STUDY ON EU IMPLEMENTATION OF THE MINAMATA CONVENTION ON MERCURY

Prepared for:

EUROPEAN COMMISSION – DG ENVIRONMENT

7 July 2014

INTRODUCTION AND KEY FINDINGS

JAKOB MAAG, COWI – JAM@COWI.DK

ICF INTERNATIONAL bipro GARRIGUES COWI

Study elements

- Gap analysis of EU law on mercury vis-á-vis the Minamata Convention
- Proposals for options for covering gaps
- Comparative screening of options
- Impact assessment of selected options

Gap analysis

- **Comprehensive mapping of existing EU legislation with relevance for the mercury life cycle**
- **Article by article description and analysis of Convention provisions**
- **Coverage of each substantive article by existing and proposed EU legislation**

Gap analysis – key findings

- Convention provisions mirror to a high degree the existing EU legislation
- Most provisions are already met or could be met by making minor adjustments to EU law
- In a few instances, current EU legislation clearly does not meet the Convention provisions
- A number of instances with unresolved questions regarding the degree of coverage

Preliminary comparative screening of options

- **60 options were proposed**
- **All options were given scores based on expert assessment (only)**
  - Stakeholder input on the comparative assessment is welcome
- **Parameters assessed:**
- **Socio-economic costs/impacts; investments in BAT, substitution costs, etc.**
  - (minimal / moderate / potentially significant)
- **Administrative/political efforts by EU and MS authorities**
  - (minimal / moderate /potentially significant)
- **Environmental benefits (including health)**
  - (minimal / moderate / potentially significant)
- **Signal effect towards other Parties of the MC**
  - (neutral / high-ambition / low-ambition)

8 issues with potentially significant socio-economic impacts

- **Article 3(8) on mercury import**
  - Beyond MC (BMC) option only
- **Article 4(3) on dental amalgam**
  - Beyond MC (BMC) option only
- **Article 4(6) + 5(7) on obligation to "discourage" new mercury products and processes**
- **Article 5(3) + 5(6) on restricting mercury use in production processes (sodium/potassium -methylate/ethylate, etc.)**

8 issues with potentially significant socio-economic impacts

- **Article 8(3+4/5) on (air) emission controls for new and existing sources**
- **Article 9(4+5): Releases to water and land**
  - Beyond MC (BMC) option only
- **Article 11(3) on mercury waste**
  - Beyond MC (BMC) option only

Impact assessment of selected options

- **<u>Scenarios assessed:</u>**
- **Business as usual (BAU; baseline 1)**
- **Minimal implementation of the Convention (MI; baseline 2)**
- **Beyond (minimal implementation) of the Minamata Convention (BMC)**

Impact assessment of selected options

- **Parameters:**
  - Economic impacts
  - Social impacts
  - Environmental impacts
  - Administrative impacts (for authorities)
- **Environmental effect in terms of reduced mercury input and/or releases**
- **Within time and budget limits**

Options assessed in detail

- Article 3(8) on mercury import
- Article 4(1) on product export, etc.
- Article 4(3) on dental amalgam
- Article 4(6) + 5(7): "Discourage" new mercury products and processes
- Article 5(3) + 5(6) on sodium/potassium - methylate/ethylate (alcoholates)
- Article 8(3+4/5) on (air) emission controls for new and existing sources
- Article 11(3) on mercury waste

Results – minimal implementation scenario (MI)

- **Economic impacts:**
  - Potentially significant: Alcoholates production in chemicals sector
  - Otherwise minimal to moderate impacts
  - Quantified costs of MI scenario: 2 to 70 million EUR/year (revised)
  - Additional costs (not quantified) are expected
- **Social and administrative impacts:**
  - Minimal negative impacts
- **Environmental impacts (including health):**
  - If Convention implementation is successful globally: Significant mercury release reductions, with benefits globally and on EU territory
  - Emission and release sources inside EU: Incremental mercury release reductions are expected to be moderate under minimal implementation scenario

Beyond (minimal implementation) of the MC (BMC scenario)

