not being able to make optimal profits and create most jobs. While this cannot be fully ruled out, the risk is considered as minimal at today's technical level. Making and lab-testing inventions involving mercury will still be possible under the MC, but marketing can only take place under certain conditions (stated above). History has seldom seen only one solution to a technical challenge.

To conclude, probably there will be no relevant new inventions and if so, there will probably be non-mercury techniques available. However, it cannot be excluded.

If any relevant new mercury related products or processes will be developed it is not known what type of products and processes it will be and whether alternatives to the use of mercury will be available or can be developed. As a consequence it is not possible to describe specific impacts neither qualitatively nor quantitatively (possible types of impacts are described in Table 4-16). An assessment of impacts needs to remain at a speculative level and can only be based on examples of past uses of mercury within products or manufacturing processes.

A qualitative description of possible impacts is given in Table 4-16. As specific impacts cannot be described a quantitative differentiation between the minimal implementation scenario and the implementation beyond MC must also remain at a qualitative level.

Generally it can be expected that compared to a general "soft" discouragement (MI), a conditional ban (BMC) is appropriate to avoid new products and processes coming to market since under a conditional ban products and processes could only be introduced under the specific, rather demanding conditions on benefiots mentioned above.

4.6.3.2 Social impacts

It is not possible to determine whether social impacts would arise for options MI and beyond MC as compared to the BAU. Quantification is not possible. Positive and negative social impacts may outweigh each other.

4.6.3.3 Economic impacts

It is uncertain whether any economic impacts arise for both options MI and beyond MC, versus BAU. Quantification is not possible. Positive and negative economic impacts may outweigh each other.

Under the BMC (conditional ban) the following specific economic impacts can be quantified for a new mercury related product or production process:

- › To implement a conditional ban, mercury could be added to the Candidate List and later into Annex XIV of REACH and thus be made subject to authorisation. Besides non-quantifiable impacts this will cause specific economic impacts for industry in the case that industry will seek authorisation for a new product or process according to the existing ECHA procedures. Costs for authorisation under Annex XIV of REACH are usually in a range between 50,000 and 400,000 EUR for the effort for the authorisation process (particularly data collection and dossier elaboration). In addition fees to ECHA will arise in an amount of approximately 50,000 EUR.
- › Alternative implementation options include (1) to use Article 68(2) of REACH that allows the ban of articles for consumer uses containing mercury on the basis of its classification as CMR cat 1 b, or (2) a restriction under REACH, or (3) a conditional ban expressed in a further developed Regulation (EC) 1102/2008. These would require examination to determine whether the conditions are fulfilled and it can be expected that the costs would be in a similar range. Such economic impacts will only arise if a new product or process was suggested for authorisation under a conditional ban.

4.6.3.4 Environmental impacts

An outright ban (with conditions) on the marketing/use of mercury in new applications would make a clear statement towards industry developers which could eliminate most potential novel uses of mercury.

The environmental impact of a “soft discouragement” would depend very much on how exactly it is implemented. While perhaps satisfying a flexible interpretation of the Minamata Convention, it could likely have all degrees of environmental impacts between “no effect” and virtually full elimination of mercury input to society with novel mercury uses. The choice of implementation mode is therefore important for the effectiveness of the measure.

4.6.4 Identified data gaps

No data gaps identified. Specific information on the development of new products or processes could enable a quantification of possible impacts. Corresponding information has not been identified.

[#Should stakeholders have data on newer marketed mercury-added products or processes, kindly submit them during the stakeholder workshop process.]

4.6.5 Conclusions

The discouragement of new mercury uses in new products or processes can eliminate potential risks through mercury's lifecycle.

The mercury applications used today, are based on technology invented about 50 or more years ago. There are no indications on the current development of relevant products/processes involving mercury. The probability that one or several mercury related commercial products and manufacturing processes will be developed is considered very low but cannot be ruled out completely. It should be noted that R&D activities are exempted from the MC, as well as in existing EU law relevant to mercury, and would thus still be possible. Only when considering a general marketing or large scale industrial use, the ban would become effective, unless significant benefits to health and the environment can be proven, as required under the MC. Moreover, mercury is being phased out in most of its former uses in commercial products and manufacturing processes and is replaced by suitable alternatives.

To conclude, in light of the already heavily restricted use of mercury, no relevant new inventions for new mercury related products or manufacturing processes are expected.

Specific impacts can neither be quantified for a soft discouragement (MI) nor for a conditional ban (beyond MC). If impacts will occur at all, positive and negative social and economic impacts may outweigh each other while risks for the environment and health for consumers and workers can be avoided.

If under a conditional ban it will be required to examine whether the MC conditions for acceptance of the technique are fulfilled, industry could face additional costs of 100,000 to 450,000 EUR for authorisation costs and fees. The assessment checks if environmental or human health benefits are provided. The related costs are considered acceptable and provide some motivation for only introducing novel mercury uses which have significant benefits.

The choice of implementation mode is important for the effectiveness of the measure and could result in everything between “no effect” (but compliance with the MC) and virtually full elimination of mercury input to society from novel mercury uses. An explicit ban will have a stronger signal value both internally in the EU and towards other Parties of the Minamata Convention.

4.7 MC Article 5(3): Restricting mercury use in VCM, sodium/potassium methylethylate/ethylate and polyurethane production

4.7.1 Problem definition and specific objectives

As mentioned in section 7.3.3.1, the EU status of the three targeted processes is as follows:

- › VCM: VCM is an illustrative process in the Large Volume Organic Chemicals (LVOC) BREF (adopted in February 2003, currently under revision), and is also expected to feature as such in the revised document. Reference to mercury is only made in terms of historic examples of abandoned processes, whereas alternative process routes are well established and in wide use. One identified use of current mercury use in VCM manufacturing is reported for a minor use in one facility (in Slovakia). Due to the minimal impacts of the obligations of the MC for this process in the EU, the impacts are not investigated further here.
- › Polyurethane (PUR): REACH Annex XVII (as amended by Regulation (EU) 848/2012) stipulates that the five hitherto most used phenyl-Hg catalysts may not be manufactured, used or placed on the market, if the concentration of mercury in the mixtures is equal to or greater than 0.01% by weight, with effect from October 2017. This restriction does not cover all available mercury catalysts for the purpose. The COWI/Concorde East/West (2008) study indicates however that mercury-free alternatives are available for all polyurethane applications. This is supported by the fact that, as of June 2013, no mercury compounds (neither such used for PUR catalysis) were registered under REACH. This means that they – in order to adhere to the REACH regulation – are no more used or can only be used in minute amounts (below 100 tonnes/y) in the EU and must be registered by 2018 to be accepted as “existing” chemicals on the market (“existing” chemicals can be marketed with less documentation than new chemicals) (Maag *et al.*, 2014). As the impacts of this obligation of the MC are thus expected to be minimal, these impacts are not assessed further in this study.

Sodium/potassium ethylate/methylate⁴ process with mercury: The production of sodium/potassium ethylate/methylate is not addressed explicitly in the LVOC BREF, or in the BREF on chlor-alkali production. Apparently, the mercury process is only used in one MS (Germany). Alternative mercury-free processes are available globally, and according to Envirocat (2014), sodium methylate is now available from a mercury-free production in one MS (France). Production of sodium/potassium ethylate/methylate is the focus of the impact assessment of this MC Article 5(3).

Accordingly, the options selected for further assessment relating to this article of the Minamata Convention are listed in the table below. It should be noted that for sodium/potassium methylate/ethylate production, the MC provision stating “*Measures to be taken by the Parties shall include ...measures to reduce the use of mercury aiming at the phase out of this use as fast as possible and within 10 years of the entry into force of the Convention*” can be understood both as “shall phase out” and “shall try to phase out”.

⁴ Actually four substances produced in the same process facilities but with varying feedstock chemicals: Sodium methylate, sodium ethylate, potassium methylate and potassium ethylate.

Table 5 3 Options assessed regarding this article of the Minamata Convention

Scenario	Options to be assessed (keywords)	Preliminary IA score*1
Baseline 1	Business as usual (BAU)	-
Baseline 2: Minimum implementation (MI)	New option MC5(3)-3: Implement Article 5(3) and Annex B, Part II for mercury-based alcoholates production with the understanding of point (i) “shall try to phase out” “- <i>as fast as possible and within 10 years of the entry into force of the Convention</i> ” (see text above table). Including: Obligation to reduce mercury emissions by 50 % by 2020 compared to 2010, and promotion of measures for making available alternative processes for the production of minority alcoholates or substitutes for those alcoholates in their end-uses.	-
Beyond MC	Option MC5(3)-1a , -1b or -2: Implement restrictions stipulated by MC Article 5(3) via new regulation, with a ban of alcoholates production using mercury cells within 10 years.	C-2,A-2,E2,S1

Notes: *1: According to comparative assessment presented in Section 3.1.2; societal impacts across all options for this MC article. For details on scores, click [here](#). Scores:

C: Socio-economic costs/impacts: 0 = minimal, -1 = moderate, -2 = potentially significant costs.

A: Administrative/political efforts (by EU and MS authorities): 0 = minimal, -1 = moderate, -2 = potentially significant efforts.

E: Environmental benefits: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.

S: Signal effect towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambition implementation of the MC, -1 = signalling low-ambition implementation of the MC.

4.7.2 Baseline conditions

As described above, only two companies globally produce the alcoholates in question with mercury-dependent technology. This production takes place in Germany. They are reported to be major players in the global market. The same companies produce the alcoholate sodium methylate (only this substance) with mercury-free technology in other parts of the world⁵, as do all other known producers globally. The mercury-process is reported to have about 20% lower production costs than existing alternatives, but is dependent on the presence of an existing local demand for co-produced chlorine. In the existing production, the facilities are situated on the same sites as mercury-cell chlor-alkali plants and excess mercury from the latter provides mercury input for the alcoholates production. Industry informs that the production is not covered by the voluntary industry commitment to abandoning the mercury cell chlor-alkali process by 2020.

⁵ Because according to Evonik (2014), there is no local demand for the co-produced chlorine in these production sites.

Similarly, it is not covered by the 2017 IE Directive's deadline for cessation of this latter non-BAT technology. See the description of available alternatives below.

The registration status of the four substances as of April 2014 in ECHA's registration of joint submissions, and the registrants, are shown in Table 4-17.

Table 4-17 Registered volumes (production + imports) of the four alcoholates in the EU targeted by the Minamata Convention, and the companies which have submitted the registrations (ECHA, 2014a).

Substance name (as indicated in registration database)	CAS No	Registered volume, t/y (volume band)	Registrants
Sodium methanolate (Sodium methylate)	124-41-4	100,000 - 1,000,000	BASF SE (DE) Evonik Degussa GmbH (DE) Desatec GmbH (DE) DSM Nutritional Products (UK) Ltd (UK) DSM Nutritional Products GmbH (DE) DuPont Nutrition Biosciences ApS (DK) EnviroCat (FR)
Sodium ethanolate (Sodium ethylate)	141-52-6	1,000 - 10,000	BASF SE (DE) Evonik Degussa GmbH (DE)
Potassium methanolate (Potassium methylate)	865-33-8	1,000 - 10,000	BASF SE (DE) Evonik Degussa GmbH Suomen Muurahaishappo Oy (FI)
Potassium ethanolate (Potassium ethylate)	917-58-8	Currently not registered, i.e. the volume is <100	The substance is pre-registered (ECHA, 2014b)

These registration bands give a useful indication of the level of the economy involved for each of the substances.

Sodium/potassium methylates (also called methoxides) are compounds used primarily for “cracking” of plant/animal oils for biodiesel. Sodium methylate sales volumes are expected to grow due to the increasing demand for biodiesel. In a business as usual (BAU) scenario, this is expected to increase the income for both the mercury process and the non-mercury process. The debate on use of food for fuels is driving innovation of bio-fuels based on other materials, but the status for bio-diesel in this respect has not been investigated for this study.

In the case of biodiesel production, the methyl alcoholate induces a transesterification (partial “decomposition”) of the fatty acid glycerides, forming linear mono-alkyl esters, which is the biodiesel, and the alcohol glycerol. Sodium/potassium methylates are the major substances used for this purpose (Biodiesel Magazine, 2012). Sodium methylate is primarily used for plant oils, while potassium methylate is primarily used for animal fat. The latter is used in much lower amounts than plant oils in biodiesel production.

Biodiesel Magazine (2012) mentions BASF, Dupont, SMOTEC Plus and Evonik among the suppliers of alcoholates for biodiesel production. SMOTEC Plus is a Germany-based catalyst manufacturer which produces sodium methylate with a mercury-free process in its production plant in Saudi Arabia. The mercury-free process was, according to Biodiesel Magazine (2012), chosen because the product is then suited for the food, pharmaceutical and nutraceutical markets, and because as SMOTEC Plus is cited: “Unless you’re in the chlorine [supply] chain, you can’t get the feedstock” for the mercury-based alcoholate production process. Depending on feedstock type and quality, also acid catalysts like sulphuric acid and methanesulfonic acid are used in biodiesel production.

Sodium methylate is also used for pharmaceuticals, food ingredients and pigments (Envirocat, 2014 and Jackson, 2006). A broader range of alcoholates, including sodium/potassium ethylate and sodium/potassium methylate, are used for a number of different purposes in synthesis of organic chemicals (BASF, 2013).

Sodium ethylate is mainly used for pharmaceutical applications, which is a small market in the EU according to registrations and EnviroCat (2014). According to BASF/Evonik (2012) and Evonik (2014), potassium ethylate and sodium ethylate are used as catalysts in the synthesis of pharmaceuticals, pesticides, aroma substances, coatings, edible fats and fine chemicals, partly in internal production, partly externally.

4.7.3 Impacts assessment

In the following table, the stakeholders affected and the impact relevance are summarised.

Table 4-18 Stakeholders affected by options in question and impacts in summary

Options assessed	Stakeholders affected	Impacts
Option MC5(3)-1a , -1b or -2 (mercury ban)	Industry using mercury process	COSTS: Cost of substitution. Lost value-added from premature scrapping of production facilities.
	Industry using mercury-free process	BENEFITS (distributional effect only): If the MC obligation on sodium/potassium methylate/ethylate is effective, more of the market will shift to producers using mercury-free processes. These include producers within the EU as well as outside.
	Consumers	COSTS of price increases to users. For consumers of the resulting biofuels (a major use) marginal price differences are expected, due to the minor contribution to overall costs from sodium methylate.
	Global and EU population and environment	BENEFITS of reduced mercury releases from the lifecycle of mercury for sodium/potassium-methylate/ethylate production.
New option MC5(3)-3	Industry using mercury process	COSTS: Cost of substitution, but with more time and thus no or little lost value from premature scrapping of production facilities.
	Industry using mercury-free process	BENEFITS (distributional effect only): No or only slow shift of the market to producers currently using mercury-free processes. These include producers within the EU as well as outside.
	Consumers	COSTS of price increases to users most likely lower than for an outright ban. For consumers of the resulting biofuels (a major use) marginal price differences are expected, due to the minor contribution to overall costs from sodium methylate.
	Global and EU population and environment	BENEFITS of reduced mercury releases from the lifecycle of mercury for sodium/potassium-methylate/ethylate production, but possibly at a slower rate than with an outright ban.

4.7.3.1 The mercury process

In the mercury process, sodium methylate is produced from a floating mercury amalgam (Na-Hg) similar to chlor-alkali production in mercury cells. By-products are chlorine and hydrogen. (BASH/Evonik, 2012; DuPont, 2014).

The companies using the mercury process in Germany are also engaged in mercury-free production of sodium methylate in other parts of the world (North and South America). The use of the mercury process in existing facilities is reported to be cost-effective.

4.7.3.2 Alternatives

ICIS (2009), citing Evonik, states that Evonik's sodium methylate production uses an electrolysis (mercury) process at its German facility and reactive distillation at its USA facility. According to (Evonik, 2014; Dan Dan Shao et al., 2012), the reactive distillation process for sodium methylate production uses NaOH and methanol as feedstock in a forced distillation process where the chemical reaction takes place.

Sodium methylate is also produced by a direct reaction of metallic sodium with pure methanol (DuPont 2014; Envirocat, 2014), or from sodium hydroxide solutions (including low grade) with the use of sodium-selective ceramic filters (Ceramatec, 2014) in small units which can be serve individual bio-diesel plants and produce on demand. According to Ceramatec, the method has potential for production of other alcoholates than sodium methylate.

Potassium methylate and sodium methylate can be produced directly by biodiesel producers from the reaction of the relevant hydroxide with methanol. According to EnviroCat (2014), this is seldom done nowadays for sodium methylate, but often done for potassium methylate. Evonik (2014) explains that this is because the self-made sodium methylate contains a certain amount of water, and water induces soap formation in the bio-diesel production, which in turn reduces the yield of bio-diesel per tonne of plant oil. The same happens with self-produced potassium methylate, but the soap produced from this substance can better be handled in the bio-diesel production.

As for alternative catalysts for bio-diesel production, GIMS (2011) summarises the three types of catalysts used as follows:

- › “Sulphuric acid catalysts : They are little used (because reaction is slow) just for the esterification of raw materials with a high free fatty acid content (animal fats)
- › Enzymes: this technology is currently at the R&D stage
- › Methylate basic catalysts: they represent the overwhelming majority of industrial catalysts. Sodium methylate is the most widely used. Potassium methylate, sodium hydroxide, and potassium hydroxide can also be used. Sodium hydroxide and potassium hydroxide have a lower yield (production of soap) and require an additional purification process. Potassium methylate is more expensive than sodium methylate. These catalysts require a raw material containing less than 2% of free fatty acids, which is the case with vegetable oils. Around 15-17 kg of sodium methylate solution is needed to produce 1 ton of biodiesel.”

Envirocat (2012, 2014) states that the sodium methylate production price with the direct reaction of sodium and methanol (mercury-free) is about 20% higher than the sodium methylate produced with the mercury process. For the key use, biodiesel production, this does however not affect the consumer price of the biodiesel significantly, due to the small amounts of catalyst sodium methylate used per tonne of biodiesel, and due to lower transport needs (see below). According to GIMS (2011), the increase in biodiesel costs when using sodium methylate from

mercury-free production will be 0.2% compared to biodiesel produced by use of catalysts from the mercury process.

According to EnviroCat (2014) the reason why non-mercury process sodium methylate can be competitive in spite of its higher production price, is that it can be produced in relatively small units constructed close to the customers, thereby minimizing transport costs. They state that transport costs constitute a substantial part of the downstream user price for the substance.

EnviroCat (2014) is currently importing sodium ethylate from Japan, in liquid and powder form, produced with non-mercury technology.

According to Evonik (2014), economically and technically feasible industrial scale production of potassium ethylate without the mercury-process has proven difficult, though it may be possible in lab scale.

Both of the producers of alcoholates using the mercury process state that they are dedicated to research for alternative processes (Evonik, 2014; BASF, 2014).

The market

Based on information from Evonik (2014) and Envirocat (2014) the total annual production of sodium methylate in the EU is estimated at around 250,000 - 300,000 tonnes of 30% sodium methylate solution (in methanol), of which about 160,000 - 200,000 tonnes/y are consumed in the EU and the rest is exported. The export is solely based on the mercury process currently.

Evonik (2014) assesses the global market at around 480,000 tonnes/year of 30% sodium methylate solution (some sodium methylate is sold as powder, which is included in the estimate as converted to the solution basis).

According to BASF (2014), the general market price range for un-diluted sodium methylate is estimated at between 2,100 and 2,800 EUR/tonne 100 % sodium methylate.

EnviroCat (2014) states that the bulk supply price for sodium methylate for bio-diesel production in Europe in 2013 was around 700 EUR/tonne of a 30% solution in methanol (ready for use) and slightly higher for high quality sodium methylate from the non-mercury process. Some five years ago, the price was around 600 EUR/tonne 30% solution. The price is very dependent on the methanol price.

Evonik (2014) mentions an average sales price of 850 EUR/tonne of solution.

EnviroCat (2014) states that it does not see any market preference for sodium methylate produced with mercury vs. non-mercury. Price differentiation is rather an effect of the grade of the product; fine chemicals and pharmaceutical production requires a purer sodium methylate quality, which is supplied from both technologies.

Based on information from bio-diesel producers who produce potassium methylate themselves, EnviroCat (2014) quotes an internal production price of around 600 EUR/tonne 30% methanol solution. Note that the resulting potassium methylate is not marketed, but used by the companies themselves. Envirocat (2014) also informs that “in the fine chemistry, potassium methylate “Mercury process” was sold at 1.60EUR/kg” (1600 EUR/tonne).

As shown in **Error! Reference source not found.**, the total value of the EU production around 2013 is estimated at some 180 – 260 million EUR, of which around 90% was from the mercury-based process.

The physical export of sodium methylate is currently 100% mercury process based, yet, the same EU-based companies are already engaged in non-mercury process production of sodium methylate outside the EU (North and South America), and such activity likely also contributes to income in the EU.

Table 4-19 Market volume and value of sodium methylate around 2013.

Amounts; t/y 30% sodium methylate solution (in methanol):	Low	High
Global market	480,000	480,000
EU production	250,000	300,000
-Mercury based only	225,000	275,000
EU market	160,000	200,000
Extra-EU export	90,000	100,000
Unit price		
Average market price, EUR/t 30% solution	700	850
Value, EUR/y (rounded):		
Global market	340,000,000	410,000,000
EU production	180,000,000	260,000,000
-Mercury based only	160,000,000	230,000,000
EU market	110,000,000	170,000,000
Extra-EU export	63,000,000	85,000,000

4.7.3.3 Social impacts

10 full time personnel are employed per 25,000 tonnes/year of sodium methylate solution production capacity in mercury-free production in the EU, while about 20-30 full time equivalent jobs are engaged in the EU in the full supply chain

(including production) of sodium methylate per the same production capacity (EnviroCat, 2014, and GIMS, 2011). This corresponds to 40 and 80-120 persons, respectively, per 100,000 tonnes/year of sodium methylate solution.

The numbers of personnel employed in the mercury-process production of alcoholates in the EU is not known, but is roughly estimated here based on indicative information from Evonik (2014) at around 300-500 persons in the whole supply chain for an estimated 200,000 - 250,000 t/y production (or some 200 persons per 100,000 tonnes/year of sodium methylate solution).

BMC scenario: While these numbers are considered uncertain, and not necessarily consistent with the lower production costs, they could indicate that the mercury-based production technology is more labour-intensive, and that the loss of 0-200 jobs cannot be ruled out.

Under the **MI scenario**, the transition will come more slowly, or not at all (in case adequate alternatives are not developed for all four alcoholates).

4.7.3.4 Economic impacts

BMC scenario

With the regulation of mercury-based sodium methylate production required under the Minamata Convention, the mercury-based production may perhaps first get more expensive due to requirements for a 50% emission reduction and associated investments in emission abatement techniques (unless substitution is preferred from the start), and may later potentially be eliminated within the deadlines prescribed by the Convention (2020, or if exempted up to 2030).

Higher production prices could have the consequence that the physical export of sodium methylate would be reduced following the EU's and Germany's ratification of the Convention to total phase-out. On the other hand, the relevant EU companies are major global players on the sodium methylate market, and elimination of the low-cost mercury process might not necessarily reduce the market share for these firms, though it has the potential for reducing their profit, especially if a total phase-out occurs before the existing mercury-based production is fully paid back.

As regards investments in production plants for alternative production of sodium methylate, Envirocat (2014), states an establishment price of 6 million EUR for a non-mercury production capacity of 25,000 tonnes/y sodium methylate solution (plus off-site storage and pipeline infrastructure of another 8 million EUR in total).

As regards the reactive distillation process for sodium methylate production (non-mercury), according to Process worldwide (2012), BASF invested an amount “in the low double-digit million euro range” for the establishment of a 60,000 tonnes/y production capacity plant in Brazil which started operation in 2011. This is in the same range as the Envirocat investments.

Taking the Envirocat numbers as an example, substituting the remaining mercury-based sodium methylate production of some 255,000 – 275,000 tonnes solution/y

would require investments of around 60 million EUR (if transport and storage infrastructure is already in place; if not around 140 million EUR). These numbers do however not include any additional need for sodium metal production capacity. The market situation for sodium metal has not been investigated for this study.

Evonik (2014) states that it considers the production of the four alcoholates (in the same process) inter-dependent, and should a cessation of the production of sodium methylate, sodium ethylate and potassium methylate with the mercury-process be demanded (because alternative production processes are already available), it would be likely to shut down the mercury process production of all four alcoholates due to a reduced economic feasibility. BASF (2014) makes a similar statement: *“Since we currently do not have a process for the production of all four alcoholates, the phase out would lead to a cessation of supply of 3 of the four alcoholates [...]. We could only supply sodium methylate from the above mentioned alternative source. This would severely hit customers who need these alcoholates e.g. as intermediates and catalysts”*.

If a technically and economically feasible alternative production process for the fourth and least used substance, potassium ethylate, is not developed, this substance would thus no longer be available on the market. Whether this substance can be substituted by other chemicals in its possible uses has not been investigated in this study.

Substituting the remaining mercury-based sodium methylate production of some 255,000 – 275,000 tonnes solution/y would require investments of around 60 – 140 million EUR depending on the infrastructure available. These numbers do not include any additional need for sodium metal production capacity. The current market situation for sodium metal has not been investigated for this study. Additionally, the production costs (annual operational costs) with the alternative production process are estimated to be 20% higher than those for the mercury-based process, equalling perhaps some 10-30 million EUR per year (estimated at about 20% of half of the sales revenues) at the current production rates. Annualising the investment costs over a 10 year period gives 10 to 23 million EUR per year and combined with the increased operational costs the total additional annual costs can be estimated at 20-53 million EUR⁶. According to the current producer using the non-mercury process, parts of this cost is offset by the possibility for small production units that are situated closer to the users and so have lower transport costs.

Similar quantitative assessment for the substitution of the production process for the other three alcoholates in question is not possible based on the available data, though the current production rates indicate expenses potentially in order of a factor 10-100 lower than for sodium methylate. Taking the lower annual production volumes for the other three alcoholates into consideration, total costs of

⁶ The investment costs have been annualised using a discount rate of 10% in order to have comparability with other estimates presented in this report. The EU IA guidance suggests that a 4% discount rate should be applied. Using 4% instead of 10% the total annual costs will be 17-47 million EUR instead of 20-53 million EUR.

substitution for all four substances are here roughly assumed to not exceed 160 mio EUR for investments plus a maximum of 40 mio EUR/y for increased production costs. Annualising the investment using the same assumption as above, the annualised investment costs amount to about 25 million EUR and hence, the total additional annual costs for substitution is not expected to be above 65 million EUR⁷.

As regards the possible costs for reducing the mercury emissions and releases by 50% by 2020 compared to 2010, Evonik (2014) understands the MC requirement for 50% emission and release reductions as for the whole production site, meaning that it considers this goal at least partially fulfilled when the expected 2017 closure/conversion of the mercury-cell chlor-alkali plant on the site is implemented. BASF (2014) states that it finds the 50% reduction goal challenging, but it will “take every effort to achieve the target concerning emission reduction to air, water and products.”

The costs directly related to the emission/releases reduction provision of the MC for this industry are indicated to be potentially moderate for Evonik. The costs for emission/releases reductions at BASF are difficult to assess quantitatively. Based on experience from well operated mercury-cell chlor-alkali production, such reductions are most likely to be met with further improved operational mercury management practices, especially during maintenance operations.

MI scenario

Evonik (2014) states that it understands MC Article 5(3) / Annex B, Part II MC, in a way that only when economically and technically feasible alternatives are identified, must a cessation of the mercury use for this purpose be attained within 5 years (a combination of points i) and v) of Annex B, Part II MC; an interpretation equalling the MI scenario described here.

As regards costs for mercury emissions/releases reduction, the situation under the MI scenario is similar to that of the BMC scenario described above.

As regards costs for substitution, these may likely be lower than for the BMC scenario because there will potentially be more time for substitution and losses from premature scrapping (conversion or decommissioning) of the production facilities may therefore be smaller.

In the hypothetical case that no alternatives considered technically and economically feasible are found for the last of the four targeted alcoholates, potassium ethylate, and production will be allowed to continue for all four alcoholates for this reason, the only costs would be those associated with development of alternatives (and not implementation of alternatives).

⁷ 10 years and 10% as discount rate were used in order to have comparability with other estimates presented in this report. Using 4% as discount rate the annualised costs will be 20 million EUR and the total annual costs including the increased operational costs will be 60 million instead of 65 million EUR.

On the other hand, should alternatives become available, the total costs for substitution could potentially approach the substitution costs estimated for the BMC scenario.

4.7.3.5 Environmental impacts

The total mercury emissions to the atmosphere from the two production sites using the mercury process were reported to be 190 kg Hg/y (BASF/Evonik, 2012); this number however also includes reported mercury emissions from the mercury-cell chlor-alkali production on the same sites. With Evonik's understanding of the reduction basis in mind (as mentioned above), the reductions from their production site will primarily be from the shutdown or conversion of the chlor-alkali production on the same site. This means that the reductions from the alcoholates production itself may be minor. BASF seems to indicate that emissions/releases reductions from the actual alcoholates production may take place.

Evonik (2014) understands the MC requirement for 50% emission and release reductions as for the whole production site, meaning that it considers this goal at least partially fulfilled when the expected 2017 closure/conversion of the mercury-cell chlor-alkali plant on the site in 2017 is implemented. BASF (2014) states that it finds the 50% reduction goal challenging, but will “take every effort to achieve the target concerning emission reduction to air, water and products.”

The total mercury input (replenishment) per year for the production is not known, but is assumed to be in the range of some 0.3-1 tonnes Hg/y, taking possible accumulation in the process equipment into account.

The total mercury emission/release reduction potential can under both the **MI scenario** and the **BMC scenario** not be estimated more precisely than as between 0.3-1 tonnes Hg/y.

According to BASF/Evonik (2012), the energy consumption for the production of sodium methylate from the mercury-free processes are higher than that of the mercury-process, with consequently higher carbon footprint: it reports that the mercury-process uses 2.3 kWh electricity per 1 kg of sodium-methylate produced, while the direct sodium-metal process (direct mixing of sodium metal and methanol; including production of the sodium metal) uses 4.4 kWh/kg sodium methylate, and the reactive distillation process requires 2.2 kWh electricity and <3 kWh thermal energy (steam). Envirocat (2014) informs that according to their estimates, the energy demand (electricity) for sodium methylate production with the direct sodium metal process is around 30% higher than that of the mercury process, but that the geographical vicinity to the users with these smaller production plants has the potential to reduce this to 10-15% more energy. The company's current sodium metal production in France uses its own hydropower (climate neutral).

For the potassium (K-) alcoholates, BASF/Evonik (2012) state that the production of metal potassium (used for the direct potassium and alcohol reaction) requires high temperature distillation and an energy demand of >5.3 kWh/kg K.

BASF/Evonik (2014) also note that the production of the sodium (Na) metal from NaCl (salt) takes place at high temperatures with the use of graphite electrodes with the potential for formation of perchlorinated carbon substances and dioxins. According to Envirocat, their mother company, Alkaline Group, has produced metal sodium for decades and has not observed any such formation. It also states that the relevant IED BREF (on non-ferrous metal production) does not mention this formation. Therefore, no filters for this have been deemed necessary (Envirocat, 2014).

Envirocat (2014) states that metal sodium is transported under dangerous goods regulations in the solid state in a protective N₂ (nitrogen) atmosphere. Metal sodium, as well as potassium can oxidise explosively with high heat generation in case of contact with water. It also states that relevant measures are taken to eliminate the risks at the sodium methylate production site.

4.7.4 Identified data gaps

- › Annual mercury input (replenishment) to alcoholates production was based on release and output amounts with uncertain accounting of accumulation in process equipment/buildings.
- › Information on available alternatives to potassium ethylate (in the processes where this substance is used), and consequences in case its production should be terminated.

[#Should stakeholders be in a position to supply any of these types of data, kindly submit them during the stakeholder workshop process.]

4.7.5 Conclusions

MC Article 5(3) restricts the use of mercury in the industrial processes of production of VCM, PUR and sodium and potassium methylates and ethylates. Of these processes only the production of sodium and potassium methylates and ethylates⁸, so-called alcoholates, in the EU is considered potentially affected in a significant scale by implementation of the Minamata Convention. The substances are used as catalysts in biodiesel production as well as in certain other synthesis of organic chemicals.

Two German companies are the world leaders in production of these substances, of which sodium methylate is by far the economically most important. These companies use the mercury-based process in their production in the EU, but a non-mercury alternative process in their producing facilities in North and South America. All other sodium methylate production globally is based on non-mercury technology. Non-mercury production of sodium methylate is also currently taking

⁸ Actually four substances produced in the same process facilities (but with varying feedstock chemicals): Sodium methylate, sodium ethylate, potassium methylate and potassium ethylate.

place in the EU contributing with about 10% of the total EU based production of this substance.

Non-mercury technologies for production of potassium methylate and sodium ethylate are also commercially available. The production of the fourth substance, potassium ethylate, with non-mercury technology appears to be possible on lab scale, but the companies using the mercury-based process for production of this substance do not consider the alternative process technically and economically feasible. The substance is however currently not registered under REACH, meaning that (if used) it is only used in quantities below 100 tonnes annually in the EU.

Under the **BMC scenario** (ban of mercury process) the total annual costs for substitution of the current mercury-based production can be roughly estimated at 20-53 million EUR⁹ based on available data. According to the current EU producer using the non-mercury process, parts of this cost can be offset by the possibility for small production units that are situated closer to the users and so have lower transport costs. Similar quantitative assessment for the substitution of the production process for the other three alcoholates in question is not possible. Based on the much lower production volumes, it is however roughly estimated that the total costs of substitution for all four substances would likely not exceed 65 million EUR/year¹⁰. The costs directly related to the emission/releases reduction provision of the MC for this industry are difficult to assess quantitatively. Based on experience from well operated mercury-cell chlor-alkali production, such reductions are most likely to be met with further improved operational mercury management practices, especially during maintenance operations.

The **MI scenario** and the BMC scenario do not differ as regards costs for reduction of emissions/releases; costs may be moderate. As regards substitution, the costs under the MI scenario are more difficult to assess, as they would depend much on the development of any alternative processes considered technically and economically feasible. Under the MI scenario costs could range from research costs only (in case no feasible alternatives were found) to maximally the same costs for research and implementation as estimated for the BMC scenario above. Research costs cannot be quantified precisely; but it is expected that a reasonable research activity could be run for 1-2 million EUR/year.

Social impacts, BMC scenario: While the numbers available are considered uncertain, and not necessarily consistent with the lower production costs for the mercury process, they could indicate that the mercury-based production technology

⁹ The investment costs have been annualised using a discount rate of 10% in order to have comparability with other estimates presented in this report. The EU IA guidance suggests that a 4% discount rate should be applied. Using 4% instead of 10% the total annual costs will be 17-47 million EUR instead of 20-53 million EUR.

¹⁰ 10 years and 10% as discount rate were used in order to have comparability with other estimates presented in this report. Using 4% as discount rate the annualised costs will be 20 million EUR and the total annual costs including the increased operational costs will be 60 million instead of 65 million EUR.

is more labour-intensive, and the loss of 0-200 jobs cannot be ruled out. Under the **MI scenario**, the transition will come more slowly, or not at all (in case adequate alternatives are not developed for all four alcoholates).

Environmental benefits from elimination of this process under the **BMC scenario** (and perhaps under the MI scenario) are deemed relevant, yet moderate in the EU context. The reduction in air emissions is estimated at about 190 kg/y and reductions of the mercury input at about 0.3-1 t/y. The reductions potentially achieved under the **MI scenario** can also not be quantified more precisely than 0.3-1 t/y.

The companies using the mercury-based production process consider the production of the four chemicals as economically mutually dependent and state that they may terminate the production of all four substances, should the use of the mercury-based process be prohibited for those three of the substances for which alternative non-mercury processes exist. Thus, potassium ethylate, the least used among these alcoholates, could potentially come out of production until technically and economically feasible alternative production processes are introduced. Potassium ethylate is not currently registered under REACH. It may or may not be substitutable in its uses; this has not been investigated.

As mentioned in section 7.3.2.1, the Commission has the option under the MC of asking for exemptions for Annex B listed processes (of which this is one) under the conditions of Article 6 MC for a maximum of five years (plus another five years if accepted by the COP). This might particularly be relevant, if EU industry needs additional time for substitution of the mercury process for the last of the four alcoholates in question.

4.8 MC Article 5(6) on prohibition of using mercury in new Annex B facilities using mercury

4.8.1 Problem definition and specific objectives

The processes listed in MC Annex B are:

- › Chlor-alkali production with mercury cells
- › Acetaldehyde production in which mercury or mercury compounds are used as a catalyst
- › Vinyl chloride monomer production (VCM) with mercury catalysts
- › Sodium or potassium methylate or ethylate with the mercury process
- › Production of polyurethane using mercury-containing catalysts

As described above, mercury-cell chlor-alkali facilities are explicitly non-BAT under the IE Directive (new facilities may not be established with mercury-cell technology), acetaldehyde production with mercury catalysts is assumed not to take place in the EU (another process is used), there is only minimal VCM production with mercury in one MS, and mercury catalysts in production of polyurethane seem to be substituted (or almost substituted), as described in Section 4.7. This leaves sodium or potassium methylate or ethylate with the mercury process as the only process for which restriction on the establishment of new facilities could potentially have major impacts, and this process was the reason for flagging the options for banning establishment of new MC Annex B processes for closer examination in this study.

4.8.2 Conclusions

The options suggested for implementation of Article 5(6) MC ([Options MC5\(6\)-1 and -2](#)) are identical to those proposed to address Article 5(6) MC, provided that all Annex B MC processes are included in the legislative text. Ergo, the only substantial incremental impacts of implementation of the Minamata Convention in this field are those for the mercury-based production of sodium or potassium methylate or ethylate. These impacts are described in detail in Section 4.7 and reference is made to that Section (see conclusions in Section 4.7.5).

4.9 MC Article 8(3+5) on (air) emission control measures for existing sources

4.9.1 Problem definition and specific objectives

Article 8 (3) MC requires Parties to take measures to control emissions of mercury or mercury compounds from relevant sources. Relevant sources are defined in Annex D to MC as follows:

- › coal-fired power plants
- › coal-fired industrial boilers
- › smelting and roasting processes used in production of non-ferrous metals (only lead, zinc, copper, and industrial gold)
- › waste incineration
- › cement clinker production facilities

According to Article 8 (2) lit b., MC sub-categories or specific sources within a category listed in Annex D can be chosen for emission control as long as 75% of the total emissions of the category listed in Annex D is covered.

Article 8 (5) MC lists relevant measures (including a multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions) from

which at least one shall be included in any national plan and implemented as soon as practicable but no more than ten years after the date of entry into force of the Convention for it (see section 7.5.4.1).

Coverage of requirements of Article 8(3+5) MC by current EU legislation

Control and reduction of emissions from the main industrial sources is, at EU level, covered by the IE Directive. The legal assessment reported in section 7.5 analysed the coverage for relevant sources as defined in Annex D to MC by the IE Directive.

In Table 4-20, which is based on the assessment included in Appendix 1, section 7.5.3.2 (slightly adjusted for the purpose of this chapter), provides an overview of the relevant sources as defined in Annex D to MC and their coverage by the IE Directive. More detailed information is give in Appendix 1, section 7.5.3.2.

Table 4-20 Coverage of source categories listed in Annex D of MC by IED

Source	IED coverage
Coal-fired power plants	Installations > 50 MW
Coal-fired industrial boilers	Installations > 50 MW and those that are part of larger installations covered by other EID requirements.
Smelting and roasting processes	Production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes; Melting, including the alloyage, of non-ferrous metals, including recovered products and operation of non-ferrous metal foundries, with a melting capacity exceeding 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals
Waste incineration facilities	Most likely covered
Cement clinker production facilities	Production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or in other kilns with a production capacity exceeding 50 tonnes per day

For the source categories coal-fired power plants, non-ferrous metal smelting and roasting, waste incineration and cement clinker production facilities, it is assumed that no significant emissions would originate from facilities below the thresholds set in the IED activity descriptions. Thus it is assumed that these categories are

sufficiently covered by the present EU acquis. Whether existing EU legislation covers 75% of the mercury emissions from these activities needs further assessment. [# Assessment of these aspects may be added if adequate data is identified.]

Regarding industrial boilers, such installations are to be found both in sites covered by the IED and other sites. Based on available information (including AMEC 2012) it is not clear whether sufficient facilities in the “coal-fired industrial boilers” category are covered by the IE Directive to meet the 75% mercury emission criterion. Also, specific definition of “coal-fired industrial boilers” may be developed under the MC. In case this definition will include boilers below 50MW thermal effect, the following assessment will be relevant.

Many coal-fired industrial boilers <50 MW exist, while only some of the boilers <50MW are also covered by the IE Directive (see Section 7.5.3.2). This aspect is investigated further in this section.

The EU addresses medium sized combustion plants (1 -50 MW) in the proposal for a Directive on the limitation of emissions of certain pollutants into the air from medium combustion plants (MCP Directive). This does not explicitly address mercury emissions but includes a multi-pollutant control strategy addressing NO_x, SO₂ and dust (=PM). The limit values shall not be exceeded by 2025 for plants with a rated thermal input above 5 MW and by 2030 for plants with a rated thermal input of 5 MW or less.

Small combustion plants <1MW, which are predominantly used for domestic or residential heating, are mainly covered by the Ecodesign Directive 2009/125/EC. The implementing rules adopted in this context, while initially focusing primarily on energy efficiency, will also include product standards limiting emissions of air pollutants (NO_x, PM, carbon monoxide (CO), etc. depending on the type of plant and fuel used). This work is currently ongoing.

Adjustments necessary to comply with Article 8(3+5) MC

To be certain of reaching the 75%-mercury emission criterion, the requirements of the proposed MCP Directive need to be considered and, if necessary, slightly adjusted.

Assessed options

Based on the comparative assessment of proposed options and the Commission’s criteria for selection of options to be investigated further, the options listed in the table below relating to this article of the Minamata Convention are assessed in detail.

Table 4-21 Options assessed regarding this article of the Minamata Convention

Scenario	Options to be assessed (keywords)	Preliminary IA score*1 (incremental impacts)
Baseline 1	Business as usual (BAU)	-
Baseline 2: Minimum implementation (MI1)	Option MC8(5)-4 : No action: Pursue an interpretation of Article 8(5) lit. (d) MC that when implementing a multi-pollutant strategy as described in that para, not all relevant specific sources need to be addressed, and provide evidence that the EU has such a multi-pollutant strategy is already in place which provides sufficient coverage.	C0,A0,E0,S-1
Baseline 2: Minimum implementation (MI2)	Option MC8(5)-3a (re-worded) : Coverage in the new proposed Directive on MCP; if deemed needed with slightly adjusted wording mentioning mercury explicitly.	C0, A0, E0, S0 (incremental impacts)
Beyond (minimal) MC BMC	Option MC8(5)-3b : Integrate mercury emissions in the new proposed Directive on MCP explicitly by including mercury emission limit values (which refer to the efficiency of at least fabric filters for coal fired plants in the 20-50MW range)	C-1,A-1,E2,S1

Notes: *1: According to comparative assessment presented in Section 3.1.2; societal impacts across all options for this MC article. For details on scores, click [here](#). Scores:

C: Socio-economic costs/impacts: 0 = minimal, -1 = moderate, -2 = potentially significant costs.

A: Administrative/political efforts (by EU and MS authorities): 0 = minimal, -1 = moderate, -2 = potentially significant efforts.

E: Environmental benefits: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.

S: Signal effect towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambition implementation of the MC, -1 = signalling low-ambition implementation of the MC.

Note that coal fired industrial boilers are not defined clearly in the Minamata Convention; this may be done in the MC BAT/BEP Committee over the next years. The definition will likely have significant impacts on the implementation of Article 8 MC in the EU. For example, it is not currently clear whether coal-fired district heating facilities would be considered “industrial”.

4.9.2 Baseline conditions

Relevant installations

In 2011 there were 142,543 medium sized combustion plants in the EU. These can be allocated to different capacity classes (see Table 4-22) (AMEC 2012).

Table 4-22 Total number of medium combustion plants in EU-27 in 2011(AMEC 2012)

total number of medium sized combustion plants			
1-5 MW	5-20MW	20-50 MW	Total
107,506	29,959	5,078	142,543

The combustion plants are used for a wide variety of applications, including electricity generation, domestic/residential heating and cooling and providing heat/steam for industrial processes (EC impact assessment, 2014). Fuel types used are biomass, “other solid” (mainly coal), liquids, natural gas and other gases. Coal (as well as the other fuels mentioned) contains mercury as an ‘unintentional trace element’ which is released during combustion and entering the atmosphere via the flue gases. Coal is mainly used in the capacity class 20-50 MW (this accounts for about 72% of total coal consumption; see Table 4-23; EC impact assessment, 2014).