- **Restricting mercury supply via ban on import**
  - Cost 0-14 million EUR for increased mercury prices or substitution for industry
  - Plus some minor distributional effects
- **A conditional ban on new commercial mercury uses; primarily a signalling effect**
  - Incremental impacts unlikely; not quantifiable
  - Moderate costs for proving significant benefits for health and environment of new mercury use (if any)

BMC scenario, continued

- **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 mercury per year will be eliminated from circulation in the EU
- **A ban of dental amalgam with technically justified specific exemptions**
  - Costs for substitution 300-15,000 million EUR/y
  - 90-110 tonnes mercury per year will be eliminated from circulation in the EU
  - Associated release reductions significant but not yet quantified
- **Requiring final disposal for all remaining mercury waste sources and thus introduce a general ban on mercury recycling**
  - 2-10 million EUR/y disposal costs
  - Possible loss of revenue for recyclers up to 7.8 million EUR/y
  - Elimination of releases from the life cycle of 100-200 tonnes Hg/y

Conclusions

- **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.**
- **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.**

Article 3(8) MC on restricting imports of mercury

Mercury supply (Draft Final Report section 4.3)

Alexander Potrykus, BiPRO GmbH

Minamata Convention provisions

- ***Article 3(8) on import restrictions***

  "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.

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

EU legislation coverage (legal baseline) and options

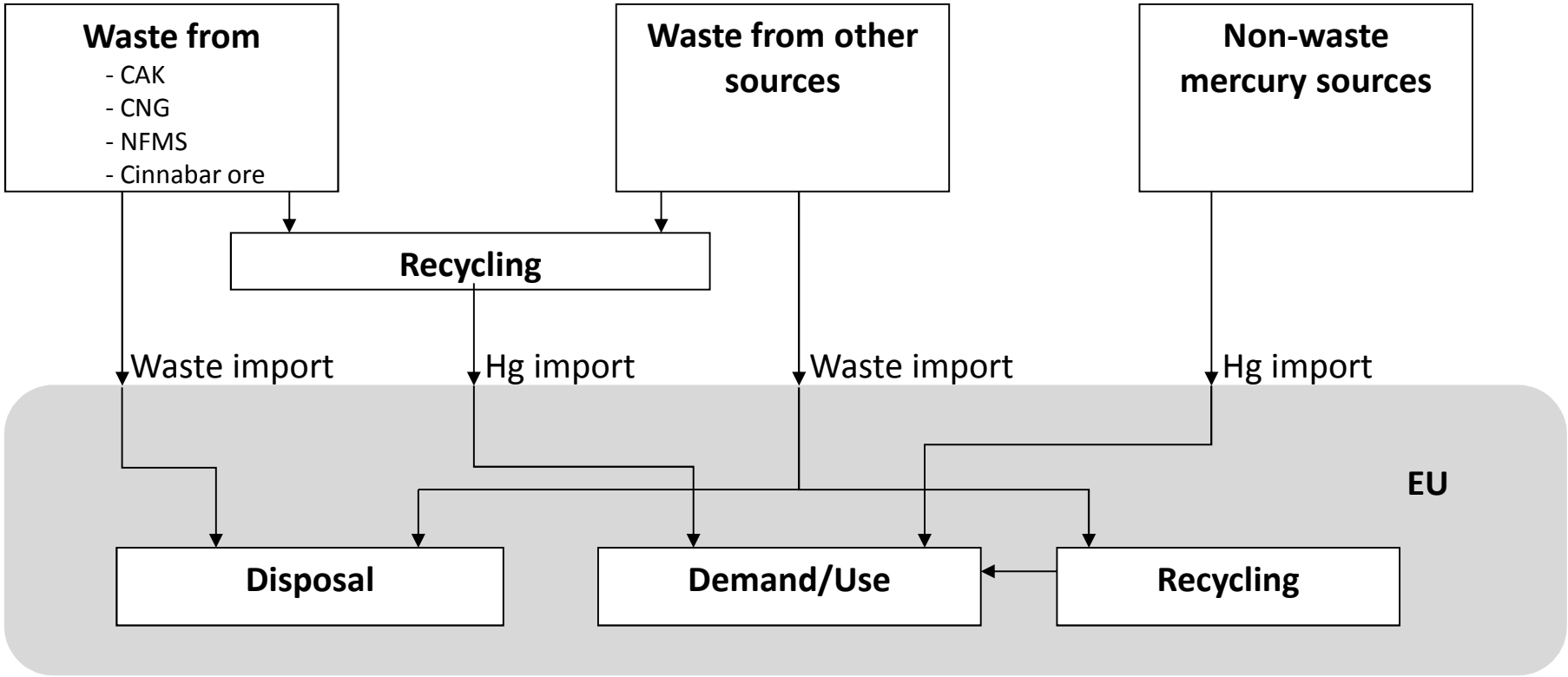
- **Coverage:**
  There is no current EU legislation codifying a ban or imposing conditions or restrictions on import of mercury.