Table 4-23 Share and quantity of coal as fuel type in different capacity classes in EU27 in 2011 (AMEC 2012)

Quantity of fuels used in MCP and share and quantity of coal as fuel type used in different capacity classes				
	1-5 MW	5-20MW	20-50 MW	All classes (1-50 MW)
total fuel consumption (PJ)	1,678	2,826	1,367	5,871
Share of coal used as fuel (%)	2	3	22	
coal consumption (PJ)	33.6	84.8	300	419
Share of coal from coal used in all classes (%)	8.0	20.2	71.8	100

Due to (1) the high share of coal used as fuel from industrial boilers in the capacity class 20 to 50 MW, and (2) the fact that the PM emission limits are considered only to be reachable by implementing basic PM filters, it is assumed that it is sufficient to address explicitly only coal-fired industrial boilers between 20 and 50 MW under the MCP Directive (in addition to the current coverage of this category in the IE Directive), in order to fulfil the 75% mercury emission criterion for this source category as required by MC.

AMEC (2012) uses MS and other information to estimate that about 40% of the medium combustion plants between 20-50 MW are covered by the IED. No specific information is available regarding coal-fired industrial boilers. Therefore the same percentage is used for the impact assessment here.

Article 8 (5) MC refers to existing sources, in this case existing coal-fired industrial boilers. Therefore, for calculating the impacts in 2025, the number of existing coal-fired industrial boilers in the capacity class 20-50 MW in that year is relevant. According to an assumption made in the administrative cost assessment of the EC impact assessment report 2014 for the MCP Directive, the number of plants will be stable from 2010 until 2025. It is assumed that in 2025 approximately 27% of plants in the EU would be new compared to the reference year 2010 (EC impact assessment, 2014). This share is provided for all medium combustion plants between 1-50 MW. As no specific data are available this share is also assumed for coal-fired industrial boilers between 20-50 MW. The MC is likely to enter into force around 2017, at which time the EU may likely also be a Party to the Convention. With the assumption that in 2025 27% of the plants will be new compared to 2010, it is assumed that - compared to 2017 - there will be about 14% new installations. This means that in 2025 86% of the (in 2017, year of entering into force in EU) existing plants will be considered as existing plants by MC, and are therefore relevant for the impact assessment of Article 8(3+5) here.

Against this background it is estimated that about 670 coal-fired industrial boilers in the capacity class 20-50 MW not already covered by IED exist in 2011 and about 576 of these are projected to still exist around the year of EU compliance of Article 8(5), namely around 2025 (no later than 10 years after entering into force for the EU); see Table 4-24.

Table 4-24 Estimated number of coal-fired industrial boilers in the capacity class 20-50 MW not already covered under the IE Directive.

Number of combustion plants (20-50 MW)	Number of coal-fired industrial boilers (20 - 50 MW)	Number of existing coal-fired industrial boilers (20 - 50 MW) not covered by IED in 2011	Number of existing coal-fired industrial boilers (20 - 50 MW) not covered by IED in 2025
5,078	1,117	670	576

Release abatement technology

Multi-pollutant flue gas cleaning systems are present in most coal-fired power plants in the EU (assumed 90% by COWI 2012). For industrial boilers <50 MW, information on current abatement technologies applied is scarce though it is thought that installation of filters is less common.

More than 15 Member States have already taken action to reduce air pollution from MCPs by setting emission limit values. These differ significantly across Member States. These limit values refer to more than 75% of the medium sized combustion plants in the capacity class 20-50 (EC impact assessment, 2014), but do not automatically cover PM. It is assumed that some kind of abatement technology is applied to comply with any existing limit values. Different abatement technologies exist which vary according to the targeted pollutants.

Based on the information above it is further estimated that about 70% (including a range from 50% to 90%) of medium combustion plants in the capacity class 20-50 MW are already equipped with abatement technologies for PM removal which have at least the efficiency of a cyclone (65% dust abatement (AMEC 2012)) meaning that about 30% (173 plants) have no abatement technologies for PM removal, or technology with a lower efficiency than cyclones (see Table 4-25). Further, it is assumed for the sake of providing realistic scenarios for this impact assessment, that about 30% of medium sized combustion plants in the capacity class 20-50 MW will be equipped with fabric filters (this share is included in the share of 70% which are already equipped with technologies for PM removal which have at least the efficiency of a cyclone). There is a long tradition in the EU of applying PM abatement systems on larger facilities, and they normally can be retro-fitted on existing boilers.

Table 4-25 Estimated number of existing coal-fired industrial boilers (20 - 50 MW) not covered by IED in 2025 with the need for abatement technologies

Number of existing coal-fired industrial boilers (20 - 50 MW) not covered by IED in 2025	Number of existing coal-fired industrial boilers (20 - 50 MW) not covered by IED in 2025 and not containing at least a cyclone	Number of existing coal-fired industrial boilers (20 - 50 MW) not covered by IED in 2025 and not containing at least a fabric filter
576	173	404

Under the assumption that the MCP Directive will be implemented within the next few years, medium combustion plants >5 MW have to comply with the limit values defined in the legislation by 2025 at the latest. According to AMEC (2012) combustion plants have to be equipped with abatement systems with at least a PM retention efficiency level as cyclones in order to fulfil the requirements of the proposed MCP Directive. Therefore it is assumed that by 2025 all coal-fired industrial boilers (including those 20 - 50 MW) will be among other equipped with abatement systems with at least a PM retention efficiency level as cyclones to reduce PM. For further calculation it is assumed that they are equipped with cyclones. As such, the provision of MC Articles 8(5) “(d) *A multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions;*” would be met, and no additional measures would be needed. This is because particle filters retain a part of the mercury in the flue gas (see Section 4.9.3.1 above). Theoretically, filters (including mercury-specific) with higher efficiency could be applied, but this is not likely to happen unless strict mercury emission limits are being implemented.

According to Article 4 of the proposal for the MCP Directive, operators need to notify the operation of the plant to the competent authorities, which will ensure registration. The authorities would keep a register of the notified plants. Monitoring of the plant including annual measurements of SO₂, NO_x and PM by

the operator for medium combustion plants will be required according to Annex IV of the MCP Directive proposal.

4.9.3 Impacts assessment

In the following table, the stakeholders affected and the relevant impacts are summarised.

Table 4-26 Stakeholders affected by options in question and impacts in summary

Options assessed	Stakeholders affected	Impacts
Option MC8(5)-4	None	None; no action option
Option MC8(5)-3	None	No incremental impacts. This option relies solely on the already proposed MCP Directive, though with a few adjustments of the wording (for legal clarity) to ensure that already anticipated co-benefits for mercury emission reductions from application of PM filters are adequately and explicitly stated (recital text on co-benefits for mercury + explicit PM basic filter requirement for coal fired MCP's (in the 20-50MW range).
Option MC8(5)-3b (coal-fired industrial boilers)	Industry and other operators of coal-fired industrial boilers in the capacity class 20-50 MW	<i>Economic impacts</i> Higher costs due to additional abatement equipment
	Developers, producers and suppliers of abatement technologies (fabric filters)	Economic benefits are expected as coal-fired industrial boilers have to be equipped with at least fabric filters instead of only cyclones. Possible gain of jobs for producers and suppliers of abatement technologies (fabric filters)
	Consumers	The costs for operators could result in higher prices of energy and related products for consumers. No specific data are available
	Global and EU population and environment	Benefits of reduced mercury releases from medium sized coal-fired industrial boilers.
	Competent authorities	Administrative burdens for implementation may be significant due to a potentially high number of facilities which may currently be subject to less environmental control. However, as the Medium Combustion Plant Directive has already been proposed, this impact is considered to be associated with that Directive. Additional administration with specific relevance to

Options assessed	Stakeholders affected	Impacts
		mercury will be minimal.

4.9.3.1 Technical considerations

Control or reductions of mercury releases from coal-fired boilers can be achieved either by selection of fuels with low inherent mercury concentrations, or by configuring the boilers with mercury abatement technologies. The mercury content of the coal depends on geological properties. If only fuels with lower mercury concentrations are allowed to be used to reduce mercury emissions, coal with higher mercury content will be used outside EU. This would result in a shifting of mercury emissions which is not desirable. One approach could be to allow use of coal with high Hg content only where efficient mercury abatement technologies are applied. This approach is however not considered a realistic approach, and is not further evaluated in this impact assessment.

According to AMEC (2012), cyclones abate about 65% of dust whereas fabric filters retain about 99% of dust. Cyclones are expected to only be capable of low mercury removal due to their limited capability to separate submicron particles from the flue gas (UNEP 2010a). An average of 10% removal efficiency of mercury is assumed. In the EC impact assessment report (2014) information from a UNEP report is provided that the retention of mercury in dust filters like fabric filters and high-end electrostatic precipitators (ESP) vary from around 10% to above 90% depending on coal type (due to presence of oxidising elements in the coal, primarily halogens) and filter configurations. On average they are considered to retain about 50% (COWI 2012). According to UNEP (2013) the average mercury capture is at least 70% by using fabric filters.

Option MC8(5)-4 (MI1)

Article 8(5) MC lit. (d) refers to a multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions. This possibility to fulfil the requirements of Article 8(5) MC is not related to “*relevant sources*” as it is for all other possibilities a Party has to comply with the obligations of Article 8(5) (see Article 8(5) MC lit. (a) to (c) and lit. (e)).

As stated in Section 7.5.4.1 it may be a possible interpretation that a Party may be stating complying with the obligations of Article 8(5) MC via the path of Article 8(5) lit. (d) MC by having such a strategy in place, without being obliged to cover/address all *relevant sources* directly – as long as co-benefits for control of mercury emissions are delivered.

In the EU such a pollutant control strategy is already in place via the IED.

This option is not assessed further here.

Option MC8(5)-3a (MI2)

One of the possibilities of Article 8 (5) MC is based on a multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions. The proposal for the MCP-Directive sets emission limit values listed in Annex II of this Directive for emissions into air of sulphur dioxide, nitrogen oxides and particulate matter. The combustion plants have to comply with these limit values from January 2025 (medium combustion plants above 5 MW) and 2030 respectively (medium combustion plants 5 MW and less). Coal combustion releases mercury in oxidised (Hg^{2+}), elemental (Hg^0) or particulate bound (Hg^p) form (UNEP 2010). Oxidised and particle-bound mercury is relatively easy to capture using PM and SO_2 controls (UNEP 2010). By applying such flue gas filters to comply with the limit values listed in Annex II of the proposed MCP Directive, mercury will therefore also be reduced. According to AMEC (2012) medium combustion plants have to be equipped with at least cyclones for complying with the PM limit values set in the proposed MCP Directive. That means that the condition of Article (5) MC referring to a multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions will be fulfilled. By assuming that the MCP-Directive will be implemented as described and more than 75% of the mercury emissions will be covered by this Directive and the IED, the requirements of Art. 8 of MC are fulfilled without further action needed.

For legal certainty it could be added in the proposed MCP Directive text that for coal-fired industrial boilers in the capacity class 20-50 MW, PM abatement technologies with at least the efficiency of cyclones have to be used. For further legal certainty it could be added (in the recitals) that the abatement technologies for PM (and also for SO_2) indirectly reduce mercury emissions.

Therefore no further impacts are expected.

Option MC8(5)-3b (BMC)

Mercury reduction from emissions to air could also be addressed more explicitly in the MCP Directive for industrial boilers in the capacity class 20-50 MW. By setting limit values which could be complied with at least with fabric filters (Hg removal efficiency about 70%), potentially higher mercury emission reduction rates could be achieved. For this option the impacts are calculated (as far as possible) and assessed in the following options.

4.9.3.2 Social impacts

No social impacts will arise for options MC8(5)-4 and MC8(5)-3a.

Impacts related to Option MC8(5)-3b (BMC)

It is assumed that by addressing mercury emission control and reduction including specific limit values for mercury for coal-fired combustion plants in the capacity class 20 – 50 MW by MCP Directive, the following social impacts may occur:

- Theoretical loss of jobs in industry related to fewer plants and plant operators due to costs for equipping the plants with abatement technologies and operation and maintenance. As the energy demand may persist, the impact is however deemed minimal.

- › Possible gain of jobs for developers, producers and suppliers of abatement technologies as demand for fabric filters which are assumed to be more complex and expensive than cyclones will increase.

Quantification is not possible.

4.9.3.3 Economic impacts

No economic impacts will arise for options MC8(5)-4 and MC8(5)-3a.

Impacts related to Option MC8(5)-3b

Administrative costs

With the assumption that the proposal of the MCP Directive will be implemented within the next few years, registration and emission control will be carried out as required according to Annex II of the Directive with associated costs. These costs are however not an impact of Option MC8(5)-3b, because they are completely related to the proposed MCP Directive. In this context administrative costs for coal-fired industrial boilers in the capacity class 20-50 MW are estimated to be about 2.4 €/m/year for operators and authorities (see Table 4-27). The calculation is based on data provided in AMEC (2012). The annual on-going costs for authorities include the costs of checking compliance. The annual on-going costs for operators include accommodating site visits by inspectors and reporting changes in operation (AMEC 2012).

Table 4-27 Administrative costs (of the MCP Directive) if combustion plants will be regulated (without permit regime)

Stakeholder	administrative costs (million EUR/year)		
	average	low	high
Authority	1.4	0.68	2.2
Operator	0.94	0.53	1.4
Total	2.4	1.2	3.6

By addressing mercury control and reduction, including limit values for coal-fired combustion plants in the capacity class 20-50 MW in the MCP Directive, only additional monitoring and control of mercury emissions will be necessary. Resulting incremental administrative costs are expected to be moderate.

Costs for operators

With the assumption that the Proposal of the MCP Directive will be implemented within the next few years, all combustion plants have to be equipped with abatement technologies to fulfil requirements set in Annex II of the MCP Directive. According to information from AMEC (2012) at least cyclones are necessary to stay below the foreseen PM limit values. Therefore it is assumed that without any action related to the MC all relevant coal-fired industrial boilers will be equipped with at least a cyclone for PM control as an effect of the proposed MCP Directive.

Mercury would thus be targeted sufficiently to fulfil the MC requirements for existing MCPs, but the actual mercury retention may be moderate if only coarse PM filters are implemented on the combustion plants. By addressing mercury control and reduction including limit values for coal-fired combustion plants in the capacity class 20 – 50 MW in the MCP Directive requiring at least fabric filters. As a consequence specific costs for operators to equip the relevant plants with at least fabric filters would arise. Mercury would also be reduced by any desulphurisation measures present, but as PM abatement technologies are generally the low cost option we only consider PM abatement technologies (fabric filters) for further calculation.

In AMEC (2012) annual costs for abatement measures including capital costs and operating costs are provided for cyclones and fabric filters. For calculating annual costs a 10 % discount rate and an annualisation period of ten years have been used. These data have been used for calculating annual abatement costs for coal-fired industrial boilers in the capacity class 20 - 50 MW not already equipped with relevant abatement technologies (see Table 4-28, Table 4-29). The ranges are introduced here to reflect the uncertainties associated with the current coverage of the IE Directive and the prevalence of existing abatement systems.

Table 4-28 Estimated number of boilers not already equipped with relevant abatement technologies

number of coal fired industrial boilers (20 - 50 MW) equipped with less than a cyclone			number of coal fired industrial boilers (20 - 50 MW) equipped with less than fabric filter		
average	low	high	average	low	high
173	48	432	404	240	778

Table 4-29 Total estimated annual abatement costs

Values are rounded*	Annual abatement costs for equipping coal-fired industrial boilers (20 - 50 MW) with a cyclone (mio EUR/year)	Annual abatement costs for equipping coal-fired industrial boilers (20 - 50 MW) with a fabric filter (mio EUR /year)	Difference (mio EUR/year)
Average	1.20	29.4	28.2
Low	0.332	17.5	17.2
High	2.99	56.8	53.8

Note *: Calculations were based on detailed numbers.

The difference in costs reflects the economic impact under BMC compared to BAU/MI. This would mean that additional abatement activities required would result in roughly estimated annual costs of about 28 million EUR (17 – 54 million EUR) for relevant plant operators.

Gains for producers and suppliers of abatement technologies (fabric filters)

An estimated 404 coal-fired industrial boilers (20-50 MW) have to be equipped with at least fabric filters instead of at least cyclones to comply with additional requirements under the BMC (MCP Directive addressing mercury emissions with specific control measures and potential limit values). Therefore new filters have to be built and supplied. These are assumed to be more complex and expensive than cyclones. Several major producers of fabric filters are EU based, therefore economic benefits are expected. No detailed quantification of benefits is possible; the costs for plant operators give an indication of the magnitude however.

Costs for consumers

The costs for operators could result in higher prices of energy and products for consumers. No specific data are available.

4.9.3.4 Environmental impacts

No incremental environmental impacts beyond those of the MCP Directive (proposal) will arise for options MC8(5)-4 (BAU) and MC8(5)-3a (MI).

By setting limit values for mercury emission and thus installing more efficient abatement technologies mercury releases will be further reduced.

Mercury emissions from industrial small scale combustion plants amounted to about 15 tons in 2002. This figure is surrounded by uncertainties as information referring to mercury emissions from small combustion plants is scarce (AEA 2005). No specific data about the future development of MCPs which use coal as fuel exist. For our assessment it is estimated that the number of coal-fired MCPs and therewith the (unabated) mercury emissions will remain stable. AEA (2005) estimates that mercury emissions would be reduced by 50% in 2020 due to an expected switch away from coal-based fuels to alternatives such as oil and gas. Therefore mercury emissions will be presented in a range assuming no change in amount of coal used and therewith amount of mercury emissions as upper limit and assuming a change as anticipated in AEA (2005) as lower limit.

Regarding existing installations: With the assumptions that:

- › industrial small scale combustion plants are usually > 1 MW
- › the share of coal used in MCP in the capacity class 20 – 50 MW is about 70% of coal used in all classes of MCP
- › 60% of the coal-fired industrial MCP in the capacity class 20 – 50 MW are not already covered by IE Directive

the mercury emissions from the here considered coal-fired industrial MCP in the capacity class 20 – 50 MW amounted to approximately 5.5 tons in 2011. In 2025 these emissions are projected to amount to around 2 – 6 tons /year, taking the uncertainties of the assumptions made into consideration.

Assuming incremental mercury emission reductions of about 60% by equipping the installations with at least fabric filters (under the BMC scenario), the resulting reduction in the emission to the EU atmosphere would be around 1 - 3 tons/year.

As a consequence of reduced emissions, environmental and health benefits are expected.

4.9.4 Identified data gaps

- › Data on how much of the mercury emissions, or as a proxy, production volume of each of the following source categories are currently covered by the IE Directive:
 - › coal-fired power plants
 - › coal-fired industrial boilers (in more detail than described already)
 - › smelting and roasting processes used in production of non-ferrous metals (only lead, zinc, copper, and industrial gold)
 - › waste incineration
 - › cement clinker production facilities
- › Data on prevalence of air pollution abatement systems by type for each of the source categories mentioned above.

[#Should stakeholders be in a position to supply any of these types of data, kindly submit them during the stakeholder workshop process.]

4.9.5 Conclusions

Option 8(5)-4 is a possible interpretation of Article 8 MC which requires no action under MC but it is not certain if this is legally a viable option.

For the source categories coal-fired power plants, non-ferrous metal smelting and roasting, waste incineration and cement clinker production facilities, it is assumed that no significant emissions would originate from facilities below the thresholds set in the IED activity descriptions. Thus it is assumed that these categories are sufficiently covered by the present EU acquis. Whether existing EU legislation covers 75% of the mercury emissions from these activities needs further assessment. [# Assessment of these aspects may be added if adequate data is identified.]

For coal-fired industrial boilers many plants <50 MW are not specifically covered by the IE Directive. Also, a specific definition of “coal-fired industrial boilers” may be developed under the MC. This assessment was made taking into consideration a possible inclusion of boilers below 50MW thermal effect.

An MCP Directive covering coal-fired industrial boilers is already proposed. If this Directive is implemented, mercury releases from coal-fired industrial boilers will be addressed (by this Directive) in a multi-pollutant strategy approach and the requirements of the MC will be fulfilled (option MC8(5)-3a).

MC8(5)-3b (BMC), which would go beyond a minimal implementation of the MC would result in (1) a higher mercury reduction and therefore more significant benefits for environment and health on the one hand, (2) possible negative impacts

on MCP operators and (3) possible positive impacts on producers and suppliers of abatement technology as follows:

- Activities required under BMC would result in additional annual costs amounting to about 28 mio EUR (range 17 mio EUR – 54 mio EUR) for relevant plant operators (expected to be passed over to consumers)
- Non-quantifiable benefits would occur at producers and suppliers of abatement technology

Significant additional administrative costs are not expected.

Significant environmental benefits are expected under the BMC due to the estimated incremental mercury emission reduction of around 1-3 t/y.

Option MC8(5)-3a is recommended as a minimum. Addition of text to the proposed MCP Directive coal-fired MCPs in the capacity class 20-50 MW to have abatement technologies that are at least as efficient as cyclones would provide legal certainty. This would have no incremental impacts, as the use of such filters is already deemed necessary to achieve MCP emission limits for PM. For added legal certainty it is recommended to add text to the recitals noting that the abatement technologies for PM (and for SO₂) also provide co-benefits to the reduction of mercury air emissions. Applying option MC8(5)-3b with filters that are more effective than fabric filters would result in even higher effectiveness in terms of mercury emission reductions, but also higher costs.

4.10 MC Article 8(3+4) on (air) emission controls; requirement for BAT/BEP for new sources

4.10.1 Problem definition and specific objectives

Article 8(3+4) relates to new emission sources in the categories defined in Annex D to the Minamata Convention (MC); namely:

- › coal-fired power plants
- › coal-fired industrial boilers
- › smelting and roasting processes used in production of non-ferrous metals (only lead, zinc, copper, and industrial gold)
- › waste incineration
- › and cement clinker production facilities

As for Article 8(3+5) MC described in Section 4.9, the assessment here is limited to coal-fired industrial boilers.

For the source categories coal-fired power plants, non-ferrous metal smelting and roasting, waste incineration and cement clinker production facilities, it is assumed that no significant emissions would originate from facilities below the thresholds set in the IED activity descriptions. Thus it is assumed that these categories are sufficiently covered by the present EU acquis [# Assessment of these aspects may be added if adequate data is identified.]. Whether existing EU legislation covers 75% of the mercury emissions from these activities needs further assessment.

Regarding industrial boilers, such installations are to be found both in sites covered by the IED and other sites. Coal-fired industrial boilers are not defined further in the Minamata Convention. Such boilers in the EU territory would be covered by the IE Directive if they have capacities above 50 MW, and BAT as defined under the IE Directive is already required. As for smaller coal-fired industrial boilers, we here assumed that they roughly equal medium combustion plants as defined in the existing Medium Combustion Plants Directive proposal (MCP Dir.).

For new sources in these source categories, Article 8(3+4) MC requires the use of BAT/BEP as soon as practicable but no later than five years after the date of entry into force of the MC for that party. BAT/BEP has to be further defined in an ongoing effort in the BAT/BEP Committee established under the INC (International Negotiation Committee) of the Minamata Convention and ultimately to be decided on by the Conference of the Parties to the Convention. Generic principles for BAT and BEP are given in the MC; see Section 7.5.3. The BAT principles are quite similar to those defined in the EU IE Directive.

As the concrete BAT/BEP requirements are not yet defined, no precise impact assessment can be made. As realistic scenarios for potential impacts as regards coal-fired industrial boilers, we therefore assess the options described in Section 4.9, and listed below, which refer to the proposal of the MCP Directive in combination with existing requirements in the IE Directive for large combustion plants with effect above 50 MW. It is assumed that all coal fired industrial boilers will need PM retention (with co-benefits for mercury reduction) with basic filter configurations such as cyclones to meet the MCP Directive proposed (not an impact of the MC), while coal fired industrial boilers in the range 20-50 MW would in the BMC scenario be assumed to need fabric filters, which generally have a higher retention rate for oxidised and particle-bound mercury.

The MCP Directive includes a multi-pollutant control strategy addressing NO_x, SO₂ and dust. The limit values shall not be exceeded by 2025 for plants with a rated thermal input above 5 MW. Noting this date and the fact that the use of BAT/BEP shall be required as soon as practicable but no later than five years after the date of entry into force of the MC for that party, the requirements of the proposed MCP Directive can be used for compliance with MC only if the EU complies with the requirements of MC later than 2020 (since BAT/BEP would then only need to be applied for new installations by 2025). Otherwise there would be a possible gap. This could be closed by bringing forward the date of required compliance with limit values as set in Annex II of MCP Directive for coal-fired MCPs targeted for BAT/BEP.

Table 5 3

Options assessed regarding this article of the Minamata Convention

Scenario	Options to be assessed (keywords)	Preliminary IA score*1
Baseline 1	Business as usual (BAU)	-
Baseline 2/ Minimum implementation (MI)	Option MC8(5)-3a (re-worded) : Coverage in the new proposed Directive on MCP; if deemed needed with slightly adjusted wording mentioning mercury explicitly.	C0,A0,E0,S0 (incremental impacts)
Possibly beyond (minimal) implementation of the MC (BMC)	Option MC8(5)-3b : Integrate mercury emissions in the new proposed Directive on MCP explicitly by including mercury emission limit values (which refer to the efficiency of at least fabric filters for coal fired plants in the 20-50MW range)	C-1,A-1,E2,S1

Notes: *1: According to comparative assessment presented in Section 3.1.2; societal impacts across all options for this MC article. For details on scores, click [here](#). Scores:

C: Socio-economic costs/impacts: 0 = minimal, -1 = moderate, -2 = potentially significant costs.

A: Administrative/political efforts (by EU and MS authorities): 0 = minimal, -1 = moderate, -2 = potentially significant efforts.

E: Environmental benefits: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.

S: Signal effect towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambition implementation of the MC, -1 = signalling low-ambition implementation of the MC.

4.10.2 Baseline conditions

The general baseline conditions for coal-fired industrial boilers are described in Section 5.8.2.

With the assumptions made in Section 5.8.2 that 94 coal-fired industrial boilers in the capacity class 20-50 MW (and not covered by IE Directive) will be new sources in 2025 compared to 2017 (possible year of entering into force of MC in EU).

Table 4-30 Average number of coal-fired industrial boilers in the capacity class 20-50 MW not covered under IED in 2025

Average number of new combustion plants (20-50 MW) in 2025	Average number of new coal-fired industrial boilers (20 - 50 MW) in 2025	Average number of new coal-fired industrial boilers (20 - 50 MW) not covered by IED in 2025
711	156	94

As stated in Section 5.8.2, combustion plants have to be equipped with abatement systems with a PM retention efficiency as least as good as that provided by cyclones to fulfil the requirements of the proposed MCP Directive. The requirements have to be fulfilled in 2025 at the latest according to the MCP Directive Proposal. It is assumed that all new installations which will be built after 2017 (possible entry into force of MC in EU) will already be equipped with abatement technologies to comply with the MCP Directive, because this is a cheaper option than to build new installations without abatement technologies and to retrofit them later.

4.10.3 Impacts assessment

The general impact types assessed here are identical to those described in Table 4-26 in Section 4.9.3.

4.10.3.1 Technical considerations

See Section 4.9.3.1

4.10.3.2 Social impacts

See Section 4.9.3.2

4.10.3.3 Economic impacts

The impacts on competent authorities, producers and suppliers of abatement technologies are assumed to be the same as for existing sources (see section 5.8.3.3).

The background assumptions made in section 5.8.3.3 are used in the calculation of operators' costs. As stated in section 5.9.2 it is assumed that about 94 new plants exist in 2025 and that these will be equipped with at least cyclones to comply with the existing requirements of the MCP Directive. By addressing mercury control and reduction including limit values for coal-fired combustion plants in the capacity class 20 – 50 MW in the MCP Directive requiring at least fabric filters, these installations would have to be equipped with fabric filters instead of cyclones with associated incremental costs.

Table 4-31 Estimated annual abatement costs

Average annual abatement costs for equipping coal-fired industrial boilers (20 - 50 MW) with a cyclone (mio EUR/year; not an MC impact)	Average annual abatement costs for equipping coal-fired industrial boilers (20 - 50 MW) with a fabric filter (mio EUR /year)	Difference (mio EUR/year)
0.65	6.8	6.2

The cost difference reflects expected range in the economic impact under MI compared to BAU. The additional abatement activities required would result in roughly estimated annual costs of about 6.2 mio EUR for relevant plant operators (see Table 4-31). These are maximum costs as some installations built after 2017

might already be equipped with fabric filters. The actual costs could even be less, as installing new facilities with abatement technologies is cheaper than retrofitting existing ones (AMEC 2012).

4.10.3.4 Environmental impacts

As described in Section 4.9.3.4, mercury retention will be increased by around 60% by using fabric filters instead of cyclones. Based on the available emission estimates for medium size combustion plants and the assumptions presented in Section 4.9.3.4, the emissions of new coal-fired industrial MCP in the capacity class 20 – 50 MW not covered by IE Directive would amount to around 0.3 - 0.9 tons in 2025. If BAT/BEP would require mercury retention equal to the use of fabric filters, the mercury emissions could be reduced by another 60% by equipping the installations with fabric filters instead of just cyclones. The resulting emission reduction would be around 0.2 – 0.5 tonnes/year. As a consequence, a reduction in EU and global releases is expected, yielding environmental and health benefits.

4.10.4 Identified data gaps

- › Data on how much of the mercury emissions, or as a proxy, production volume of each of the following source categories are currently covered by the IE Directive:
 - › coal-fired power plants
 - › coal-fired industrial boilers (in more detail than described already)
 - › smelting and roasting processes used in production of non-ferrous metals (only lead, zinc, copper, and industrial gold)
 - › waste incineration
 - › cement clinker production facilities
- › Data on prevalence of air pollution abatement systems by type for each of the source categories mentioned above.

[#Should stakeholders be in a position to supply any of these types of data, kindly submit them during the stakeholder workshop process.]

4.10.5 Conclusions

For the source categories coal-fired power plants, non-ferrous metal smelting and roasting, waste incineration and cement clinker production facilities, it is assumed that no significant emissions would originate from facilities below the thresholds set in the IED activity descriptions. Thus it is assumed that these categories are sufficiently covered by the present EU acquis [# Assessment of these aspects may be added if adequate data is identified.]. Whether existing EU legislation covers 75% of the mercury emissions from these activities needs further assessment.

For coal-fired industrial boilers many plants <50 MW are not specifically covered by the IE Directive. Also, a specific definition of “coal-fired industrial boilers” may be developed under the MC. This assessment was made taking into consideration a possible inclusion of boilers below 50MW thermal effect.

Specific BAT/BEP requirements are not yet defined so no precise impact assessment can be made. As realistic scenarios for potential impacts for coal-fired industrial boilers, the options described in Section 4.9 have been assessed for new installations (assumed to be installed after entry into force of the MC in the EU).

An MCP Directive covering coal-fired industrial boilers, and including a multi-pollutant control strategy, is already proposed. If this Directive is implemented, mercury releases from existing and new coal-fired industrial boilers will be addressed (by this Directive), at least to some extent.

The scenarios applied in the assessment here are based on an assumption that all coal fired industrial boilers will need PM retention (with co-benefits for mercury reduction) with basic filter configurations such as cyclones to meet the MCP Directive proposed (not an impact of the MC), while coal fired industrial boilers in the range 20-50 MW would in the BMC scenario need fabric filters, which generally have a higher retention rate for particle-bound mercury.

The proposed MCP Directive states that relevant PM requirements shall be complied with only by 2025. The MC specifies that new facilities of this type shall be in compliance within 5 years of the Convention entering into force for that Party. If the EU is quick to ratify the MC this could create a compliance gap that could be closed by shifting the compliance date of the MCP Directive forward.

The possible need for fabric filters would result in (1) a higher mercury reduction and therefore more significant benefits for environment and health on the one hand, (2) possible negative impacts on MCP operators (increased costs) and (3) possible positive impacts on producers and suppliers of abatement technology as follows:

- › The use of fabric filters for 20-50 MW coal fired facilities would result in additional annual costs amounting to about 20 mio EUR for relevant plant operators (expected to be passed over to consumers);
- › Non-quantifiable benefits would occur at producers and suppliers of abatement technology.

Significant incremental administrative costs are not expected.

As the specific MC BAT/BEP requirements have not yet been defined, a concrete recommendation cannot be made at present. For a minimal implementation, the proposed MCP Directive (with the adjustments described in Section 4.9) in combination with the existing IE Directive may fulfil the obligations of the Convention. In case stricter BAT/BEP would be set, fabric filters could - by way of example - reduce EU mercury emissions from relevant MCPs with an estimated 0.2 – 0.5 tonnes/year.

If the EU wishes to set more ambitious goals for mercury reduction, technical means are commercially available for substantially improved atmospheric mercury emission reduction, beyond that achieved by fabric filters, albeit at higher costs for operators of the facilities and, ultimately, for consumers.

4.11 MC Article 11(3): Mercury waste

4.11.1 Problem definition and specific objectives

Based on the comparative assessment of proposed options and the Commission's criteria for selection of options to be investigated further, the following options relating to this article of the Minamata Convention are assessed in detail.

Table 5.3 Options assessed regarding this article of the Minamata Convention

Scenario	Options to be assessed (keywords)	Preliminary IA score*1
Baseline 1	Business as usual (BAU)	-
Baseline 2: Minimum implementation MI	Option MC11(3)-2 addressing MC11(3b): Ensuring that reclaimed/recycled mercury is only used for allowed uses under the MC, or for environmentally sound disposal as defined under the MC.	C-1,A-1,E1,S1
Beyond MC BMC	Option MC11(3)-1 addressing MC11(3b): Ensured that other waste types, not currently covered by Reg. 1102/2008 are covered by EU Law, meaning that recycling/recovery would be fully prohibited.	C-2,A-2,E2,S1

Notes: *1: According to comparative assessment presented in Section 3.1.2; societal impacts across all options for this MC article. For details on scores, click [here](#). Scores:

C: Socio-economic costs/impacts: 0 = minimal, -1 = moderate, -2 = potentially significant costs.

A: Administrative/political efforts (by EU and MS authorities): 0 = minimal, -1 = moderate, -2 = potentially significant efforts.

E: Environmental benefits: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.

S: Signal effect towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambition implementation of the MC, -1 = signalling low-ambition implementation of the MC.

4.11.2 Baseline conditions

Mercury is persistent and toxic almost no matter what chemical form it is in. Mercury once brought into the biosphere, for intentional use or as trace pollutant, thus needs to be managed to reduce or avoid adverse impacts on humans and the environment. In the EU, waste fractions containing elevated mercury levels are therefore categorized as hazardous waste needing special collection and treatment. Until recently recycling has been the preferred option for mercury waste, but as the demand for mercury for intentional use has decreased in developed countries over the last decades, the priority for high-concentration mercury waste is now turning towards environmentally safe final deposition (COWI, 2014).

The generation of mercury waste is directly related to its use in products and processes. The baseline regarding mercury waste is therefore closely related to the

supply, consumption and trade of mercury. The corresponding baseline is described in section 4.3.2. Data on EU mercury consumption in industrial processes and products in the EU for 2007 are shown in Table 4-2. Moreover, the development in mercury consumption under a business as usual scenario for 2014-2015 and a rough expert estimate of the expected annual demand in the time frame 2025 to 2030 indicating expected trends are given in Table 4-3.

Mercury-containing waste is also generated by other processes than intentional mercury use, as mercury that is present in trace concentrations in some materials (naturally or originating indirectly from human activity) may be concentrated in some relevant processes, thereby reaching mercury concentrations in some outputs (solid wastes, etc.) beyond trace level. Most of the mercury amounts practically extractable from such waste may however no longer be recycled (by-product mercury from non-ferrous metal and natural gas extraction) and is therefore not dealt with further in this section.

The current EU supply of mercury is estimated at 250 to 300 t/y. The changes in supply will among other depend on the selection of policies for control of trade in mercury. A general import ban ([Option MC3\(8\)-2](#)) would significantly reduce supply by around 100 t/y.

A significant decline in mercury demand in the EU has been observed over the last 2-3 decades. At present, the demand is deemed to be still steadily declining, but possibly at a slower pace than previously. It is expected that the demand will decrease to a range between 40 and 280 t/y by 2025-2030.

Globally, under a business as usual scenario, mercury supply is expected to exceed demand in the time span from 2010 to 2050 with some total 28,000 to 46,000 tonnes in the period, or a range from 700 to 1,150 tonnes per year (see COWI (2012; citing UNEP 2011a)). The future development of EU supply and demand is difficult to assess. Assuming a continuous supply at a level around 250 to 300 t/y stemming from waste recycling (150 to 200 t/y) and imports of mercury (around 100 t/y), an excess supply from internal recycling in a range between 0 and 100 t/y would result. If demand exceeds the supply available within the EU, the supply will have to be adjusted from import from the global mercury market (concerning the flexibility of supply see section 4.3.3).

4.11.3 Impacts assessment

In the following table, the stakeholders affected and the impact relevance are summarised.

Table 4-32 Stakeholders affected by options in question and impacts in summary

Options assessed	Stakeholders affected	Impacts
Option MC11(3)-2 MI scenario	Industry	Waste owners will incur COSTS for disposal of mercury-containing waste. The costs depend on the selected disposal option. Permanent underground disposal of metallic mercury is considered the most economic environmentally sound disposal option.
	Recyclers in the EU	<p>COSTS (distributional effects only) of foregone profits for recyclers. These are however expected to be only moderately affected by this provision as the mercury consumption in the EU will be only moderately reduced (by 0 to 50 t/y) due to the MC's "allowed uses" provisions. This is because mercury use is heavily restricted already in the EU and because specific mercury sources are already considered as waste according to Article 2 of Regulation (EC) No 1102/2008 including among other metallic mercury from the chlor-alkali industry.</p> <p>Corresponding job losses are possible</p> <p>BENEFITS (distributional effect only): Some recyclers are developing services in the stabilisation and final disposal of mercury waste. This activity is expected to grow.</p> <p>Corresponding job gains are possible</p> <p>Administrative COSTS for documenting that mercury is only sold for allowed uses. These are expected to be minimal as recyclers are already registering customer names in their accounts. If a permission system for mercury is required this would impose higher administration costs.</p>
	Importers of mercury	BENEFITS (distributional only): Depending how mercury demand changes, any reduction in supply from recycling would need be compensated for by imports. This would lead to corresponding increases of revenues for importers of mercury. Corresponding job gains are possible.
	Waste disposal companies	<p>BENEFITS (distributional effects only): Some waste disposal companies are developing business in stabilisation and final disposal of mercury waste and this activity will grow.</p> <p>Corresponding job gains are possible</p>
	Global and EU population and environment	BENEFITS of reduced mercury releases from recycling and the life cycle of otherwise re-marketed mercury.

Options assessed	Stakeholders affected	Impacts
	Competent authorities	Administrative COSTS for ensuring that mercury is only sold/bought for allowed uses (normal compliance control activities conducted in MS). Should an actual permission system for mercury be desired, this would impose higher administration costs.
Option MC11(3)-1 BMC scenario	Industry	Potential for higher COSTS if mercury prices rise due to lower supply, though that effect may be neutralised by increases in imports.
		COSTS of mercury substitution. Industry may have to bear additional costs of mercury substitution if mercury supply is insufficient.
	Recyclers in the EU	COSTS of foregone profits from recycling. Corresponding job losses are possible BENEFITS: Some recyclers are developing business in stabilisation and final disposal of mercury waste and this activity will grow (distributional effect). Corresponding job gains are possible
	Waste disposal companies	BENEFITS: Some waste disposal companies are developing business in stabilisation and final disposal of mercury waste and this activity will grow (distributional effect). Corresponding job gains are possible
	Global and EU population and environment	BENEFITS of reduced mercury releases from recycling and the whole lifecycle of otherwise re-marketed mercury

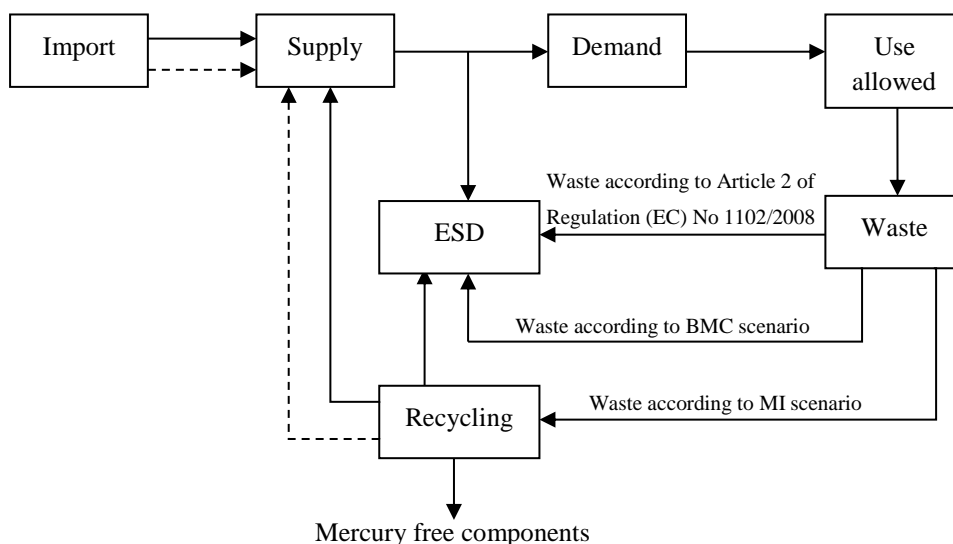
4.11.3.1 Technical considerations

If recycling was prohibited (beyond MC; [Option MC11\(3\)-1](#)), future demand would have to be met by mercury imports alone. The supply from recycling of mercury from waste from within the EU, amounting to approximately 100 t/y, would have to instead be disposed of in an environmentally sound manner.

If recycled mercury is only used for uses allowed under the MC, or for environmentally sound disposal as defined under the MC (MI; [Option MC11\(3\)-2](#)), future demand can be supplied from EU internal recycling and from imports. This will allow more flexibility to ensure future EU supply.

If imports for allowed uses are banned (see section 4.3; [Option MC3\(8\)-2](#)) and recycling prohibited (BMC; [Option MC11\(3\)-1](#)) there will be no relevant remaining source to provide supply for EU demand, and EU demand would thus have to be substituted for, or otherwise reduced.

The following figure illustrates the flows of waste related mercury, and metal mercury, for the EU concerning the BMC and the MI Scenario.



----- possible additional supply if supply < demand

ESD = Environmentally Sound Disposal

Table 4-33: Illustration of the flows of waste related mercury, and metal mercury, for the EU concerning the beyond MC and the MI Scenario

The main sources of generation of mercury waste can be allocated to two categories:

- (1) those wastes which are considered as waste according to Article 2 of Regulation 1102/2008:
 - > metallic mercury that is no longer used in the chlor-alkali industry;
 - > metallic mercury gained from the cleaning of natural gas;
 - > metallic mercury gained from non-ferrous mining and smelting operations; and
 - > metallic mercury extracted from cinnabar ore in the EU.
- (2) other wastes generated from specific applications in the following products and processes (see COWI (2008)):
 - > dental waste;
 - > mercury waste from other miscellaneous uses such as porosimetry and pycnometry, calibration of mercury monitors, etc.;

- › waste from light sources such as fluorescent lamps including CFLs, and specialised discharge lamps;
- › waste of older mercury button-cell batteries (until they are out of the society);
- › mercury waste from remaining measuring equipment;
- › mercury waste from switches and relays; and
- › waste from mercury chemicals.

The wastes listed under category (1) have since 2011 been considered as waste to be disposed of according to Regulation (EC) No 1102/2008. Such wastes are therefore within the EU already excluded from the option to be reclaimed/recycled for uses allowed under the MC and have to be disposed of as waste.

The mercury in wastes listed under category (2) is in principle available to be reclaimed/recycled for uses allowed under the MC. The MI option ([Option MC11\(3\)-2](#)) would allow this. The recyclable mercury content of such wastes contributes to supply. The mercury free residues of such waste could be either recycled or disposed of.

The BMC option ([Option MC11\(3\)-1](#)) would, in addition, prohibit recycling of mercury from the wastes listed under category (2). As a consequence recycling of mercury from waste would be fully prohibited. The corresponding wastes would have to be disposed of. Any mercury-free components of such waste could still be recycled.

Available information on the wastes listed under category (2) is summarised in the COWI (2008) study. The following table gives an overview of the quantities of mercury in the wastes listed under category (2) ending up in waste, being recycled, disposed of in MSW and otherwise disposed of. It shows that substantial amounts of mercury have accumulated in society and will be removed gradually and become available for mercury recycling in the EU.

Table 4-34 Quantity of mercury in different waste types listed under category 2 in the EU in tonnes; (reference year 2007; based on COWI and Concorde East/West (2008))

Origin of waste	Total quantity (t/y)	Recovery (t/y)	MSW disposal (t/y)	Other disposal (t/y)	Accumulated in society (t)
Light sources	14.2	1.6	11	1.6	65
Batteries	30	4	20	6	99
Dental amalgams	95	30	22	43	1,000
Measuring equipment	21.4	4.5	13.5	3.4	70
Switches and relays	14	7	5.6	1.4	125
Chemicals	40.5	6.5	22	12	300
Miscellaneous	70	13	0	57	125
Total	285.1	66.6	94.1	124.4	1,784
Percentage (in %)	100	23.4	33.0	43.6	n.a.

According to the COWI (2008) data, out of a total mercury quantity of about 285 t/y approximately 67 t/y is recovered (23.4%). The remaining mercury, around 219 t/y, is disposed of. The total mercury supply from recycling in 2007 (excluding mercury waste from chlor-alkali production) in the EU was about 100 t/y. The current annual supply from recycling of waste with origin in the EU is assumed to still amount to approximately 100 tonnes (year 2014; still excluding waste from chlor-alkali production).

As a consequence, in the BMC option, waste containing about 100 tonnes/y of mercury would have to be disposed of instead of being recycled.

The effort for environmentally sound disposal depends particularly on the (1) type of waste to be disposed of and the (2) quantity and volume of waste to be disposed of.

Depending on the type of mercury-containing waste the effort for disposal will increase if specific treatment such as stabilisation / solidification is required and/or specific requirements for disposal are necessary. The quantity to be disposed of depends on the content of mercury in waste and any pre-treatment needed prior to disposal since the treatment processes may increase the quantity and volume of the waste to be disposed of.

There are no data from which volumes of waste containing mercury can be directly estimated. Table 26 of COWI (2014) reports typical mercury concentrations in relevant mercury-containing products but these data cannot be used to estimate volumes of waste that contain the 100 t/y mercury.

In Germany in 2005 there were 32,600t of waste fractions containing mercury (in significant concentrations). Information on mercury content is available for some waste fractions (see COWI (2008)). If the generation of mercury-containing waste throughout the EU matched that of Germany (on a per capita basis), then about 200,000 tonnes of mercury-containing waste was generated in 2005 in EU 27 (including waste from chlor-alkali production). But Germany is not considered a representative country with respect to mercury waste generation and several sources of mercury-containing waste are not relevant in the context of the options discussed or have significantly changed since 2005. It can be assumed that annual quantities of mercury-containing waste have decreased since 2005 and are currently below 200,000 t/y.

As mentioned, prices for treatment of waste per kg of mercury depend on the mercury concentration and the character of the waste. In (COWI 2012) a differentiation is made between (1) waste with low to moderate concentrations of mercury and (2) waste with high concentrations of mercury. Cost estimates for environmental sound disposal of waste with low to moderate concentrations of mercury have not been calculated in that report.

Waste with low to moderate concentrations of mercury

It is not possible on the basis of the existing data to assess the impacts if wastes containing moderate concentrations of mercury would have to be disposed of. The

quantities of relevant waste would also be heavily dependent on the thresholds set for mercury-containing waste by the Conference of the Parties to the MC.

However, approximate costs can be estimated from existing information. Waste with even quite low concentrations of mercury is considered hazardous according to the EU waste regulation. Costs for disposal of mercury waste with low to moderate mercury content are similar to disposal costs for other hazardous waste. Corresponding costs for wastes containing persistent organic pollutants (POPs) range from 80 to 250 EUR/t, depending on treatment: for disposal (80 EUR/t), disposal with stabilisation (250 EUR/t), underground disposal (250 EUR/t) and incineration (100 EUR/t); (best estimate for average costs ~ 170 EUR/t). Recycling costs are around 40 EUR/t (see BiPRO, 2011). With these cost factors, and assuming around 100,000 t/y of mercury-containing waste with low to moderate mercury content and that 23.4 % (otherwise recovered; see 4.3) will have to be disposed of instead of being recycled, then the incremental costs are around 3 million EUR/y, by way of example. Waste quantities may be significantly higher or lower and costs for treatment of mercury waste may be significantly higher. Prices (gate fees) for treatment of mercury-containing waste in Denmark range from 100 to 2,700 EUR/kg Hg for specific waste types and may even be higher. Prices range from 12,000 to 15,000 EUR/kg Hg for specific waste types such as thermometers, manometers etc. with fluid metal mercury which require labour intensive segregation of mercury and mercury refining abroad (see COWI, 2012).

Other additional costs are associated with the segregation and collection of such waste, as well as for the transport and packaging of the waste prior to the final waste treatment. Transport costs for regional (lorry) transport are generally considered low compared to the costs for safe treatment/deposition (COWI, 2012).

Waste with high concentrations of mercury

Besides the necessity to dispose of mercury waste under category (2) a high volume of mercury stemming from wastes listed under category (1) will have to be disposed of in an environmentally sound manner. This concerns particularly excess mercury from decommissioned chlor-alkali plants and is an obligation from Regulation (EC) 1102/2008 and is thus not an impact of the MC.

In total, around 11,000 tonnes of metallic mercury will need to be disposed of as waste in the EU over the next 40 years. The majority, approximately 8,400 tonnes, will accrue between 2011 and 2020, thus averaging 840 t/y in that period (see Hagemann et al. (2014)).

As outlined above, the relevant excess EU supply (i.e. not coming from waste listed under category (1)) is expected to be in the range of 0 - 260 t/y. 260 tonnes excess supply would be available if supply was 300 t/y while demand stood at 40 tonnes. This is not a realistic scenario, as actual supply is expected to mirror demand, at least in the short term. With supply in the 250 - 300 t/y (275 t/y) range and demand in the 40 - 280 tonnes range (160 t/y) it is estimated that 115 t/y of excess mercury would be generated. This additional excess mercury would have to be disposed of as waste in addition to the quantities which have to be disposed of due to the obligation from Regulation (EC) 1102/2008.

A certain share (about 23%; see Table 4-34) of the mercury wastes category (2) is separately collected and treated as hazardous waste while a substantial share is disposed of, e.g. with municipal waste, and is thus often either incinerated or landfilled and contributes thus to significant mercury emissions. This should be avoided by increasing the share of mercury which is disposed on in an environmentally sound manner.

Technologies for the environmentally sound disposal of mercury wastes containing low or and high mercury wastes are available (see e.g. UNEP (2011): Basel Convention draft technical guidelines for the environmentally sound management of wastes consisting of elemental mercury and wastes containing or contaminated with mercury).

In Spain's reply to the questionnaire for the current study, a technology for the environmental sound disposal of low concentration wastes is described (stabilization and solidification technology to treat mercury-contaminated soil and waste with sulphur micro-cements). According to the information provided, the technology is applicable and has been already tested in soils and wastes with low mercury contamination levels ($\text{Hg} \leq 2\%$ by weight).

Concerning high concentration mercury waste, the situation is summarised in the following.

The economic and environmental assessment in BiPRO (2010) recommends the following environmentally sound options for the disposal of metallic mercury:

- Pre-treatment (sulphur stabilisation) of metallic mercury and subsequent permanent disposal in salt mines (highest level of environmental protection, acceptable costs).
- Pre-treatment (sulphur stabilisation) of metallic mercury and subsequent permanent disposal in a hard rock underground formation (high level of environmental protection, acceptable costs).
- Permanent disposal of metallic mercury in salt mines (high level of environmental protection, most cost effective option).

Hageman et al. (2014) investigated the risks for operational and long-term safety of underground storages of metallic mercury. Measures were derived to reduce the risks to an acceptable level. A similar analysis was undertaken for mercury sulphide, which results from most procedures for the stabilisation of metallic mercury. Relevant risks and measures derived are described in the study report (see Hagemann et al. (2014)).

Measures are related to the operation of an underground storage (1) for metallic mercury (such as specific criteria for the mercury to be disposed of, transport and storage containers, storage areas and conditions) as well as (2) for mercury sulphide (compared to metallic mercury, fewer additional measures are required). The assessment of the long term safety of underground storage concluded: "Metallic mercury and mercury sulphide do not react with salt rock under deposit

conditions, thus an impairment of the effectiveness of the geological barrier is of no concern. Thus it must be concluded that neither elemental mercury nor mercury sulphide exhibit properties that threaten the long-term safety of an underground landfill. No mercury-specific risks are likely after closure of the underground landfill.” In the hypothetical event of a failure of the technical barriers, from a geochemical perspective, both elemental mercury and mercury sulphide are suitable for deposition in salt mines. In the hypothetical event of a solution inflow, the low solubility of elemental mercury and mercury sulphide acts as an internal barrier (Hagemann et al. (2014)).

The long-term behaviour of mercury sulphide and mercury compounds in an above-ground landfill is also of interest. Hagemann et al. (2014) expected that its surface sealing will be permeable to air in the long term. Mercury sulphide can then come into contact with atmospheric oxygen and become oxidised to elemental mercury and sulphate. The formation of methylmercury may occur under suitable geochemical conditions. A landfill with mercury sulphide would inevitably become a local source of mercury emissions. Both elemental mercury as well as methylmercury can leave the landfill via the gas circuit (landfill gas). For this reason, Hagemann et al. (2014) conclude that the deposit of mercury sulphide as well as of other strong mercury waste should be prohibited in above-ground landfills.

In conclusion Hagemann et al. (2014) recommend the underground storage of liquid or stabilised/solidified mercury under specific conditions, but not in above ground landfills.

Spain’s reply to the questionnaire issued under the current study states that the leaching behaviour of final products of a stabilisation process of mercury in a polymeric sulphur matrix via mercury sulphide was tested in both monolithic and crushed samples using the EU standard (CEN/TS 14405:2004 and UNE-EN-12457) and the US EPA Toxicity Characteristic Leaching Procedure (TCLP), Method 1311. The leaching values lead to concentrations well below 0.01 mg/kg. Thus, the products meet the EU acceptance criteria for landfills for inert wastes (<0.01 mg/kg, as per Decision 2003/33/EC); However, a long term assessment of possible risks of above ground landfilling should be considered.

An example describing treatment of high concentration mercury waste is available from Germany. According to the European Commission, in Germany 171.1 tonnes of mercury were delivered up to 31 December 2011 from the chlor-alkali industry to facilities for temporary or permanent storage. 166 tonnes of this were stabilised and taken to a salt mine. Gas and non-ferrous metal production reported a generation of 18.8 tonnes, 12.4 tonnes of which were stabilised at DELA and disposed of in the Sondershausen underground storage. 1.9 tonnes were processed by BATREC (Switzerland) and exported to Germany for permanent storage. The final whereabouts of the remaining quantity is not exactly clear. (information taken from Hagemann et al. (2014)).

The measures proposed by Hagemann et al. can generate one-off costs and operational costs. One-off costs will incur as an impact of current EU legislation and are not an impact of the MC. Operational costs for carrying out the disposal

depend on amounts disposed and are a potential impact of the MC. Such costs include: manufacture and provision of transport and storage containers; filling of transport and storage containers at the waste producer's site including the final inspection; laboratory analyses of metallic mercury; testing/monitoring activities of independent experts; interim storage of loaded transport and storage containers; additional expenditure at the underground storage operation due to additional safety requirements (modified transport concept, storage in campaigns, air monitoring, repeat training); disposal of reference samples. A quantification of these specific costs is not made in Hagemann et al. (2014).

Currently there are two relevant processes for stabilisation that are prepared for industrial use (MAYASA, Spain and a facility in Germany). The costs of stabilisation including disposal is specified 2,000 EUR/t for stabilisation (see Hagemann et al. (2014)).

The disposal of 1 tonne of hazardous waste typically costs between 260 and 900 EUR/t, irrespective whether metallic mercury or pre-treated mercury is disposed (see BiPRO (2010)).

The weight of stabilised mercury increases by 16 - 300% compared to metallic mercury. The total costs for the disposal of stabilised mercury ranges including stabilisation/solidification and underground disposal ranges thus from 2,000 to 4,700 EUR/t (best estimate 3,350). In case of a temporary storage prior to the stabilisation/solidification the costs could increase significantly as additional transport movements (from the temporary storage site to the pre-treatment site to the final disposal site) could be necessary (see BiPRO (2010)).

According to BiPRO (2010) the permanent underground storage of liquid mercury in appropriate containment would result in costs between 260-900 EUR/t for the storage and between 600 – 1,100 EUR/t mercury for the container summing up to range from about 900 to 2000 EUR/t (best estimate 1,450). Other cost factors (transport, inspection, monitoring etc.) are discussed in BiPRO (2010). They are considered comparatively low. Permanent underground disposal of metallic mercury is considered the most cost efficient option as well as environmental sound.

4.11.3.2 Economic impacts

Under the minimal implementation of the Minamata Convention using [Option MC11\(3\)-2](#) recycling would be limited to uses allowed under the Minamata Convention. As defined in Article 2 MC: “*“Use allowed” means any use by a Party of mercury or mercury compounds consistent with this Convention, including, but not limited to, uses consistent with Articles 3, 4, 5, 6 and 7.*” Our interpretation is that mercury uses not regulated by the Convention are still allowed for a party after its implementation of the Convention. Providing the EU recycler's mercury prices are competitive (or an import ban is imposed), the demand for recycled mercury in the EU is unlikely to be significantly affected by the restriction to uses allowed under the Convention, either between EU implementation of the Convention and the phase-out dates of allowed uses, nor after these phase out dates.

Under the assumptions discussed in Section 4.3, the potential loss of revenue from foregone sales of recycled mercury after phase-out dates of the allowed uses would be in the order of 0-4 million EUR/y (for potential reductions of demand in the range of 0-50 t Hg/y). Depending on the demand, mercury sufficient to compensate for the supply reduction would need to be imported, resulting in an corresponding increase in revenues at importers of mercury.

The waste associated with 0 to 50 t mercury per year would instead have to be disposed of in an environmentally sound manner. Assuming that most of it would be disposed of as high concentration mercury waste, the costs for 0 – 50 t/y are comparatively low. They would range from 0 to 100,000 EUR/y for underground disposal as metallic mercury and from 0 to 235,000 EUR/y for underground disposal as stabilised mercury waste. These will be costs for waste owners and revenue for waste treatment/disposal facilities (a distributional effect).

As outlined above there is no information available on quantities of low concentration mercury waste. The following example can however serve as an illustration: If the 0 to 50 tonnes of mercury would hypothetically be disposed of as a low concentration mercury waste containing 1% of mercury, the disposal costs would range between 0 and 1.3 million EUR/y. At a mercury concentration of 0.1% these costs would increase by a factor of 10.

If recycling was restricted to allowed uses, recyclers and authorities will incur some administrative costs for documenting and controlling that mercury is only sold for allowed uses. These costs are expected to be minimal. Recyclers are already registering customer names in their accounts. An actual permission system for mercury would impose higher administration costs. By example, in Denmark a “poison permit” is already required for purchase of mercury for most uses, and this may likely be the case in other MS as well.

If [Option MC11\(3\)-1](#) (BMC) is implemented, 2 - 7.8 million EUR/year in revenues would be lost from foregone sales of recycled mercury (equivalent to current supply from recycling around 100 t/y) would, under the assumptions made in section 4.3.

The fall in mercury supply (reduction from 250 to 300 t/y to 150 to 200 t/y) may result in higher mercury prices for industry though if imports increase to compensate, then price effects would be moderated.

Industry may have to bear additional costs of mercury substitution if mercury supplies become scarce for uses allowed under the MC, if (for instance) insufficient mercury is available from imports. This is considered unlikely given the flexibility of the mercury market. If imports were also restricted, additional cuts in EU mercury demand would be necessary; principally for the two major remaining mercury uses - dental amalgam (where substitutes are available, but at a higher price) and analysis techniques (porosimetry and pycnometry). Porosimetry can technically be substituted for most uses, but development and implementation of new analysis standards would be required, implying additional costs.

If there was a total ban on mercury recycling in the EU, waste containing 100 t mercury per year would need to be disposed of in an environmentally sound manner. Assuming that most would be disposed of as high concentration mercury waste, the disposal costs are considered comparatively low. They would range from 90,000 to 200,000 EUR/y for underground disposal as metallic mercury and from 200,000 to 470,000 EUR/y for underground disposal as stabilised waste. These will be costs for waste owners but revenue for waste treatment/disposal facilities (distributional effects).

If the 100 tonnes of mercury was hypothetically disposed of as a low concentration mercury waste containing 1% of mercury, the disposal costs would range between 0.6 and 2.6 million EUR/y. At a mercury concentration of 0.1% these costs would increase by a factor of 10.

4.11.3.3 Social impacts

As a decrease in mercury recycling is expected to be partly counterbalanced by increased business in final disposal activities, the MI option is not expected to give major changes in the number of people employed in the waste handling business, while the BMC option may result in a moderate loss of jobs in the recycling business due to the lower revenue generated from disposal vs. sale of recycled mercury. Job losses at recyclers may be balanced partly by job gains at importers.

4.11.3.4 Environmental impacts

[Option MC11\(3\)-2](#) (MI), which limits recycling to allowed uses, would potentially result in reduced mercury releases from EU-based mercury recycling, and also in the long run in reduced mercury circulation in society in the EU, if global mercury supply decreases and pushes industry towards substitution of mercury.

In the global context, there is a potential for reduced mercury circulation in society and thereby for reduced releases in the life-cycle of mercury.

These effects are dependent on the developments in the general global supply situation for mercury.

[Option MC11\(3\)-1](#) (BMC) would eliminate mercury releases from mercury recycling in the EU and would have a greater potential for reducing the mercury circulation in society in the global context. It might also have a stronger signal value to other potential parties to the Minamata Convention and thereby a potential for additional release reductions in the mercury life-cycle. Again however, these effects are dependent on the developments in the general global supply situation for mercury.

Releases

The E-PRTR data base was checked, but no aggregated relevant data for mercury releases from mercury recycling were identified.

Mercury input to society

As regards expected reduction of mercury re-introduction (input) to society, a realistic annual potential for the period 2017-2030 is 0-50 t Hg/y. The maximum potential in the long run is estimated at 100-200 t Hg/y.

Severely restricting mercury recycling in the EU would force final environmentally sound disposal of a higher amount of mercury, thus emptying accumulated societal mercury stocks. Other potential benefits (triggered by higher mercury prices) include:

- › stimulating substitution further in dental amalgam use
- › stimulating development and implementation of mercury alternatives in porosimetry and pycnometry (material analysis techniques)
- › making less mercury available on the global mercury market with increasing mercury prices and reduced mercury demand and associated releases in the global context as a result.

4.11.4 Identified data gaps

- › Up-to-date mercury supply data from recycling in the EU.
- › Data on mercury releases from mercury recycling in the EU.
- › Quantities of low content mercury wastes

4.11.5 Conclusions

Both the MI option (which ensures that reclaimed/recycled mercury is only used for allowed uses under the MC or for environmentally sound disposal as defined under the MC) and the BMC option (meaning that recycling/recovery would be fully prohibited) can contribute to positive environmental and health impacts by reducing mercury releases in the life cycle of mercury. The BMC option would have higher positive environmental impact. However the effects of both options are dependent on the developments in the general global supply situation for mercury, and the additional benefit from the BMC option is difficult to assess.

Recyclers would see lower sales of recycled mercury and incur losses of 0-4 million EUR/y (MI) or 2 - 7.8 million EUR/y (BMC). Compensating growth in mercury imports would be expected to meet demand, leading to increased revenues at mercury importers.

The additional waste disposal costs associated with the MI option are estimated at 0 - 100,000 EUR/y for underground disposal as metallic mercury and from 0 - 235,000 EUR/y for underground disposal as stabilised waste. BMC option costs are higher at 90,000 - 200,000 EUR/y for underground disposal as metallic mercury and 200,000 - 470,000 EUR/y for underground disposal as stabilised waste. The costs for disposal of waste with low mercury concentration are difficult to assess but may be significant under both options.

Additional costs for final EMS disposal of waste with medium mercury concentrations of types which would be recycled cannot be quantified precisely; rough estimates are 0-2 mio EUR/y under the MI scenario, and 2-10 mio EUR/y under the BMC scenario).

These will be costs for waste owners and revenues for waste treatment/disposal facilities.

In the MI scenario, certain administrative costs will incur at recyclers and authorities for documenting and controlling that mercury is only sold for uses allowed. The corresponding incremental effort at recyclers and competent authorities is expected to be minimal.

As a decrease in mercury recycling is expected to be partly counterbalanced by increased business in final disposal activities, the MI option is not expected to result in major changes in the number of people employed in the waste handling business, while the BMC option may result in a moderate loss of jobs due to the lower revenue generated from disposal vs. sale of recycled mercury.

The impacts of implementing the MI or the BMC option are influenced by the decision taken on a mercury import ban. If imports for allowed uses are banned and recycling/recovery fully prohibited there will be no remaining mercury source to service EU demand. Therefore, it is suggested that if a general import ban is implemented, recycling should be restricted as described in the MI option. This would allow future demand to be supplied from EU internal recycling.

On the other hand, severely restricting mercury recycling in the EU would force final environmentally sound disposal of a higher amount of mercury, thus drawing down accumulated mercury stocks, while having the added benefit (due to potentially higher mercury prices) of (1) stimulating substitution further in the dental amalgam use (a major EU use) and (2) stimulating development and implementation of mercury alternatives in porosimetry and pycnometry (material analysis techniques; another major use), while (3) at the same time drawing from the global mercury market with potentially increasing mercury prices and reduced mercury demand and associated releases outside the EU as a result. A total recycling ban could thus potentially have higher environmental effect than a total import ban. The potentially larger dependence on external sources of mercury should however be kept in mind, in case this is considered a prioritised issue.

4.12 Other MC Articles

As described in Section 4.1, the options for closing gaps in the EU legislation vis-à-vis the Minamata Convention with potentially significant societal impacts (that is, with score C-2 in the preliminary comparative assessment) were investigated individually in Sections 4.3 -4.11. The current Section addresses, in the table below, options covering other gaps towards the Convention on a keyword level; that is, options which are deemed as having lower impacts (i.e. lower impact scores).

Table 4-35 Overview of impacts of proposed options.

Article and para. in MC	Link to relevant section in this report*1	Impact of MC provision	As compared to the MC, EU law delivers	Preliminary comparative impact scores*2	Summary of potential impacts
3(3)	7.1.2	Ban on new primary mercury mining	De facto compliance or full compliance	C0,A0,E0,S0, $\Sigma 0$	Non-action or simple law text adjustment with no impacts
3(4)	7.1.3	Ban on existing primary mercury mining	De facto compliance or full compliance	C0,A0,E0,S0, $\Sigma 0$	Non-action or simple law text adjustment with no impacts
3(5) lit. (a)	7.1.4	Identification of mercury stocks	Non-compliance	C-1,A-1,E0,S0, $\Sigma -2$	Administrative costs of establishing an inventory of existing mercury stocks
3(5) lit. (b)	7.1.4	Disposal of excess mercury from chlor-alkali facilities as waste	De facto compliance	C0,A0,E0,S0, $\Sigma 0$	Adjust existing wording to ensure compliance; no impacts
3(6)	7.1.5	Ban of mercury export	Full compliance	-	No action needed
3(8)	7.1.6	Ban on mercury import	Non-compliance	C-1,A-1,E1,S0, $\Sigma -1$ //C-2,A-2,E2,S1, $\Sigma -1$	See Section 4.3
4(1)	7.2.2	Prohibition of manufacture/import/ex-port of mercury-added products (Annex A, Part I)	Non-compliance as regards manufacture and export	C-1,A-1,E1,S1, $\Sigma 0$ //C-1,A-2,E1,S1, $\Sigma -1$	See Section 4.4
4(3)	7.2.3	Measures with respect to mercury-added products (Annex A, Part II): Dental amalgam	Non-compliance	C-2,A-2,E2,S1, $\Sigma -1$ //C0,A1,E0,S-1, $\Sigma 0$	See Section 4.5
4(5)	7.2.4	Preventing the incorporation of mercury-added products in	Full compliance	-	No action needed

Article and para. in MC	Link to relevant section in this report*1	Impact of MC provision	As compared to the MC, EU law delivers	Preliminary comparative impact scores*2	Summary of potential impacts
		assembled products			
4(6)	7.2.5	Obligation to "discourage" manufacture and distribution of new products	Non-compliance	C-2?,A0,E2?,S1,Σ1?	See section 4.6
5(2)	7.3.2	Prohibition of mercury use in the processes listed in part I of Annex B	Non-compliance	C0,A0,E0,S0,Σ0	Introduce explicit ban on acetaldehyde production with mercury catalysts (an obsolete process in the EU)
5(3)	7.3.3	Obligation to restrict the use of mercury in the processes listed in part II of Annex B	Non-compliance	C-2,A-2,E2,S1,Σ-1 //C0,A0,E0,S-1,Σ-1	See Section 4.7
5(5)	7.3.4	Identify Annex B facilities within its territory and quantify amounts used (soft law)	Full compliance / non-compliance	C0,A-1,E0,S1,Σ0	Administrative costs for performing a study
5(6)	7.3.5	Prohibition of using mercury in new Annex B facilities	Non-compliance	C-2,A-2,E2,S1,Σ-1	See Section 0
5(7)	7.3.6	Discourage "the development of new facilities using any other mercury-based manufacturing process	Non-compliance	C-2?,A0,E2?,S1,Σ1? //C-2?,A-2+, E2?,S1,Σ-1?	See section 4.6
7(2)	7.4.2	Reduce/eliminate emissions from Artisanal and small-scale gold mining (ASGM)	Non-compliance	C-1,A-1,E1,S1,Σ0	Introduce explicit EU restrictions on mercury use in gold mining. Impacts on miners in one MS and administrative costs for implementation and enforcement
7(3)	7.4.3	Determination of significance of ASGM / Developing and	Non-compliance	C0,A0,E0,S-1,Σ-1	Administrative efforts for establishing significance/non-significance and potential development of an action plan

Article and para. in MC	Link to relevant section in this report*1	Impact of MC provision	As compared to the MC, EU law delivers	Preliminary comparative impact scores*2	Summary of potential impacts
		implementing a national action plan if applicable		//C-1,A-1,E1,S1,Σ0	
8(3) / 8(4)	7.5.3	Require BAT/BEP for new sources	Compliance not determined	C-2,A-2,E2,S1,Σ-1	See Section 4.9.1
8(3) / 8(5)	7.5.4	Emission control measures for existing sources	Compliance not determined	C-2,A-2,E2,S1,Σ-1	See Section 4.9
8(7)	7.5.5	Establish emissions inventory	Compliance not determined	C-1,A-1,E0,S1,Σ-1 //C0,A0,E0,S-1,Σ-1	Industry costs and administrative costs of establishing an inventory, if necessary (possibly by adjusting reporting requirements of the existing E- PRTR)
9(3)	7.6.2	Identify relevant sources for releases (to water and land)	Compliance not determined	C-1,A-1,E0,S1,Σ-1	Industry costs and administrative costs for identifying sources and maintaining an inventory (possibly just based on the existing E- PRTR)
9(4)	7.6.3	Releases control	Compliance not determined	C0,A0,E0,S-1,Σ-1 //C-2?,A-2?,E2?,S1,Σ-1	Non-action or designate relevant sources and target any gaps identified; the latter with potential impacts on involved stakeholders (see details of analysis in Section 7.6.3); not further assessable at present
9(6)	7.6.4	Establish release inventory	Compliance not determined	C0,A0,E0,S-1,Σ-1 //C-1,A-1,E1,S1,Σ0	Non-action or adjust E-PRTR to meet MC obligations
10(2)	7.7.2	Storage of non-waste mercury	Compliance not determined	C-1,A0,E1,S1,Σ1 //C-1,A-1,E1,S1,Σ0	Implement/build out standards for interim storage of mercury. Costs for involved industry stakeholders and administrative costs for establishment and enforcement
11(3)	7.8.2	Mercury waste	Compliance not determined	C-2,A-2,E2,S1,Σ-1 //C-1,A-1,E1,S1,Σ0 //C-1,A0,E1,S1,Σ1	See Section 0

Article and para. in MC	Link to relevant section in this report*1	Impact of MC provision	As compared to the MC, EU law delivers	Preliminary comparative impact scores*2	Summary of potential impacts
12(1)	7.9.2	Contaminated sites (soft law)	Non-compliance	C0,A-1,E0,S1,Σ0 //C0,A-2,E0,S1,Σ-1	Non-action or administrative efforts for inventory
16(1)	7.11.2	Health aspects	Full compliance	-	No action needed

Notes:

*1 Place cursor on section number and Ctrl + click to follow link (in MS Word only).

*2: According to comparative assessment presented in Section 4.13.2; societal impacts across all options for this MC article. For details on scores, click [here](#). Scores:

C: Socio-economic costs/impacts: 0 = minimal, -1 = moderate, -2 = potentially significant costs.

A: Administrative/political efforts (by EU and MS authorities): 0 = minimal, -1 = moderate, -2 = potentially significant efforts.

E: Environmental benefits: 0 = minimal, 1 = moderate, 2 = potentially significant benefits.

S: Signal effect towards other Parties of the MC: 0 = neutral, +1 = signalling high-ambition implementation of the MC, -1 = signalling low-ambition implementation of the MC. *

4.13 Final disposal of metal mercury

As an additional element of study, this section gives a summary based on two recent studies of the impacts of underground disposal of metal mercury in elemental liquid mercury form versus as stabilised prior to disposal. For other aspects of the mercury waste issue, see section 4.11.

4.13.1 Technical considerations

In an environmental and economic assessment of relevant options for the temporary and permanent storage of metallic mercury, BiPRO (2010) has evaluated four relevant options for the final disposal of metallic mercury and concluded that three out of the four options can be recommended for environmentally sound final disposal of metallic mercury (see section 4.11.3.1). The recommended options are all underground disposal options of stabilised or liquid mercury, while above ground disposal was not recommended.

In the environmental assessment a relevant uncertainty was identified related to the underground disposal of liquid mercury in salt rock formations. The storage of liquid mercury in salt rock is generally seen as a safe storage option. Under the precondition that a safe encapsulation of the waste mercury is ensured, a high level of protection of the biosphere is given. However, it was stated that (1) “... compared to the disposal of stabilised mercury lower safety margins apply in case of an unforeseen severe incident like flooding of the salt mine – due to the significantly higher solubility of metallic mercury in water compared to stabilised mercury.” and (2) “...little is known about the long-term behaviour of liquid mercury in the salt rock formation.” (BiPRO, 2010).

Disposal options involving stabilisation of metallic mercury prior to final disposal are related to reduced risks of mercury releases particularly due to the low solubility of the stabilised waste (see BiPRO, 2011). Against this background the question arises whether metallic mercury should be stabilised prior to final disposal.

Since then Hagemann et al. (2014) investigated the risks for operational and long-term safety of underground storages of metallic mercury in salt formations and their potential mobilisation by saline solutions (see also section 4.11.3.1).

The results of Hagemann et al. (2014) can contribute to decrease the uncertainties identified in the BiPRO (2010) study concerning the long term safety and behaviour of mercury in an unforeseen severe incident like flooding of the final disposal site where liquid mercury in salt rock is disposed.

Concerning the long term safety in salt rock Hagemann et al. (2014) conclude that “...neither elemental mercury nor mercury sulphide exhibit properties that threaten the long-term safety of an underground landfill”.

Concerning an unforeseen severe incident like flooding of the final disposal site in salt rock Hagemann et al. (2014) conclude “In the hypothetical event of a failure of the technical barriers, from a geochemical perspective, both elemental mercury and

mercury sulphide are suitable for deposition in salt mines. In the hypothetical event of a solution inflow, the low solubility of elemental mercury and mercury sulphide acts as an internal barrier.”

Due to environmental concerns, BiPRO (2010) did not recommend final disposal of mercury in above ground disposal sites; particularly because of possible releases of mercury to the environment. Hagemann et al. (2014) confirm this assessment. They expect that the surface sealing of above ground facilities will be permeable to air in the long term. Mercury sulphide can then come into contact with atmospheric oxygen and become oxidised to elemental mercury and sulphate. The formation of methylmercury may occur under suitable geochemical conditions. A landfill with mercury sulphide would inevitably become a local source of mercury emissions. Both elemental mercury as well as methylmercury can leave the landfill via the generally occurring off-gassing (landfill gas). Hagemann et al. (2014) conclude that the deposit of mercury sulphide as well as of other high-concentration mercury waste should be prohibited in above-ground landfills.

Further technical details can be found in the corresponding studies BiPRO (2010) and Hagemann et al. (2014).

BiPRO (2010) describes waste acceptance criteria and facility related requirements for the temporary and permanent storage of mercury specifying requirements on:

- › Composition of the mercury
- › Containments
- › Acceptance procedures
- › Certificates
- › Record keeping
- › Facility related requirements
- › Monitoring inspection and emergency

Many of these requirements have been taken over in Directive 2011/97/EU amending Directive 1999/31/EC as regards specific criteria for the storage of metallic mercury considered as waste. However, at that time additional assessments of the long-term behaviour of metallic mercury in underground storage were not available for the determination of sound and knowledge-based requirements for permanent storage. The requirements laid down in Directive 2011/97/EU are therefore limited to temporary storage and are considered as appropriate and representing the best available techniques for the safe storage of metallic mercury for a time span of up to 5 years (see recital 10 of Directive 2011/97/EU).

Hagemann et al. (2014) investigated the risks for operational and long-term safety of underground storages that result from the specific properties of metallic mercury and for mercury sulphide, which results from most procedures for the stabilisation of metallic mercury. On this basis, measures were derived, which may help to reduce the risks to an acceptable level. Hagemann et al. 2014 propose the following requirements:

Table 4-36 *Recommended additional requirements for the permanent storage of metallic mercury and mercury sulphide (from Hagemann et al. (2014))*

Process / Event	Recommended requirement for the permanent storage of metallic mercury	Recommended requirement for the permanent storage of mercury sulphide
Certification / Labelling	Permanent labeling of inner and outer containers, certificate of producers, amount, and test results similar to Directive 2011/97EU, additional test result of the independent expert.	Permanent labeling of inner and outer containers, certificate of producers, amount, and test results similar to Directive 2011/97EU.
Acceptance control	Advanced acceptance control (purity, identity) by an independent expert and an accredited testing laboratory. No open handling of mercury in the underground storage.	-
Container corrosion	Minimum purity of mercury 99.9% by weight, absence of aqueous, oily, or solid phases. Containers should be corrosion-proof with respect to storage conditions.	-
Underground mechanical impact	Use of containers from which no mercury leaks during mechanical impacts (impact, crash) which cannot technically be excluded. For multiwalled containers: increase in geomechanical stability due to pressure-resistant elements, e.g. concrete.	For multi-walled containers: avoidance of cavities to increase geomechanical stability.
Thermal impact	Use of containers from which no mercury leaks during mechanical and subsequent thermal impacts (vehicle fire) which cannot technically be excluded. Example: multiple-walled containers with thermal insulation.	Use of containers from which no mercury leaks during mechanical and subsequent thermal impacts which cannot technically be excluded. Example: multiple-walled containers with thermal insulation.
Storage area	Facility separate from storage areas for other types of waste Storage in stages Immediate backfilling and closure Lower floor level.	Facility separate from storage areas for other types of waste Storage in stages Immediate backfilling and closure.
Occupational safety	Multiple daily concentration measurement in open storage sections in which work is being done Visual inspection of open storage sections at least once a month Providing personal protective equipment.	Providing personal protective equipment.
Fire protection	Minimising fire loads and ignition sources in the storage area. Avoiding oncoming traffic and overtaking on transport routes. Setting a maximum speed and avoiding above-ground and underground interim storage Storage area can be separated from the remaining mine operation by ventilation structures.	Minimising fire loads and ignition sources in the storage area. Avoiding oncoming traffic and overtaking on transport routes. Setting a maximum speed. Storage area can be separated from the remaining mine operation by ventilation structures.

Process / Event	Recommended requirement for the permanent storage of metallic mercury	Recommended requirement for the permanent storage of mercury sulphide
Emergency planning	Preparation of plans and measures for the event that a release of mercury has occurred (e.g. leakage or fire).	Preparation of plans and measures for the event that a release of mercury has occurred (e.g. fire).
Emergency planning	Preparation of plans and measures for the event that a release of mercury has occurred (e.g. leakage or fire).	Preparation of plans and measures for the event that a release of mercury has occurred (e.g. fire).

These requirements could be taken into consideration in any supplement to or adjustment of the criteria for the storage of metallic mercury as laid down in Directive 2011/97/EU in order to target permanent disposal of metallic mercury.

4.13.2 Economic impacts

An economic assessment of (among other) final disposal options is discussed in BiPRO (2010). In the following, the relevant information from the economic assessment is summarised for the following disposal options (for details see BiPRO 2010):

- 1 Permanent storage of liquid mercury in salt mines
- 2 Pre-treatment (stabilisation) + permanent storage of stabilised mercury in salt mines
- 3 Pre-treatment (stabilisation) + permanent storage of stabilised mercury in deep underground hard rock formations
- 4 Pre-treatment (stabilisation) + permanent storage of stabilised mercury in above ground facilities

For the economic assessment the following costs have been estimated and evaluated:

- › Permanent storage costs (incl. engineering and construction costs if necessary)
- › Costs of a temporary storage of metallic mercury
- › Costs for maintaining, monitoring and inspection of the permanent storage site before its final closure (time period depends on the expected closure time of the storage site)
- › Transportation costs
- › Capital costs for the pre-treatment facility
- › Operating and maintenance costs for the pre-treatment process

The assessment is based on information available. For several parameters only estimates are available as no specific quantification is available.

Each option is more cost intensive when it involves pre-treatment, as additional handling, processing and transports is required. Storage costs charged for the disposal in salt mines range between 260 - 900 € per tonne. Storage costs at hard rock formations are in general low but highly depend on the necessary engineering and construction measures which have to be implemented for the specific waste and/or location.

Specific containers are only required for the storage of metallic mercury. Costs for these containers are in a range between 600 - 1,100 Euros per tonne of metallic mercury. For stabilised products big bags or drums are used which are significantly cheaper (~ 10 €/t).

Transport costs are in particular relevant for options including pre-treatment subsequent permanent storage. Transport costs are estimated to amount to approximately 140 €/t metallic mercury.

The number of available storage sites only plays a minor role in case of metallic mercury. The main producers of metallic mercury waste (chlor-alkali plants) are spread around Europe. The existence of several storage options for metallic mercury would not significantly reduce the costs but would require additional costs for the preparation of storage sites for a relatively low volume of waste (due to the high density of mercury).

In case of a pre-treatment (stabilisation) the costs will increase significantly as additional transports (from the pre-treatment site to the final disposal site) are necessary. The pre-treatment results in a product with higher volume and higher total weight than metallic mercury. For the sulphur stabilisation, an elevation of the weight (at least 16%) and volume (around 500%) has to be considered. As a consequence transport costs and the number of transports significantly increase. Therefore it is advantageous to have short distances from the pre-treatment site to the storage site. As for pre-treated products different types of disposal sites (salt rock, hard rock) are possible, the transport costs might be reduced by selecting the nearest appropriate disposal site.

Specific cost estimates are available for the sulphur stabilisation process. The pre-treatment including transport costs and final disposal is around 2,000 €/t metallic mercury. These costs also include the capital costs and the operational costs for the plant. Only one company offered this price (in 2010). All other technologies seemed to be more expensive. However, COWI (2012) gave examples of similar price levels for other comparable waste types.

Costs for inspections, monitoring and surveillance are considered comparatively low.

Hagemann et al. (2014) do not provide additional relevant information for the economic assessment. Against this background the above listed options are evaluated as follows:

Option (1): Permanent storage of liquid mercury in salt mines

This option is considered to be the most economic disposal solution. Storage costs range between 300 and 900 €/t metallic mercury plus the costs for the container with around 600 – 1,100 €/t metallic mercury. The transport costs are relatively low as only one transport from the waste generator to the salt mines is required. The total cost thus range between 900 and 2,000 €/t metallic mercury.

Option (2): Stabilisation and permanent storage in salt rock

The pre-treatment process is the most cost intensive part of this option. The costs for the stabilisation, the transport to the disposal site and the final disposal costs are at least 2,000 €/t metallic mercury.

No specific container is required. The stabilized product can be disposed in relatively cheap big bags or drums.

Storage costs increase significantly due to the increased amount of waste which has to be stored. Storage costs are typically charged per tonne of waste. Each stabilisation process results in higher volume as well as increased total weight compared to metallic mercury.

The transport costs are higher compared to option (1) as additional transports are required. The transport costs from the pre-treatment site to the final disposal site depend on the distance and the number of available storage sites.

Option (3): Stabilisation and permanent storage in hard rock

The economic situation of option (3) is very similar to option (2). The mere disposal costs of pre-treated mercury in hard rock or salt rock formations are relatively low compared to the other costs. No information was available on the number of sites fulfilling the requirements for the storage of stabilised mercury in hard rock formations.

Ranking

In conclusion, option (1) is considered the most economic option. Options (2) and (3) have similar costs which are higher compared to option (1).

4.13.3 Environmental impacts

BiPRO 2010 also contains an environmental assessment of the four above listed options.

The following aspects have been considered in the evaluation:

- › Level of protection of the environment in case of permanent storage
 - › Protection of the ground water against mercury
 - › Protection of the biosphere
- › Hg-emissions during storage and handling
- › CO₂ emissions resulting from transport

- › Energy consumption
- › Reversibility (in case of temporary and permanent storage)
- › Safety of workers
- › Removal of mercury from the biosphere
- › Prevention against natural events
- › Monitoring possibility
- › Possibility of corrective actions with or without incidents
- › Safety margins in case of incidents

The level of protection of the environment and human health is the most important criterion of the environmental assessment. Independently of which type of waste is stored - metallic or stabilised - the release of mercury or mercury compounds into the environment should be prevented as far as possible.

Underground storage sites provide generally a higher level of protection of the environment against mercury releases compared to above ground storage sites. Each underground storage facility needs a site specific risk assessment which provides the long term safety of the stored waste in the facility.

Mercury emissions might occur during the transport, handling but also storage of the metallic mercury. It is obvious that the number of handling processes will increase the probability of mercury emissions/releases. Therefore single permanent storage solutions were considered environmentally more favourable concerning possible mercury releases than options including pre-treatment.

Each transport is related to CO₂ emissions. Therefore options with several transport requirements are assessed as less environmental favourable than options with only one transport way. On the other hand options which include the possibility of several storage sites all around Europe are seen as environmentally more beneficial as regards the CO₂ emissions resulting from transports due to shorter distances. The risk of mercury emission during the transport of stabilised products is considered negligible but the number of transports increases resulting in higher corresponding CO₂ emissions.

For the transport of metallic mercury the requirements of the transport of hazardous waste apply. The risk of an incident is considered very low but in case it happens the consequences for the environment are considered significantly higher compared to the transport of stabilised mercury.

The energy consumption of permanent storage without prior treatment is considered very low. Energy consumption is in particular relevant for options with pre-treatment processes. For the stabilisation of the metallic mercury energy is required. However, due to the fact that in case of the sulphur stabilisation the process is slightly exothermic the energy consumption is moderate. However, energy is required e.g. to provide vacuum conditions or for mixing.

In case of a permanent storage of stabilised waste only storage in hard rock formations and above ground storage would allow the retrieval of the permanently stored waste. Due to the creeping potential of salt rock, the retrieval of permanently stored waste in salt mines is only possible for a certain time period.

The safety of workers includes the prevention against possible exposure to mercury and mercury vapour. In case of a pre-treatment the probability of an exposure therefore increases. However, also a permanent storage in salt mines might have the risk of exposure to mercury e.g. in case of leaking containment or any other incident.

The removal of mercury from the biosphere is an important aspect of permanent storage. A permanent storage providing the highest degree of removal of the mercury from the biosphere is environmentally more favourable. In particular permanent underground storage facilities are constructed and designed in a way to remove the waste from the biosphere.

Permanent above ground storages have the disadvantage that interaction with the environment and emission of the waste to the environment are more likely compared to underground options. Also the consequences of natural catastrophes are considered to have a stronger impact in case of above ground storage compared to underground storage options.

These disadvantages might be compensated by the easier access to the waste in case of any incidents. The monitoring and the possibility of interventions are easier for above ground facilities.

Against this background and in the light of relevant additional information from Hagemann et al. (2014), the above listed options are assessed as follows:

Option (1): Permanent storage of liquid mercury in salt mines

The storage in salt rock is generally seen as a safe storage option. Under the pre-condition that a safe encapsulation of the waste mercury is ensured, a high level of protection of the biosphere is given.

This evaluation is supported by the conclusions from Hagemann et al. (2014) (see above)

- › concerning an unforeseen severe incident like flooding of the final disposal site in salt rock it is stated that even in the hypothetical event of a failure of the technical barriers both elemental mercury and mercury sulphide are suitable for deposition in salt mines.
- › concerning the long term safety in salt rock it is stated that neither elemental mercury nor mercury sulphide exhibit properties that threaten the long-term safety of an underground landfill (in salt rock formations).

After the closure of the salt mine, the possibility of corrective actions with or without an incident is low or not given.

Once the facility is closed the retrieval of the waste is very difficult or even not possible without major risks for the whole storage site.

Option (2): Stabilisation and permanent storage in salt rock

The solid pre-treated product should, in a long term, be encapsulated within the salt rock formation. Even in case the pre-treated product gets in contact with water due to unforeseeable circumstances the low solubility of the product keeps the environmental pollution limited, and releases are distributed over a very long time period. Due to this, a rapid release of mercury to the environment resulting in acute local contamination can be considered unlikely.

Possible mercury emissions during the handling, stabilisation and transport have to be taken into consideration. Further transports are required to bring the stabilised product to the storage site. From an environmental point of view the increased CO₂ emissions from the transport are negligible compared to the higher protection level of the environment. Mercury emission during the stabilisation processes highly depend on the established emission control measures. Applying state-of-the art equipment reduces significantly mercury emissions during the handling and stabilisation process.

BiPRO (2010) considered option (2) to be the most beneficial solution from an environmental point of view. In the light of the new information provided by Hagemann et al. (2014) option (1) is now considered equally beneficial for the environment or even slightly more beneficial due to possibly lower mercury emissions (less handling), reduced transport costs and less energy demand.

Option (3): Stabilisation and permanent storage in hard rock

Underground hard rock formation storage facilities are seen as a safe storage option by applying adequate multi-barrier systems. A total encapsulation of the waste is not possible as it is the case in salt rock formations and which is an additional environmental safety factor.