- **Option MC3(8)-1 (MI scenario)**
  Apply a conditional import restriction relating to Non-Parties. Procedure for checking imports from Non-Parties to the MC.

- **Option MC3(8)-2 (BMC scenario)**
  Apply a general import ban on imports from all countries outside the EU

Baseline conditions – Mercury supply, demand and trade (1)

Possible import flows of mercury and mercury waste and their possible fate



To be disposed of according to Regulation (EC) No 1102/2008 : Waste from
CAK = chlor-alkali industry; CNG = cleaning of natural gas; NFMS = non-ferrous mining and smelting operations; Cinnabar ore

Article 11(3) MC: Transport across borders only for environmentally sound disposal (including recycling according to draft Basel TG)

Baseline conditions – Mercury supply, demand and trade (2)

SUPPLY: EU internal consumption is supplied from the following sources

- **recycling 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 mercury reported by statistics (~ 100 t/y)**

→Total current annual supply around 250-300 tonnes/year

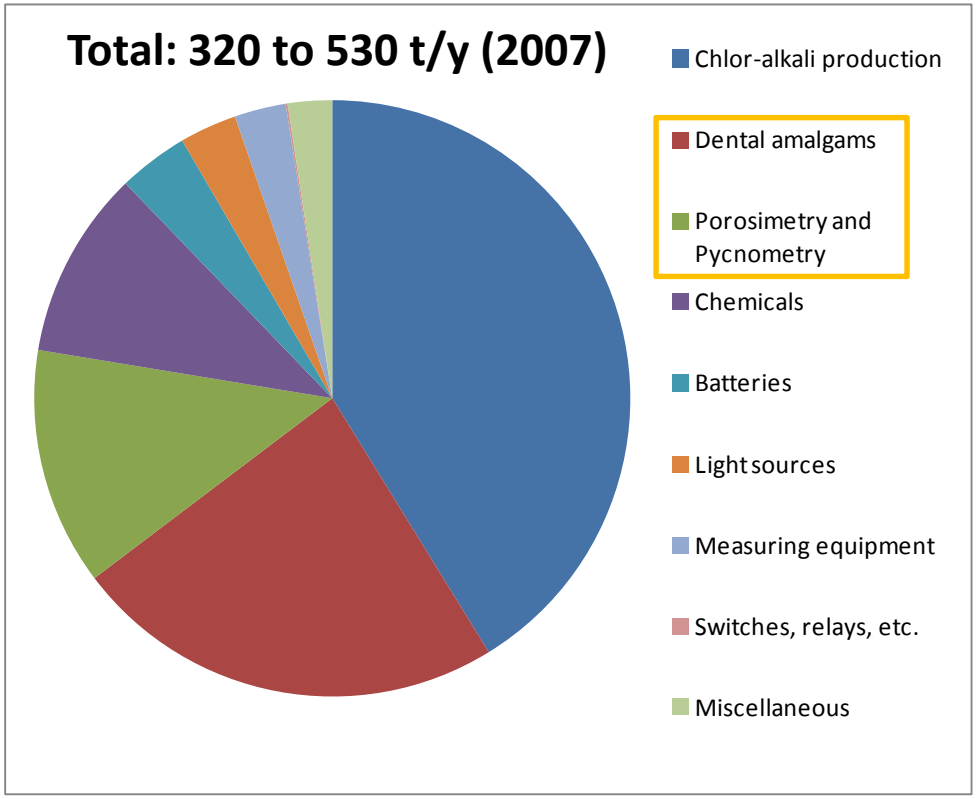
(rough estimate – is more specific information available?)