Option (3) is comparable to option (2) but due to the fact that in hard rock formations a total encapsulation is not possible and in addition presence of water cannot be completely excluded. The risk of mercury entering the biosphere via water flows over the long term has been assessed slightly higher compared to salt mines. Due to these risks solidification of liquid mercury should be mandatory prior to final disposal in hard rock formations.

On the other hand hard rock formations with stable cavities allow corrective measures over a long time period. With reference to the safety of workers no difference are seen between salt mines and hard rock formations. The retrievability of the stored material is given.

Option (4) Stabilisation and permanent above ground storage

The permanent above ground storage of stabilised mercury is evaluated as less favourable compared to the underground storage options. The risk of an interaction with the environment (e.g. penetrating rain water, floods) with a subsequent release of mercury from the storage site has been assessed higher compared to underground storage. Although in case of unforeseen incidents potential emissions can be detected and counter measures could be applied the risk of mercury entering the environment is still very high. Once the protection barrier of the site is destroyed the possibility to stop mercury entering the environment is very limited.

This assessment is confirmed by Hagemann et al. (2014) which conclude that the deposit of mercury sulphide as well as of other strong mercury waste should be prohibited in above-ground landfills because above ground landfills will become a source of mercury releases in the long term (see above).

The retrievability of the waste is given but on the other hand the risk of unauthorised retrieval of the stabilised waste is higher compared to underground storage.

Ranking

In conclusion, option (1) is considered the environmentally most advantageous option. Options (2) and (3) are slightly less beneficial from an environmental perspective due to possibly higher mercury emissions (increased handling required), higher transport efforts and higher energy demand. Option (4) is considered associated with significant environmental disadvantages.

4.13.4 Conclusion

Based on the findings of the two authoritative studies reviewed, permanent storage of liquid mercury in salt mines (option (1)) is considered the most favourable option both from an environmental and economic perspective. Also stabilisation and permanent storage in salt rock (options (2)) and stabilisation and permanent storage in hard rock (option 3) are considered environmentally sound disposal options. It should be noted that solidification of liquid mercury should be mandatory prior to final disposal in hard rock formations.

5. Integrated analysis and comparison of scenarios

In this section the assessment of the three scenarios:

- › Business as usual (no further actions)
- › Minimal implementation (“MI”; package of options that ensure compliance with MC)
- › Beyond MC implementation (“BMC”; by each option that go further than the perceived minimal implementation of the MC)

is summarised with regard to their economic, social, environmental and administrative impacts in an integrated fashion.

The specific options included in each scenario have been described in Section 4 and the detailed assessment of the impacts are presented in Section 5.

This impact assessment focuses on the societal implications of the implementation of the obligations of the Minamata Convention which go beyond the current EU legislation. It focuses on the individual steps in the mercury lifecycle addressed in the Minamata Convention, organised by its articles, and does not go into detail of how the obligations can legally be implemented in EU law. The impact assessment includes analysis of economic, social and environmental impacts (point 8.3 of the Commission IA Guideline), administrative burdens to competent authorities (point 8.4 of the IA Guideline), but not simplification (point 8.5 of the IA Guideline), transposition or compliance.

5.1 Legal baseline

The provisions of the Minamata Convention on Mercury mirror to a high degree the existing EU legislation on mercury, and the overall goals of the Convention are in line with the EU Mercury Strategy. This means that the EU has already realised much of the potential for mercury release reductions that the Convention aims for. Any assessment of the necessary adjustments to EU law to enable EU ratification of the Minamata Convention should be seen in this light.

This study has adopted a relatively conservative¹¹ assessment of the gaps in the EU mercury legislation vis-à-vis the Minamata Convention. Several issues are open for interpretation, and the actual proposals for meeting identified gaps will be subject to the Commission's discretion.

The gap assessment confirmed that most of the Convention provisions are already met or could be met by making minor adjustments to EU law. These adjustments are expected to have minimal impacts. In a few instances, current EU legislation clearly does not meet the obligations of the Minamata Convention. In some instances, there are unresolved questions regarding the degree of coverage of the present EU legislation.

5.2 Impacts of a business as usual scenario

A business as usual scenario would be in conflict with the EU Community Strategy on Mercury and the stated intentions of the EU to ratify the Minamata Convention. It would have the direct consequence that the mercury exposure imposed by mercury release sources within the EU territory would not be reduced. Furthermore, a significant part of the atmospheric mercury deposition in the EU has origin outside its territories, due to long range atmospheric transport. Additional mercury is transported with ocean currents and rivers to EU waters. The EU is therefore dependent on the global cooperation towards reducing anthropogenic mercury releases, in order to substantially reduce mercury exposure of humans and the environment in its territories. The EU not ratifying the Convention could reduce the chances significantly of the Convention reaching the needed global mercury release reductions.

5.3 Impacts of a minimal implementation (MI) scenario

5.3.1 Economic impacts

The table below lists the identified economic impacts of a strictly minimal implementation of the Minamata convention in the EU, organised by article of the Convention. The table's indications of impacts focus on articles where gaps in the EU legislation were identified (see details in section 3).

The potentially most significant economic impacts are expected in the chemicals production sector, where a mercury process is currently applied for production of alcoholates used for various catalytic processes.

Significant costs may also arise for the incremental reduction of mercury air emissions from major sources categories addressed in the Minamata Convention. Most of the mercury release sources in the relevant categories are considered covered by existing EU legislation, yet the assessment of the coverage of current EU legislation is more uncertain here, and a need for additional policy measures

¹¹ Meaning strict.

cannot be ruled out. The costs indicated in the table for new sources reflect assumptions for BAT/BEP definitions for coal fired combustion plants currently in development under the Minamata Convention. Also here, relevant EU legislation was however planned already (the proposed Medium Combustion Plant Directive), which is expected to cover at least part of the need in this regard.

Total quantified costs of a strictly minimal implementation of the Minamata Convention are estimated at 0-160 million in investments plus annual costs of 0-65 mio EUR. Additional costs, not quantified in the assessment, are expected. Annualising the quantified investment costs and adding the annual operational costs gives total annual costs of 0 to 90 million EUR¹².

Table 5-1 Summary of Economic impacts by (sub-) article of the MC.

MC article	Economic impacts by (sub-) article of the MC
3	No significant economic impacts (0-0.4 mio EUR foregone profits for importers).
4	<p>4 (1): Restriction of export of products: Impacts are expected to be moderate. Detailed assessment has not been possible.</p> <p>4(3): Dental amalgam: No major impacts of the MI scenario.</p> <p>4(6): Discouragement of new mercury-added products: Impacts are deemed unlikely based on history, especially under a soft interpretation of “discouragement”.</p> <p>Other sub-articles: No significant impacts.</p>
5	<p>5(3): Existing alcoholates production with a mercury process: Under a soft interpretation (MI scenario), impacts are deemed more moderate than with an outright ban (BMC scenario) as producers would have more time to identify technically and economically feasible alternatives. Substitution could require incremental investments of an estimated 0-140 million EUR plus increased production costs in excess of 2-30 mio EUR/year. Annualising the investment costs over a 10 year period will give 0 to 23 million EUR per year and combined with the increased operational costs the total additional annual costs can be estimated at 2-53 million EUR¹³. These numbers cover only the alcoholate produced in the largest quantities (sodium methylate), for which an alternative production process is in commercial use. Two others (sodium ethylate and potassium methylate for which alternatives are also available and in use and are more costly than the mercury process), are produced in volumes ~10-100 times lower than sodium methylate. The fourth alcoholate (potassium ethylate) is not currently registered under REACH, meaning that it is only produced in quantities below 100 tonnes/year in the EU. No commercially mature alternative production process is currently available for this fourth substance. Total costs of</p>

¹² The investment costs are annualised using 10 year and 10% in order to have comparability with other estimates presented in this report, for which other parameters could not be selected. If instead using 4% as discount rate, the total annual costs would be 2 to 85 million EUR.

¹³ The investment costs have been annualised using a discount rate of 10%. The EU IA guidance suggests that a 4% discount rate should be applied. Using 4% instead of 10% the total annual costs will be 2-47 million EUR instead of 2-53 million EUR.

MC article	Economic impacts by (sub-) article of the MC
	<p>substitution for all four substances are here roughly assumed to not exceed 160 mio EUR for investments plus up to 40 mio EUR/y in higher production costs. Annualising the investment using the same assumption as above yields annualised investment costs of about 0-25 million EUR and so total additional annual costs for substitution of less than 65 million EUR¹⁴.</p> <p>5(6): New Annex B MC facilities: Impact types limited to those described for 5(3).</p> <p>5(7): Discouragement of new mercury using processes: Impacts are deemed unlikely based on history, especially under a soft interpretation of “discouragement”.</p> <p>Other sub-articles: No significant impacts.</p>
7	No significant impacts in the EU perspective.
8	<p>8(3+4): Most source categories are assumed to be covered by the Industrial Emissions Directive. The determining BAT/BEP requirements under the MC are not yet defined. MC obligations for minor coal fired boilers are expected to be covered, at least partially, by the proposed Medium Combustion Plants (MCP) Directive. Based on realistic assumptions for future MC BAT/BEP definitions, incremental costs (beyond those already incurred by the MCP Directive) are estimated at 0-20 mio EUR/year.</p> <p>8(3+5): Most source categories are assumed covered by the Industrial Emissions Directive. MC obligations for minor coal fired boilers are expected to be covered by the proposed Medium Combustion Plants (MCP) Directive (potentially with slightly adjusted wording), with no incremental impacts from implementation of the MC.</p>
9	<p>9(4): If the none-action path is chosen, no costs are incurred (but this may send negative signals to other Parties to the MC). Otherwise identification of relevant source categories, and follow up actions for these, could result in significant costs could be needed, but they cannot be assessed at this stage.</p> <p>Other sub-articles: Moderate costs are anticipated.</p>
10	Moderate costs are anticipated for implementation of interim storage requirements (requirements are not yet defined).
11	<p>11(3): Procedures that ensure that recycled mercury is only used for purposes allowed under the MC could cause minor loss of revenue for recyclers due to reduced mercury demand (0-4 mio EUR) and minor costs for waste owners (consumers) for final disposal of waste with high concentration of mercury. These costs to waste owners are estimated at 0-0.2 mio EUR (depending on demand reductions and disposal mode). Additional costs for waste with moderate mercury concentrations, yet suitable for recycling, are estimated at 0-2 mio EUR/y.</p>

¹⁴ 10 years and 10% as discount rate. Using 4% as discount rate the annualised costs will be 20 million EUR and the total annual costs including the increased operational costs will be 70 million instead of 75 million EUR.

MC article	Economic impacts by (sub-) article of the MC
12	No impacts under MI scenario (soft law).
-	Total <u>quantified</u> costs under a minimal implementation scenario: 2 to 90 million EUR.

5.3.2 Social impacts

The table below lists the social impacts of a strictly minimal implementation of the Minamata convention in the EU. The impact assessment focuses on articles where gaps in the EU legislation were identified.

The assessment of the social impacts focuses here only on the possible employment changes in the affected industries. The employment effects are distribution effects which might be only transitional. The public health effect from reduced exposure to mercury which is one of the most important benefits of the MC is described under environmental effects via the indirect indicators reduced releases of mercury and reduced input to society of mercury. The latter indicates a risk of releases.

No major social impacts are expected under a minimal implementation scenario.

Table 5-2 Summary of social impacts by (sub-) article of the MC.

MC article	Social impacts by (sub-) article of the MC
3	No significant impacts.
4	<p>4 (1): Restriction of export of products: Impacts are expected to be moderate. Detailed assessment has not been possible.</p> <p>4(3): Dental amalgam: No major impacts.</p> <p>4(6): Discouragement of new mercury-added products: Impacts are deemed unlikely based on history, especially under a soft interpretation of “discouragement”.</p> <p>Other sub-articles: No significant impacts.</p>
5	<p>5(3): Existing alcoholates production with a mercury process: Numbers are uncertain but may indicate a minor loss in the order of 0-200 jobs.</p> <p>5(6): New Annex B MC facilities: No additional social impacts.</p> <p>5(7): Discouragement of new mercury using processes: Impacts are deemed unlikely based on history, especially under a soft interpretation of “discouragement”.</p> <p>Other sub-articles: No significant impacts.</p>

MC article	Social impacts by (sub-) article of the MC
7	Impacts on ASGM miners in French Guiana (to our unconfirmed knowledge mercury use is already illegal there, and in that case any impacts would not be incremental compared to the present situation).
8	8(3+4): No incremental social impacts are expected. 8(3+5): No incremental social impacts are expected.
9	9(4): If a none-action path is chosen, no social impacts are incurred. If not, moderate social impacts could be a result (cannot be assessed at this stage). Other sub-articles: Moderate impacts are anticipated.
10-12	No significant impacts expected.

5.3.3 Environmental impacts

The implementation of the Minamata Convention is expected to have significant environmental impacts globally, and it will also reduce the inflow of mercury from global sources to the EU territory. As mentioned, the EU has already realised much of the potential for mercury release reductions within its own territory. Release reductions outside of the EU may thus have relatively significant impacts within the EU territory.

As regards mercury release reduction within the EU itself, the level of ambition in the implementation of the Convention is also expected to have significant influence on the environmental impacts within the EU territory. In a minimal implementation scenario however, the incremental mercury release reductions are expected to be moderate.

The table below lists the environmental impacts of a strictly minimal implementation of the Minamata convention in the EU, organised by articles of the Convention which place explicit obligations on the EU.

Table 5-3 Summary of environmental impacts by (sub-) article of the MC.

MC article	Environmental impacts by (sub-) article of the MC
3	As dedicated mining is already <i>de facto</i> prohibited in the EU, no incremental impacts of EU implementation of this aspect of the MC are expected.
4	4 (1): Globally: Reduced releases and exposure from EU-produced mercury-added products. EU: Indirect impacts from the life cycle globally of mercury in these products. 4(3): Dental amalgam: EU (and indirectly globally): Moderate, but slow incremental impacts are

MC article	Environmental impacts by (sub-) article of the MC
	<p>expected under a minimal implementation (soft MC provisions).</p> <p>4(6): Discouragement of new mercury-added products: Impacts are deemed unlikely based on history, especially under a soft interpretation of “discouragement”.</p> <p>Other sub-articles: No significant impacts.</p>
5	<p>5(3) and 5(6): EU (alcoholates production): Air emission reductions: Up to about 0.2 tonne mercury/year. Reductions of mercury input to society and associated potential emissions/releases: 0.3-1 tonne mercury/year.</p> <p>5(7): Discouragement of new mercury using processes: Major impacts are deemed unlikely based on history, especially under a soft interpretation of “discouragement”.</p> <p>Other sub-articles: No significant impacts.</p>
7	Potential impacts in French Guiana (it is understood, though not confirmed, that use of mercury is already illegal there, and in that case impacts would not be incremental compared to the present situation).
8	<p>8(3+4): EU: Depending on the ongoing definition of BAT/BEP under the MC, incremental reductions of mercury releases may occur, beyond what the current MCP Directive proposal can deliver. Incremental emission reductions in the order of 0.2-0.5 t/y may be expected.</p> <p>8(3+5): EU: Incremental reductions of mercury releases are not expected, beyond what the current MCP Directive Proposal can deliver.</p>
9	9(4): If a none-action path is chosen, no incremental environmental impacts will occur. If action is taken, moderate to significant release reductions may be the result. Cannot be assessed further at this stage.
10	Interim storage requirements may potentially result in elimination of future mercury spills and associated exposures.
11	11(3): Minimal environmental impacts are expected under the MI scenario.
12	No impacts under the MI scenario (soft law).

5.3.4 Administrative burdens

As described in the table below, moderate incremental administrative burdens to competent authorities are expected from the implementation of the Minamata Convention, beyond those associated with implementing the Convention provisions in EU law. In many cases similar or equivalent enforcement and administration procedures are already in place, and administrative processes can likely be coordinated to minimise incremental burdens.

Table 5-4 Summary of administrative burdens by (sub-) article of the MC.

MC article	Administrative burdens by (sub-) article of the MC
3	3(8): Moderate incremental efforts for administration of import restriction procedures.
4	4 (1): Restriction of export of products: Incremental efforts for enforcement are expected to be moderate. 4(3): Dental amalgam: No major impacts. 4(6): Discouragement of new mercury-added products: General control efforts as part of control activities for other products and industry control; the incremental impact is considered minimal.
5	No major impacts expected.
7	No significant incremental impacts.
8	No major incremental impacts expected (beyond existing IE Directive and proposed MCP Directive)
9	If a none-action path is chosen, no impacts are incurred. Otherwise specific identification of source categories and follow-up actions for which some administrative effort would be expected (studies, action plan development and follow-up activities).
10	No significant incremental impacts.
11	No significant incremental impacts.
12	No impacts under the MI scenario (soft law).

5.4 Impacts of implementation going beyond the Minamata Convention

Options for implementation that go beyond the perceived strictly minimal implementation of the Convention have been proposed in some areas. This section presents the impacts of such options one by one, as compared to the minimal implementation (MI) scenario. Other measures that go beyond the strictly minimal implementation exist but have low impacts, or cannot yet be studied due to lack of data, and are not assessed in detail in this study.

5.4.1 Article 3(8) on import restrictions

The table below compares the impacts of the Minimum Implementation (MI) scenario and the Beyond MC (BMC) scenario.

Table 5-5 Overview of impacts from the MI scenario vs. the BMC scenario regarding import restrictions.

MC article	MI	BMC
3(8) on mercury imports	<p>Introduce procedures to ensure that import conditions comply with MC:</p> <p>No significant cost impacts (0-0.4 mio EUR foregone profits for importers). Larger administrative costs than BMC.</p> <p>Reduced releases from primary Hg mining globally.</p>	<p>Total import ban from countries outside the EU (import of waste for ES disposal exempted):</p> <p>Possible loss of revenue for Hg importers: 0-4 mio EUR/y.</p> <p>Potential cost range for industry for raised Hg prices (or substitution) 0-14 mio EUR/y.</p> <p>Environmental benefits, see discussion</p>

Discussion

The expected **economical impacts** under the BMC are 0-18 mio EUR higher than in the MI for this option.

Social impacts are difficult to assess in detail but are expected to be minimal based on the relatively low cost. A very rough estimate under the BMC is 0-100 jobs lost due to reduced imports and higher mercury prices for industry.

As regards **environmental impacts**, a possible import ban should be seen in the context of mercury supply to the EU and should thus involve decisions on mercury recycling. The general objective of the MC – to reduce mercury supply and use – will be better achieved within the EU by restricting the import from all countries (BMC). In the global context, an EU import ban could ideally result in lower production of mercury with reduced releases as a consequence. On the other hand, if global production would not be reduced, it could reduce mercury prices outside the EU and potentially result in increased (or maintained) mercury consumption in regions and activities with less environmental management (for example ASGM), where supply restrictions are most needed. See further discussion of this issue under the discussion of mercury recycling below.

It is proposed that under an import ban, import of waste for environmentally sound disposal of mercury should remain possible in order to use the available capacity to assist other countries with environmentally sound disposal.

5.4.2 Prohibition of manufacture/import/export of mercury-added products of Annex A, Part I

With the observed lack of detailed data about export the targeted product types, a quantitative assessment is not possible, neither for the MI nor the BMC scenario.

For products targeted under BMC by EU marketing restrictions (“EU standard”), but not by MC restrictions, the manufacture, import and export will still be allowed outside the EU. Therefore production may simply be moved outside the EU (by EU based global companies and to companies places outside EU), with consequent losses of revenues and jobs within the EU, but unchanged or increased environment and health impacts globally.

5.4.3 Article 4(3) dental amalgam lifecycle

The table below compares the impacts of the Minimum Implementation (MI) scenario and the Beyond MC (BMC) scenario.

Table 5-6 Overview of impacts from the MI scenario vs.the BMC scenario regarding dental amalgam.

MC article	MI	BMC
4(3): Dental amalgam lifecycle	Administrative measures only: Minimal impacts, both socio-economic and environmental.	Ban of dental amalgam with specified exemptions; technically possible and already implemented by DK and SE: Annual costs to consumers are estimated by two studies to be 0.3 – 15 billion EUR. Significant environmental benefits in the life cycle of dental amalgam.

Discussion

Dental amalgam was explicitly excluded from the scope of this study and has therefore only been summarised here.

Environmental impacts: Going beyond the MC and implementing a general ban on dental amalgam with technically justified specific exemptions (for example such as those proposed in DK) would potentially be very effective measure for reducing mercury releases within the EU territory. According to the most recent consumption estimates available (2007), 90-110 t/y of mercury is used for this purpose, the biggest consumption after chlor-alkali production, and despite the use of amalgam separators in some countries, much of this mercury ends up in sewage sludge applied to land in agriculture, in municipal waste which is landfilled or incinerated and in crematoria, all with additional releases and exposures as consequences. Even if amalgam separators were implemented EU wide and their correct functioning was controlled, this activity would likely remain among the major sources of the mercury releases to the environment in the EU. The effects of direct mercury exposure from amalgam fillings while in the mouth are still under discussion and will not be elaborated on here.

Economic impacts: An amalgam ban is also the single most costly option assessed. The cost estimates come with the caveats that (1) price increase estimates were largely drawn from high income Member States and (2) prices of the

substitutes have not yet stabilised and actual incremental costs are therefore expected to be at the low end of the cited 0.3-15 bio EUR range.

As regards **social impacts**, job intensity would rather rise than fall due to the more work-intensive application in dental clinics, as well as continued R&D activities for improved filling quality. Increased prices could have negative impacts on dental care level for low-income citizens.

5.4.4 MC Articles 4(6) and 5(7): Discouragement of new products and processes with intentional mercury use

The table below compares the impacts of the Minimum Implementation (MI) scenario and the Beyond MC (BMC) scenario.

Table 5-7 Overview of impacts from the MI scenario vs. the BMC scenario regarding discouragement of new products and processes.

MC article	MI	BMC
MC Articles 4(6) and 5(7): Discouragement of new products and processes with intentional mercury use	Soft (administrative) discouragement of new Hg uses: Potentially limited impacts, both cost-wise and environmentally. See discussion.	Conditional ban on new Hg uses: More effective and with higher signal value than MI. New invention of marketable products and processes cannot be ruled out but are not considered likely. See discussion.

Discussion

Economic and social impacts: The discouragement of new mercury uses in new products or processes can eliminate potential risks through mercury's lifecycle. The mercury applications used today, are based on technology invented about 50 or more years ago (though variations of the same have been launched later on the market). There are no signs of current development of relevant products/processes involving mercury. The probability that one or several mercury related commercial products and manufacturing processes will be developed is therefore considered low but it cannot be ruled out completely.

R&D activities are exempted from the MC, as well as in existing EU law relevant to mercury, and would thus still be possible. Only when considering a general marketing or large scale industrial use, the ban would become effective, unless significant benefits to health and the environment can be proven, as required under the MC.

In the BMC scenario (a conditional ban) it will be required to examine whether the MC conditions for significant environmental or human health benefits are fulfilled. Industry could face additional costs in the 100,000-450,000 EUR range for authorisation costs and fees, or similar procedures. This also gives some motivation for only introducing novelty mercury uses which have significant benefits.

Environmental impacts: The choice of implementation mode is important for the effectiveness of the measure and could result in everything between “no effect” (but compliance with the MC) and virtually full elimination of mercury input to society via novel mercury uses.

5.4.5 MC Article 5(3): Restricting mercury use in sodium/potassium methylate/ethylate production

Table 5-8 Overview of impacts from the MI scenario vs. the BMC scenario regarding discouragement of new products and processes.

MC article	MI	BMC
MC Articles 5(3): Restricting mercury use in sodium/potassium methylate/ethylate production	Release reductions plus work to identify alternatives for last uses, possibly culminating in total substitution: Moderate to substantial impacts, depending on whether an alternative process for the last of the four alcoholates considered technically and economically feasible is identified and implemented (potassium ethylate; with only small production volume). See discussion.	Ban of Hg use in alcoholates production: Significant economic impacts: Annual estimated costs at 20-65 million EUR/year. See discussion.

Discussion

Economic impacts: Under the **BMC scenario** (ban of mercury process) the total annual costs for substitution of the current mercury-based production of sodium methylate can be roughly estimated at 20-53 million EUR¹⁵ based on available data. Similar quantitative assessment for the substitution of the production process for the other three alcoholates in question is not possible. Based on the much lower production volumes, it is however roughly estimated that the total costs of substitution for all four substances would likely not exceed 65 million EUR/year¹⁶.

The costs directly related to the emission/releases reduction provision of the MC for this industry are difficult to assess quantitatively; costs may be moderate. Based on experience from well operated mercury-cell chlor-alkali production, such reductions are most likely to be met with further improved operational mercury management practices, especially during maintenance operations.

¹⁵ The investment costs have been annualised using a discount rate of 10% in order to have comparability with other estimates presented in this report. The EU IA guidance suggests that a 4% discount rate should be applied. Using 4% instead of 10% the total annual costs will be 17-47 million EUR instead of 20-53 million EUR.

¹⁶ 10 years and 10% as discount rate were used in order to have comparability with other estimates presented in this report. Using 4% as discount rate the annualised costs will be 20 million EUR and the total annual costs including the increased operational costs will be 60 million instead of 65 million EUR.

The companies using the mercury-based production process consider the production of the four chemicals as economically mutually dependent and state that they may terminate the production of all four substances, should the use of the mercury-based process be prohibited for those three of the substances for which alternative non-mercury processes exist. Thus, potassium ethylate, the least used among these alcoholates, could potentially come out of production until technically and economically feasible alternative production processes are introduced. Potassium ethylate is not currently registered under REACH. It may or may not be substitutable in its uses; this has not been investigated.

The **MI scenario** and the BMC scenario do not differ as regards costs for reduction of emissions/releases. As regards substitution, the costs under the MI scenario are more difficult to assess, as they would depend much on the development of any alternative processes considered technically and economically feasible. Under the MI scenario costs could range from research costs only (in case no feasible alternatives were found) to maximally the same costs for research and implementation as estimated for the BMC scenario above. Research costs cannot be quantified precisely; but it is expected that a reasonable research activity could be run for 1-2 million EUR/year.

Social impacts, BMC scenario: While the numbers available are considered uncertain, and not necessarily consistent with the lower production costs for the mercury process, they could indicate that the mercury-based production technology is more labour-intensive, and the loss of 0-200 jobs cannot be ruled out. Under the **MI scenario**, the transition will come more slowly, or not at all (in case adequate alternatives are not developed for all four alcoholates).

Environmental benefits from elimination of this process under the **BMC scenario** (and perhaps under the MI scenario) are deemed relevant, yet moderate in the EU context. The reduction in air emissions is estimated at about 190 kg/y and reductions of the mercury input at about 0.3-1 t/y. The reductions potentially achieved under the **MI scenario** can also not be quantified more precisely than 0.3-1 t/y.

5.4.6 MC Article 8(3+5) on (air) emission control measures for existing sources

The table below compares the impacts of the Minimum Implementation (MI) scenario and the Beyond MC (BMC) scenario.

Table 5-9 Overview of impacts from the MI scenario vs. the BMC scenario regarding existing emission sources.

MC article	MI	BMC
8(3+5) on (air) emission control measures for existing sources	<p>Two options are discussed, (1) a non-action option for all source categories and (2) an option assuming that only industrial coal fired boilers are not covered sufficiently by the IE Directive; only the latter which rely on the proposed MCP Directive is dealt with here:</p> <p>No incremental costs are anticipated under this option, as the MCP Directive in effect supplies a multi-pollutant strategy with co-benefits to mercury reductions. Minor text adjustments in the MCP Directive proposal are however recommended.</p>	<p>An option (demanding action for industrial coal fired boilers only) going beyond the current MCP Directive Proposal by suggesting that the proposed Directive specifies more effective mercury retention (minimum fabric filters for plants in the 20-50MW range):</p> <p>The addition of an explicit mercury emission limits to the MCP Directive Proposal for 20-50 MW coal fired MCP's corresponding to the use of PM retention with fabric filters would impose additional cost on plant operators (and ultimately consumers) estimated at 17-54 mio EUR (best estimate 28 mio EUR). Part of this amount will also be revenues to filter producers/supplier in the EU.</p> <p>Significant environmental benefits are expected due to the estimated incremental emission reduction of around 1-3 t/y. Applying more effective filters (than fabric filters) would result in higher effectiveness in terms of mercury emission reductions, but also higher costs.</p> <p>Minor incremental administrative efforts for enforcement controls specifically for mercury.</p>

Discussion

The extent to which the IE Directive provides compliance with the MC is still uncertain for some source categories and may need more scrutiny. For coal fired boilers below 50 MW, the proposed MCP Directive is expected to fulfil the basic requirements of the MC for existing sources (if the MCP Directive is implemented; a few text adjustments are suggested, see report text).

However significant additional **environmental benefits** can be achieved by requiring advanced PM filters (e.g. fabric filters) for coal fired MCPs in the largest effect class (20-50MW); incremental air emission reductions in the range of 4-8 t/y are expected.

The associated incremental **economic impacts** of this BMC scenario are estimated at 15-46 mio EUR/y (best estimate 24 mio EUR/y).

As regards **social impacts**, job losses are not expected under the BMC. The extent to which additional costs would be passed on to consumers has not been quantified.

5.4.7 MC Article 11(3): Mercury waste (recycling)

The table below compares the impacts of the Minimum Implementation (MI) scenario and the Beyond MC (BMC) scenario.

Table 5-10 Overview of impacts from the MI scenario vs. the BMC scenario regarding recycling of mercury.

MC article	MI	MI/BMC(?)
11(3): Mercury waste (recycling)	<p>Procedures that ensure that recycled mercury is only used for purposes allowed under the MC:</p> <p>Possible loss of revenues for recyclers.</p> <p>Possible cost (to waste owners/consumers) equalling revenues (benefits) to waste disposal facilities of 0-0.1 mio EUR for underground disposal of metallic mercury (beyond what is already required) or, if stabilised and stored underground 0-0.24 mio EUR. Additional costs for final ES disposal of waste with medium mercury concentrations of types which would be recycled could not be quantified precisely (roughly estimated to be in the order of 0-2 mio EUR/y).</p> <p>Moderate contributions to positive environmental and health impacts by reducing mercury releases in the life</p>	<p>Requiring final disposal for all remaining mercury waste sources and thus introduce a general ban on mercury recycling:</p> <p>Possible loss of revenues for recyclers estimated.</p> <p>Possible cost (to waste owners/consumers) equalling revenues (benefits) of waste disposal facilities of 0.09-0.2 mio EUR for underground disposal of metallic mercury (beyond what is already required) or, if stabilised and stored underground 0.2-0.47 mio EUR. Additional costs for final ES disposal of waste with medium mercury concentrations of types which would be recycled could not be quantified precisely but may be significant (roughly estimated to be in the order of 2-10 mio EUR/y).</p> <p>Potentially significant contributions to positive environmental and health impacts by reducing mercury releases in the life cycle of mercury; see discussion.</p>

MC article	MI	MI/BMC(?)
	cycle of mercury.	

Discussion

Going beyond the requirements of the Minamata Convention by requiring all mercury waste disposed of in an environmentally sound way could have potentially significant **environmental benefits**. The decision on whether to implement the MI or the BMC option must be taken with due consideration to preferences regarding a mercury import ban and the general mercury supply to the EU. If imports for allowed uses are banned and recycling fully prohibited there will be no remaining source to service EU demand. If a general import ban is implemented, recycling should be restricted as described under the MI option only, if continued use of mercury in the EU is desired.

On the other hand, severely restricting mercury recycling in the EU would force final environmentally sound disposal of a higher amount of mercury, thus emptying accumulated mercury stocks in society, while having the added benefit (due to potentially higher mercury prices) of (1) stimulating substitution further in the dental amalgam use (a major EU use) and (2) stimulating development and implementation of mercury alternatives in porosimetry and pycnometri (material analysis techniques; another major use), while (3) at the same time drawing from the global mercury market with increasing mercury prices, reduced mercury demand and associated reduced releases outside the EU as a result. A total recycling ban could thus potentially have higher environmental benefits than a total import ban. The larger dependence on external sources of mercury should however be kept in mind, in case this is considered a prioritised issue.

The possible incremental **economic impacts** of a Beyond MC implementation would be loss of revenues for recyclers (estimated at 2-4 mio EUR/y) and costs for waste owners (ultimately consumers) for final consumption (2-8 mio EUR/y). As companies providing final disposal services are often the same as those recycling mercury, implementing the BMC scenario may be almost cost neutral for the recycling sector, but activities might be centralised on fewer companies. As the recycling business is primarily driven by gate fees to consumers, the net changes in costs of a BMC scenario might be almost cost neutral, and the total societal costs are estimated at 0-12 mio EUR/year.

5.5 Data gaps

Major data gaps include [#Should stakeholders be in a position to supply any of these types of data, kindly submit them during the stakeholder workshop process]:

- Data on the volumes and values of the export of product types targeted by EU marketing restrictions and MC restrictions, respectively.
- Data on number of jobs associated with export of product types targeted by EU marketing restrictions and MC restrictions, respectively.

- › Mercury emissions/releases associated with the production of targeted exported product types within the EU.
- › Information on available alternatives to potassium ethylate (in the processes where this substance is used), and consequences in case its production should be terminated.
- › Data on how much of the mercury emissions, or as a proxy, production volume of each of the following source categories are currently covered by the IE Directive:
 - › coal-fired power plants
 - › coal-fired industrial boilers (in more detail than described already)
 - › smelting and roasting processes used in production of non-ferrous metals (only lead, zinc, copper, and industrial gold)
 - › waste incineration
 - › cement clinker production facilities
- › Data on prevalence of air pollution abatement systems by type for each of the source categories mentioned above.
- › Uncertainty induced by the fact that BAT/BEP and the basis of the 75% rule on emissions are not yet defined under the MC.
- › Updated mercury input and release inventories for various mercury source categories of relevance for this assessment.
- › Updated mercury supply data from recycling in the EU.
- › Quantities of waste with moderate concentrations of mercury (suited for recycling).

5.6 Conclusions

A business as usual scenario would be in conflict with the EU Community Strategy on Mercury and the stated intentions of the EU to ratify the Minamata Convention. It could have the direct consequence that the mercury exposure within the EU territory would not be reduced. This is because a significant part of the atmospheric mercury deposition in the EU has origin outside its territories due to long range transport. Additional mercury is transported with ocean currents and rivers to EU waters. The EU not ratifying the Convention could reduce the chances of significantly of the Convention reaching the needed global mercury release reductions.

Total quantified costs of a strictly minimal implementation of the Minamata Convention are estimated at 2 to 90 million EUR/year¹⁷. Additional costs, not quantified in the assessment, are expected. The most costly single initiative assessed, restriction of mercury use in alcoholates production, is estimated at 0-160

¹⁷ The investment costs are annualised using 10 year and 10%. If instead using 4% as discount rate, the total annual costs would be 2 to 85 million EUR.

million EUR in investments plus annual operational costs of some 2-40 million EUR. Annualising the investment costs and adding the annual operational costs gives total annual costs of 2 to 65 million EUR¹⁸.

The provisions of the Minamata Convention on Mercury mirror to a high degree the existing EU legislation on mercury, and the overall goals of the Convention are in line with the EU Mercury Strategy. This means that the EU has already realised much of the internal potential for mercury release reductions which the Convention aim at. This was foreseen, and the EU Mercury Strategy identifies international action as needed in order to lower the observed impacts to health and environment further within the EU territory.

The Minamata Convention is the best opportunity available so far for realising this goal cost-effectively for the EU, while at the same time substantially reducing the harmful impacts of mercury globally.

Significant additional benefits to health and environment can be achieved, especially inside the EU territory, by implementing selected measures which go further in fulfilling the intentions of the EU Mercury Strategy and the Minamata Convention, yet go beyond what is perceived as the minimal interpretation of the Convention. In addition, pursuing any such more ambitious measures might have a stronger signal value towards other Parties to the Convention. The selected measures assessed in this study and their potential economic impacts are the following:

- Further reducing the mercury emissions from existing medium-size coal fired combustion plants (at a cost estimated at 17-54 million EUR/y; roughly estimated emission reductions expected: 1-3 t/y).
- Restricting mercury supply via restrictions on import (0-14 million EUR costs for increased prices or substitution for industry plus some minor distributional effects).
- A conditional ban on new commercial mercury uses; this measure primarily has a signalling effect (costs cannot be known with complete certainty but are expected to be marginal).
- Banning mercury use in alcoholates production (costs estimated at 22-65 million EUR/y, if which a part will also be incurred under MI scenario; 0.3-1 tonne Hg/y will be eliminated from circulation in the EU)
- A ban of dental amalgam with technically justified specific exemptions (300-15,000 million EUR/y; 90-110 tonne Hg/y will be eliminated from circulation in the EU with associated release reductions).

Other measures going beyond the strictly minimal implementation of the Minamata Convention exist, but do either still need additional evidence before assessment

¹⁸ The investment costs are annualised using 10 year and 10%. If instead using 4% as discount rate, the total annual costs would be 2 to 70 million EUR.

(relating to MC Articles 8 and 9), or are expected to have a low impact, and are therefore not assessed in detail in this study.

Some significant data gaps were identified, which may need further study. These include certain aspects relating to the following issues:

- › Export of mercury-added products.
- › Processes with mercury use (potassium ethylate use and alternatives).
- › Coverage by the IE Directive of major air emission sources targeted by the Minamata Convention.
- › Updated mercury consumption and release inventories for various mercury source categories of relevance for this assessment.
- › Updated mercury supply data from recycling in the EU.

[#If adequate data become available from stakeholders during the consultation process, the assessment may be supplemented on these issues; see detailed data gaps sections.]

6. References

Achilles M (1989): Historische Versuche der Physik. Daniel Gabriel Fahrenheit und das Thermometer, 1989, pp. 7-12

AEA Technology and NILU-Polska (2005): "Costs and environmental effectiveness of options for reducing mercury emissions to air from small-scale combustion installations". Final report (version 2). For the European Commission, DG Environment, December 2005. Accessed June 2014 at http://ec.europa.eu/environment/chemicals/mercury/pdf/sci_final_report.pdf

AMEC (2012): "Collection and analysis of data to support the Commission in reporting in line with Article 73(2)(a) of Directive 2010/75/EU on industrial emissions on the need to control emissions from the combustion of fuels in installations with a total rated thermal input below 50MW." European Commission Final Report, July 2012. Accessed April 2014 at <http://www.endseurope.com/docs/120723a.pdf>

BASF (2013): Life Science Intermediates for Organic Synthesis - Product overview. Accessed march 2014 at <http://www.basf.com/group/corporate/de/literature-document/Brand+2+Hydroxyacetophenone-Brochure--Life+Science+Intermediates+for+Organic+Synthesis+Product+Overview-English.pdf>

BASF (2014): Personal communication with Paul-Michael Bever, BASF, and submitted material. April 2014.

Bates (2006): Bates, Michael N., Mercury amalgam dental fillings: An epidemiologic assessment. International Journal of Hygiene and Environmental Health, Volume 209, Issue 4, 2006, pp. 309-316

Biodiesel Magazine (2012): Catalyzing Biodiesel Growth - An analysis of conventional acid and base catalysts used in today's biodiesel industry (by Brian Sims). Biodiesel Magazine, 2012, accessed March 2014 at <http://www.biodieselmagazine.com/articles/8371/catalyzing-biodiesel-growth>.

BIOIS (2012): Study on the potential for reducing mercury pollution from dental amalgam and batteries. Bio Intelligence Service. Final report. European Commission, DG Environment, 11 July 2012.

BiPRO (2010): Requirements for facilities and acceptance criteria for the disposal of metallic mercury. BiPRO on behalf of European Commission, DG Environment. Final report, 16 April 2010

BiPRO (2011): Study on waste related issues of newly listed POPs and candidate POPs”. BiPRO GmbH as part of the ESWI Consortium. Final report. DG Environment. 13 April 2011

BMWi (2001): Bundesministerium für Wirtschaft und Technologie, Berlin. Die sozio-ökonomischen Auswirkungen der Schließung von Chlor-Alkali-Elektrolyse-Anlagen nach dem Amalgamverfahren in Deutschland gemäß PARCOM-Beschluss 90/3. Abschlussbericht. BiPRO GmbH, 2001.

Booth (1977): Jeremy Booth, A Short History of Blood Pressure Measurement. Paper, Meeting 2 February 1977, Section of the History of Medicine, Volume 70, November 1977

Ceramatec (2014): On Site Sodium Methylate Production For Transesterification. Accessed March 2014 at: <http://www.ceramatec.com/technology/ceramic-solid-state-ionic-technologies/separation-&-purification-technologies/sodium/on-site-sodium-methylate-production-for-transesterification.php>

COWI (2010): Mercury – Reductions are feasible. COWI and Operate for the Nordic Council of Ministers, ANP 2010:738, Copenhagen 2010.

COWI (2012): Cost effectiveness of options for a global legally binding instrument on mercury - in the perspective of the European Union. Available at <http://ec.europa.eu/environment/chemicals/mercury/pdf/Report-Support-Hg-Negotiations.pdf>

COWI (2014): Survey of mercury and mercury compounds. Part of the LOUS-review. Environmental Project No. 1544, 2014. COWI for the Danish EPA. Available at <http://www2.mst.dk/Udgiv/publications/2014/01/978-87-93026-98-8.pdf>

COWI and Concorde East/West (2008): Options for reducing mercury use in products and applications, and the fate of mercury already circulating in society. For the European Commission, DG Environment. Available January 2014 at http://ec.europa.eu/environment/chemicals/mercury/pdf/study_report2008.pdf.

Dan Dan Shao et al. (2012): Simulation of Process for Preparing Sodium Methoxide Using Aspen Plus. Advanced Materials Research, 557-559, 2350.

Danish EPA, 2013: Udkast til Bekendtgørelse om forbud mod import, salg og eksport af kviksølv og kviksølvholdige produkter [draft statutory order on the prohibition of import, sale and eksport of mercury and mercury-containing products]. Accessed April 2014 at <http://prodstoragehoeringspo.blob.core.windows.net/12af176d-d973-4db3-a931-056cc688dfec/Udkast%20til%20bekendtg%C3%B8relse%20om%20kviks%C3%B8lv.pdf>

DE Pat (1965): Richard Moser, Patent DE 1185724 B Mitchell: United States Patent Office, Irving L. Mitchell. Mercury Relay, Rockville Centre, N.Y., assignor to Ebert Electronics Corporation, Queens Village New York, Patented 1965

DuPont (2014): Sodium Methylate for the Biodiesel Industry. Accessed March 2014 at http://www2.dupont.com/Reactive_Metals/en_US/uses_apps/.

EC impact assessment (2014): Commission staff working document, impact assessment. European Commission, Brussels, accessed May 2014 at: http://ec.europa.eu/environment/air/clean_air_policy.htm

ECHA (2014a). ECHA database on registered substances. European Chemicals Agency (ECHA). Accessed 14 April 2014 at: <http://echa.europa.eu/web/guest/information-on-chemicals/registered-substances>

ECHA (2014b). ECHA database on pre-registered substances. European Chemicals Agency (ECHA). Accessed 14 April 2014 at: <http://echa.europa.eu/web/guest/information-on-chemicals/pre-registered-substances>

EnviroCat (2012): Request for a restriction of the use of “mercury-based” processes for the production of sodium methylate. Paris, 2012. Received from Envirocat in personal communication with E. Beaurepaire, March 2014.

EnviroCat (2014): Personal communication with E. Beaurepaire and B. Gastinne, March-May 2014.

European Commission (2013). Best Available Techniques (BAT) Reference Document for Large Combustion Plants. Industrial Emissions Directive 2010/75/EU. Joint Research Centre. Draft 1 (June 2013).

European Commission (2013). JRC Reference Reports. Best Available Techniques (BAT) Reference Document for the Production of Cement, Lime, Magnesium Oxide. Industrial Emissions Directive 2010/75/EU. 2013.

European Commission (2009). Reference Document on Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities. January 2009.

European Commission (2006). Integrated Pollution Prevention and Control. Reference Document on Best Available Techniques for Large Combustion Plants. July 2006.

European Commission (2001). Integrated Pollution Prevention and Control. Reference Document on Best Available Techniques in the Non Ferrous Metals Industries. December 2001.

Evonik (2014): Personal communication with Norbert Nimmerfroeh, Evonik, and submitted material, April 2014.

GIMS (2011): «Mercury free» sodium methylate : A green alternative for biodiesel manufacturing. Sodium Methylate Importers Association (GIMS), June 2011. Received from Envirocat in personal communication with E. Beaurepaire, March 2014.

Hagemann et. al (2014): Sven Hagemann, Ute Oppermann, Thomas Brasser, Behaviour of mercury and mercury compounds at the underground disposal in salt formations and their potential mobilisation by saline solutions, Umweltbundesamt, UBA Texte 07/2014

ICIS (2009): Evonik commits to biodiesel future. Accessed March 2014, at <http://www.icis.com/resources/news/2009/05/05/9213060/evonik-commits-to-biodiesel-future/>.

Jackson, S (2006): Standard – for good reason. Biodiesel Magazine, 2006. Accessed March 2014 at <http://www.biodieselmagazine.com/articles/715/standard-for-good-reason>.

Kiefer (2014): Kiefer, David, When the Industry Charged Ahead. Chemistry chronicles. Last access: 17.04.2014

Knowles Middleton (1963): W.E. Knowles Middleton. The Place of Torricelli in the History of the Barometer, Vol. 54 No. 1, March, 1963, pp. 11-28

Maag J, Kjølholt J, Hagen Mikkelsen S, Nyander Jeppesen C, Clausen AJ and Ostenfeldt M: Survey of mercury and mercury compounds - Part of the LOUS-review. Environmental Project No. 1544, 2014. COWI for the Danish Environmental Protection Agency. Accessed May 2014 at: <http://www2.mst.dk/Udgiv/publications/2014/01/978-87-93026-98-8.pdf>

Process worldwide (2012): BASF inaugurates its first sodium methylate plant in South America. Accessed May 2013 at http://www.process-worldwide.com/engineering_construction/plant_design/basic_detail_engineering/articles/352249/

UNECE (2012). Press Release. UNECE Air Convention Parties adopt more stringent controls of heavy metals emissions and measures to help Parties from Eastern Europe, the Caucasus and Central Asia to join in. Available at: <http://www.unece.org/index.php?id=31845> [Accessed 30 May 2014]

UNEP (2007): Guide for Negotiators of Multilateral Environmental Agreements Available at: http://www.unep.org/publications/contents/pub_details_search.asp?ID=3925. [Accessed: 30 May 2014]

UNEP (2010): Study on mercury sources and emissions, and analysis of cost and effectiveness of control measures “UNEP Paragraph 29 study”. UNEP, Division of Technology, Industry and Economics (DTIE), Chemicals Branch, Geneva, Switzerland, November, 2010

UNEP (2010a): Process Optimization Guidance for Reducing Mercury Emissions from Coal Combustion in Power Plants. UNEP, Division of Technology, Industry and Economics (DTIE), Chemicals Branch, Geneva, Switzerland, November, 2010

UNEP (2011): Technical guidelines for the environmentally sound management of wastes consisting of elemental mercury and wastes containing or contaminated with mercury. UNEP, Conference of the Parties to the Basel Convention on the

Control of Transboundary Movements of Hazardous Wastes and Their Disposal
UNEP/CHW.10/6/Add.2/Rev.1, Unedited Advance, 31. October 2011.

UNEP, 2011a: Further comparative analysis of options for financial mechanisms to support the global legally binding instrument on mercury.

UNEP(DTIE)/Hg/INC.3/4. UNEP, Aug 2011.

UNEP (2013): Toolkit for Identification and Quantification of Mercury Releases, Reference Report and Guideline for Inventory, Level 2, Version 1.2. UNEP, Division of Technology, Industry and Economics (DTIE), Chemicals Branch, Geneva, Switzerland, April, 2013.

USGS (2011, 2012, 2013, 2014): Mineral commodity summaries – Mercury. Accessed at <http://minerals.usgs.gov/minerals/pubs/commodity/mercury/>.

US Pat (1884): United States Patent Office, Charles L. Clarke. Galvanic Battery. Manchester, England, assignor to the domestic electrical manufacturing company, Patented 1884.

US Pat (1901): United States Patent Office, Peter Cooper Hewitt. Method of manufacturing electric lamps, of New York, assignor to Peter Cooper Hewitt, Patented 1901.

US Pat (1907): United States Patent Office, Thomas A. Edison. Fluorescent electric lamp, of Llewellyn Park, New Jersey, Patented 1907.

US Pat (1914): United States Patent Office, Klatte, F., Manufacture of esters and ethers of ethyleneglycol and of vinyl alcohol, Schwanheim-on-the-Main, Germany, assignor to Chemische Fabrik Griesheim-Elektron, Patented 1914

US Pat (1939): United States Patent Office, Lieseberg, F., Wietzel, G., Production of acetaldehyde from gases containing acetylene, Ludwigshafen-on-the-Rhine and Mannheim, assignor to I.G. Farbenindustrie Frankfort-on-the-Main, Patented 1939

US Pat (1951): United States Patent Office, Lorell John Schilling. Mercury Switch, Galesville, assignor to Babson Bros. Co, Patented 1951

US Pat (1968): United States Patent Office, Willett, Joseph T.. Mercury compounds as catalysts for the polyurethane reaction, Trenton, Mich., assignor to Wyandotte Chemicals Corporation, Patented 1968

7. Appendix 1 Gap analysis of EU legislation vis-à-vis the Convention, with proposals for options

This section explains the requirements of the Minamata Convention and compares them to those contained in current EU legislation. Options for closing the gaps between the two, where such gaps exist, are then proposed.

The gap analysis and the detailed suggested options given for closing the gaps are based on a conservative interpretation of the Convention in which any potential gaps were identified and covered. Actual implementation of any measures needed to cover gaps will be based on the European Commission's interpretation of the obligations of the Minamata Convention and how these can be met in the most practical manner in the EU law.

The chapter introduces each of the Minamata Convention (MC) articles that impose obligations to Parties and then describes:

- › Obligations of the provision (by paragraph of the article in question);
- › EU legislation addressing the provision; and
- › Initial proposals for additional measures.

Each provision imposing legal obligations on the Parties is categorised as either a “firm law” or a “soft law” provision. Any important interpretation issues are identified.

Soft law vs. firm law

The term “soft law” (also “soft law measure”, “soft law obligation”) does not have a fixed legal meaning, and there is not a common understanding what soft law is. Usually, in the context of international law and international agreements in particular, “soft law” is distinguished:

- › on the one side, from a “firm law” obligation (or, synonymously used, “hard law” obligation respectively) describing an obligation to act, or to refrain from acting, for which an addressee is legally responsible; and
- › on the other side, from the absence of any obligation which both are clearer categories than “soft law”.

During the negotiation of international agreements, when it comes to describing the obligations of the Parties, it is common practice to use terms having certain meaning in common understanding – either having the impact of imposing firm

law obligations for the Parties, or having an impact that enables Parties to lessen, minimize or even avoid obligations or actions entirely. In this sense, for instance the UNEP document “Guide for Negotiators of Multilateral Environmental Agreements”¹⁹ distinguishes the following impacts of some frequently used terms in such international agreements:

***“May:** under no obligation. ‘May’ is permissive and discretionary on the part of the Party carrying out the action. A clause that says: ‘a country may take into consideration...’ creates no obligation for a country to do so.*

***Must:** is required to. ‘Must’ is almost always binding.*

***Shall:** An action that is required. A clause that uses the verb ‘shall’ is almost always binding, unless the ‘shall’ is used with another word that undermines its strength - e.g., ‘a contracting Party shall strive to do X, Y or Z’ or shall endeavour to. Here, the binding commitment is only to try to do X, Y, or Z, not to actually do it.*

***Should:** an action that is not required, but is advised – e.g., a country ought to try to do X, Y or Z.”*

Following this understanding of the respective terms, and with a specific view on the question of how the current EU acquis covers obligations stemming from the Minamata Convention, the term “soft law” is used in the following sections to describe obligations below the level at which action (or refraining from action) is mandated (and if applicable, such action would need to be reflected by the Parties legislation).

Examples of firm law and soft law obligations within the Minamata Conventions can, by illustration, be found in Article 8(3) MC:

A Party with relevant sources shall take measures to control emissions and may prepare a national plan setting out the measures to be taken to control emissions and its expected targets, goals and outcomes.

where “shall take measures” describes a legal obligation to take action; and “may prepare” describes an action that is left to the discretion of each Party.

Note that the use of the term “soft law” in the following sections, as described above, is without prejudice to the fact that a provision imposing a firm law obligation may contain a wording that lessens or minimizes the obligation on other occasions than described above (such as “where feasible”); a factor which is taken into account during the discussion of possible interpretations of the provision.

¹⁹ Accessed from http://www.unep.org/publications/contents/pub_details_search.asp?ID=3925. 30 May 2014.

7.1 Article 3: Mercury supply sources and trade

7.1.1 Introduction to MC obligations

Article 3 of the Minamata Convention (MC) addresses “supply sources and trade”. Article 3(1) contains the following important specific definitions of terms and scope, applicable for all provisions of Article 3:

- The term “mercury”, where used in Article 3 MC, does not – in contrast to the general definition of mercury of Article 2 lit. (d) MC – only include elemental mercury, but also mixtures of mercury with other substances, including alloys of mercury with a mercury concentration of at least 95 per cent by weight;
- “Mercury compounds”, where used in Article 3, means – in more detail than the general definition of Article 2 lit. (e) – “mercury (I) chloride (known also as calomel), mercury (II) oxide, mercury (II) sulphate, mercury (II) nitrate, cinnabar and mercury sulphide”.

Article 3(2) MC restricts the scope of Article 3, stipulating that its provisions should not apply to quantities of mercury or mercury compounds to be used for laboratory-scale research or as a reference standard; certain naturally occurring trace quantities of mercury or mercury compounds; or mercury-added products (defined in Article 2 lit. (f) MC).

In terms of substantial obligations, Article 3 MC addresses the following four different aspects:

(1) Primary mercury mining

Article 3(3) MC: Parties shall not allow primary mercury mining that was not conducted within the territory at the date of entry into force of MC for that party. Any mercury mining conducted at that time shall be terminated within 15 years from that date and the mercury mined shall only be intended for “allowed uses” as defined in relevant articles of the MC, or disposal that does not lead to recovery (Article 3(4) MC).

(2) Identification of stocks and waste disposal

According to Article 3(5) lit. (a) MC, parties shall endeavour to identify

- mercury stocks or mercury compounds exceeding 50 tonnes (= metric ton) and
- sources of mercury supply generating stocks exceeding 10 tonnes per year,

that are located within their territory.

Article 3(5) lit. (b) MC requests parties to take measures to ensure that, where they determine that excess mercury from the decommissioning of chlor-alkali facilities is available, such mercury is disposed of in

accordance with the relevant guidelines for environmentally sound management, elaborated under the MC.

(3) Export and import of mercury

Export of mercury is subject to a general ban with exceptions for “allowed uses” or environmentally sound interim storage as defined in MC and only with the written consent of the importing country (Article 3(6) MC)). For export to non-parties the same principles apply, taking specified objectives of the MC into account, procedural rules regarding the written consent required by Article 3(6) MC are laid down in Article 3(7) MC; the MC secretariat is to keep a public register of such consents.

Article 3(8) MC states that a Party shall not allow import from a non-party unless the mercury is from a source accepted under the MC. Article 3(9) introduces a specific procedure as an exemption from the requirements of Article 3(8), which according to Article 3(10) is only an interim exemption.

(4) Reporting, documentation and future amendments

Article 3(11) MC requests parties to submit information to the Conference of the Parties (COP) on the implementation of the requirements of Article 3.

Elaboration of further guidance:

The further paragraphs of Article 3 deal with obligations of the COP, in terms of providing guidance and developing/adopting required content of procedural documents (Article 3(12)) and in terms of evaluating how specific mercury compounds should be made subject to the provisions of Article 3 regarding import and export.

7.1.2 Article 3(3): Ban on new primary mercury mining

7.1.2.1 Obligations of the provision

Article 3(3) MC reads in full text:

Each Party shall not allow primary mercury mining that was not being conducted within its territory at the date of entry into force of the Convention for it.

The wording “shall not allow” clearly introduces a binding obligation for all MC parties once the Convention enters into force for them. Whether a Party necessarily and explicitly has to legally introduce a ban on primary mercury mining is open to discussion. One may opine that it is sufficient for a Party to ensure a de-facto compliance for those Parties without a legal measure where no relevant mining activity is to be expected.

7.1.2.2 EU legislation addressing the provision

Current EU legislation does not explicitly prohibit new primary mercury mining. However, Regulation (EC) 1102/2008 states that mercury extracted from cinnabar ore (the primary source for dedicated mercury mining) shall be disposed of as waste, meaning that the economic incentive for mercury extraction has been removed. Mercury can be extracted from other minerals, but this is less economically viable due to lower mercury concentrations in these mineral ores.

7.1.2.3 Initial proposals for additional measures

Option MC3(3)-1

An explicit ban on primary mercury mining could be introduced into EU legislation by amending Regulation (EC) 1102/2008. This could be selected as the key Regulation implementing the provisions of the MC at EU level.

Option MC3(3)-2

Another option would be to refrain from any legal measure with a view on the fact that no relevant mining activity is to be expected, and that *de facto* compliance may be regarded as sufficient for a Party to comply with the obligation of Article 3(3).

Discussion

New and additional socio-economic impacts are not expected to arise from the prohibition of new primary mercury mining because the economic incentive for mercury extraction has already been removed by Regulation (EC) 1102/2008.

Adjustment of Regulation (EC) 1102/2008 appears to be an effective and efficient way of addressing the MC requirements on this issue at the EU level, even if it only pertains to two Member States. Within Europe, dedicated (or “primary” as it is termed in MC) mercury mining has occurred previously in Spain and Slovenia. Both countries have additional geologically available mercury (cinnabar) deposits (USGS, 2013).

7.1.3 Article 3(4): Phasing-out of existing primary mercury mining

7.1.3.1 Obligations of the provision

Article 3(4) MC reads:

Each Party shall only allow primary mercury mining that was being conducted within its territory at the date of entry into force of the Convention for it for a period of up to fifteen years after that date. During this period, mercury from such mining shall only be used in manufacturing of mercury added products in accordance with Article 4, in manufacturing processes in accordance with Article 5, or be disposed in accordance with Article 11, using operations which do not lead to recovery, recycling, reclamation, direct re-use or alternative uses.

The wording “shall not allow” clearly introduces a binding obligation for all MC parties once the Convention enters into force for them. Major interpretation issues are not observed.

7.1.3.2 EU legislation addressing the provision

A ban on existing primary mercury mining is not contained in current EU legislation. As mentioned, Regulation (EC) 1102/2008 however already states that mercury extracted from cinnabar ore (the primary source for dedicated mercury mining) shall be disposed of as waste, such that the economic incentive for mercury extraction has been removed.

7.1.3.3 Initial proposals for additional measures

Targeting both new and existing facilities in an explicit ban of dedicated mercury mining in an amendment of Regulation (EC) 1102/2008 as mentioned in Option MC3(3)-1 above would fulfil the requirement in MC3(4) (**Option MC3(4)-1**). No direct socio-economic effects are anticipated from such a change because the economic incentive for mercury extraction has been removed already by Regulation (EC) 1102/2008.

In parallel to Option 3(3)-2, the EU may also wish to pursue a path of claiming *de facto* compliance without adopting any legal measure (**Option MC3(4)-2**).

7.1.4 Article 3(5): Identification of mercury stocks / Disposal of excess mercury from chlor-alkali facilities as waste

7.1.4.1 Obligations of the provision

Article 3(5) MC stipulates that each party shall

(a) Endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year, that are located within its territory;

(b) Take measures to ensure that, where the Party determines that excess mercury from the decommissioning of chlor-alkali facilities is available, such mercury is disposed of in accordance with the guidelines for environmentally sound management referred to in paragraph 3 (a) of Article 11, using operations that do not lead to recovery, recycling, reclamation, direct re-use or alternative uses.

As regards soft vs. firm obligations, article 3(5) addresses the Parties in two different fields, and in entirely different ways:

- Article 3(5) lit. (a) describes a commitment (“shall endeavour”) of the Parties, in other terms: a measure of soft law, regarding mercury stocks;

- Article 3(5) lit. (b) introduces a legal obligation for the Parties regarding the treatment of excess mercury from the decommissioning of chlor-alkali facilities; such excess is to be disposed of as waste.

As regards interpretation issues, the concept of “excess mercury” is not defined in the MC. This may lead to uncertainty about the extent of the obligation and whether the wording “metallic mercury that is no longer in use in the chlor-alkali industry” contained in Regulation (EC) 1102/2008 (see below) is coherent with the MC’s understanding (see below).

7.1.4.2 EU legislation addressing the provision

An EU obligation reflecting the soft-law provision of Article 3(5) lit. (a) MC does currently not exist. However, similar reporting requirements on the fate of mercury movements from specified key sources in Regulation 1102/2008 are in place.

Regarding the obligation of Article 3(5) lit. (b) MC, Article 2(2) of Regulation (EC) 1102/2008 reads as follows:

From 15 March 2011, the following shall be considered as waste and be disposed of in accordance with [the Waste Framework Directive] in a way that is safe for human health and the environment:

(a) metallic mercury that is no longer used in the chlor-alkali industry; [...]

If the “excess mercury”, in the sense of Article 3(5) lit. (b) MC, is taken to be synonymous with the “metallic mercury that is no longer used in the chlor-alkali industry” referred to by Regulation 1102/2008, then the legal obligation stemming from MC is already fulfilled by EU legislation. “Mercury that is no longer used” may be interpreted as more precise than “excess mercury”, meaning that the MC provision is most likely met already.

7.1.4.3 Initial proposals for additional measures

Option MC3(5a)-1

An option for providing compliance with the soft-law measure of Article 3(5) MC is amendment of Article 6 of Regulation 1102/2008 so as to oblige Member States to identify and quantify individual stocks of mercury.

Option MC3(5a)-2

Another option is to launch a study to identify existing mercury stocks.

Options MC3(5b)-1 to MC3(5b)-3

The EU could clarify that they from now on make reference to the understanding of “excess mercury” as understood in the MC (even if this was developed further at that level), by:

- 1 Aligning the text of Regulation (EC) 1102/2008 to the text of MC;

- 2 Clarifying in recitals that Article 2(2) (a) of the Regulation should be understood as in MC; or
- 3 Adopting guidance at EU level that Article 2(2) (a) of the Regulation should be understood as in MC.

Option MC3(5b)-4

EU could leave Article 2(2) Regulation (EC) 1102/2008 as it is and work at MC level towards an understanding of “excess mercury” that is in line with the understanding as of the Regulation.

7.1.5 Article 3(6): Mercury export

7.1.5.1 Obligations of the provision

Article 3(6) of MC reads

Each Party shall not allow the export of mercury except:

- (a) To a Party that has provided the exporting Party with its written consent, and only for the purpose of:*
 - (i) A use allowed to the importing Party under this Convention; or*
 - (ii) Environmentally sound interim storage as set out in Article 10; or*
- (b) To a non-Party that has provided the exporting Party with its written consent, including certification demonstrating that:*
 - (i) The non-Party has measures in place to ensure the protection of human health and the environment and to ensure its compliance with the provisions of Articles 10 and 11; and*
 - (ii) Such mercury will be used only for a use allowed to a Party under this Convention or for environmentally sound interim storage as set out in Article 10.*

These are firm, legally binding, provisions.

The specific definition of “mercury” for the purpose of Article 3, as introduced by Article 3(1) is relevant to the interpretation of these provisions:

References to “mercury” include mixtures of mercury with other substances, including alloys of mercury, with a mercury concentration of at least 95 per cent by weight [...]

7.1.5.2 EU legislation addressing the provision

Article 1(1) of Regulation (EC) 1102/2008 contains an export ban as required by the MC; indeed, it goes beyond the MC obligations since the ban at EU level

applies to certain compounds, and applies without any restrictions in terms of intended uses. Since the MC allows for the Parties to keep stricter measures, this stricter approach of the EU is not in conflict with the MC.

7.1.6 Article 3(8): Import ban from Non-Parties

7.1.6.1 Obligations of the provision

Article 3(8) of the MC introduces a binding obligation for the Parties to restrict the import of mercury:

Each Party shall not allow the import of mercury from a non-Party to whom it will provide its written consent unless the non-Party has provided certification that the mercury is not from sources identified as not allowed under paragraph 3 or paragraph 5 (b).

The reference in this provision to “sources” as of paragraph 3 and paragraph 5 (b) relates to new primary mercury mining and excess mercury of chlor-alkali facilities respectively.

7.1.6.2 EU legislation addressing the provision

There is no current EU legislation codifying a ban or imposing conditions / restrictions on import of mercury.

7.1.6.3 Initial proposals for additional measures

An import ban could be introduced by, for example, amending Regulation (EC) 1102/2008, which already includes a requirement for information exchange on this issue from Member States to the Commission.

Option MC3(8)-1

The first option is to introduce a conditional import ban via amendment to Regulation (EC) 1102/2008 that reflects the concept and wording of the MC, i.e. related to “Non-Parties” to the MC. In effect this would mean that imports were allowed, but only if conditions similar to those for import from MC Parties were fulfilled.

Option MC3(8)-2

A second option is available, i.e. amending Regulation (EC) 1102/2008 to impose requirements that go beyond the obligation of the MC, by imposing a ban on imports from all countries outside the EU (in Regulation (EC) 1102/2008).

Discussion

In case a total mercury import ban is considered for possible implementation, it would be advisable to check whether the supply of mercury recycled from within the EU (the only other mercury source accepted under current EU legislation) would be sufficient to cover demand during the transition period. An additional consideration is that importing mercury (for allowed uses) into the EU will contribute to keeping global mercury prices high, a situation which is believed to discourage/reduce mercury use in small scale gold mining and other uses in

developing countries that have less efficient mercury management procedures in place.

7.2 MC article 4: Mercury-added products

7.2.1 Introduction to MC obligations

Article 4 of the MC concerns “mercury-added products”. Article 4 imposes substantial obligations relating to a number of products that contain mercury.

Product prohibition occurs by the Parties “taking appropriate measures” to “not allow” the manufacture, import, or export of the mercury-containing products which are listed in Annex A, Part I. Part I includes a list of products that are scheduled to be phased out by 2020. However, pursuant to Article 6 MC, Parties can apply for a five year exemption to the phase-out date and this can be renewed for a total of 10 years.

Mercury-added products to be phased out by 2020 include (with specified exceptions):

- batteries (except for button zinc silver oxide batteries with a mercury content < 2%, button zinc air batteries with a mercury content < 2%);
- most switches and relays;
- compact fluorescent lamp (CFL) bulbs equal to or less than 30 watts that contain more than 5 mg mercury per bulb;
- linear fluorescent bulbs-triband lamps of less than 60 watts and that contain more than 5 mg mercury and halophosphate lamps of less than 40 watts and which contain more than 10 mg mercury;
- high pressure mercury vapour lamps;
- mercury in a variety of cold cathode fluorescent lamps and external electrode fluorescent lamps for electronic displays;
- cosmetics including skin lightening products with mercury above 1 ppm except mascara and other eye area cosmetics (in case no effective safe substitute alternatives are available);
- pesticides, biocides, and topical antiseptics; and
- non-electronic devices such as barometers, hygrometers, manometers, thermometers, and sphygmomanometers.

Under certain circumstances, Parties may choose to, as an alternative to prohibition, indicate that they will implement different measures or strategies to address products listed in Part I of Annex A.

Parties are to discourage the manufacture and distribution in commerce of new mercury-added products unless they find that a risk and benefits analysis shows environmental or human health benefits (Article 4(6) MC).

The MC Secretariat will receive information from Parties on mercury-added products and make the information publicly available along with any other relevant information.

7.2.2 Article 4(1): Prohibition of manufacture/import/export of mercury-added products of Annex A, Part I

7.2.2.1 Obligations of the provision

Article 4(1) MC reads:

Each Party shall not allow, by taking appropriate measures, the manufacture, import or export of mercury-added products listed in Part I of Annex A after the phase-out date specified for those products, except where an exclusion is specified in Annex A or the Party has a registered exemption pursuant to Article 6.

“Mercury-added products” is defined in Article 2 (f) MC as “a product or product component that contains mercury or a mercury compound that was intentionally added”.

Article 4(1) MC, which introduces a binding obligation for the Parties, has to be read together with Part I of Annex A, and indeed also with Article 4(2) MC, for the exact dimension of the obligation to become clear. Annex A introduces a number of exemptions, as follows:

The following products are excluded from this Annex:

- (a) *Products essential for civil protection and military uses;*
- (b) *Products for research, calibration of instrumentation, for use as reference standard;*
- (c) *Where no feasible mercury-free alternative for replacement is available, switches and relays, cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays, and measuring devices;*
- (d) *Products used in traditional or religious practices; and*
- (e) *Vaccines containing thiomersal as preservatives.*

The relevant list of products reads as follows (with the second column showing the phase-out date for the respective product/product group):

Table 7-1 *Mercury-added products targeted by the Minamata Convention and their phase-out dates.*

Mercury-added Products	Date after which the manufacture, import or export of the product shall not be allowed (phase-out date)
<i>Batteries, except for button zinc silver oxide batteries with a mercury content < 2%, button zinc air batteries with a mercury content < 2%</i>	2020
<i>Switches and relays, except very high accuracy capacitance and loss measurement bridges and high frequency radio frequency switches and relays in monitoring and control instruments with a maximum mercury content of 20 mg per bridge, switch or relay</i>	2020
<i>Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤ 30 watts with a mercury content exceeding 5 mg per lamp burner</i>	2020
<i>Linear fluorescent lamps (LFLs) for general lighting purposes:</i> (c) <i>Triband phosphor < 60 watts with a mercury content exceeding 5 mg per lamp;</i> (d) <i>Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp</i>	2020
<i>High pressure mercury vapour lamps (HPMV) for general lighting purposes</i>	2020
<i>Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays:</i> (a) <i>short length (≤ 500 mm) with mercury content exceeding 3.5mg per lamp</i> (b) <i>medium length (> 500 mm and ≤ 1 500 mm) with mercury content exceeding 5 mg per lamp</i> (c) <i>long length (> 1 500 mm) with mercury content exceeding 13 mg per lamp</i>	2020
<i>Cosmetics (with mercury content above 1ppm), including skin lightening soaps and creams, and not including eye area cosmetics where mercury is used as a preservative and no effective and safe substitute preservatives are available^{1/}</i>	2020
<i>Pesticides, biocides and topical antiseptics</i>	2020
<i>The following non-electronic measuring devices except non-electronic measuring devices installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available:</i> (a) <i>barometers;</i> (b) <i>hygrometers;</i> (c) <i>manometers;</i> (d) <i>thermometers;</i> (e) <i>sphygmomanometers.</i>	2020

Article 4(2) MC allows the Parties to take an alternative route to fulfilling the obligation of Article 4(1) MC:

A Party may, as an alternative to paragraph 1, indicate at the time of ratification or upon entry into force of an amendment to Annex A for it, that it will implement different measures or strategies to address products listed in Part I of Annex A. A Party may only choose this alternative if it can demonstrate that it has already reduced to a de minimis level the manufacture, import, and export of the large majority of the products listed in Part I of Annex A and that it has implemented measures or strategies to reduce the use of mercury in additional products not listed in Part I of Annex A at the time it notifies the Secretariat of its decision to use this alternative. In addition, a Party choosing this alternative shall:

- (a) Report at the first opportunity to the Conference of the Parties a description of the measures or strategies implemented, including a quantification of the reductions achieved;*
- (b) Implement measures or strategies to reduce the use of mercury in any products listed in Part I of Annex A for which a de minimis value has not yet been obtained;*
- (c) Consider additional measures to achieve further reductions; and*
- (d) Not be eligible to claim exemptions pursuant to Article 6 for any product category for which this alternative is chosen. (...)*

Parties may ask for exemptions for Annex A listed items under the conditions of Article 6 MC for 5 years (plus another 5 years if accepted by the Conference of the Parties (COP)). Note that an exemption can only be extended once per product per phase-out date, and no exemptions are permitted after the 10-year period has expired as from the phase-out date listed in Annex A.

MC6(2) specifically mentions that an exemption can be registered by a regional organisation such the EU:

“2. An exemption can be registered either for a categoryor... sub category identified by any State or regional economic integration organization.”

7.2.2.2 EU legislation addressing the provision

Many of the products listed in Annex A, Part I are already explicitly subject to EU legislation, with the mercury content being subject to maximum limit values. However, market-based EU laws (Batteries Directive, RoHS Directive, Cosmetics Regulation, REACH, etc.) address the “placing on the market” of the item in question only. This covers “import”, but neither “export” nor “manufacture”, and thus leaves a gap between the MC requirements and current EU legislation.

Export is only addressed by Regulation (EC) 689/2008 for cosmetics (and high-concentration mercury covered also by Regulation (EC) 1102/2008).

Table 7-2 provides an overview of how the three obligations of MC 4(1) are addressed by current EU legislation, taking into account that the obligations will start to be relevant by 2020.

Table 7-2 EU *acquis* coverage of MC requirements for products.

	MC entry	EU legislation banning placing on the market	EU legislation on banning export	EU legislation on banning manufacturing
1	Batteries, except for button zinc silver oxide batteries with a mercury content < 2%, button zinc air batteries with a mercury content < 2%	EU Batteries Directive 2006/66/EC prohibits placing on the market of all batteries that contain more than 0.0005% by weight of mercury except button cells with 2% by weight. Button cell exception expires in 2015. As the 0.0005% limit is intended to cover all intentional mercury (but allow trace concentrations), the Dir. covers MC4(1) sufficiently as regards placing on the market.	None	None
2	Switches and relays, except very high accuracy capacitance and loss measurement bridges and high frequency radio frequency switches and relays in monitoring and control instruments with a maximum mercury content of 20 mg per bridge, switch or relay	RoHS Directive 2011/65/EU restricts the use of mercury in concentrations over 1 % w/w with some exemptions as of its Annex III. Based on data on Hg amount per type switches and relays are deemed covered sufficiently by the RoHS Directive	None	None
3	Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤ 30 watts with a mercury content exceeding 5 mg per lamp burner	RoHS Directive 2011/65/EU goes beyond this with a (stricter) limit of 2,5mg (or 3,5mg) of mercury, which is no issue under MC since Parties are entitled to keep stricter measures	None	None
4	Linear fluorescent lamps (LFLs) for general lighting purposes: (e) Triband phosphor < 60 watts with a mercury content exceeding 5 mg per lamp; (f) Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp	+ RoHS Directive 2011/65/EU covers this sufficiently	None	None
5	High pressure mercury vapour lamps (HPMV) for general lighting purposes	RoHS Directive 2011/65/EU currently includes an exemption for this product type, but the exemption expires by 13 April 2015	None	None
6	Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays: (a) short length (≤ 500 mm) with mercury content exceeding 3.5mg per lamp (b) medium length (> 500 mm and ≤ 1 500 mm) with mercury content exceeding 5 mg per lamp (c) long length (> 1 500 mm) with mercury content exceeding 13 mg per lamp	These lamps are exempted in the RoHS Directive 2011/65/EU but with thresholds for exempted lamps matching exactly the thresholds in of the MC.	None	None
7	Cosmetics (with mercury content above 1ppm), including skin lightening soaps and creams, and not including eye area cosmetics where mercury is used as a preservative and no effective and safe substitute preservatives are available	“Mercury and its compounds” is included in the list of prohibited substances (Annex II, entry 221 in Regulation 1223/2009 on cosmetic products), with the exception of two mercury compounds which are allowed to be used in eye cosmetics, with threshold concentrations of 0.007 % w/w Phenyl Mercuric Acetate and Thimerosal. The MC provision is deemed covered.	Cosmetic soaps containing mercury	None
8	Pesticides, biocides and topical antiseptics	Mercury and mercury compounds are not approved as active substances for plant protection products or biocides under EU legislation. . Topical antiseptics are subject to EU legislation on medicals (Directive 2001/83/EC; Regulation (EC) 2004/726). It cannot be ruled out that authorisations may exist at MS level.	Pesticides containing mercury compounds	None
9	The following non-electronic measuring devices except non-electronic measuring devices installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available: (a) barometers; (b) hygrometers; (c) manometers; (d) thermometers; (e) sphygmomanometers	Annex XVII of REACH, entry 18a is related to “Mercury (CAS No 7439-97-6)” and restricts the use in fever thermometers and other non-electronic measuring devices. Note that this entry is modified by Regulation (EU) No 847/2012 amending Annex XVII to Regulation (EC) No 1907/2006 with effect of April 2014. Once in force and thereby repealing several reservations to the restriction currently existing, entry 18a will be covering the MC obligation.	None	None

To conclude:

- › The EU acquis does not cover manufacturing of the mercury-added products of Article 4 / Annex A Part I of MC;
- › Only for very few products (cosmetic soaps and pesticides), is the export of such items currently banned by the EU acquis;
- › In contrast, the import of most of the items (with the exception of antiseptics, where approvals may exist) is already now, or will be by 2020, well covered by EU legislation.

Do EU Batteries / RoHS Directives, as well as Cosmetics / REACH Regulations, with their “placing on the market concept” really cover all kind of imports, even if import occurs with the intention to use, or to supply it for free?

Placing on the market “is defined in Article 3(12) RoHS Directive as “*making available an EEE on the Union market for the first time*”. “Making available” itself is defined in Article 3(11): “*any supply of an EEE for distribution, consumption or use on the Union market in the course of a commercial activity, whether in return for payment or free of charge*”

Similarly, Article 2 h) of Cosmetics Regulation defines placing on the market as “the first making available of a cosmetic product on the Community market”, with Article 2 g) specifying that (g) ‘making available on the market’ means any supply of a cosmetic product for distribution, consumption or use on the Community market in the course of a commercial activity, whether in return for payment or free of charge;

Article 3(12) REACH Regulation defines the same term as “supplying or making available, whether in return for payment or free of charge, to a third party. Import shall be deemed to be placing on the market”.

Article 3(14) of Batteries Directive reads: “ ‘placing on the market’ means supplying or making available, whether in return for payment or free of charge, to a third party within the Community and includes import into the customs territory of the Community”

When interpreting the term, it is important to bear in mind that the relevant provisions of the legal documents have Article 114 TFEU (ex-Article 95 TEC) as their basis, the competence of the EU on the internal market. Thus, placing on the market is here understood as placing on the EU market. Manufacture and export are clearly not part of “placing on the market” in all three legal documents. This is confirmed e.g. by REACH Regulation restrictions which may apply to placing on the market, use or manufacturing (Article 67 REACH) – there would be no justification for mentioning manufacturing here if it was already covered by placing on the market.

The REACH Regulation and Batteries Directive do directly include “*import*” (without further requirements) for the definition of placing on the market, so all cases of imports, including those destined for own use by the same legal person, or making it available free

of charge, are covered.

The RoHS Directive and Cosmetics Regulation use a slightly different approach, albeit with the same result, since the definition includes “*supply for consumption / use*” if taking a look as part of “*making available*” - including free of charge (Article 3(11)).

Thus, there are no loopholes in the MC requirements.

7.2.2.3 Initial proposals for additional measures

Additional measures will be necessary to comply with MC obligations in several dimensions:

- › For all items, “manufacture” needs to be addressed;
- › “Export” needs to be addressed for most of the items.

There are several possible ways of addressing these issues:

Option MC4(1)-1a

One option is to introduce a restriction package for all the above-mentioned product / product groups with respect to their mercury content in a manner that is fully consistent with Annex A, Part I MC, via a new or revised regulation dedicated to implementation of the MC (presumably as revision of Regulation 1102/2008). This would cover import, export and manufacture. Existing specific legislation would need to be modified or repealed as required.

Option MC4(1)-2

A further option is to introduce into REACH Annex XVII a restriction package for all the above-mentioned product / product groups with respect to their mercury content in a manner that is in full line with Annex A, Part I MC. This would cover import, export and manufacture. Devices which are already addressed within Annex XVII REACH could be excluded (as they are already covered). Other existing specific legislation would need to be modified or repealed accordingly.

Option MC4(1)-3

Alternatively it would in principle be possible to introduce provisions restricting export / manufacturing – and import, where not already covered - of the mercury-added products of Annex A Part I, into the array of relevant specific EU legislations where other aspects for the same product are already covered ((Batteries Directive, RoHS Directive, Cosmetics Regulation, REACH, etc.). This would expand the obligations placed on economic actors by those EU laws to cover also the export and manufacture of the relevant mercury-added products.

Option MC4(1)-4

The EU might also wish to choose the MC Article 4(2) route described above for some of the products concerned in view of its existing rather comprehensive product legislation and/or request specific exemptions under Article 6 MC.

Discussion

From a point of streamlining legislation and clear, comprehensible legal texts, Option MC4(1)-1 appears the easiest and most convincing alternative, since the addressees of the provisions (manufacturers, import and export business, competent enforcement authorities) would then have all relevant provisions within one legal document. Further, such an approach would avoid the need to adhere to the specific procedures required under REACH and/or other specific legislation (e.g. observing consultation of Committees which have a defined competence under the specific legal document). It would most likely allow for a more rapid ratification and effective implementation. Also, introducing such restrictions into a legal document that was dedicated to the implementation of the MC would facilitate more straightforward implementation of amendments to the MC in the future.

Option MC4(1)-4 is in principle possible, but may undermine the EU's overall intention to support the MC and its quick and effective implementation by other Parties.

Setting up a separate Regulation instead of using existing horizontal legislation when implementing an international convention on chemicals: The example of EU POPs Regulation

Where gaps exist in the EU acquis with respect to the diverse obligations set out by the MC (not just those under Article 4 MC) the two general options for transposing these obligations are to:

- Introduce the changes required in appropriate locations across the EU's existing legislative framework (such as REACH for chemicals related provisions, or IE Directive regarding industrial processes); or
- Consolidate the changes into a single legal instrument dedicated to mercury, presumably as a revision of the existing Regulation (EC) 1102/2008.

It seems appropriate to recall the general considerations made by the Commission when considering the implementation of the Stockholm Convention on POPs and the POPs Protocol under the LRTAP Convention. The justification for opting for a separate Regulation can be found in the Commission's legislative proposal (COM (2003) 333 final):

Although most of the listed POPs are no longer produced or used in the Community, the present chemicals legislation does not include actual provisions to prevent and eliminate intentionally produced POPs from being placed on the market. In addition, Community legislation on waste does not include all the measures set forth in the Stockholm Convention.

The proposal then discusses the different fields where action was necessary.

Example - release inventory: considerations of subsidiarity

The proposal, *inter alia*, concludes that:

[...] While control measures on intentionally produced chemicals would continue to have to be fully harmonised in order to prevent any distortion of the internal market, the implementation of additional release control measures on by-products, provisions on soil contamination as well as certain general obligations of the Convention could be addressed in accordance with the subsidiarity principle

- i.e. not necessarily at EU level. Consequently, Article 6(1) of POPs Regulation (EC) 850/2004 dealing with the transposition of the (firm-law) obligation of establishing and maintain a release inventory reads:

[...] Member States shall draw up and maintain release inventories for the substances listed in Annex III into air, water and land in accordance with their obligations under the Convention and the Protocol.

Example - chemicals: interplay with planned general legislation

Of further interest are the considerations with respect to marketing of chemicals:

At the same time as the current proposal, the Commission is preparing a comprehensive reform of the chemicals legislation [i.e. REACH] [which] would be the best instrument to implement the necessary control measures on production, marketing and use of intentionally produced POPs. However, given the scale and complexity of the proposal on the new chemicals legislation, the final adoption of the new rules may take some time. Therefore, and in order to facilitate early ratification of the two international POP agreements, the implementation measures related to production, marketing and use of the currently listed POPs are included in the present proposal as a temporary measure. In the medium term, it is intended that these measures will be subsequently incorporated in the new chemicals legislation. The proposal for the new chemicals legislation will therefore include measures to transfer these provisions from the POP Regulation. [...] Later on, the provisions on production, marketing and use of the listed POPs and on the prevention of production and use of substances exhibiting POP characteristics are to be introduced as a part of the new chemicals legislation.

This intention is also reflected in Recital (8) of POPs Regulation ("In the future, the proposed REACH Regulation could be an appropriate instrument by which to implement the necessary control measures on production, placing on the market and use of the listed substances and the control measures on existing and new chemicals and pesticides exhibiting persistent organic pollutants' characteristics. However, without prejudice to the future REACH Regulation and since it is important to implement these control measures on the listed substances of the Protocol and the Convention as soon as possible, this Regulation should for now implement those measures"). However, interestingly, REACH Regulation has not been used as a tool for integrating such measures. Instead, acts amending the Annexes of POPs Regulation are used for integrating new entries restricting the marketing and use of POPs (for instance in the case of PFOA, see Regulation (EU) No 757/2010), and even shifting prior restriction entries of the Annex XVII REACH into the Annexes of POPs Regulation (for instance in the case of SCCP, see Regulation (EU) No 519/2012, and Regulation (EU) No 126/2013 respectively). Neither REACH, nor the amending acts, provide a justification for deviating from the approach originally intended.

7.2.3 Article 4(3): Measures with respect to mercury-added products of Annex A, Part II

7.2.3.1 Obligations of the provision

Article 4(3) MC sets out the following obligations for the Parties:

Each Party shall take measures for the mercury-added products listed in Part II of Annex A in accordance with the provisions set out therein.

Annex A, Part II is worded as follows:

Table 7-3 MC provisions for dental amalgam.

Mercury-added products	Provisions
Dental amalgam	<p><i>Measures to be taken by a Party to phase down the use of dental amalgam shall take into account the Party's domestic circumstances and relevant international guidance and shall include two or more of the measures from the following list:</i></p> <ul style="list-style-type: none"> <i>(i) Setting national objectives aiming at dental caries prevention and health promotion, thereby minimizing the need for dental restoration;</i> <i>(ii) Setting national objectives aiming at minimizing its use;</i> <i>(iii) Promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration;</i> <i>(iv) Promoting research and development of quality mercury-free materials for dental restoration;</i> <i>(v) Encouraging representative professional organizations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices;</i> <i>(vi) Discouraging insurance policies, and programmes that favour dental amalgam use over mercury-free dental restoration;</i> <i>(vii) Encouraging insurance policies and programmes that favour the use of quality alternatives to dental amalgam for dental restoration;</i> <i>(viii) Restricting the use of dental amalgam to its encapsulated form;</i> <i>(ix) Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.</i>

Although the wording of the provision seems to suggest that this is a firm law measure, a review of the nine measures shows that the Parties are to choose among several soft law measures. In terms of interpretation, some of the points mention the obligation to take action at “national” level, which we assume also covers actions at EU level, since the EU can impose measures at national level.

Parties have the option to request an exemption pursuant to MC Article 6.

7.2.3.2 EU legislation addressing the provision

There are no EU-wide measures on dental amalgam currently in place and, to our knowledge, none of the measures given in the MC are currently adopted at the EU

level. Several of the measures are adopted in Member State legislation/initiatives. The issue of dental amalgam is currently under review at EU level.

7.2.3.3 Initial proposals for additional measures

Whereas some of the measures might best be addressed at Member State level, from the perspective of subsidiarity, and keeping in mind that the dental amalgam issue is under review in other Commission work, we propose the following options:

Option MC4(3)-1

This is a ‘low ambition’ option demanding no legal changes, but relying only on encouragement/studies/promotion; that is, at least two of the MC Annex A- Part II measures iii, v and ix. If any action is necessary, the two measures could be implemented as (for example) parts of a Commission communication on a dental amalgam strategy (or a revised EU mercury strategy). Measures MC Annex A, Part II v and ix are deemed the minimal implementation measures:

(v) Encouraging representative professional organizations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices;

(ix) Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.

Measure (ix) can be claimed to be addressed already as EU waste regulation require collection and separate treatment of mercury amalgam waste. Key element in best environmental practice for dentistry are the use of amalgam separators in the facilities sewage system and separate collection of amalgam waste.

Option MC4(3)-2

A more ambitious alternative is to establish an EU law regulating relevant key aspects of environment and health protection related to amalgam use, going beyond the requirements of MC. An example would be an EU-wide ban on dental amalgam, with exemptions for specified cases (for example inspired by an ongoing current review of the Danish mercury ban (see COWI, 2014), in combination with enforcement actions to secure MS implementation of current waste requirements on dental amalgam (use and maintenance of amalgam separators and separate collection of amalgam waste). Such measures would presumably have to be laid down within a Regulation implementing the MC at EU level.

7.2.4 Article 4(5): Measures with respect to prevention of the incorporation into assembled products of mercury-added products

7.2.4.1 Obligations of the provision

Article 4(5) MC reads:

Each Party shall take measures to prevent the incorporation into assembled products of mercury-added products the manufacture, import and export of which are not allowed for it under this Article.

7.2.4.2 EU legislation addressing the provision

EU legislation on the restricted mercury-added products (REACH, RoHS,...) covers such products when they are incorporated into appliances.

7.2.4.3 Initial proposals for additional measures

None.

7.2.5 Article 4(6): Discouragement of the manufacture and the distribution in commerce of new mercury-added products

7.2.5.1 Obligations of the provision

Article 4(6) MC reads:

Each Party shall discourage the manufacture and the distribution in commerce of mercury-added products not covered by any known use of mercury-added products prior to the date of entry into force of the Convention for it, unless an assessment of the risks and benefits of the product demonstrates environmental or human health benefits. A Party shall provide to the Secretariat, as appropriate, information on any such product, including any information on the environmental and human health risks and benefits of the product. The Secretariat shall make such information publicly available.

The provision introduces a firm law obligation for the Parties to take appropriate measures to discourage mercury-added products addressed by this Article. The term “discourage” is however not defined in the MC, and there is scope for interpretation in how far firm implementing measures need to be to provide “discouragement”.

7.2.5.2 EU legislation addressing the provision

At present, EU law does not contain any specific obligation to discourage products containing mercury. However, in addition to the existing restrictions (cf. section on REACH above), the Authorisation scheme under the REACH Regulation is a tool that can “discourage” the use of those substances which are identified as Substances of Very High Concern (SVHC), and later subject to the authorisation requirement (see description on next page).

Identification as SVHC, candidate list, and authorisation under REACH

SVHC under REACH

SVHCs are defined under REACH as all substances that have at least one of the properties listed in Article 57 lit. (a) to (f) of the REACH Regulation, in more detail

- substances meeting criteria for the classification as carcinogenic, mutagenic or reprotoxic (“CMR”, lit. (a) to (c)) categories 1A or 1B, in accordance with CLP;
- substances which are persistent, bioaccumulative and toxic (“PBT”, lit. (d)), in line with the criteria of

Annex XIII REACH;

- substances which are very persistent and very bioaccumulative (“vPvB” (lit. (e)), in line with the criteria of Annex XIII REACH;
- substances which give rise to an equivalent level of concern to those of substances listed above (lit. (f)).

Mercury as possible SVHC

Elemental mercury is classified as Reprotoxic 1B, and by this it meets the criteria for being identified as a SVHC.

REACH approach for SVHC Identification and subsequent authorisation requirement

The approach of REACH regarding SVHCs is as follows:

1. A substance is identified as a SVHC and included in the so-called “Candidate List”
2. Then, it can be prioritised and recommended by the European Chemicals Agency (ECHA) for its inclusion in Annex XIV, and thus subject to the authorisation requirement. It has to be noted that the REACH Regulation provides the following criteria which shall normally be used for prioritising substances for their inclusion in Annex XIV: PBT or vPvB properties; wide dispersive use; high volumes.
3. The decision of including substances in Annex XIV is made by the Commission, through comitology.

ECHA’s prioritisation criteria may be overlooked in very specific case, such as for the implementation of an international commitment.

The “Candidate List” (substances identified as SVHC under REACH) and the “Authorisation List (Annex XIV)” are published on the ECHA web-site.

Consequences from identification as SVHC / listing in Candidate List

Where a substance is listed in the Candidate List, the following communication obligations apply:

- 1) update of the Safety Data Sheet (SDS) for the substance itself or in a mixture;
- 2) in case of the substance being present in articles there is a duty to communicate this fact according to Article 33(1) REACH)

Additionally, SVHCs in articles have to be notified to ECHA under conditions of Article 7(2) REACH.

Consequences from listing in Annex XIV

Once a substance has been listed in Annex XIV and is thus subject to the authorisation requirement that substance, after a transition period (“sunset date”), shall not be placed on the market for a use, or used unless a specific authorisation has been granted for that use. To be authorised, operators (manufacturers, importers, and/or downstream users) shall submit an application for authorisation to ECHA, to be accompanied by a fee; after the scientific committees of ECHA have delivered an opinion on the application, the Commission makes a decision via comitology.

7.2.5.3 Initial proposals for additional measures

Option MC4(6)-1

Mercury could be added to the Candidate List and later into Annex XIV of REACH and thus be made subject to authorisation. Another option could be to use Article 68(2) of REACH, that allows the ban of articles for consumer uses containing mercury, on the basis of its classification as CMR cat 1 b. Otherwise a restriction under REACH could be introduced, or a conditional ban could be expressed in a further developed Regulation (EC) 1102/2008.

Option MC4(6)-2

A general (softer) discouragement could be also expressed explicitly, within a further developed Regulation (EC) 1102/2008. Such discouragement could be expressed as a statement towards the institutions and agencies at EU level, or towards the Member States, or to both.

Discussion

Submitting mercury to Annex XIV of REACH would lead to a general ban on the use of the substance within the EU after the sunset date, with the possibility for manufacturers / importers and downstream users to apply for an authorisation under the so-called “controlled risk” route or the so called “socio-economic route”. Imports of articles are, however, not covered by the authorisation scheme (for import to be covered a restriction under REACH would be required). Considering that the requirement to discourage the launch of new mercury-added products pertains to EU manufacture, making mercury subject to a general authorisation requirement would certainly comply with the soft law obligation to “discourage” further use. However, following the REACH procedures may require more administrative efforts than a stand-alone measure. The Commission and ECHA have their published agenda on substance evaluation and prioritisation for inclusion available. A general mercury inclusion has so far not been part of that agenda.

On the other hand, if opening the REACH regulation is an option, one possible approach could be to introduce a new article providing a general “fast track” entry under REACH of substances subject to international (or other extra-EU) obligations, by-passing the usual REACH procedures. This article could simply refer to a new annex to REACH which gave the specific details of the restrictions of the chemicals in question, as required by the international treaty. It could be used in the future to support implementation of international obligations on chemicals, such as addition of new substances to the Stockholm Convention on POPs, thereby avoiding the need for specific regulations transposing the terms of individual conventions.

Option MC4(6)-2, although having a limited impact, may be a viable low-ambition option.

7.3 MC article 5: Manufacturing processes in which mercury or mercury compounds are used

7.3.1 Introduction to MC obligations

Article 5 MC covers manufacturing processes in which mercury or mercury compounds are used.

Article 5(2) MC covers the phasing out of two processes using mercury (chlor-alkali production by 2025 and acetaldehyde production using mercury or mercury compounds as a catalyst by 2018). Parties can apply for a five year exemption to the phase-out date pursuant to Article 6, renewable for a total of 10 years.

Several processes are subject to restrictions (Article 5(3) MC). These include the production of vinyl chloride monomer (VCM), sodium or potassium methylate or ethylate, and polyurethane. Parties are required to take certain measures specified in Annex B, Part II, with respect to each of these processes, including production, use, and emission reduction.

Parties have to “take measures” to control emissions and releases. They shall also “endeavour” to identify facilities that use mercury for the processes in Annex B. Parties are not allowed to permit the use of mercury in new chlor-alkali plants and acetaldehyde production facilities after the treaty comes into force.

Parties are required to “discourage” the development of new processes using mercury (Article 5(7) MC). Parties can allow these mercury-using processes if they can demonstrate that it “provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits.”

Exempted processes, not covered by Article 5 MC, include processes using mercury-added products, processes for manufacturing mercury-added products, or processes that process mercury-containing waste. These activities are covered in other MC articles.

7.3.2 Article 5(2): Prohibition of mercury use in the processes listed in part I of Annex B: chlor-alkali production, acetaldehyde production

7.3.2.1 Obligations of the provision

Article 5(2) MC reads

Each Party shall not allow, by taking appropriate measures, the use of mercury or mercury compounds in the manufacturing processes listed in Part I of Annex B after the phase-out date specified in that Annex for the individual processes, except where the Party has a registered exemption pursuant to Article 6.

The wording “shall not allow” makes clear that the obligations under this Article are firm legal obligations for the Parties.

Reading this Article together with Article 5(6) MC shows that Article 5(2) addresses existing facilities.

Annex B, Part I lists the following processes:

Table 7-4 Processes covered by Annex B, Part I and their phase-out dates

Manufacturing processes using mercury or mercury compounds	Phase-out date
Chlor-alkali production	2025
Acetaldehyde production in which mercury or mercury compounds are used as a catalyst	2018

Parties may ask for exemptions for Annex B listed processes under the conditions of Article 6 MC for a maximum of five years (plus another five years if accepted by the COP). Article 6(2) MC specifically mentions that an exemption can be registered by a regional organisation such as the EU:

An exemption can be registered either for a categoryor... sub category identified by any State or regional economic integration organization.

7.3.2.2 EU legislation addressing the provision

The IE Directive covers chlor-alkali processes (Annex I to the Directive, section 4.2, lit. a) and c)). A specific BREF is dedicated to the production of chlor-alkali. A revised BREF was adopted in December 2013; the BAT conclusions read as follows:

“The mercury cell technique cannot be considered BAT under any circumstances.”

This statement becomes part of the reference standard for permits (Article 14(3) IE Directive). Existing installations have to comply with the BAT conclusions within four years after publication of the BREF (Article 21(3) IE Directive).

Acetaldehyde production is covered by the IED regime (Annex I to the Directive, section 4.1, lit. b)) subject to the BREF on Large Volume Organic Chemical Industry (LVOC; current version of February 2003; review process currently ongoing). The production process is described in that document without mentioning the use of mercury or mercury compounds as a catalyst. Indeed, such a process is not conducted currently in the EU.

7.3.2.3 Initial proposals for additional measures

EU legislation, after adoption of revised chlor-alkali BAT conclusions with Commission Implementing Decision 2013/732/EU, sufficiently covers the MC obligations as of Article 5(2) regarding chlor-alkali production.

Option MC5(2)-1

To adequately address the MC obligations relating to acetaldehyde production including mercury, it would be possible to – in effect - implement a ban on this process by amending the BREF document on LVOC within the current review process. It is understood that if there is common understanding during BREF deliberations that a certain process should not be used, such a statement

characterizing the process as non-BAT could be introduced in the BAT conclusions without a specific in-depth assessment.

Option MC5(2)-2

Another possibility would be to implement this ban as part of the revised EU Regulation 1102/2008, implementing the obligations of MC.

7.3.3 Article 5(3): Restricting the use of mercury in the processes listed in part II of Annex B: VCM, Na/K-methylate/ethylate, polyurethane

7.3.3.1 Obligations of the provision

Article 5(3) MC reads:

Each Party shall take measures to restrict the use of mercury or mercury compounds in the processes listed in Part II of Annex B in accordance with the provisions set out therein.

The wording “shall take measures” makes clear that this is a firm legal obligation for the Parties. Note that reading this Article together with Article 5(6) MC shows that Article 5(3), just as Article 5(2) MC, intends to address existing facilities.

Major interpretation issues are not observed. For sodium/potassium methylate/ethylate and polyurethane, the phrase “*Measures to be taken by the Parties shall include ...measures to reduce the use of mercury aiming at the phase out of this use as fast as possible and within 10 years of the entry into force of the Convention*” (see below) can be understood both as “shall phase out” and “shall try to phase out”.

Annex B, Part II lists the following processes and related obligations:

Table 7-5 Processes covered by Annex B, Part II and related MC requirements.

Mercury using process	Provisions
<i>Vinyl chloride monomer production (VCM)</i>	<p><i>Measures to be taken by the Parties shall include but not be limited to:</i></p> <ul style="list-style-type: none"> <i>(i) Reduce the use of mercury in terms of per unit production by 50% by the year 2020 against 2010 use;</i> <i>(ii) Promoting measures to reduce the reliance on mercury from primary mining;</i> <i>(iii) Taking measures to reduce emissions and releases of mercury to the environment;</i> <i>(iv) Supporting research and development in respect of mercury-free catalysts and processes;</i> <i>(v) Not allowing the use of mercury five years after the Conference of the Parties has established that mercury-free catalysts based on existing processes have become technically and economically feasible;</i> <i>(vi) Reporting to the Conference of the Parties on its efforts to develop and/or identify alternatives and phase out mercury use in accordance with Article 21.</i>
<i>Sodium or Potassium Methylate or Ethylate</i>	<p><i>Measures to be taken by the Parties shall include but not be limited to :</i></p> <ul style="list-style-type: none"> <i>(i) Measures to reduce the use of mercury aiming at the phase out of this use as fast as possible and within 10 years of the entry into force of the Convention;</i> <i>(ii) Reduce emissions and releases in terms of per unit production by 50 percent by 2020 compared to 2010;</i> <i>(iii) Prohibiting the use of fresh mercury from primary mining;</i> <i>(iv) Supporting research and development in respect of mercury-free processes;</i> <i>(v) Not allowing the use of mercury five years after the Conference of the Parties has established that mercury-free processes have become technically and economically feasible;</i> <i>(vi) Reporting to the Conference of the Parties on its efforts to develop and/or identify alternatives and phase out mercury use in accordance with Article 21.</i>
<i>Production of polyurethane using mercury containing catalysts</i>	<p><i>Measures to be taken by the Parties shall include but not be limited to:</i></p> <ul style="list-style-type: none"> <i>(i) Taking measures to reduce the use of mercury, aiming at the phase out of this use as fast as possible, within 10 years of the entry into force of the Convention;</i> <i>(ii) Taking measures to reduce the reliance on mercury from primary mercury mining;</i> <i>(iii) Taking measures to reduce emissions and releases of mercury to the environment;</i> <i>(iv) Encouraging research and development in respect of mercury-free catalysts and processes;</i> <i>(v) Reporting to the Conference of the Parties on its efforts to develop and/or identify alternatives and phase out mercury use in accordance with Article 21;</i> <p><i>Paragraph 6 of Article 5 shall not apply to this manufacturing process.</i></p>

The reporting obligations (as mentioned under the sections VCM (vi), methylate/ethylate (vi), and polyurethane (v)) are not further considered in this report.

The use reduction obligations (VCM (i)) are related to “per unit production”.

Parties may ask for exemptions under the conditions of Article 6 MC as described previously.

7.3.3.2 EU legislation addressing the provision

The three processes relevant to Article 5(3) MC are addressed by Annex I, section 4.1 to the IE Directive, insofar as they are carried out at an 'industrial scale'. The processes are covered by the BREF documents as follows:

- **VCM:** VCM features as an illustrative process in the Large Volume Organic Chemicals (LVOC) BREF (adopted in February 2003, currently under revision), and is planned to feature as such in the revised document. Reference to mercury is only made to historic examples of abandoned processes, alternative process routes are well established and in wide use. One example of current mercury use in VCM manufacturing is reported for a minor use in one facility (in Slovakia).
- **Na/K-Ethylate/methylate process with mercury:** The Na/K-ethylate/methylate process is not addressed specifically in the LVOC BREF, but is likely covered there (being – at least partly - large volume organic substances). Nor is it addressed specifically in the BREF “Manufacture of Organic Fine Chemicals” (OFC, adopted in August 2006). The mercury process is reportedly used in only one MS.
- **Production of polyurethane (PUR):** The use of mercury-containing catalysts is not addressed in detail in the current BREF on “Production of Polymers” (POL, adopted in August 2007).
- REACH Annex XVII (as amended by Regulation (EU) 848/2012) stipulates that five specified phenyl-Hg compounds must not be manufactured, used or placed on the market, if the concentration of mercury in the mixtures is equal to or greater than 0.01 % by weight, with effect from October 2017. However, this does not cover all mercury catalysts for PUR use. As of June 2013, no mercury compounds ((including compounds used for polyurethane (PUR) catalysis) were registered under REACH. This means that they – in order to adhere to the REACH regulation – are no longer used or can only be used in minute amounts in the EU (<100 t/y). They must be registered by 2018 to be accepted as “existing” chemicals on the market (COWI, 2014).

In conclusion, the restrictions required by Article 5(3) MC / Annex B are currently not addressed by the EU *acquis*.

7.3.3.3 Initial proposals for additional measures

Restrictions regarding existing facilities

Most of the restrictions mentioned in Article 5(3) / Annex B, Part II MC relate to facilities which would currently be operated only under permit in the EU, either at the level of law or at the level of environmental permits; these restrictions are highlighted in bold below:

Table 7-6 Annex B, Part II MC facilities which would be operated with existing permits in the EU.

Vinyl chloride monomer production (VCM)	<ul style="list-style-type: none"> (i) Reduce the use of mercury in terms of per unit production by 50% by the year 2020 against 2010 use; (ii) Promoting measures to reduce the reliance on mercury from primary mining; (iii) Taking measures to reduce emissions and releases of mercury to the environment; (iv) Supporting research and development in respect of mercury-free catalysts and processes; (v) Not allowing the use of mercury five years after the Conference of the Parties has established that mercury-free catalysts based on existing processes have become technically and economically feasible; (vi) (...)
Sodium or Potassium Methylate or Ethylate	<p>Measures to be taken by the Parties shall include but not be limited to :</p> <ul style="list-style-type: none"> (i) Measures to reduce the use of mercury aiming at the phase out of this use as fast as possible and within 10 years of the entry into force of the Convention; (ii) Reduce emissions and releases in terms of per unit production by 50 percent by 2020 compared to 2010; (iii) Prohibiting the use of fresh mercury from primary mining; (iv) Supporting research and development in respect of mercury-free processes; (v) Not allowing the use of mercury five years after the Conference of the Parties has established that mercury-free processes have become technically and economically feasible; (vi) (...)
Production of polyurethane using mercury containing catalysts	<p>Measures to be taken by the Parties shall include but not be limited to:</p> <ul style="list-style-type: none"> (i) Taking measures to reduce the use of mercury, aiming at the phase out of this use as fast as possible, within 10 years of the entry into force of the Convention; (ii) Taking measures to reduce the reliance on mercury from primary mercury mining; (iii) Taking measures to reduce emissions and releases of mercury to the environment; (iv) Encouraging research and development in respect of mercury-free catalysts and processes; (v) (...)

All these measures could be implemented by setting EU-wide standards for operation which should be considered by MS authorities during the renewal of the environmental permits for each facility.

The EU could request specific exemptions as available under Article 6 MC. This is possible in principle, but could potentially undermine the EU's overall intentions of supporting the MC and its quick and effective implementation by other Parties.

Option MC5(3)-1a

The restrictions stipulated by Article 5(3) MC that are related to facilities' processes could be implemented by amendment of the BAT conclusions in the relevant BREFs. Section 7.3.2.2 discusses the legal effects of inserting restrictions in BAT conclusions for existing facilities.

Option MC5(3)-1b

This is similar to Option MC5(3)-1a, but with polyurethane being regulated under REACH by extending the current ban of five mercury catalysts to a general ban on mercury catalysts for this use, as already recommended in the ECHA RAC opinion on the issue.

Option MC5(3)-2

Another possibility would be to implement these restrictions as part of the revised EU Regulation 1102/2008, implementing the obligations of MC.

Research / development obligations

As a supplement to the options above, the EU could support research and development on the use of mercury in the Na/K-methylate/ethylate process. Such support / encouragement could be fostered through EU means and funds, and - if needed - a commitment could be laid down in an Article in the revised Regulation 1102/2008, together with other commitments for research and development.

Implementing the MC obligations would have minimal impacts for VCM and polyurethane. The current use for VCM is reported to be minimal (and is limited to one MS). The COWI/Concorde East/West (2008) study indicates that mercury-free alternatives are available for all polyurethane uses. For the Na/K-methylate/ethylate mercury process, alternatives are available globally, and from one new production facility in the EU (in France).

7.3.4 Article 5(5): Taking measures to "address" emissions and releases from Annex B processes

7.3.4.1 Obligations of the provision

Article 5(5) MC reads as follows:

Each Party with one or more facilities that use mercury or mercury compounds in the manufacturing processes listed in Annex B shall:

(a) Take measures to address emissions and releases of mercury or mercury compounds from those facilities;

(b) Include in its reports submitted pursuant to Article 21 information on the measures taken pursuant to this paragraph; and

(c) Endeavour to identify facilities within its territory that use mercury or mercury compounds for processes listed in Annex B

and submit to the Secretariat, no later than 3 years after the date of entry into force of the Convention for it, information on the number and types of such facilities and the estimated annual amount of mercury or mercury compounds used in those facilities. The Secretariat shall make such information publicly available.

Article 5(5) lit. (a) MC applies a firm legal obligation on Parties to the MC. Note that it is redundant if full phase-outs are implemented in response to Article 5(3) MC. The wording pair “emissions and releases”, as used throughout the MC, is understood to mean “*emissions*” to the atmosphere, and “*releases*” to land and water, as apparent from Article 8 and 9 MC.

The obligation of Article 5(5) lit. (c) MC is a soft law duty as apparent from the wording (“shall endeavour”).

Major interpretation issues are not observed.

7.3.4.2 EU legislation addressing the provision

Since the processes covered by Annex B are, without exemption, subject to the IED regime, emissions and releases are addressed by the IE Directive’s provisions on requirements for permits, and obligations for operators of such facilities. This obligation of Article 5(5) lit. (a) MC is thus covered by EU acquis.

The soft law commitment applied by Article 5(5) lit. (c) MC is not fulfilled by maintaining the register according to PRTR Regulation, since the PRTR Regulation does not require reporting of the amounts of any substance used but Article 5(5) lit. (c) MC does.

7.3.4.3 Initial proposals for additional measures

Option MC5(5c)-1

The EU Commission could launch an investigation with MS authorities, or a study, on the presence of Annex B facilities in the EU, possibly in the framework of discussion on relevant BREF reviews.

7.3.5 Article 5(6): Prohibition of using mercury in new (Annex B) facilities

7.3.5.1 Obligations of the provision

Article 5(6) MC stipulates that

Each Party shall not allow the use of mercury or mercury compounds in a facility that did not exist prior to the date of entry into force of the Convention for it using the manufacturing processes listed in Annex B. No exemptions shall apply to such facilities.

The wording “shall not allow” clearly introduces a binding obligation for all MC parties once the Convention enters into force for them. Major interpretation issues are not observed.

Annex B, Part II exempts polyurethane production from the application of Article 5(6) MC. No major interpretation issues are anticipated.

7.3.5.2 EU legislation addressing the provision

If the relevant processes are addressed by BAT conclusions under the IE Directive regime (such as mercury used in chlor-alkali production), such statements become part of the reference for permit conditions (Article 14(3) IE Directive); accordingly, no new permit may be issued once the new BREF is adopted. However, the chlor-alkali process is the only Annex B process where BAT conclusions specifically address the mercury issues which are in the focus of MC.

7.3.5.3 Initial proposals for additional measures

Option MC5(6)-1 (potentially identical to Option MC5(3)-1a)

To adequately address the MC obligations, it would be possible to implement a ban on the other Annex B processes by amending the relevant BREF documents with explicit BAT conclusions on these processes.

Option MC5(6)-2 (potentially identical to Option MC5(3)-2)

Another possibility would be to implement this ban as part of the revised EU Regulation 1102/2008, implementing the obligations of MC.

7.3.6 Article 5(7): Discouraging the development of new facilities using any other mercury-based manufacturing process

7.3.6.1 Obligations of the provision

Article 5(7) MC reads:

Each Party shall discourage the development of any facility using any other manufacturing process in which mercury or mercury compounds are intentionally used that did not exist prior to the date of entry into force of the Convention, except where the Party can demonstrate to the satisfaction of the Conference of the Parties that the manufacturing process provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits.

Article 5(7) MC sets out a firm law obligation addressed to the Parties. As with Article 4(6), the term “discourage” is however not defined in the MC, and it there is scope for debate in firm implementing measures need to be in order to provide “discouragement”.

7.3.6.2 EU legislation addressing the provision

There is no EU legislation providing compliance with this obligation.

7.3.6.3 Initial proposals for additional measures

The main challenge of this obligation is that it is related to a currently unknown process and process conditions.

Option MC5(7)-1 (identical to Option 4(6)-1)

The Article 5(7) MC obligation could be satisfied by submitting mercury and all its compounds (as a whole) to the REACH authorization regime. Any use of the

substance would then be banned unless it could be demonstrated within an application either that the risk can be controlled, or that the socio-economic consequences outweigh the impacts of the ban. Alternatively a restriction could be introduced under REACH, or a conditional ban introduced through revision to Regulation (EC) 1102/2008.

Option MC5(7)-2

The IE Directive could be modified. Given the challenges described above this would presumably be via a specific article related to use of mercury and its compounds.

Option MC5(7)-3

A third option would be to lay down a (softer) ‘discouraging’ provision, possibly related rather generally to mercury / mercury compounds rather than to processes, within the revised Regulation 1102/2008, similarly to (or as part of) Option MC4(6)-3.

Discussion

The discussion of REACH in Section 7.2.5 explains the issues to be considered when using REACH in this context.

Regarding Option MC5(7)-2, The IE Directive currently does not recognize any substance-specific general restrictions or encouragements. The adjustment suggested by Option MC5(7)-2 would introduce a new dimension into the Directive, for which it is hard to see an advantage in comparison with laying down an identical provision in a Regulation specifically dedicated to mercury. The latter also would avoid frictions such as with the REACH procedures.

7.4 MC article 7: Artisanal and small-scale gold mining (ASGM)

7.4.1 Introduction to MC obligations

Artisanal and small-scale gold mining (ASGM) activity is defined by Article 2(1) MC as “*mining and processing in which mercury amalgamation is used to extract gold from ore.*”

Article 7(2) MC requires Parties for which such activity is relevant to take steps “*to reduce, and where feasible eliminate, the use of mercury and mercury compounds in, and the releases to the environment of mercury from, such mining and processing.*”

ASGM is an allowed use under the treaty but where a Party determines that ASGM and processing in its territory is “*more than insignificant*”, it is required to develop a national action plan (Article 7(3) MC), in line with the requirements of Annex C to MC. Such plans have to be submitted to the Secretariat within three years after entry into force with a review every three years.

7.4.2 Article 7(2): Reducing / elimination of use of mercury and mercury compounds during ASGM

7.4.2.1 Obligations of the provision

Article 7(2) MC reads:

Each Party that has artisanal and small-scale gold mining and processing subject to this Article within its territory shall take steps to reduce, and where feasible eliminate, the use of mercury and mercury compounds in, and the emissions and releases to the environment of mercury from, such mining and processing.

The wording “*shall take steps*” makes clear that there is a direct binding obligation for each Party to the Convention. The “significance” of the presence of ASGM is not relevant for the purpose of this Article. What measures are taken is not prescribed by Article 7(2), however, they must lead to reduction of the use of mercury and its compounds, and, where feasible (a term which itself is not further defined in MC, and which is not further explained in terms whether technical or economic feasibility is meant here), to their elimination.

7.4.2.2 EU legislation addressing the provision

The IE Directive covers “production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes” in its Annex I, point 2.5 (b).

The BREF “Non-ferrous Metals Industries” (NFM, current version of December 2001, currently under revision) does cover “precious metals”, but has not further detailed description of the use of mercury amalgamation in gold mining (nor of small scale gold mining).

The BREF “Management of Tailings and Waste-Rock in Mining activities” (MTWR, current version 2009) covers gold mining, irrespective of the amounts produced or the processing method used. The document does not specifically address or even mention the use of mercury or mercury compounds in gold mining / processing.

It is therefore not clear whether ASGM is covered under the IED.

7.4.2.3 Initial proposals for additional measures

Option MC7(2)-1

As a review of the BREF for the non-ferrous metal industry is in progress, one option is to define the use of mercury in gold extraction as non-BAT in a BAT conclusion on the issue, or alternatively to address possible other restrictions and release reduction techniques (retorts, fume hoods) in order to substantially reduce gold mining with the use of mercury amalgamation and associated releases.

Option MC7(2)-2

A third option would be to introduce binding legislation, restricting the use of mercury in ASGM, in a revised Regulation (EC) 1102/2008.

Discussion

Should the establishment of a general regulation including as many aspects of the MC as relevant be preferred, Option MC7(2)-3 may very well be the simplest to implement, securing coherence to the MC and giving a clear signal to other Parties to the MC.

7.4.3 Article 7(3): Determination of significance of ASGM / Developing and implementing a national action plan if applicable

7.4.3.1 Obligations of the provision

In Article 7(3) MC, the following obligations are laid down:

Each Party shall notify the Secretariat if at any time the Party determines that artisanal and small-scale gold mining and processing in its territory is more than insignificant. If it so determines the Party shall:

(a) Develop and implement a national action plan in accordance with Annex C;

(b) Submit its national action plan to the Secretariat no later than three years after entry into force of the Convention for it or three years after the notification to the Secretariat, whichever is later; and

(c) Thereafter, provide a review every three years of the progress made in meeting its obligations under this Article and include such reviews in its reports submitted pursuant to Article 21.

The Article firstly stipulates a firm law obligation for each Party to *determine* whether ASGM “in its territory is more than insignificant”. The term “insignificant” is open to interpretation, without a definition within MC providing guidance. In case:

- the Party determines insignificance of ASGM on its territory, the obligations of Article 7(3) MC are fulfilled;
- the Party determines that there is significant ASGM, the further obligations as of Art. 7(3) lit. (a) to (c) MC do apply.

7.4.3.2 EU legislation addressing the provision

No corresponding EU legislation is in place.

7.4.3.3 Initial proposals for additional measures [if needed]

Option MC7(3)-1

Since the MC does not prescribe criteria for determining “significance”, a first option would be to use the relative perspective that only one out of 28 Member States has ASGM activities, and to deny significance on this basis. No further obligation from Article 7(3) MC would apply in this case.

Option MC7(3)-2

Another option would be to specify the concept of significance which the EU would like to use under Article 7(3) MC, with the - at least in theory - possible result that the EU might affirm “significance” of ASGM for its territory and subsequently establish an action plan in accordance with Annex C MC.

7.5 MC article 8: Emissions

7.5.1 Introduction to MC obligations

The objective of Article 8 MC is “controlling and where feasible reducing emissions of mercury and mercury compounds”. Emissions mean air emissions from point sources as listed in Annex D to MC (coal-fired power plants and industrial boilers; smelting and roasting processes used in production of non-ferrous metals (only lead, zinc, copper, and industrial gold); waste incineration; and cement clinker production facilities). There are no specific quantitative requirements in the Article text.

Article 8 MC distinguishes between existing and new sources. For existing sources, the objective of the Article is “*for the measures applied by a party to achieve reasonable progress in reducing emissions over time.*” Preparation of a national plan to control emissions is optional. If one is created, it is submitted to the COP within four years of entry into force for the Party. Parties can opt for (at minimum) one item from a menu that includes a self-set quantified goal, emission limit values, BAT/BEP, multi-pollutant control strategy, and alternative measures.

New sources have stronger control measures than existing sources. For new sources “*best available techniques and best environmental practices*” (BAT/BEP; defined in Article 3 MC, see below) is required to be implemented no later than five years after the treaty enters into force for that Party.

Parties have to establish an inventory of emissions from relevant sources (Annex D) as soon as possible and not later than five years after entry into force for it.

7.5.2 Article 8(3): Controlling emissions

7.5.2.1 Obligations of the provision

Article 8(3) MC reads:

A Party with relevant sources shall take measures to control emissions and may prepare a national plan setting out the measures to be taken to control emissions and its expected targets, goals and outcomes. Any plan shall be submitted to the Conference of the Parties within 4 years of the date of entry into force of the Convention for that Party. If a Party develops an implementation plan in accordance with Article 20, the Party may include in it the plan prepared pursuant to this paragraph.

“Emissions” means “*emissions of mercury or mercury compounds to the atmosphere*” (Article 8(2) lit. (a) MC).

Having in mind the rationale of Article 8 MC as expressed in Article 8(1) (“*This Article concerns controlling and, where feasible, reducing emissions of mercury and mercury compounds, [...] through measures to control emissions from the point sources falling within the source categories listed in Annex D*”) it is clear that only emissions of relevant sources are covered by the obligation, such “*relevant source*” being defined as “*a source falling within one of the source categories listed in Annex D. A Party may, if it chooses, establish criteria to identify the sources covered within a source category listed in Annex D so long as those criteria for any category include at least 75 per cent of the emissions from that category*” (Article 8(2) lit. (b) MC). Annex D contains the following five point source categories:

Coal-fired power plants;

Coal-fired industrial boilers;

Smelting and roasting processes used in the production of non-ferrous metals (a footnote explains that: For the purpose of this Annex, “non-ferrous metals” refers to lead, zinc, copper and industrial gold.)

Waste incineration facilities;

Cement clinker production facilities.

Some difficulties exist regarding the interpretation of the second part of the definition of “relevant source” in Article 8(2) lit. (b) MC, reading “*A Party may, if it chooses, establish criteria to identify the sources covered within a source category listed in Annex D so long as those criteria for any category include at least 75 per cent of the emissions from that category.*” The authors of this report interpret this text to mean:

- › Parties may opt to target actions under Article 8(3) MC to
 - › sub-categories of sources, or
 - › individual sources respectively
- › of the source categories named in Annex D, which are identified alongside established criteria,
- › but only if the defined sub-categories of sources, or individual sources cover 75 % of the total (mercury/mercury compounds) emissions from the category as of Annex D MC (note that the 75% criteria may be defined further under the MC, e.g. in terms of what is the reference point (unabated emissions, historical emissions, 2013 emissions, dynamic, etc.) and this would affect the analysis).

Article 8(3) MC clearly sets out two different obligations.

The first one, requiring that Parties “*shall take measures to control emissions*”, is a firm law obligation; the second one, “*preparing a national plan*”, is an option (“*may*”). The term “*control*” (which describes the firm law obligation of Article 8(3) MC) is not further specified or defined in this Article, nor in the Convention as

such. Its meaning becomes apparent in the context of Article 8(4) and 8(5) MC respectively with which Article 8(3) MC is closely interlinked: Where Article 8(3) MC requires that control measures are taken by the Parties, Article 8(4) MC and Article 8(5) MC concern the standard to be applied for the operation (and to be controlled by Parties) of new and existing sources, respectively.

Whereas each source is either new or existing, and thus for each source always either Article 8(4) MC or Article 8(5) MC applies, the question to what extent EU legislation covers the MC obligations. Consequently, options are developed specifically for new and existing sources, within the section below on the assessment of Article 8(4) MC and Article 8(5) (see sections 7.5.3 and 7.5.4).

Whether the EU intends to establish an action plan under Article 8 MC is not further discussed in this section.

7.5.3 Article 8(3) / 8(4): Use of BAT/BEP for new sources

7.5.3.1 Obligations of the provision

Article 8(4) MC, states that:

“For its new sources, each Party shall require the use of best available techniques and best environmental practices to control and, where feasible, reduce emissions, as soon as practicable but no later than five years after the date of entry into force of the Convention for that Party. A Party may use emission limit values that are consistent with the application of best available techniques.”

Where Article 8(3) MC requires that control measures are taken by the Parties, Article 8(4) MC concerns the standard to be applied for the operation. The standards MC considered here are set in the context of the definition provided in Article 2 MC:

(b) “Best available techniques” means those techniques that are the most effective to prevent and, where that is not practicable, to reduce emissions and releases of mercury to air, water and land and the impact of such emissions and releases on the environment as a whole, taking into account economic and technical considerations for a given Party or a given facility within the territory of that Party. In this context:

- (i) “Best” means most effective in achieving a high general level of protection of the environment as a whole;*
- (ii) “Available” techniques means, in respect of a given Party and a given facility within the territory of that Party, those techniques developed on a scale that allows implementation in a relevant industrial sector under economically and technically viable conditions, taking into consideration the costs and benefits, whether or not those techniques are used or developed within the territory of that Party, provided that they are accessible to the operator of the facility as determined by that Party; and*

(iii) *“Techniques” means technologies used, operational practices and the ways in which installations are designed, built, maintained, operated and decommissioned;*

(c) *“Best environmental practices” means the application of the most appropriate combination of environmental control measures and strategies.*

The BAT definition of MC includes an installation-specific element (*“taking into account economic and technical considerations for [...] a given facility within the territory of that Party”* in the chapeau; *“in respect of a given Party and a given facility within the territory of that Party [...]”* during the definition of what are “available” techniques”.

The COP of the MC is - as per Article 8(8) MC – to develop guidance for BAT/BEP. Such guidance will also likely be the subject of political negotiations due to its economical, practical and environmental implications. The resulting guidance may influence the assessment of gaps in the EU acquis versus the MC.

The point source categories of Annex D MC are:

Coal-fired power plants;

Coal-fired industrial boilers;

Smelting and roasting processes used in the production of non-ferrous metals (a footnote explains that: For the purpose of this Annex, “non-ferrous metals” refers to lead, zinc, copper and industrial gold.)

Waste incineration facilities;

Cement clinker production facilities.

“New sources” are defined according to Article 8(2) lit. (c) MC as

“any relevant source within a category listed in Annex D, the construction or substantial modification of which is commenced at least one year after the date of:

- (i) *Entry into force of this Convention for the Party concerned; or*
- (ii) *Entry into force for the Party concerned of an amendment to Annex D where the source becomes subject to the provisions of this Convention only by virtue of that amendment;”*

where *“substantial modification” means modification of a relevant source that results in a significant increase in emissions, excluding any change in emissions resulting from by-product recovery. It shall be a matter for the Party to decide whether a modification is substantial or not”* (Article 8(2) lit. (d) MC).

Since the definition of “new sources” embraces the concept of “relevant source”, the 75 % criterion as discussed in section 7.5.2.1, applies in parallel here, including possible insecurities due to planned future guidance under the MC.

It is assumed that “*feasibility*” in the sense of Article 8(4) MC is determined by the Parties, leaving a certain freedom to the Parties.

Article 8(4) MC imposes a firm law obligation to the Parties but provide some scope for national flexibility, the impact of which cannot precisely be determined at this stage, notably in terms of possible future guidance to be published under MC.

7.5.3.2 EU legislation addressing the provision

Control and reduction of emissions from the main industrial sources is at EU level covered by the IE Directive.

Concept of “BAT” under the IE Directive

The general principles governing the basic obligations of the operators of all installations (both existing and new) covered by the IE Directive are set out in Article 11²⁰. This includes the requirement for the Member States to take the necessary measures to provide that all the appropriate preventive measures are taken against pollution and that the best available techniques are applied.

Article 15(2) of the IE Directive further requires that the emission limit values are based on the best available techniques, without prescribing the use of any technique or specific technology.

BAT itself is defined by Article 3(10) of the IE Directive as follows:

‘best available techniques’ means the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:

(a) ‘techniques’ includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;

(b) ‘available techniques’ means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;

²⁰ The IE Directive does not make a distinction between existing and new installations in its obligations concerning BAT. However, within BAT conclusions such a distinction may be, and generally will be, made for particular sectors, measures, emissions.

(c) ‘best’ means most effective in achieving a high general level of protection of the environment as a whole;

This EU concept, in contrast to BAT concept under the MC, does not recognize local/installation specific elements but rather works at sectoral level (across the EU). This is reflected in BAT conclusions which apply across the EU.

The MC’s concept of “*best environmental practice*” (BEP) is not recognised by the IE Directive. Without prejudice to further clarification of the term and the entire BAT/BEP concept at MC level, it is presumed that BEP could be partially captured by BAT (operational aspects, maintenance), but also by going beyond installations level (e.g. to broader policy measures). It is assumed here that BEP does not tighten the requirements for the EU to apply the BAT concept per the IE Directive.

BAT conclusions

The basic concept of BAT conclusions is explained in chapter 8.1, entry “IE Directive”. For the purpose of Article 8 MC, it is important to stress that Article 13(7) IE Directive foresees that conclusions from earlier BREFs shall apply as BAT conclusions pending the adoption of updated BREFs, with the exception of emission limit values contained in such earlier BREFs.

Modification of installations

In case of substantial modification of an installation, Article 20(2) IE Directive requires that a new permit is granted,

“Member States shall take the necessary measures to ensure that no substantial change planned by the operator is made without a permit granted in accordance with this Directive”

where ‘substantial change’ is defined by Article 3(9) IE Directive as meaning “*a change in the nature or functioning, or an extension, of an installation or combustion plant, waste incineration plant or waste co-incineration plant which may have significant negative effects on human health or the environment*”.

Substantial changes are thus treated like new installations for permitting purposes, but may be subject to BAT for existing installations, depending on the exact wording of BAT conclusions.

Scope / coverage of Annex D categories by IE Directive

The IE Directive applies to certain installations operating one or more of the activities set out in its Annex I, as well as certain other activities, which are only subject to the “sectoral” Chapters III to VI. The five source point categories of Annex D MC can be mapped to the types of installations covered by the scope of IE Directive as follows:

Table 7-7 Coverage of Annex D categories by IE Directive.

MC Annex D category	Allocation to types of installations of IE Directive
Coal-fired power plants	Combustion of fuels in installations with a total rated thermal input of 50 MW or more (“LCP”; Chapter II, Annex I, point 1.1 and sectoral Chapter III / Annex V).

MC Annex D category	Allocation to types of installations of IE Directive
	<p>The MC entry refers only to “<i>power plants</i>”, without providing a definition. A possible interpretation is that this entry relates only to electricity generating plants, but this is contestable.</p> <p>The 50 MW criterion of Annex I of the IE Directive relates to total capacity on a site (within an installation), so certain units/plants below 50 MW will be included (this is reflected in the scope of the LCP BREF under revision, which may cover units down to 15 MW); under Chapter III the capacity needs to be considered at “common stack” level, taking into account the aggregation rules of Article 29 - therefore, again units/plants below 50 MW will be covered.</p>
<i>Coal-fired industrial boilers</i>	<p>Industrial boilers exceeding the threshold of 50 MW fall in the scope of IE Directive as mentioned for the power plants.</p> <p>Industrial boilers below 50 MW directly associated with activities listed in Annex I to the IED will also be covered by the Directive as being part of IED installations, and their permits will need to contain conditions and limits based on BAT.</p> <p>The proposed directive on medium combustion plants (see section Error! Reference source not found. for background) is targeted at plants with a thermal input of 1MW to 50MW and sets emission limit values for SO₂, NO_x and PM, which would apply to existing plants from 1 January 2025 (plants > 5 MW) or 1 January 2030 (≤ 5 MW). New installations have to comply with the requirements one year after the date of transposition.</p> <p>The proposal provides no specifics for mercury, neither in terms of limit values, nor in terms of BAT requirements or quantified reduction goals. SO₂ and PM limits could have some co-beneficial effects for Hg reduction, but only if effective filters are applied (fuel switches and other non-filter solutions do not necessarily reduce mercury emissions).</p> <p>Proposal going for discussion with EP and Council from 2014 on.</p>
<i>Smelting and roasting processes used in the production of non-ferrous metals (a footnote explains that: For the purpose of this Annex, “non-ferrous metals” refers to lead, zinc, copper and industrial gold.)</i>	<p>2.5. Processing of non-ferrous metals: (a) production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes;</p> <p>(b) melting, including the alloyage, of non-ferrous metals, including recovered products and operation of non-ferrous metal foundries, with a melting capacity exceeding 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals.</p> <p>(Annex I, point 2.5 to the Directive)</p> <p>Remark: Note that the delimitation to smelting and roasting is likely meant to exclude the initial concentration (non-thermal) steps. Here mercury releases also happen, but mainly to land and water, due to the huge amounts of waste rock generated). Releases from the concentration steps are very poorly described in published literature and inventories.</p>
<i>Waste incineration facilities</i>	<p>It is assumed that MC only covers incineration (and not co-incineration) of waste. All waste incineration plants are covered by Chapter IV of the IE Directive with the exception of: (a) plants treating only the following wastes: (i) waste listed in point (b) of point 31 of Article 3 [i.e. certain types of biomass waste]; (ii) radioactive waste; (iii) animal carcasses; (iv) waste resulting from the exploration for, and the exploitation of, oil and gas resources from off-shore installations and incinerated on board the installations; (b) experimental plants used for research, development and testing in order to improve the incineration process and which treat less than 50 tonnes of waste per year.</p> <p>In addition, most of these plants are covered by Chapter II of the IED as they are falling under point 5.2 of Annex I, which sets a capacity threshold: <i>Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants:</i></p> <p>(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour;</p>

MC Annex D category	Allocation to types of installations of IE Directive
	<i>(b) for hazardous waste with a capacity exceeding 10 tonnes per day.</i>
<i>Cement clinker production facilities</i>	Production of cement, lime and magnesium oxide: (a) production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or in other kilns with a production capacity exceeding 50 tonnes per day; [...] (Chapter II / Annex I, point 3.1 of IE Directive)

If an installation (/ source) is not covered by the IE Directive, there is no EU obligation for applying BAT for the control of mercury emissions. However, Member States may regulate such installations through national law or facility-specific environmental permits.

Irrespective of whether the substantial measures set out at IE Directive's level are sufficient for covering the requirements of Article 8(3), (4) MC, it can be concluded that the question **the extent to which the IE Directive covers the source categories of Annex D MC needs to be assessed in detail** and on a case-by-case basis – with the exception of the entry “waste incineration facilities” which are understood to be covered by the IE Directive. The interpretation of Article 8(2) lit. (b) MC adopted by this report implies that IE Directive currently addresses the Annex D MC source categories only if the installations covered by Annex I IE Directive include at least 75 % of the total (mercury) emissions from each of the relevant Annex D MC source categories. Determination of whether this threshold is satisfied requires the following data:

- › Total mercury emissions in the EU from each of the Annex D MC categories; and
- › Mercury emissions in the EU of the installations covered by IE Directive.

For both these parameters, robust and reliable data, which would allow for a clear statement, were not located during this study.

Addressing mercury emissions specifically

Article 8(3), (4) of the MC requires the control, and where feasible reduction, of mercury emissions from relevant sources. For covering this under the EU acquis, mercury emissions need to be addressed within binding obligations for the Member States.

Such an obligation is already applied where mercury emissions are directly addressed within the binding text of the IE Directive, or where BAT conclusions are setting BAT-associated emission levels for mercury. In addition, it seems appropriate to also take into consideration any reference to controlling of emissions from “heavy metals”, or requirements for other pollutants, which would necessitate application of multi-pollutant control measures (e.g. abatement for dust or SO₂) since such measures may also have a significant effect on mercury emissions which EU may consider to be sufficient for responding to the obligations of Article 8(3) / (4) MC.

Further, Article 11 of the IE Directive sets out general principles regarding the basic obligations of an operator, including that “BAT is applied” and “no significant pollution is caused”. Member States have to ensure that the permit includes all measures necessary for compliance with the requirements of Article 11 (and 18) IE Directive.

Against this background, current IE Directive provisions and BREFs/BAT conclusions contain the following relevant elements:

Table 7-8 Current IE Directive provisions and BREFs/BAT conclusions pertaining to MC Annex D facilities.

MC Annex D category	Provisions in IE Directive or BAT conclusions
<i>Coal-fired power plants</i>	<p>General reference to Hg in section 4.5.7 (page 271-272 of relevant LCP BREF (July 2006). Revision of that BREF underway, current first draft as of June 2013 contains detailed BAT conclusions how to monitor, and control Hg emissions to air from different types of combustion processes (see section 10.2. of the current Draft).</p> <p>Annex V, Part 2 of IE Directive and BAT conclusions contains the obligation for controlling SO₂, NO_x, and dust emissions for installations permitted January 2013 or later. Detailed assessment necessary to what extent secondary measures (filters, scrubbers) would be needed that would affect Hg emissions</p>
<i>Coal-fired industrial boilers</i>	<p>If thermal input > 50MW, see above.</p> <p>If thermal input < 50MW, possible coverage under other entries of Annex I of IE Directive and respective BREFs. Co-benefit consideration apply similarly as for LCP</p> <p>In future, a proposed directive on medium combustion plants may become relevant. At first glance, the proposed text does not seem to cover MC obligations.</p>
<i>Smelting and roasting processes used in the production of non-ferrous metals (a footnote explains that: For the purpose of this Annex, “non-ferrous metals” refers to lead, zinc, copper and industrial gold.)</i>	<p>Current relevant NFM BREF (December 2001) generally describes BAT in the context of Hg emissions.</p> <p>Revision of that BREF underway, current third draft as of February 2013 which contains detailed BAT conclusions how to monitor, and control Hg emissions (for the latter see section 14.1.6 of the current Draft), applicable for all processes addressed by the BREF, including lead, zinc, copper, and gold.</p>
<i>Waste incineration facilities</i>	The IE Directive text itself (in its Annex VI) contains specific control measures on emissions, including an average emission limit value of 0.05 mg/Nm ³ for Mercury and its compounds, expressed as mercury (Hg) over a sampling period of a minimum of 30 minutes and a maximum of 8 hours.
<i>Cement clinker production facilities</i>	CLM BREF, 2013 contains BAT conclusions for cement industry in chapter 4.2., including conclusions on mercury emissions to air and in waste, and how to control them.

Summary

Whether the current EU acquis falls short of meeting the MC’s obligations on mercury emissions control from single point sources cannot be determined with certainty at this stage.

7.5.3.3 Initial proposals for additional measures

As the discussion above explained there are two issues to be considered when looking to ‘close the gap’ between the MC obligations and the current EUQ aquis:

- › Gaps relating to the installations / source categories covered (and particularly regarding the question to what extent the 75 % criterion is fulfilled by the installations covered by IE Directive).
- › Gaps relating to the use of BAT as the standard applied to (mercury) emissions.

The options suggested are relevant for source categories for which the 75 % criterion is not fulfilled (or in general, if the EU decides not to follow the 75 % route).

Option MC8(4)-1: IED

Legal measures for controlling mercury emissions from the source categories not sufficiently covered by the IED Directive could be introduced either via BAT conclusions or via amendment of the actual IE Directive or its Annexes (setting emission limit values, as for waste incineration plants).

Option MC8(4)-2: Regulation (EC) 1102/2008

The revised Regulation (EC) 1102/2008 could be used to implement the remaining obligations of Article 8(4) MC.

Discussion

The advantage of option Article 8(4)-1 is that a well-established system is in place at EU level to address the obligations of the MC. This is particularly help if the EU considers that multi-pollutant strategies are sufficient for covering MC obligations under Article 8.

Article 8(4) MC relates to the standard of operation / control of mercury emissions from certain specified sources. The advantage of Option MC8(4)-2 is that it provides an opportunity to implement exactly this obligation. An amendment of IE Directive might be more resource intensive in its implementation due to IED procedures.

7.5.4 Article 8(3) / 8(5): Implementing emission control measures for existing sources

7.5.4.1 Obligations of the provision

Article 8(5) MC stipulates

For its existing sources, each Party shall include in any national plan, and shall implement, one or more of the following measures, taking into account its national circumstances, and the economic and technical feasibility and affordability of the measures, as soon as practicable but no more than ten years after the date of entry into force of the Convention for it:

- (a) *A quantified goal for controlling and, where feasible, reducing emissions from relevant sources;*
- (b) *Emission limit values for controlling and, where feasible, reducing emissions from relevant sources;*
- (c) *The use of best available techniques and best environmental practices to control emissions from relevant sources;*
- (d) *A multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions;*
- (e) *Alternative measures to reduce emissions from relevant sources.*

Article 8(5) MC is closely interlinked with Article 8(3) MC. “Existing source” means “any relevant source that is not a new source” (Article 8(2) lit. (e) MC). See Section 7.5.3.1 for a discussion of this definition and Section 7.5.3.2 for a discussion of the definition of BAT/BEP

There is no requirement for an existing facility to apply BAT/BEP. Instead, Parties can opt to apply one or more items from the list of options provided (a quantified goal (could be any goal); emission limit values; BAT/BEP; multi-pollutant control strategy, and alternative measures) in order to comply with Article 8(5) MC.

Interestingly, the options of Article 8(5) MC lit. (a) to (c) and lit. (e) all related explicitly to “relevant sources”, but such requirements are not included in the option of pursuing “a multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions” (Article 8(5) MC lit. (d)).

A possible interpretation that a Party may be claiming complying with the obligations of Article 8(5) MC via the path of Article 8(5) lit. (d) MC by having such a strategy in place, without being obliged to cover/address all *relevant sources* directly – as long as co-benefits for control of mercury emissions are delivered.

Article 8(6) MC states that

Parties may apply the same measures to all relevant existing sources or may adopt different measures in respect of different source categories. The objective shall be for those measures applied by a Party to achieve reasonable progress in reducing emissions over time.

The wording “each Party shall include in any national plan, and shall implement” indicates that it is a firm obligation, but in fact several of the measures are quite flexible. The goal set under measure (a) could in principle be unambitious, though this would not signal a strong commitment to the MC to other Parties.

7.5.4.2 EU legislation addressing the provision

Measures with respect to “relevant sources”

The relevant EU legislation is the IE Directive. This recognises the BAT concept, which is a close parallel to the BAT/BEP concept as of the MC (section 7.5.3.1).

The general principles of operation are laid down in Article 11 IE Directive. Existing sources are covered by Article 21(1) of the IE Directive; permit conditions need to be updated if necessary against the conditions of the IE Directive. From the options foreseen by MC, IE Directive requires, for instance, Emission Limit values (Article 14 lit. (a) IE Directive).

Thus, where the basic mechanisms of IE Directive are in principle suitable tools for an implementation of the obligations of Article 8(5) MC, the difficulties depicted during the assessment of Article 8(3) / 8(4) MC (in relation to scope and requirements) are also applicable here: With respect to what extent emissions from relevant sources are covered by current EU acquis, and with respect to what possible shortcomings in current EU approach exist, the result is identical: Whereas the EU acquis covers the MC requirements regarding waste incineration facilities, the coverage of the other Annex D sources needs to be assessed further in the context of the 75% criterion of Article 8(2) lit. (b) MC.

Regarding coal-fired industrial boilers, a Directive on Medium-sized Combustion Plants was proposed in December 2013 by the Commission (see section 8.2). The proposal does not explicitly address mercury emissions, but includes “*a multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions*”. Possibly, the measures of that Directive could also be judged as complying with the MC option to implement “*Alternative measures to reduce emissions from relevant sources*” Article 8(5) lit. (e) MC.

Possible interpretation of “Multi-pollutant control strategy” (Article 8(5) lit. (d) MC)

If Article 8(5) lit. (d) MC is interpreted to mean that that implementing a “*multi-pollutant control strategy*” is a fulfilment of the obligations under Article 8(5) MC irrespective of whether all relevant sources are explicitly addressed (see section 7.5.4.1), then it could be argued that the IE Directive, together with other provisions of the EU acquis on ambient air quality, already provides for such a control strategy. It could also be argued that such a control strategy would be broadened further once the proposed Directive on Medium Combustion Plants enters into effect.

7.5.4.3 Initial proposals for additional measures

Except for Option MC8(5)-4, the options suggested below are relevant for source categories for which the 75 % criterion is not fulfilled (or in general, if the EU decides not to follow the 75 % route).

Option MC8(5)-1 (potentially identical to Option MC8(4)-1)

One option is to choose the IE Directive regime as the compliance tool for existing sources. Legal measures to control mercury emissions could be introduced either via BAT conclusions, or via a formal amendment of the actual IE Directive text.

Option MC8(5)-2 (potentially identical to Option MC8(4)-2)

Revised Regulation (EC) 1102/2008 could be used to implement the remaining obligations of Article 8(4) MC.

Option MC8(5)-3

Integrate mercury emissions in the new proposed Directive on MCP to address emissions from industrial boilers.

Option MC8(5)-4

Pursue an interpretation of Article 8(5) lit. (d) MC that when implementing a multi-pollutant strategy as described in that para, not all relevant specific sources need to be addressed, and claim that the EU has such a multi-pollutant strategy already in place.

Discussion

Similarly to the obligation of introducing control measures, Article 8(5) MC is specifically related to the standard of operation / controlling mercury emissions from certain specified sources. The advantage of Option MC8(5)-2 in this respect is that it provides for an opportunity to implement exactly this obligation, whereas an amendment of IE Directive might be more resource intensive in its implementation due to IED procedures.

7.5.5 Article 8(7): Establishing an emission inventory

7.5.5.1 Obligations of the provision

Article 8(7) MC reads:

Each Party shall establish, as soon as practicable and no later than five years after the date of entry into force of the Convention for it, and maintain thereafter, an inventory of emissions from relevant sources.

See 7.5.2.1 for a discussion of the term “*relevant sources*”. The interpretation issue of Article 8(2) lit. (b) MC applies here just as for the other paras under Article 8 MC.

Article 8(7) MC does not specify that inventories need to be introduced at installation level. According to Article 8(9) MC, the methodology will be clarified via guidance of the COP.

Article 8(7) stipulates a firm-law obligation for the Parties.

7.5.5.2 EU legislation addressing the provision

PRTR Regulation

The EU established an emission inventory via the E-PRTR, the relevant legal instrument being the PRTR Regulation (EC) No 166/2006.

Operators of facilities carrying out the activities listed in Annex I to PRTR Regulation (EC) have to report on releases of pollutants, including mercury with the following thresholds:

Table 7-9 Reporting thresholds for mercury under the E-PRTR.

No	CAS No	Pollutant	Threshold for releases (column 1)		
			to air (column 1a) kg/year	to water (column 1b) kg/year	to land (column 1c) kg/year
21		Mercury and compounds (as Hg) (Footnote: All metals shall be reported as the total mass of the element in all chemical forms present in the release)	10	1	1

Facilities covered in Annex I of the PRTR Regulation are, to a large extent, identical to those of the IE Directive. In detail, Annex D MC categories matches with Annex I PRTR Regulation as follows:

Table 7-10 Facilities covered in Annex I of the PRTR Regulation.

Annex D category MC	Annex I PRTR Regulation
<i>Coal-fired power plants</i>	1. (c) Thermal power stations and other combustion installations (Capacity threshold: with a heat input of 50 MW)
<i>Coal-fired industrial boilers</i>	1. (c) Thermal power stations and other combustion installations (Capacity threshold: with a heat input of 50 MW)
<i>Smelting and roasting processes used in the production of non-ferrous metals (a footnote explains that: For the purpose of this Annex, “non-ferrous metals” refers to lead, zinc, copper and industrial gold.)</i>	2. (e) Installations (i) For the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes (Capacity threshold: With a melting capacity of 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals) (ii) For the smelting, including the alloying, of non-ferrous metals, including recovered products (refining, foundry casting, etc.)
<i>Waste incineration facilities</i>	Installations for the incineration of non-hazardous waste in the scope of IE Directive following current common interpretation (Threshold capacity: With a capacity of 3 tonnes per hour)
<i>Cement clinker production facilities</i>	3. (c) Installations for the production of: (i) Cement clinker in rotary kilns with a production capacity of 500 tonnes per day (ii) [...] (iii) Cement clinker or lime in other furnaces with a production capacity of 50 tonnes per day

In line with the understanding of Article 8(2) lit. (b) MC as provided in this chapter, and in parallel to the assessment of previous paras of Article 8 MC, the question of how far the current EU acquis falls short of MC requirements needs further assessment, in particular where MC source categories are in EU PRTR Regulation subject to capacity thresholds below which an installation is not subject to the Regulation's requirements.

If taking as a basis the understanding of Article 8(2) lit. (b) MC outlined in this report, this means that the PRTR Regulation currently addresses the Annex D MC source categories only if the installations covered by Annex I of the PRTR Regulation include at least 75 % of the total (mercury) emissions from the Annex D MC source categories.

Other relevant questions are whether (i) the minimum threshold for releases of mercury, and (ii) the further design of E-PRTR, are compliant with MC requirements. The guidance to be developed by the COP under Article 8(9) MC will determine the answers.

The options suggested are relevant for source categories for which the 75 % criterion is not fulfilled (or in general, if the EU decides not to follow the 75 % route).

Activities under CLRTAP Heavy Metals Protocol

The EU has approved (by Council Decision 2001/379/EC) the Heavy Metals Protocol under the UNECE LRTAP Convention. In implementing the obligations of the Parties to that Protocol “to develop and maintain emission inventories” (Article 3(5) of the Protocol), the EU and its Member States have established an inventory under the framework of EMEP.

7.5.5.3 Initial proposals for additional measures

Option MC8(7)-1

An option is to use the PRTR Regulation to implement those MC requirements not already covered by the EU acquis (industrial boilers, lower reporting thresholds).

Option MC8(7)-2

A revised Regulation (EC) 1102/2008 could be used to implement the remaining obligations of Article 8(7) MC.

Option MC8(7)-3

The EU could opt to further develop the emission inventory activities under the UNECE CLRTAP Heavy Metals Protocol in order to ensure alignment with MC requirements. It is understood that the relevant bodies under the Protocol intend to hold further discussions on what impacts the MC will have on their work in 2014²¹.

²¹ UNECE press release. *UNECE Air Convention Parties adopt more stringent controls of heavy metals emissions and measures to help Parties from Eastern Europe, the Caucasus and Central Asia to join in.* <http://www.unece.org/index.php?id=31845>. Accessed 30 May 2014.

7.6 MC article 9: Releases

7.6.1 Introduction to MC obligations

The aim of Article 9 MC is “controlling and where feasible reducing releases of mercury”; *releases* in the MC context meaning mercury releases to land and water from point sources which are not covered in other provisions of MC.

Article 9 MC covers “*relevant sources*” – those are anthropogenic point sources identified by Parties which release “significant” amounts of mercury.

Preparing a national plan to control emissions is optional. If one is created, it is submitted to the COP within four years of entry into force for the Party.

In terms of control, Parties are to apply one of the following measures, “*as appropriate*”: release limit values, BAT/BEP, multi-pollutant control strategy, or alternative measures. Parties are to identify sources of mercury releases to land and water no later than three years after entry into force for the country, and on a regular basis thereafter. Parties are to establish an inventory of releases from relevant sources as soon as possible and no later than five years after entry into force for the country. COP “as soon as practicable” is to develop guidance on BAT/BEP and a method for preparing inventories of releases.

An interpretation issue arise with respect of the definition of mercury release sources subject to Article 9 of the MC:

As defined in Article 9(2) lit. b: “*For the purposes of this Article [...] “Relevant source” means any significant anthropogenic point source of release as identified by a Party that is not addressed in other provisions of this Convention;[..], This wording is also used in Article 9(1) MC. This definition could be interpreted narrowly (interpretation A) to exclude the major mercury release sources covered under Article 8 MC, namely the ones listed below:*

- › Coal-fired power plants
- › Coal-fired industrial boilers
- › Smelting and roasting processes used in the production of the non-ferrous metals lead, zinc, copper and industrial gold
- › Waste incineration facilities
- › Cement clinker production facilities

It should be mentioned that according to Article 8(8), The Conference of the Parties shall, at its first meeting, adopt guidance on BAT/BEP *taking into account ... the need to minimize cross-media effects*, (addressing “releases” resulting from “emission” controls), and depending on the BAT/BEP guidance developed this may potentially cover this gap as regards releases.

Another possible - and more flexible - understanding of the definition (interpretation B) , which can be considered to be more in line with the overall aim of MC, would be that Article 9 covers “any significant anthropogenic point source of release as identified by a Party for which releases (to land and water) are not addressed in other provisions”. This latter interpretation would include all major

point sources, but the interpretation is farther from the original wording than the interpretation mentioned above.

7.6.2 Article 9(3): Identification of relevant point source categories

7.6.2.1 Obligations of the provision

Article 9(3) MC reads that

“Each Party shall, no later than three years after the date of entry into force of the Convention for it and on a regular basis thereafter, identify the relevant point source categories.”

“Relevant source” means “any significant anthropogenic point source of release as identified by a Party that is not addressed in other provisions” of MC (Article 9(2) lit. (b) MC), where “releases” are defined as “releases of mercury or mercury compounds to land or water.” See regarding interpretation issues above.

The obligation of Article 9(3) MC is a firm law obligation.

7.6.2.2 EU legislation addressing the provision

Irrespective of which one of the interpretations above is followed for the purpose of this Article, the identification of such sources allows a broad discretion to Parties.

It could be claimed that the current IE Directive framework sufficiently identifies significant anthropogenic point source of mercury releases, as required by the MC. Then again, there has been no dedicated identification procedure for mercury releases prior to the definition of installations to be covered by IE Directive.

7.6.2.3 Initial proposals for additional measures

Option MC9(3)-1

EU could explicitly identify relevant anthropogenic point sources in a survey repeated every three years. This could be based just on PRTR reporting.

7.6.3 Article 9(4+5): Take measures to control releases from identified sources

7.6.3.1 Obligations of the provision

Article 9(4) MC foresees that

“A Party with relevant sources shall take measures to control releases and may prepare a national plan setting out the measures to be taken to control releases and its expected targets, goals and outcomes. Any plan shall be submitted to the Conference of the Parties within 4 years of the date of entry into force of the Convention for that Party. If a Party develops an implementation plan in accordance with Article 20, the Party may include in it the plan prepared pursuant to this paragraph.”

“Relevant source” is to be understood in line with the definition provided by Article 9(2) lit. (b) MC (see interpretations above).

Similarly to Article 8(3) MC, Article 9(4) MC includes two obligations:

- The first one, requiring that Parties “*shall take measures to control emissions*”, is a firm law obligation.
- The second one, “*preparing a national plan*”, is a soft law option (“*may*”) and is not further discussed in this section.

Parties can select control measures from the list provided by Article 9(5) MC:

“The measures shall include one or more of the following, as appropriate:

- (a) Release limit values to control and, where feasible, reduce releases from relevant sources;*
- (b) The use of best available techniques and best environmental practices to control releases from relevant sources;*
- (c) A multi-pollutant control strategy that would deliver co-benefits for control of mercury releases;*
- (d) Alternative measures to reduce releases from relevant sources.”*

As with Article 8(5) MC, three of the four options listed here (lit. (a), (b), and (d) directly relate to “*relevant sources*” whereas such relevance is not expressed within the option of selecting a multi-pollutant strategy.

7.6.3.2 EU legislation addressing the provision

Measures with respect to “relevant sources”

EU legislation covers releases of mercury to land and water from single point sources under two aspects:

- The IE Directive regime requires that installation operators take an integrated approach to preventing pollution to air and water (Article 11 IE Directive); compliance with this standard has to be ensured by the Member States and has to be the basis of the permit (Article 14 IE Directive)
- EU Water Framework Directive (Directive 2000/60/EC as amended by Directive 2008/105/EC and subsequently Directive 2013/39/EU) requires Member States to ensure that surface and groundwater bodies reach good chemical and good ecological status. Environmental quality standards for several priority substances, including for mercury, have to be met. Article 16 of Directive 2000/60/EC also requires measures to be aimed at the progressive reduction and, for priority hazardous substances (of which mercury is one), at the cessation or phasing-out of discharges, emissions, and losses within 20 years of the legislation becoming applicable.

- Other legislation such as REACH, RoHS or EU waste acquis also contributes to the aims of the Water Framework Directive.

It is assumed that these measures sufficiently cover the requirements of Article 9(4) MC. Depending on to what interpretation of Article 9(2) lit. (b) MC is followed, and depending on what sources are identified as “*relevant sources*”, there is a need for clarification on the extent to which “*relevant sources*” are covered or not by the IE Directive.

Possible interpretation of “*Multi-pollutant control strategy*” (Article 9(5) lit. (c) MC)

Similarly to the option developed for Article 8(5) MC, one could argue that Article 9(5) lit. (c) MC allows for fulfilling the obligations under this Article by implementing a “*multi-pollutant control strategy*” with co-benefits for control of mercury releases, and that such a multi-pollutant strategy is already in place at EU level.

7.6.3.3 Initial proposals for additional measures

Option MC9(4)-1

No legislative action; pursue an interpretation for “*relevant sources*” which secures that these are already covered by the EU acquis.

Option MC9(4)-2

No legislative action; claim that EU has a multi-pollutant strategy already in place.

Option MC9(4)-3

Undertake, as follow-up of the survey mentioned as Option 9(3)-1, a gap analysis and develop measures targeting any gaps identified.

7.6.4 Article 9(6): Establishing a release inventory

7.6.4.1 Obligations of the provision

Article 9(6) MC stipulates that

Each Party shall establish, as soon as practicable and no later than five years after the date of entry into force of the Convention for it, and maintain thereafter, an inventory of releases from relevant sources.

Regarding the understanding of “*relevant sources*”, see above.

7.6.4.2 EU legislation addressing the provision

As noted in section 7.5.5.2, the EU has established an emission inventory via E-PRTR, the relevant legal instrument being PRTR Regulation (EC) No 166/2006, covering a list of releases of pollutants including mercury. Reporting obligations for the operators of the facilities carrying out the activities listed in Annex I to PRTR Regulation (EC) have to report on releases of pollutants, including to water and to land, with the following thresholds:

Tabel 7-1 E-PRTR reporting thresholds for mercury.

No	CAS No	Pollutant	Threshold for releases (column 1)		
			to air (column 1a) kg/year	to water (column 1b) kg/year	to land (column 1c) kg/year
1		Mercury and compounds (as Hg) (Footnote: All metals shall be reported as the total mass of the element in all chemical forms present in the release)	10	1	1

Annex I to the PRTR Regulation covers important sources of emitted mercury.

7.6.4.3 Initial proposals for additional measures

Option MC9(6)-1

Pursue an interpretation of “relevant sources” which secures that these are covered by the EU acquis (PRTR Regulation).

Option MC9(6)-2

As follow-up of the survey on identification of relevant sources mentioned as Option 9(3)-1 make a revised gap analysis, and if necessary adjust the PRTR Regulation to meet the MC obligations.

7.7 MC article 10: Sound interim storage of non-waste mercury

7.7.1 Introduction to MC obligations

Article 10 MC deals with interim storage of non-waste mercury. Such interim treatment may only occur for a mercury use allowed under the MC. Parties must “take measures” to ensure that interim storage mercury is carried out in an environmentally sound manner, and ensure that these facilities do not become mercury hotspots.

7.7.2 Article 10(2): Sound interim storage of non-waste mercury

7.7.2.1 Obligations of the provision

Article 10(2) MC reads:

Each Party shall take measures to ensure that the interim storage of such mercury and mercury compounds intended for a use allowed to a Party under this Convention is undertaken in an environmentally sound manner, taking into account any guidelines, and in accordance with any requirements, adopted pursuant to paragraph 3

The wording “shall take measures” introduces a binding obligation for all MC parties once the Convention enters into force for them.

“*Such mercury*” as used in this Article makes reference to the understanding provided by Article 10(1) MC, i.e.

- (1) mercury (i.e. “*elemental mercury (Hg(0), CAS No. 7439-97-6)*”) and mercury compounds (i.e. “*any substance consisting of atoms of mercury and one or more atoms of other chemical elements that can be separated into different components only by chemical reactions*”)
- (2) “*that do not fall within the meaning of the definition of mercury wastes set out in Article 11*”.

In turn, “*mercury waste*” in the sense of Article 11(2) MC means:

(...) *substances or objects:*

- (a) *Consisting of mercury or mercury compounds;*
- (b) *Containing mercury or mercury compounds; or*
- (c) *Contaminated with mercury or mercury compounds,*

in a quantity above the relevant thresholds defined by the Conference of the Parties, in collaboration with the relevant bodies of the Basel Convention in a harmonized manner, that are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law or this Convention. This definition excludes overburden, waste rock and tailings from mining, except from primary mercury mining, unless they contain mercury or mercury compounds above thresholds defined by the Conference of the Parties.

Since a subject or object can be either waste or not, for each subject or object either the obligations of Article 10 MC apply or those under Article 11 MC on waste (but never both obligations at the same time).

Regarding that definition, no thresholds are currently set by the COP, so it remains to be discussed to what extent the definition is operational in the transition period until the setting of such thresholds.

The definition makes reference to “*national law*”, which in our understanding includes EU law at least where it occurs as a Regulation.

7.7.2.2 EU legislation addressing the provision

The MC uses the terminology (and the underlying concept) of the Basel Convention where waste is something “to be disposed of”, in contrast to EU waste law which follows where waste is considered “*means any substance or object which the holder discards or intends or is required to discard*” (Article 3(1) Waste Framework Directive 2008/98/EC). The Basel Convention, to which MC makes reference, uses “disposal” to describe waste treatment operations which in the EU are sub-divided into “disposal” and “recovery”.

In principle, the EU concept is slightly broader than the one provided by Basel Convention and MC, respectively. Under EU law, more substances or objects are considered waste than under the MC, and consequently, processing such material is considered waste treatment (recovery). Then, again, it is important to keep in mind that mercury waste under MC is also any substance or object that is “*required to be disposed of by the provisions of national law*”. Consequently all that is defined as waste and has to be disposed of according to Article 2 of Regulation (EC) 1102/2008, is (per Article 11(2) MC) considered as waste also for the purpose of the MC.

Against this background (and with all due reservations given that no thresholds are yet defined) the text below shows points of interpretation and associated consequences for the coverage of obligations under Article 10(2) MC, i.e. on interim storage of such material:

Table 7-11 Coverage of obligations under Article 10(2) MC, i.e. on interim storage, of relevant materials.

Non-waste mercury under MC is considered non-waste under EU law.	<p>Measures regarding the environmentally sound storage can be laid down in permits. Indeed, BREFs contain at several occasions BAT standards for storage of certain materials.</p> <p>Since mercury and a number of mercury compounds are considered as “dangerous substances” (as “very toxic”), they are thus covered under Annex I, Part 2 of Seveso II (and Seveso III) Directive, it is addressed by the obligations of that Directive, but only under safety aspects (MC requires “<i>environmentally sound manner</i>” and it remains to be seen whether this is in line with the Seveso Directive’s approach).</p>
Non-waste mercury under MC is considered waste under EU law	<p>Interim storage of waste is subject to the provisions of Waste Framework Directive including its provisions for hazardous waste, (see explicitly Article 17 WFD, storage pending treatment being a waste treatment operation for which a permit is necessary and which has to be conducted in line with the standards of the Waste Framework Directive.</p> <p>Further, the storage of waste prior to recovery for a period of three years or longer is subject to the Landfill Directive and its substantial and permitting requirements. Finally, where applicable, obligations under Mining Waste, Directive 2006/21/EC may apply.</p>

Regarding material that is not considered as waste under EU law, interim storage of mercury is deemed not sufficiently covered by the EU acquis.

In contrast, in case of material considered waste in the EU, but not under MC, EU waste law covers regarding interim storage what is required by Article 10(2) MC.

7.7.2.3 Initial proposals for additional measures

Option MC10(2)-1

Standards for environmentally sound storage of non-waste mercury could be laid down in a revised Regulation (EC) 1102/2008.

Option MC10(2)-2

The Seveso Directive, possibly just the annexes, could theoretically be amended, possibly only in its annexes, to cover the MC requirements for interim storage of mercury and its compounds (lower thresholds and perhaps additional wording to expand “safety” to “environmental sound storage”).

Discussion

In relation to Option MC10(2)-2, the authors of this study have concerns whether the safety-focused approach of the Seveso Directive would adequately cover what is expected to be required under MC in terms of environmental sound management (subject to guidance to be developed by the MC COP).

7.8 MC article 11: Mercury wastes

7.8.1 Introduction to MC obligations

Article 11 MC obliges Parties to “take measures” so that mercury waste is managed in an environmentally sound manner according to Basel Convention guidelines and future guidelines which will be added to the MC. The concept of “waste” follows here the concept of Basel Convention, the definition of “*mercury waste*” integrates presence of mercury or mercury compounds above thresholds to be determined by the COP under MC itself.

Mercury waste can only be recovered, recycled, reclaimed, or directly used for an allowed use under the MC. Parties of the MC that are also parties to Basel Convention are not permitted to transport waste across international boundaries, except for environmentally sound disposal (including recycling).

7.8.2 Article 11(3): Appropriate measures for Environmentally Sound Manner (ESM) of mercury waste

7.8.2.1 Obligations of the provision

Article 11(3) MC reads:

Each Party shall take appropriate measures so that mercury waste is:

(a) Managed in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention and in accordance with requirements that the Conference of the Parties shall adopt in an additional annex in accordance with Article 27. In developing requirements, the Conference of the Parties shall

take into account Parties' waste management regulations and programmes;

(b) Only recovered, recycled, reclaimed or directly re-used for a use allowed to a Party under this Convention or for environmentally sound disposal pursuant to paragraph 3 (a);

(c) For Parties to the Basel Convention, not transported across international boundaries except for the purpose of environmentally sound disposal in conformity with this Article and with that Convention. In circumstances where the Basel Convention does not apply to transport across international boundaries, a Party shall allow such transport only after taking into account relevant international rules, standards, and guidelines.

The wording “shall take measures” makes clear that these are firm law obligations. Note that EU is party to Basel Convention, so that the obligation mentioned under lit. (c) also applies to EU.

The term “mercury waste” is defined in Article 11(2) MC. See the assessment of this term above in Section 7.7.2.1.

7.8.2.2 EU legislation addressing the provision

With reservations stemming from the fact that currently no thresholds are set by the MC and no transition regime is foreseen, EU waste legislation sets out general standards for waste management, and notably for hazardous waste which is defined by Article 3(2) Waste Framework Directive as “*waste which displays one or more of the hazardous properties listed in Annex III*”.

The following types of material is considered waste under Article 2 of Regulation (EC) 1002/2008:

(a) metallic mercury that is no longer used in the chlor-alkali industry;

(b) metallic mercury gained from the cleaning of natural gas;

*(c) metallic mercury gained from non-ferrous mining and smelting operations;
and*

(d) metallic mercury extracted from cinnabar ore in the [EU].

Such waste shall following that provision be “disposed of” in accordance with the Waste Framework Directive; which in the logic of waste legislation (where waste is either re-used, recovered (including recycled) or disposed of) in turn means that no re-use and no recovery is admissible, but only disposal.

Further, specifically with respect to the storage of mercury waste, Regulation (EC) 1102/2008 and the Landfill Directive 1999/31/EC, as amended, contain provisions on wastes containing mercury.

In detail, the EU *acquis* covers the respective obligations of Article 11 as follows:

Table 7-12 Coverage of the EU acquis of Article 11 MC on mercury waste.

(3a)	<i>Mercury waste is managed in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention and in accordance with requirements that the Conference of the Parties shall adopt in an additional annex in accordance with Article 27</i>	Standards of EU waste management are laid down in Articles 4 and 13 of the Waste Framework Directive. Measures to ensure that the standards are applied in practice are in particular permission and control obligations, with specific obligations for MS regarding hazardous waste as of Article 17 Waste Framework Directive. Any shortcoming of EU acquis needs to be assessed against the requirements of (final) guidelines under Basel Convention or MC which currently are not adopted.
(3b)	<i>Mercury waste is only recovered, recycled, reclaimed or directly re-used for a use allowed to a Party under this Convention or for environmentally sound disposal pursuant to paragraph 3 (a)</i>	<p>This obligation is addressed in the EU with respect to all waste types currently covered by Article 2 of Regulation (EC) 1102/2008 (by ruling out recycling/recovery for some waste types).</p> <p>With regard to Article 11(3b) MC, other “mercury wastes” under MC than those addressed by Article 2 of Regulation (EC) 1102/2008 are not explicitly covered by EU law yet.</p>
(3c)	<i>Mercury waste is, for Parties to the Basel Convention, not transported across international boundaries except for the purpose of environmentally sound disposal in conformity with this Article and with that Convention. In circumstances where the Basel Convention does not apply to transport across international boundaries, a Party shall allow such transport only after taking into account relevant international rules, standards, and guidelines</i>	<p>Waste Shipment Regulation (EC) 1013/2006 distinguishes between shipments of waste destined for disposal and shipments of waste destined for recovery (terms “disposal” and “recovery” used in the sense of EU Waste Framework Directive).</p> <p>Exports of waste for disposal out of the EU are prohibited under Waste Shipment Regulation (EC) 1013/2006 according to its Article 34(1), albeit with the exception to EFTA countries which are also Parties to the Basel Convention.</p> <p>Exports of waste for recovery are prohibited according to Article 36 Waste Shipment Regulation to countries to which OECD Decision 2001/107FINAL does not apply in case the waste is listed as hazardous in Annex V, or listed in Annex V, Part 3 to Waste Shipment Regulation, which many wastes containing Hg are.</p> <p>Where not prohibited, all exports of waste containing mercury above the thresholds to be determined under MC will most likely be subject to the notification procedure under Article 3(1) Waste Shipment Regulation, with the amendments as of Title IV Waste Shipment Regulation. Any Member States’ competent authority may within this procedure raise objections on grounds that the planned shipment or treatment “conflicts with obligations resulting from international conventions concluded by the Member State(s) concerned or the Community” (Article 11(1) lit. (f), Article 12(1) lit. (f) of Waste Shipment Regulation).</p>

7.8.2.3 Initial proposals for additional measures

Option MC11(3)-1

To align the EU aquis with MC 11(3b), other waste types, not currently covered by Reg. 1102/2008 could be covered by adding such waste types to Article 2 of Reg. 1102/2008. This would lead to disposal being the only permitted treatment option for the waste streams in question.

Option MC11(3)-2

Another option would be to insert a new provision into Regulation (EC) 1102/2008, allowing additionally to safe disposal for re-use, recycling or recovery of the certain specified mercury waste streams, where this is in compliance with Article 11 MC (i.e., where the re-use or recovery represents an allowed use under the MC), and in other cases leaving the obligation for disposal. The advantage of this option in comparison with Option MC11(3)-1 is that it provides more flexibility, taking into account socio-economic elements such as remaining needs for mercury supply, regarding certain waste streams.

Option MC11(3)-3

As regards MC 11(3c) (shipment), to provide legal certainty an option is to impose an explicit export ban for disposal on “mercury waste” in the sense of MC, either in the revised Regulation (EC) 1102/2008 or in the Waste Shipment Regulation. Similarly, restrictions on the export of mercury waste for recovery (addressing MC 11(3b)) could be introduced there.

7.9 MC article 12: Contaminated sites

7.9.1 Introduction to MC obligations

Article 12 MC asks Parties to “endeavour to develop” measures with respect to contaminated sites. Such actions could include developing strategies for identifying and assessing contaminated sites and actions to reduce risks, incorporating “where appropriate” an assessment of risks to human health and the environment.

The COP is to develop guidance on managing contaminated sites.

7.9.2 Article 12(1): Appropriate strategies for identification and assessing contaminated sites

7.9.2.1 Obligations of the provision

Article 12(1) MC reads:

Each Party shall endeavour to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds.

The wording makes clear that this is a soft-law obligation. Major interpretation issues are not identified.

7.9.2.2 EU legislation addressing the provision

There is currently no EU legislation in force fully covering this provision.

In 2006 the European Commission published a Thematic Strategy for Soil Protection (COM(2006) 231 final), with a follow-up report published in 2012 (COM(2012) 46 final). The strategy does not cover mercury explicitly, but it addresses point and diffuse contamination by hazardous substances, thus including mercury. The proposal for a Soil Framework Directive (COM(2006) 232 final) has so far not been adopted. The Commission has indicated (REFIT) that if no progress can be achieved on the soil file it would consider withdrawal of the proposed legislation.

Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage (including those to land) does not contain a provision on the identification of contaminated sites. It provides the determination of whether environmental damage in the sense of that Directive has occurred. It is in place, (scarce) rules on assessment are laid down in the Directive, which applies to industrial activities of its Annex I, *inter alia* activities covered by the IE Directive.

The Mining Waste Directive 2006/21/EC contributes to the EU *aquis* for dealing with contaminated sites and hazardous substances. In Article 20 it calls upon MS to ensure that an inventory of closed waste facilities, including abandoned waste facilities, located on their territory which cause serious negative environmental impacts or have the potential of becoming in the medium or short term a serious threat to human health or the environment is drawn up and periodically updated. Such an inventory, to be made available to the public, shall be carried out by 1 May 2012.

7.9.2.3 Initial proposals for additional measures

Option MC12(1)-1

Since the obligation of Article 12 MC is of a soft law nature, there is no need to amend the EU *aquis* to comply with it. The EU could however consider the following possible measures as options:

Option MC12(1)-2

To comply with this soft-law obligation, EU could consider encouraging Member States to produce an inventory, supplementary to existing inventories made due to national legislation, e.g. soil legislation in some Member States and EU induced classification and broadly describe methods of assessment, of such sites within a revised Regulation (EC) 1102/2008.

Option MC12(1)-3

Such obligation could instead be communicated via the ongoing further work in the context of the Thematic Strategy on Soil Protection.

Option MC12(1)-4

EU could introduce legislation that imposes a binding obligation for Member States to draw up an inventory, and prescribe measures of assessment, for example via a revised Regulation (EC) 1102/2008.

Discussion

The latter option, given the reluctance of Member States to grant competence to the EU in soil policy, is not likely to be supported by Member States. There are, however, at least two precedents that could be invoked to justify an intervention at EU level also in this case – Article 14 ("Existing landfill sites") in the Landfill Directive 1999/31/EC and Article 20 ("Inventory of closed waste facilities") in the Mining Waste Directive 2006/21/EC.

7.10 Further relevant obligations and mechanisms under MC (Article 13-14)

7.10.1 Article 13: Financial resources and mechanisms

Article 13 MC commits each Party to allocating resources for implementation of the MC, taking into account national policies, priorities, plans, and programmes. A variety of funding sources are encouraged, including multilateral, regional, and bilateral sources. The mechanism shall encourage the provision of resources from other sources, including the private sector, and shall see to leverage such resources for the activities it supports.

Characteristics of the mechanism to support implementation of the treaty by developing and transition countries include the provision of “*adequate, predictable, and timely financial resources*”.

The financial mechanism includes a Global Environment Facility (GEF) trust fund and a “*special international program*” that will provide capacity building and technical assistance. COP guidance to the GEF trust fund includes strategies, policies, priorities, eligibility, and an indicative list of categories of activities that could receive support from the GEF. The international programme will be operated under the guidance of the COP and accountable to it.

7.10.2 Article 14: Capacity-building, technical assistance and technology transfer

Article 14 MC obliges Parties to “*cooperate*” to provide timely and appropriate capacity-building and technical assistance “*within their respective capabilities*.” Least Developed Countries and Small Island Developing States are highlighted as recipients of technology transfer. A variety of arrangements are mentioned as possibilities: regional, sub-regional, and national. Synergies with other international conventions are encouraged. Developed country Parties, and others within their capabilities, are obligated to promote and facilitate development, transfer, and diffusion of and access to “up-to-date environmentally sound alternative technologies.”

7.11 MC article 16: Health aspects

7.11.1 Introduction to MC obligations

Article 16 MC contains a list of optional activities to be taken by the Parties regarding health impacts that includes:

- › strategies and programmes to identify and protect populations at risk;
- › development and implementation of science-based educational and preventive programs on occupational exposure to mercury;
- › promoting appropriate health-care services for prevention, treatment, and care of populations affected by mercury exposure; and
- › establishing and strengthening institutional and health professional capacities for prevention, diagnosis, treatment, and monitoring of health risks related to mercury exposure.

7.11.2 Article 16(1): Development and implementation of health aspects

7.11.2.1 Obligations of the provision

Article 16(1) MC reads:

Parties are encouraged to:

- (a) Promote the development and implementation of strategies and programmes to identify and protect populations at risk, particularly vulnerable populations, and which may include adopting science-based health guidelines relating to the exposure to mercury and mercury compounds, setting targets for mercury exposure reduction, where appropriate, and public education, with the participation of public health and other involved sectors;*
- (b) Promote the development and implementation of science-based educational and preventive programmes on occupational exposure to mercury and mercury compounds;*
- (c) Promote appropriate health-care services for prevention, treatment and care for populations affected by the exposure to mercury or mercury compounds; and*
- (d) Establish and strengthen, as appropriate, the institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to the exposure to mercury and mercury compounds.*

The wording “*are encouraged*” describes a soft law obligation.

In terms of the wording of the actions Parties may take, no major interpretation issues are observed.

7.11.2.2 EU legislation addressing the provision

The following table gives an overview of where the measures described in Article 16 MC are subject to regulation at EU level:

Table 7-13 Overview of coverage of Article 16 MC in the EU legislation.

(1) (a)	<i>Promote the development and implementation of strategies and programmes to identify and protect populations at risk, particularly vulnerable populations, and which may include adopting science-based health guidelines relating to the exposure to mercury and mercury compounds, setting targets for mercury exposure reduction, where appropriate, and public education, with the participation of public health and other involved sectors;</i>	<p>Limit values for mercury at EU level aiming at protecting the general population and vulnerable groups exist for instance regarding</p> <ul style="list-style-type: none"> • Groundwater, drinking water and shellfish water • Seafood and other foodstuff; note that the European Food Safety Agency (EFSA) has undertaken studies of Hg exposure in the EU. • Toys Directive, and • Cosmetics. <p>Note that under Directive 2004/107/EC, concentrations and deposition of mercury are to be measured to show geographical and temporal trends.</p> <p>These measures go in our understanding beyond what is required by Article 16(1) (a) MC</p>
(1) (b)	<i>Promote the development and implementation of science-based educational and preventive programmes on occupational exposure to mercury and mercury compounds;</i>	<p>Occupational exposure to mercury is covered by EU legislation, Directives 89/391/EEC and 98/24/EC, and in particular 2009/161/EC establishing an indicative occupational exposure limit value for mercury. Note that the value, based on a prior assessment, specifies that “<i>During exposure monitoring for mercury and its divalent inorganic compounds, account should be taken of relevant biological monitoring techniques that complement the IOELV</i>”.</p> <p>This measure goes beyond what is required by Article 16(1) (b) MC</p>
(1) (c)	<i>Promote appropriate health-care services for prevention, treatment and care for populations affected by the exposure to mercury or mercury compounds;</i>	No specific EU measures in place
(1) (d)	<i>Establish and strengthen, as appropriate, the institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to the exposure to mercury and mercury compounds</i>	No specific EU measures in place

7.11.2.3 Initial proposals for additional measures (if needed)

Since the obligations of Article 16(1) MC are of soft law nature, there is no need to amend the EU acquis in order to comply with those provisions. The exposure of population and vulnerable groups, and occupational exposure, are addressed at EU level to an extent which - in our understanding - does not make it necessary to take further action. The aspects mentioned in Article 16(1) lit. (c) and (d) MC respectively, which are currently not specifically addressed by EU acquis, are expected to remain a matter of Member State competence.

Option MC16(1)-1

The requirements of these provisions could be specified in a revised Regulation (EC) 1102/2008.

Option MC16(1)-2

Alternatively, these aspects could be emphasised in a Commission communication, such as an updated mercury strategy.

7.12 Further relevant obligations and mechanisms under MC (Article 17-21)

7.12.1 Article 17: Information exchange

Article 17 MC requests Parties to facilitate the exchange of various types of information including

- › scientific, technical, economic, legal, ecotoxicological, and safety information;
- › information on reduction or elimination of production, use, trade, emissions, and releases of mercury;
- › information on technically and economically viable alternatives to:
 - › mercury-added products,
 - › manufacturing processes using mercury, and
 - › activities and processes that release mercury;
- › information on alternatives, including health and environmental risks, and economic and social costs and benefits of such alternatives; and
- › epidemiological information.

Information can be exchanged through the Secretariat, through other organisations, or directly. Parties have to establish a national focal point for the exchange of information.

7.12.2 Article 18: Public information, awareness and education

Article 18 MC obliges each Party to promote and facilitate providing information to the public “*within its capabilities*.” Parties are also required to promote and facilitate “*[e]ducation, training and public awareness related to the effects of exposure to mercury and mercury compounds on human health and the environment in collaboration with relevant intergovernmental and nongovernmental organizations and vulnerable populations, as appropriate*.” Parties are supposed to use existing mechanisms or give consideration to the development of mechanisms such as PRTR, “*or the collection and dissemination of information on estimates of its annual quantities of mercury and mercury compounds that are released or disposed of through human activities*.”

7.12.3 Article 19: Research, development and monitoring

Article 19 MC contains a series of optional activities, including

- › developing and improving inventories;
- › modelling;
- › impact assessments on human health and the environment;
- › methods development;
- › information on environmental fate and transport;
- › information on commerce and trade;
- › information on alternatives; and
- › information on BAT/ BEP.

Parties are encouraged to use existing monitoring networks and research programmes if appropriate.

7.12.4 Article 20: Implementation plans

Developing and executing an implementation plan is optional for the Parties under MC. If a plan is developed, it should follow an initial assessment and be transmitted to the Secretariat. In developing an implementation plan, Parties should “consult national stakeholders to facilitate the development, implementation, review and updating of their implementation plans.”

7.12.5 Article 21: Reporting

All Parties must report to COP through the Secretariat on the measures that they have taken to implement the treaty and on the effectiveness of its measures in meeting the treaty’s objectives. The COP decides the timing and format of the

reporting, taking into account coordinating reporting on the mercury treaty with reporting required by other relevant chemicals and wastes conventions.

8. Appendix 2 Existing and forthcoming legislation with relevance to the Convention

8.1 Overview of current EU legislation with relevance to the Convention

Table 8-1 below gives an overview of existing EU legislation with relevance to the control of mercury and the Minamata Convention.

Table 8-1 Overview of existing and forthcoming EU legislation concerning mercury.

Thematic issue	EU Legislation	Summary regarding mercury
Export ban and disposal of mercury	Regulation (EC) No 1102/2008 on the banning of exports of metallic mercury and certain mercury compounds and mixtures and the safe storage of metallic mercury	<p>Regulation (EC) No 1102/2008 bans the exports of metallic mercury and certain mercury compounds and mixtures originating from the EU. The ban has applied since March 2011 to exports of:</p> <ul style="list-style-type: none"> • metallic mercury (Hg, CAS RN 7439-97-6) • cinnabar ore; • mercury (I) chloride (Hg₂Cl₂, CAS RN 10112-91-1), • mercury (II) oxide (HgO, CAS RN 21908-53-2) • mixtures of metallic mercury with other substances with a mercury concentration of at least 95 % by weight (w/w). <p>Metallic mercury (Article 2 of Regulation (EC) No 1102/2008) from the following sources is considered as waste:</p> <ul style="list-style-type: none"> • metallic mercury that is no longer used in the chlor-alkali industry; • metallic mercury gained from the cleaning of natural gas; • metallic mercury gained from non-ferrous mining and smelting operations; and • metallic mercury extracted from cinnabar ore in the EU <p>Metallic mercury from these sources is considered waste, metallic mercury and can be stored:</p> <ul style="list-style-type: none"> • temporarily or permanently in an underground salt-mine adapted for the purpose or in deep underground, hard rock formations; or even • temporarily in above-ground facilities specifically dedicated for that purpose prior to its final disposal. <p>This option constitutes a derogation from the provisions of Landfill Directive 1999/31/EC (see entry below), which prohibit the disposal of liquid waste in landfills.</p>
Industrial	Directive 2010/75/EU (IE Directive / IED) applies to the largest installations operating certain	The IE Directive covers, several activities for which mercury (use, emissions, releases) is

Thematic issue	EU Legislation	Summary regarding mercury
Emissions	<p>industrial activities (as mentioned in its Annex I); with more detailed EU wide "minimum" requirements set for certain types of activities (large combustion plants, waste incineration, installations and activities using organic solvents, titanium dioxide production).</p> <p>The Directive requires the installations covered to have a permit, containing conditions based on the application of Best Available Techniques (BAT), in particular limit values for emissions to air, water and land. The Commission organises an exchange of information between experts from the EU Member States, industry and environmental organisations ("Sevilla process") on BAT, which results in the adoption of "BAT conclusions" (Commission Implementing Decisions) as part of larger BAT Reference Documents (the so-called BREFs), which are published by the Commission. The BAT conclusions have to be used by competent authorities as the reference for setting permit conditions. The emission limits cannot exceed the BAT-associated emission levels in the BAT conclusions unless a derogation can be justified by the competent authorities.</p>	<p>relevant and/or which are addressed by the Minamata Convention (MC). BREFs have been adopted under the former IPPC Directive on, for instance:</p> <ul style="list-style-type: none"> • Chlor-alkali manufacturing (CAK BREF), • Large Combustion Plants (LCP BREF), • Large Volume Organic Chemical industry (LVOC BREF), • Production of Cement, Lime, and Magnesium Oxide (CLM BREF) • Waste Incineration (WI BREF) • Non-Ferrous Metals production (NFM BREF) <p>Under the IED, new BAT conclusions have been adopted for CAK and CLM, both covering explicitly mercury use and/or emissions. The revision of the BREF under IED is on-going for LCP, LVOC and NFM and will be started soon for WI.</p> <p>The IED includes limits for mercury emissions/releases to air and water from waste incineration and waste co-incineration plants (Annex VI), taken over from Directive 2000/76/EC. The emission limit values for large combustion plants (Annex V) only relate to SO₂, NO_x and dust.</p>
Pollutant Release and Transfer Register	Regulation (EC) No 166/2006 sets up a European Pollutant Release and Transfer Register (E-PRTR) in the form of a publicly accessible electronic database. Reporting obligations are in place for the operators of facilities specified in Annex I to the	Mercury (as the total mass of the element in all chemical forms present in the release) is a pollutant for which reporting obligations apply in case the applicable threshold of 10 kg/y to air, 1 kg/y to water, or 1 kg/y to land is exceeded

Thematic issue	EU Legislation	Summary regarding mercury
	Regulation, in case the releases of the specified pollutants to air, water and land are above the thresholds set in the Regulation.	
Chemicals and certain products	<p>Regulation (EC) No 1907/2006 (REACH) applies to substances as such, in mixtures and in articles. Main instruments of REACH include:</p> <ol style="list-style-type: none"> (1) Registration of substances which are manufactured or imported in quantities reaching 1 tonne per year per manufacturer/importer; (2) Evaluation of registration dossiers and of substances (3) Authorisation, including as first step the identification of substances as Substances of Very High Concern (SVHC) and their placing on the “Candidate list” for authorisation - this aspect is in detail discussed in section 7.2.5.2. (4) Restrictions on specific (groups of) substances (Annex XVII); new restrictions may be added via a) normal procedure (69(1)) or b) 68(2) for the use of mercury in articles for consumer uses; (5) Obligation for suppliers and users of substances to communicate along the supply chain, and towards consumers 	<p><i>Registration</i></p> <p>Elemental mercury plus 202 mercury compounds were pre-registered by industry under the REACH Regulation. As of October 2013 only elemental mercury itself has however been registered, even though a targeted registration deadline of 2010 had been announced for 101 mercury compounds as part of their pre-registration. This indicates that remaining mercury compound uses may be in very small tonnages.</p> <p><i>Evaluation</i></p> <p>Mercury or its compounds have not yet been subject to the evaluation procedure under REACH. Mercury or its compounds are not listed in current Community Rolling Action Plan (CoRAP) 2014-2016 for substance evaluation, see ECHA proposal to the Member States: Draft Community Rolling Action Plan (CoRAP) update for years 2014-2016²². Refer also to the discussion in section 7.2.5.2.</p> <p><i>Identification as SVHC / Authorisation requirement</i></p> <p>Mercury is classified as reprotoxic Cat. 1B in the CLP Regulation (see entry below) and by this meets the criteria for being identified as SVHC. However, no step has been taken to identify mercury (or any of its compounds) as SVHC.</p> <p><i>Restrictions</i></p>

²² ECHA. Access from ECHO website 30 May 2014. http://echa.europa.eu/documents/10162/13628/corap_2014-2016_en.pdf.

Thematic issue	EU Legislation	Summary regarding mercury
		<p>Existing relevant Annex XVII restrictions with respect to mercury are:</p> <ul style="list-style-type: none"> • Entry 18 which restricts the placing on the market or use of “mercury compounds” (not further specified), as such or in mixtures, for certain specific uses, such as some fouling prevention applications, the preservation of wood of the impregnation of certain textiles and yarn.; • Entry 18a is related to “Mercury (CAS No 7439-97-6)” and restricts the placing on the market of mercury in fever thermometers and other measuring devices intended for sale to the general public. This entry has been modified by Regulation (EU) No 847/2012 amending Annex XVII to Regulation (EC) No 1907/2006 which extends the restriction to the placing on the market of a series of mercury-containing devices intended for industrial and professional uses (thermometers, barometers, hygrometers, manometers, sphygmomanometers, strain gauges to be used with plethysmographs, tensiometers and other non-electrical thermometric measuring devices), and will apply from 10 April 2014. • Entry 62 introduces general restrictions on the manufacturing, placing on the market or use of five specific phenylmercury compounds as such or in mixtures, as well as on the placing on the market of articles containing these substances, above a certain concentration limit. • Mercury being classified as reprotoxic Cat. 1B in the CLP Regulation (see entry below), mercury (CAS No 7439-97-6) is also subject to the general entry 28 which restricts its placing on the market or use as such, as constituent of other substances or in mixtures, for supply to the general public.
CLP / GHS	The ‘CLP’ Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures implements the globally harmonized system (UN-GHS) at EU level, setting out internationally accepted definitions and criteria to identify the hazards of chemicals and to	<p>Annex VI of the CLP Regulation contains an entry on elemental mercury, introducing a harmonized classification:</p> <p>Repr. 1B Acute Tox. 2 * STOT RE 1</p>

Thematic issue	EU Legislation	Summary regarding mercury
	communicate those hazards via labels and safety data sheets. Annex VI contains a list of specified hazardous substances for which a harmonized classification has been agreed at EU level.	Aquatic Acute 1 Aquatic Chronic 1 Mercury compounds are also classified (with similar, but not identical, classification, but very few are also classified as Repr. 1B).
Plant Protection Products	Regulation (EC) No 1107/2009 generally covers marketing of plant protection products (PPP). It contains rules for the approval of active substances, safeners and synergists, which PPP contain or consist of, and rules for adjuvants and co-formulants. In particular, a PPP must not be authorised unless the active substance is explicitly approved at EU level; for list of approved active substance see Regulation (EU) No 540/2011.	Mercury and its compounds are not approved as active substances for PPP in the EU.
Biocides	Regulation (EU) 528/2012 covers the making available on the market of biocides. It contains provisions similar to those on PPP, with active substances needing an approval at EU level, and biocidal products needing a further authorization. For list of approved active substance see (currently still) Annex I/IA to Directive 98/8/EC.	Mercury and its compounds are not approved as active substances for biocides in the EU. REACH Annex XVII entry No 18 (which was already contained in former Existing Substance Directive 76/769/EEC) restricts the placing on the market or use of “mercury compounds” (not further specified) for certain biocidal uses (see discussion of REACH above).
Export and import of dangerous chemicals	Regulation (EC) No 689/2008 covers export and import of dangerous chemicals. The Regulation applies an export ban for certain specified chemicals, and introduces an export notification procedure as well as procedural rules regarding the implementation of the prior informed consent	The following relevant chemicals/articles are subject to the export ban (Annex V): <ul style="list-style-type: none"> • Cosmetic soaps containing mercury • Two entries mirroring the export ban imposed by Regulation (EC) 1102/2008: • Metallic mercury and mixtures of metallic mercury with other substances, including alloys of mercury, with a mercury concentration of at least 95 % weight by weight • Mercury compounds, except compounds exported for research and development,

Thematic issue	EU Legislation	Summary regarding mercury
	(PIC) procedure of the Rotterdam Convention. The Regulation is to be repealed and replaced by Regulation (EU) No 649/2012 with effect from 1 March 2014.	medical or analysis purposes, in detail: Cinnabar ore, mercury (I) chloride, mercury (II) oxide In other cases, mercury compounds are subject to export notification procedure (Annex I, Part 1) or the PIC procedure (Annex I, Part 3).
Toys	Directive 2009/48/EC deals with the safety and placing on the market of toys. The Directive contains maximum migration limit values for several chemicals, expressed as mg/kg values.	Mercury is among the pollutants for which migration limit values are set. The values are as follows: In dry, brittle, powder-like or pliable toy material 7.5 mg/kg; in liquid or sticky toy material 1.9 mg/kg; in scraped-off toy material 94 mg/kg.
Cosmetics	Regulation (EC) No 1223/2009 deals with placing on the market of cosmetic products. It contains a list of prohibited substances.	“Mercury and its compounds” is included in the list of prohibited substances (Annex II, entry 221), with the exception of two mercury containing compounds Phenyl mercuric acetate and Thimerosal, which are allowed to be used in cosmetic products, with threshold concentrations of 0,007 % (of Hg); if mixed with other mercurial compounds authorised by this Regulation, the maximum concentration of Hg remains fixed at 0,007 % /
RoHS	Directive 2011/65/EU (RoHS Directive) restricts the use of certain substances present in new electrical and electronic equipment (EEE) put on the market	New electrical and electronic equipment put on the market shall not contain mercury in concentrations over 0.1 % w/w in electrical equipment. Annex III to the Directive contains exemptions from the ban for mercury, particularly for certain lamps. All exemptions are time-limited and contain a specified maximum limit value above which the exemption is not applicable (and the item is banned from placing on the market, respectively).
WEEE	Directive 2012/19/EU on waste electrical and electronic equipment (WEEE Directive) (recast) promotes collection and separate collection, as well as treatment standards for WEEE.	The Directive contains an obligation for MS to put priority on the separate collection of certain specified EEE, among those fluorescent lamps containing mercury. Further, the Directive contains the obligation to remove from any separately collected WEEE all mercury containing components
Eco Design	Directive 2009/125/EC on ecodesign aims to reduce the environmental impact of products, including their energy consumption, throughout their entire life cycle. In so-called implementing	Regulation (EC) No 244/2009 contains specific benchmark provisions on the functionality of lamps containing Hg, and packaging/labelling requirements; for instance, the Hg content has to be indicated in mg.

Thematic issue	EU Legislation	Summary regarding mercury
	<p>measures, direct provision for mandatory requirements for specific products may be set out. Such a measure is Regulation (EC) No 244/2009 which deals with ecodesign of non-directional household lamps and sets out benchmark and packaging labelling.</p> <p>Note that according to the 7th Environment Action Programme to 2020 (Decision 1386/2013/EU), Eco Design legislation is due for revision before 2015.</p>	
Batteries	<p>Directive 2006/66/EC establishes rules on the placing on the market of batteries and accumulators (in particular, a prohibition on the placing on the market of batteries and accumulators containing certain hazardous substances), and specific rules regarding the management of waste batteries and accumulators</p>	<p>The Directive prohibits placing on the market of all batteries that contain more than 0.0005% by weight of mercury except button cells (exemption valid until 1 October 2015, according to amendment by Directive 2013/56/EU) with 2% by weight. Further, the Directive contains collection rates, and rules on packaging and labelling of batteries containing mercury.</p>
Medicals	<p>Directive 2001/83/EC on the Community code relating to medicinal products for human use applies to most medicinal products for human use, including to the manufacture of medicinal products exclusively intended for export, as well as intermediate products, active substances and excipients. One of its core features is that in principle no medicinal product may be placed on the market of a Member State unless an authorization has been issued by the competent authorities of that Member State or by the European Medicines Agency. The Directive further</p>	<p>No authorization is in place at EU level regarding mercury-containing topical antiseptics.</p>

Thematic issue	EU Legislation	Summary regarding mercury
	<p>features inter alia rules on mutual recognition procedures and decentralised procedure as well as on classification, labelling, packaging and advertising.</p> <p>Regulation (EC) 726/2004 contains procedures for the authorisation, supervision and pharmacovigilance of medicinal products for human and veterinary use.</p>	
End of Life Vehicles	<p>Directive 2000/53/EC (ELV Directive) aims to make vehicle dismantling and recycling more environmentally friendly, sets quantified targets for reuse, recycling and recovery of vehicles and their components, and pushes producers to manufacture new vehicles also with a view to their recyclability. The Directive contains restriction in materials and components of vehicles, minimum technical requirements and removal of components containing mercury</p>	<p>Restriction of mercury presence in discharge lamps for headlight application and fluorescent tubes used in instrument panel displays in vehicles type approved before 1 July 2012 and spare parts for these vehicles</p> <p>Removal of all components containing mercury that are appropriately labelled during treatment of ELV</p>
Packaging and packaging waste	<p>Directive 94/62/EC (packaging and packaging waste) contains minimum requirements for packaging material, marking / identification systems, as well as an obligation for Member States for introducing a return/collection system together with recovery targets.</p>	<p>Concentration limit of 100 ppm w/w for sum of concentration levels of lead, cadmium, mercury and hexavalent chromium in plastic packaging and packaging components.</p>
Waste management/ Hazardous	<p>Directive 2008/98/EC (Waste Framework Directive) contains standards for waste management and key concepts. It also contains key</p>	<p>The List of Wastes assumes for a number of waste types that they exhibit hazardous properties (those marked with an asterisk). In case of so-called mirror entries, i.e. where the classification of the waste as hazardous or not depends on the presence of certain (hazardous substances), the LoW determines which thresholds apply. A number of waste codes explicitly containing</p>

Thematic issue	EU Legislation	Summary regarding mercury
waste	<p>definitions, notably for “hazardous waste” (Article 3(2), Annex III), and specific provisions for the management of this waste.</p> <p>Commission Decision 2000/532/EC (List of Wastes, LoW) contains a source-based inventory of waste streams, identified by a six-digit number. Wastes marked with an asterisk are assumed to be hazardous. The Commission intends to publish a proposal for revision of Annex III and the List of Wastes in the near future.</p>	<p>mercury or “heavy metals” (of which mercury is one); these are all considered hazardous waste (entries 05 07 01*, 06 03 13*, 06 03 15*, 06 04 04*, 06 07 03*, 10 11 11*, 10 12 11*, 10 14 01*, 16 01 08*, 16 06 03*, 17 09 01*, 19 08 08*, 20 01 21*). Subject to final adoption, revised LoW will likely include the following additional waste codes: 16 03 07* metallic mercury; 19 03 08* partly stabilised mercury</p>
Transfrontier shipment of waste	<p>Regulation (EC) No 1013/2006 on shipments of waste (The Waste Shipment Regulation - WSR) applies to shipments of waste:</p> <ul style="list-style-type: none"> • between Member States, within the EU or with transit through third countries; • imported into the EU from third countries; • exported from the EU to third countries; • in transit through the EU, on the way from and to third countries. <p>It aims to transpose EU obligations stemming from Basel Convention and from OECD level. The Regulation imposes an export ban for hazardous waste to certain regions as well as a ban on export for disposal outside the EU/EFTA area. The Regulation recognizes two control procedures:</p> <ul style="list-style-type: none"> • the procedure of prior written notification and consent which may be seen as the 	<p>All wastes where mercury is mentioned, are explicitly listed in Annex V of WSR – leading to a ban of exporting such wastes to non-OECD* countries, either through incorporation of lists stemming from Basel Convention, or because they are considered as hazardous under the List of Waste or in national legislation.</p> <p>*: includes OECD countries that have not implemented OECD Council Decision C(2001)107/final</p>

Thematic issue	EU Legislation	Summary regarding mercury
	<p>default procedure for shipment, and</p> <ul style="list-style-type: none"> the general information requirements of Article 18 of the WSR which is used for the shipments of “green”-listed waste destined for a recovery operation to certain destinations. <p>The approach for classification of waste as hazardous under Basel / OECD is different from that provided for by the EU LoW; nonetheless, the WSR recognizes additionally hazardous properties of waste assessed on the basis of WFD/LoW for the purpose of export control.</p> <p>The notification procedure requires that the competent authorities of the countries concerned by the shipment (country of dispatch, country of transit and country of destination) give their consent prior to any shipment.</p>	
Landfill and storage of waste	Directive 1999/31/EC (landfill of waste) contains rules on the management, permit conditions, closure, and after-care of landfills. Council Decision 2003/33/EC specifies acceptance criteria for waste for the different classes of landfills as recognised by the Landfill Directive.	The Annexes of Landfill Directive, as amended by Directive 2011/97/EU, contains requirements for the temporary storage of metallic mercury of more than one year.
Mining waste	Mining Waste Directive 2006/21/EC covers the management of waste from land-based extractive industries, arising from the prospecting, extraction, treatment and storage of mineral resources and	Though the Directive is not addressing contaminants like mercury specifically, it contributes to the EU acquis for dealing with contaminated sites and hazardous substances. In article 20 it calls upon MS to ‘ensure that an <i>inventory</i> of closed waste facilities, including abandoned waste facilities, located on their territory which cause serious negative environmental impacts

Thematic issue	EU Legislation	Summary regarding mercury
	from the working of quarries	<p>or have the potential of becoming in the medium or short term a serious threat to human health or the environment is drawn up and periodically updated. Such an inventory, to be made available to the public, shall be carried out by 1 May 2012, taking into account the methodologies ...’.</p> <p>In the recitals 30/31 it is stated that an inventory of closed, including abandoned, waste facilities is supposed to identify those which cause serious negative environmental impacts or have the potential of becoming in the medium or short term a serious threat to human health or the environment. These inventories should provide a basis for an appropriate programme of measures.</p> <p>The Commission should ensure an appropriate exchange of scientific and technical information on how to carry out an inventory of closed waste facilities at Member State level and on the development of methodologies to assist Member States in complying with this Directive when rehabilitating closed waste facilities.</p>
Industrial hazards	<p>Directive 96/82/EC (Seveso II) relates to industrial hazards involving dangerous substances. Member States must ensure that operators of Seveso establishments:</p> <ul style="list-style-type: none"> • take all measures necessary to prevent major accidents and to limit their consequences for man and the environment; • prove to the competent authority that all the necessary measures provided for by the Directive have been taken. <p>The Seveso II Directive imposes requirements for notification (Article 6) and the drawing up of a</p>	Mercury is not explicitly addressed, but meets the criteria for a “dangerous substance” in Annex I, part 2 (as “very toxic”). The relevant thresholds are 5 tonnes for the purposes of Article 6 and 20 tonnes for the purpose of Article 9.

Thematic issue	EU Legislation	Summary regarding mercury
	<p>safety report (Article 9) where dangerous substances (as identified by Annex I) are present in the facility in quantities above the relevant thresholds (see Article 3(4) Seveso II Directive). The Seveso II Directive is to be repealed, and Member States have to comply with the provisions of new Seveso III Directive 2012/18/EU, by May 2015.</p> <p>In effect, based on a tiered approach to the level of controls, operators handling dangerous substances above certain thresholds must regularly inform the public likely to be affected by an accident, providing safety reports, a safety management system and an internal emergency plan.</p>	
Discharges to water	<p>Directive 2000/60/EC (Water Framework Directive) as amended by Directive 2008/105/EC (Environmental Quality Standards, EQS, or Priority Substances) and subsequently Directive 2013/39/EU. The Water Framework Directive establishes a framework for the protection of inland surface waters, groundwater, transitional waters, and coastal waters. Its objectives include preventing and reducing pollution, promoting sustainable water usage, environmental protection, improving aquatic ecosystems and mitigating the effects of floods and droughts. Its ultimate objective is to achieve “good ecological and chemical status” for all Community waters by 2015</p>	<p>Mercury is identified as a priority hazardous substance. Measures must be aimed at the cessation of emissions, discharges and losses of priority hazardous substances within 20 years of the legislation becoming applicable. The EQS for mercury in surface waters is currently 0.05 µg/l as an annual average and 0.07 µg/l as a maximum allowable concentration to protect against direct toxicity. However, if Member States do not apply the biota EQS of 20µg/kg they must introduce a stricter EQS for water in order to achieve the same level of protection as afforded by the EQS for biota.</p>

Thematic issue	EU Legislation	Summary regarding mercury
	(later with respect to some newly introduced pollutants) and to this end Environmental Quality Standards (EQS) are introduced. Discharges of pollutants are to be controlled according to a combined approach aimed at achieving the EQS by establishing or implementing: emission controls based on best available techniques, relevant emission limit values, or controls on diffuse emissions including best environmental practices set out in the legislation listed in Article 10 of the Water Framework Directive 2000/60/EC.	
Groundwater	Directive 2006/118/EC relates to protection of groundwater. <i>Inter alia</i> , it outlines criteria for the good chemical status of groundwater, and addresses certain specified pollutants in groundwater.	Member States had to set threshold values for pollutants, including mercury by December 2008.
Drinking water	Directive 98/83/EC is intended to protect human health by laying down drinking water quality requirements. Among other elements, the Directive stipulates minimum requirements (microbiological and chemical parameters and those relating to radioactivity).	Limit value for mercury of 1 µg/l
Marine environment	Directive 2008/56/EC, the Marine Strategy Framework Directive, establishes common principles on the basis of which Member States have to draw up their own strategies, in	Member States must define objectives and indicators including for heavy metals.

Thematic issue	EU Legislation	Summary regarding mercury
	cooperation with other Member States and third countries, to achieve a Good Environmental Status (GES) based on various criteria, among other contaminants in fish and other seafood for human consumption.	
Air quality (EU level)	<p>Directive 2008/50/EC (the ‘ambient air quality Directive’) lays down measures aimed at:</p> <ul style="list-style-type: none"> • defining and establishing objectives for ambient air quality designed to reduce harmful effects on health and the environment; • assessing the ambient air quality in Member States on the basis of common methods and criteria; • collating information on ambient air quality in order to monitor long-term trends, in particular; • ensuring that such information on ambient air quality is made available to the public; • maintaining air quality where it is good and improving it in other cases; • promoting increased cooperation between the Member States in reducing air pollution. <p>The Directive sets, <i>inter alia</i>, thresholds for assessment for certain pollutants (sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (PM₁₀ and PM_{2.5}), lead, benzene and carbon monoxide), criteria for the assessment method (in</p>	<p>Directive 2004/107/EC contains measurement obligations for mercury and mercury compounds addressed to Member States, together with reference methods for sampling and testing.</p> <p>Indirectly, mercury emissions may be affected by the multi-pollutants strategy specified in Directive 2008/50/EC, as air pollutant filters targeting SO_x, NO_x and PM also retain part of the mercury from the exhaust gas from combustion, etc. (mercury retention efficiency varies depending on fuels used and filter configurations).</p>

Thematic issue	EU Legislation	Summary regarding mercury
	<p>particular the siting of sampling points), reference methods for measurement, limit values for the protection of human health and the environment.</p> <p>Directive 2004/107/EC (the fourth daughter directive to former Directive 96/62/EC which was preceding Directive 2008/50/EC) relates to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.</p>	
Air pollution stemming from heavy metals (UNECE level)	<p>The 1998 Aarhus Protocol on Heavy Metals under the UNECE Convention on long-range transboundary air pollution (CLRTAP) addresses specifically emissions to air from cadmium, lead and mercury. The Protocol that came into force in October 2003 has been approved on behalf of the EU by Council Decision 2001/379/EC. Note that the Protocol has been amended in 2013 (apparently, these amendments have not yet entered into force and the EU has not yet accepted the amendments), introducing more stringent emission limit values for emissions applicable for certain combustion and other industrial emission sources releasing them into the atmosphere. To ensure coherence between regional and global commitments, the Parties agreed to revisit the issues of mercury-containing products and emission limit values for heavy metals in 2014.</p>	<p>In terms of basic obligations under the Heavy Metals Protocol, Parties must:</p> <ul style="list-style-type: none"> • Reduce total annual emissions of mercury into the atmosphere, compared to the reference year for the Party (1990, or an alternative year between 1985 and 1995 set when becoming a Party), through application of best available techniques (BAT), product control measures or other emission reduction strategies; • Use best available techniques for stationary sources - for new plants within 2 years, for existing plants within 8 years. The standards for best available techniques are given as examples in Annex III to the Protocol, and include both cleaning technology and substitution of mercury based technology, for example in chlor-alkali plants; • Ensure application of limit values to control emissions from major stationary sources, both new and existing. <p>Parties in the geographical scope of European Monitoring and Evaluation Programme (EMEP), such as the EU, are obliged to submit information on the levels of emissions of mercury using the methodologies specified in guidelines prepared by the Steering Body of EMEP and adopted by the Parties at a session of the Executive Body.</p> <p>Note that the obligations under the Protocol to the EU level have not been transposed as a</p>

Thematic issue	EU Legislation	Summary regarding mercury
		single Directive or Regulation, but indirectly as various provisions into other legislation (such as the IED, REACH, etc.).
Air quality / Emission ceilings (UNECE level and EU NEC Directive)	<p>A "multi-pollutant" protocol exists under CLRTAP (the Gothenburg protocol, agreed in November 1999). The Protocol in the 1999 version contains emission ceilings for certain pollutants responsible for acidification, eutrophication and ground-level ozone pollution (SO₂, NO_x, VOCs, and ammonia), which are mirrored at EU level within the NEC Directive 2001/80/EC. The NEC Directive sets upper limits for each Member State for the total emissions in 2010 of the four pollutants, but leaves it largely to the Member States to decide which measures – in addition to Community legislation for specific source categories - to take in order to comply.</p> <p>The Gothenburg Protocol has been amended in 2013 and now also features emission ceilings for PM_{2.5} (and CH₄). In December 2013, the EU Commission has published a “Clean Air Policy Package”, inter alia in order to comply with the amended Gothenburg Protocol; elements of this package comprise proposals for a revised NEC Directive, and for a Directive on Medium-Sized Combustion Plants, both addressing PM emissions, among others. These proposals are discussed in section 8.2.</p>	Indirectly, mercury emissions may be affected by the multi-pollutants strategy developed under the NEC Directive, as air pollution filters targeting SO _x , NO _x and PM also retain part of the mercury from the exhaust gas from combustion, etc. (mercury retention efficiency varies depending on fuels used and filter configurations).
Occupational	Directive 98/24/EC (protection of health and safety	Minimum requirements and occupational exposure limits (0.02 mg/m ³ 8 hrs average) for

Thematic issue	EU Legislation	Summary regarding mercury
safety	<p>from chemicals at work) lays down minimum requirements for the protection of workers from risks to their safety and health arising, or likely to arise, from the effects of chemical agents that are present at the workplace or as a result of any work activity involving chemical agents.</p> <p>Within the framework set by this Directive, Directive 2009/161/EU establishes indicative occupational exposure limits for certain chemicals.</p>	“mercury and divalent inorganic mercury compounds including mercuric oxide and mercuric chloride (measured as mercury)”
Food safety	Regulation (EC) No 1881/2006 sets out maximum levels (ML) for certain contaminants in foodstuffs.	Mercury is among the heavy metals addressed by the Regulation. ML are introduced for fishery products (at 0.5 mg/kg wet weight with several exemptions of 1 mg/kg wet weight) and for food supplements (0.1 mg/kg).
Contaminated sites / Soils	<p>Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage. A strict liability scheme applies to the dangerous or potentially dangerous occupational activities listed in Annex III to the Directive. These are inter alia industrial activities under the IED regime, activities which discharge heavy metals into water or air, installations producing dangerous chemical substances, waste management activities (including landfills and incinerators) and activities concerning genetically modified organisms and micro-organisms. Under this first scheme, the operator may be held responsible even if he is not at fault. A less strict liability scheme applies to all occupational activities other than those listed in Annex III to the</p>	<p>Mercury is only indirectly mentioned as “heavy metals” in Directive 2004/35/EC.</p> <p>Activities involving mercury will be in the scope of Annex III and thus be subject to the strict liability scheme imposed by the Directive.</p>

Thematic issue	EU Legislation	Summary regarding mercury
	Directive, but only where there is damage, or imminent threat of damage, to species or natural habitats protected by Community legislation. In this case, the operator will be held liable only if he is at fault or negligent.	
Contaminated sites / Soils	The Commission has adopted a Soil Thematic Strategy (COM (2006) 231) and a proposal for a Soil Framework Directive (COM(2006) 232). It is currently unclear to what extent the latter will become legislation. The Commission has indicated (REFIT) that, provided no progress can be achieved on the soil file, it would consider a withdrawal of the proposed legislation	Mercury is not explicitly mentioned, although the proposed Soil Framework Directive would require the identification of contaminated sites, including by mercury, and the prevention of soil contamination.

8.2 Forthcoming legislation and other initiatives on the EU-level

Mercury emissions to air may be indirectly affected by multi-pollutant control strategies as abatement measures targeting pollutants such as SO_x, NO_x and PM will generally also retain part of the mercury from the exhaust gas from combustion and process plants, etc. The mercury retention efficiency varies depending on the process, the fuels or raw materials used and the abatement measures applied.

The following proposals for new EU legislation, while not explicitly targeting mercury, may therefore be relevant in this context.

On 18 December 2013, the Commission adopted a Clean Air Policy Package, containing, *inter alia*, a Communication for a Clean Air Programme for Europe, and legislative proposals for the following:

- A revised NEC Directive containing updated national ceilings (emission reduction commitments) for six key air pollutants (PM, SO₂, NO_x, VOCs, NH₃ and CH₄) for 2020 and 2030, and
- A new Directive for Medium Combustion Plants between 1 and 50 MWth setting emission limits for PM, SO₂ and NO_x.

According to Article 4 and Annex II of the Proposal for a revised NEC Directive Member States must limit their annual emissions of SO₂, NO_x, NMVOC, NH₃, PM_{2.5} and CH₄, to meet specified reduction commitments applicable from 2020 and 2030, subject to some flexibility allowed by Article 5 of the Proposal. Furthermore, Member States must limit in 2025 their annual emissions of those pollutants to the levels defined on the basis of a linear reduction trajectory, unless this would require measures entailing disproportionate costs.

The proposal for a Directive for Medium Combustion Plants (i.e. those with a rated thermal input between 1 and 50 MWth) (COM(2013) 919 final) has the following key features:

- Article 1 defines the aim of the Directive as reducing emissions to air of SO₂, NO_x and PM from medium-sized combustion plants between 1 and 50 MWth, and thereby reducing the potential risks to human health and the environment from such emissions;
- Article 4 sets out the obligation of the competent authority to register medium combustion plants, based on notification by the operator. The elements of such notification are listed in Annex I;
- Article 5 defines emission limit values, with the corresponding values for SO₂, NO_x, and PM, applicable for existing and new plants (where it is

distinguished between *engines and gas turbines* on the one hand and *others* on the other hand) being laid down in Annex II.

Article 5(2) states that the emission limit values apply to existing combustion plants from January 2025 (medium combustion plants with a rated thermal input above 5 MW) and January 2030 respectively (existing medium combustion plants with a rated thermal input of 5 MW or less) to provide them with sufficient time to adapt technically to the requirements of the Directive. New installations have to comply with the requirements one year after the date of transposition.

Exemptions from compliance with these emission limit values for both existing and new sources granted by Member States are possible if the medium combustion plant does not operate more than 500 operating hours per year; in that case, for plants firing solid fuels, an emission limit value for particulate matter of 200 mg/Nm³ shall apply.

Article 5(4) of the Proposal requires Member States to apply more stringent emission limit values to individual plants in zones not complying with air quality limit values. Annex III lays down the benchmark values for that purpose that reflect the performance of the most advanced techniques available.

- Article 9 provides for the obligations of the operator and the competent authority in case of changes to a medium combustion plant.

9. Appendix 3 Summary of Member State questionnaire replies

As part of this study, a questionnaire was sent to all Member States pertaining to selected issues of the assessment as well as the planned review of Regulation 1002/2008 on the mercury export ban and safe disposal. It also served as a review of Regulation 1102/2008. In the following, a summary is given of the received responses to the questionnaire organised by the questions posed.

2. Which countries have to date responded to the survey?

Member States	
Yes	15 (AT, BG, CZ, DE, DK, ES, FI, HR, HU, IE, LT, PT, RO, SE, UK)

15 Member States have to date responded to this survey, as well as one country confirming that it would not be participating.

3. Member State legislation going beyond the EU law

Has your country implemented or proposed new legislation or other national initiatives since 2010 which go beyond the EU legislation on mercury?

Member States	
Yes	4 (DK, ES, LT, SE)
No	11 (AT, HR, FI, DE, IE, RO, PT, UK, HU, BG, CZ)

The majority of countries that responded (around three-quarters) had not implemented or proposed new mercury legislation/initiatives going beyond those already in place under EU law. Only four countries stated that they had. Additional

mercury restrictions imposed by these countries, typically pertained to specific sectors and types of mercury compounds e.g. statutory prohibition of import, sale and export of mercury and mercury-containing products with specified exemptions; a phased ban on dental amalgams (SE); limits on mercury emissions from crematoria not covered under EU law (LT); lower occupational exposure limit values for mercury alkyl compounds (LT); stricter mercury migration limits in toys, electrical and electronic equipment (ES); tighter requirements around temporary storage of metallic mercury (ES); environmental quality standards for mercury in water (ES); methods and criteria for evaluation of mercury concentration in air (ES).

These countries also highlighted other non-legislative initiatives, mostly awareness raising campaigns e.g. risk warnings to vulnerable groups associated with consumption of certain sea foods with potentially high mercury content (SE); use and disposal of broken energy saving light bulbs with mercury content (DK), as well as green public sector procurement initiatives which included provisions on mercury (LT).

4. Sectors affected by the Minamata Convention provisions in your country

To your knowledge, do any of the sectors/activities targeted by the Minamata Convention listed below exist in your country?

No. Member States	
Yes	14 (AT, DK, FI, DE, IE, LT, RO, ES, SE, PT, UK, HU, BG, CZ)
No	1 (HR)

Sector	No. Member States
Button cell batteries	
Switches and relays	2 (FI, UK)
Fluorescent lamps/ high pressure vapour lamps (HPMV)	2 (UK, HU)
Barometers	2 (DK, UK)
Hygrometers	2 (DK, UK)
Manometers	1 (DK)
Thermometers	2 (DK, UK)
Sphygmomanometers	2 (DK, UK)
Dental amalgams/ filling materials	6 (AT, DK, ES, SE, UK, CZ)
Acetaldehyde with Hg catalyst	
Vinyl chloride monomer (VCM) with Hg catalyst	2 (RO, HU)
Sodium or potassium methylete/ ethylete with Hg catalyst/feedstock	2 (DE -production, UK -end-use)
Polyurethane using mercury containing catalysts	
Artisanal and small-scale gold mining	
Primary metal production with smelting and roasting processes	4 (FI, ES, SE, HU)
Waste incineration	9 (AT, FI, IE, LT, ES, SE, PT, CZ, HU)
Cement clinker	9 (AT, DK, FI, IE, LT, ES, SE, PT, CZ)
Large scale commercial Hg stocks (above 50 tonnes stored)	1 (DE)
Recycling of mercury	4 (IE, CZ, UK, HU)

Commercial disposal of hazardous Hg waste

All but one of the Member States which responded had domestic sectors targeted by the Minamata Convention. Cement clinker production and waste incineration were the most prevalent sectors stated by countries (almost three-fifths of respondents), and to a less extent the production of dental amalgams and filling materials (two-fifths of respondents). This is not surprising given that these sectors were relatively mainstream in comparison to more specialised uses of mercury. The use of mercury in the manufacture of scientific instruments, electrical components and industrial components was restricted in each case to a few countries with specialised operations. Almost all countries responding were also able to provide examples of companies operating within these sectors. A few countries also specified domestic studies used to assess sectoral impacts (UK, SE, DK). The UK referred widely to a domestic study – ‘An Assessment of the Future Levels of Demand for Mercury in the UK’ (2009). Denmark highlighted a study looking at alternatives to mercury-containing measuring devices. Sweden drew on 4 domestic studies on the effects of amalgam use on different population cohorts, which formed the basis of its national ban.

5. Review of the Mercury Export Ban Regulation

5.1. Article 5 (1): “Member States shall submit to the Commission a copy of any permit issued for a facility designated to store metallic mercury temporarily or permanently (disposal operations D 15 or D 12 respectively, as defined in Annex II A of Directive 2006/ 12/EC), accompanied by the respective safety assessment pursuant to Article 4(1) of this Regulation.”

Has your country issued any such permits?

No. Member States	
Yes	2 (HU, HR)
No	12 (AT, DK, FI, DE, IE, LT, ES, SE, PT, UK, BG, CZ)
Not answered	1 (RO)

The overwhelming majority of countries had not issued permits for mercury storage facilities. Only two countries – Hungary and Croatia – stated having issued permits. Both of these were able to provide a list of permit issued. A total of 7 permits were issued in Hungary, and 63 permits issued across 44 different companies in Croatia.

5.2. Article 5 (2): “By 1 July 2012, Member States shall inform the Commission on the application and market effects of this Regulation in their respective territories.”

Has this Regulation found any application in your country?

No. Member States	
Yes	4 (IE, ES, SE, HU)
No	11 (AT, HR, DK, FI, DE, LT, RO, PT, UK, BG, CZ)

The vast majority of respondents did not find that the Article 5(2) regulation had any application in their countries. Only four countries – Hungary, Ireland, Spain and Sweden – noted any concrete application of the laws, mostly in the storage, disposal and waste export sectors.

Has any market effects of the Regulation been observed in your country?

No. Member States	
Yes	2 (ES, CZ)
No	11 (AT, HR, DK, FI, DE, IE, LT, RO, SE, PT, BG)
Not answered	2 (UK, HU)

Two Member States – Spain and Czech Republic – stated having observed market effects in their countries as a result of the regulation, though this was largely confined to sub-regions and sectors. Some negative economic impacts had been felt regionally in Spain since 2001, with the closure of mercury mining operations. Nevertheless, the affected region has since been able to shift its focus to culture and tourism with the opening of a regional mining park and to the research of environmentally sound management solutions of mercury through The National Technological Centre for Mercury Decontamination. Impacts on the chlor-alkali sector were also noted in Spain. Czech Republic highlighted some adverse trade impacts resulting from the cessation of exports of dental mercury outside the EU (this related specifically to trade with Turkey – a key partner for a major Czech mercury production and waste recollection firm - BOME).

5.3. Article 5(3): “By 1 July 2012, importers, exporters and operators of activities referred to in Article 2, as appropriate, shall send to the Commission and to the competent authorities the following data:

(a) volumes, prices, originating country and destination country as well as the intended use of metallic mercury entering the Community;
(b) volumes, originating country and destination country of metallic mercury considered as waste that is traded cross-border within the Community."

Has your country received submissions of the following types of data from importers, exporters and operators of activities referred to in Article 2 of Reg. 1002/2008: (a) volumes, prices, originating country and destination country as well as the intended use of metallic mercury entering the Community?

No. Member States	
Yes	1 (UK)
No	14 (AT, HR, DK, FI, DE, IE, LT, RO, ES, SE, PT, HU, BG, CZ)

Almost no respondents had received data submissions from relevant operators. The UK was the only country stating that it had received submissions of this kind. This comprised a submission from one company on the volumes and destinations of metallic mercury extracted from the cleaning of natural gas. This was transported for treatment in Switzerland and long-term storage and disposal in Germany.

Has your country received submissions of the following types of data from importers, exporters and operators of activities referred to in Article 2 of Reg. 1002/2008: (b) Volumes, originating country and destination country of metallic mercury considered as waste that is traded cross-border within the Community?

No. Member States	
Yes	1 (BG)
No	12 (AT, HR, DK, FI, DE, IE, RO, SE, PT, HU, CZ)
Not answered	2 (ES, LT)

Does your country find that there is a need for each of the following additions to EU legislation?

	No. Member States		
	Yes	No	Undecided
(a) extending the export ban to other mercury compounds, mixtures with a lower mercury content and products containing mercury, in particular thermometers, barometers and sphygmomanometers	6 (AT, DK, DE, LT, SE, HU)	5 (HR, FI, RO, ES, BG)	2 (IE, UK)
(b) an import ban of metallic mercury, mercury compounds and products containing mercury	5 (AT, DK, SE, HU, BG)	5 (HR, DE, FI, RO, ES)	3 (LT, IE, UK)
(c) extending the storage obligation to metallic mercury from other sources	4 (DK, LT, SE, HU)	5 (HR, FI, RO, ES, BG)	2 (IE, UK)
(d) time limits concerning temporary storage of metallic mercury	2 (DK, SE)	7 (HR, DE, FI, LT, RO, HU, BG)	2 (IE, UK)

Almost none of the respondents received data submissions from relevant operators. Bulgaria was the only country stating it had received submissions of this kind. This pertained to waste from mercury containing lamps.

Support for additional legislation varied across the Member States. For most of the proposed additions, support was on the whole evenly split between countries, with the exception of time limits on temporary storage which was opposed by the majority of Member States. Where specified, objection was raised on the basis that there were insufficient assessments undertaken as yet to provide a clear case for stricter regulation, rather than any fundamental opposition (LT). Bulgaria suggested that storage regulations should only be extended on the basis of a comprehensive impact assessment so as not to jeopardise the competitiveness of EU industry. Both Germany and Sweden concurred in principle on the need to set

clear limits on temporary storage. Sweden was open as to the precise length of the limitations. Germany highlighted specific need for additional assessments on the long-term behaviour of metallic mercury in underground storage to determine sound, knowledge-based requirements for permanent storage, though felt that present regulations were appropriate in the context of temporary storage (up to 5 years) and represented the best available techniques. In the remainder of cases, countries responding did not state the reasons for their position.

Concerning the extension of export bans to products and compounds with lower mercury content, countries in favour, had either already put in place further restrictions, or were broadly supportive of stricter regulations given the environmental risks involved (SE, DK). Specific concern was raised around the shipment of mercury wastes from scientific instruments to developing countries where it is an important source for small-scale and artisanal gold mining (DE). Lack of data and research, also in some cases made it difficult for countries to form clear positions. Where objection to import bans were raised, it was on the basis of specific exemptions such as for the import for safe underground storage and disposal which was only available in some member states (DE).

5.4. Article 8(2)

Does your country have new research (since 2008) regarding the safe disposal of mercury waste?

No. Member States	
Yes	2 (ES, DE)
No	11 (AT, HR, DK, FI, IE, LT, UK, BG, HU, CZ, RO)
Not answered	2 (SE, PT)

Two countries – Germany and Spain – mentioned new research they had undertaken regarding the safe disposal of mercury waste. A Germany study (the results of which have been informed to the EC), examined the risks of permanent disposal of metallic mercury and mercury sulphide in underground landfills in salt rock, drawing up a basis for establishing criteria and requirements to determine the feasibility of these options. Spain highlighted two studies looking at stabilisation and solidification processes/technologies to treat mercury-contaminated soil and waste with sulphur micro-cements.