- **Both sources of supply are elastic under certain conditions**
  - **recycling at least in the short run**
  - **imports for a longer period (current supply ~3,300 t/y; global surplus 2010 to 2050; primary mercury mining for certain time; mercury by-products from outside the EU)**

Baseline conditions – Mercury supply, demand and trade (3)

EU mercury DEMAND

- Significant decline over past 2 to 3 decades
- Future decline expected but at slower pace
- Mercury consumption in 2007: 320 to 530 t/y
- No updated specific information for total mercury consumption



- Expert estimate current consumption: ~ in a range between 290 and 460 t/y (including 160 to 190 t/y consumption in the chlor-alkali production; after phase out dental amalgam and porosi/pycnometry will remain most important applications)
- Is more specific information available? See following slide

Baseline conditions – Mercury supply, demand and trade (4)

Intentional mercury use	Hg consumption in 2007*1; EU_{25}, t/y	Expert estimate of Hg consumption 2014-2015; legislation adjusted	Expert estimate of EU Hg demand by 2025-2030 (BAU)
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)
Barometers, hygrometers, manometers, thermometers, sphygmomanometers	7-17	"0" + exempted products	"0" + 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 unknown, likely minor	0-10
Alcoholates (sodium or potassium methylate or ethylate)	?	0.3-1	0.3-1
Polyurethane production using mercury catalysts	20-35	Likely below 20-35 (<10 t?)	0-10 (after 2017)
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 (revised estimate 0-10)	4-10 (revised estimate 0)
Porosimetry, pycnometry and hanging drop electrodes	10-100	10-100	10-100 (less?)
Other miscellaneous uses	1-14	1-14	1-14
Total (rounded and adjusted for double counting of intermediates)	320-530	~310-490 (revised estimate 290-460)	~40-280 (revised estimate 40-270)

Baseline conditions – Mercury supply, demand and trade (5)

- Since march 2011 Regulation (EC) No 1102/2008 export ban of metallic mercury and certain mercury compounds and mixtures originating from the EU.
- EU 27 external trade data for specific mercury products (custum code product groups) are available (EUROSTAT)
- Imports of specicific custom code product groups in 2013 sum up to approximately 100 t/y
- During the past decade imports and exports have generally decreased but remain sometimes at significant levels
- More specific information available?

Impacts of proposed options – some considerations

- Sources of supply (recycling and imports) are considered elastic so that they can adjust to the demand under certain conditions (outlined above)
- Prices for mercury around 2025-2030 are deemed realistic in a range between -50 to +100 percent of the 2012 level
- Alternatives are expected to be available for most uses if supply falls below the desired demand
- Conditional restriction (MI) requires procedure of written consent and certification
- Both options require certain efforts for enforcement
- It is proposed that imports for environmentally sound disposal of mercury should remain possible (assist other countries with environmentally sound disposal).

Impacts of proposed options (economic and social)

- **Economic impacts**
  - **Foregone revenues from imports (value of imports)**
    MI: ~0.39 million €/y; BMC: ~3.9 million €/y
  - **Costs to industry due to lower supply and changing prices**
    MI: no relevant impact expected
    BMC: possible cost impacts 0 to 14 million €/y depending on development of demand. If demand develops at a low level, cost savings for industry are possible.
- **Social impacts**
  - **Depend on economic impacts.**
    No relevant impact for MI scenario.
    0 to 100 Job losses possible for BMC scenario (indicative estimate)

Impacts of proposed options (administrative and environmental)

- **Administrative impacts**
  - ➢ **For both options control systems need to be implemented with similar effort**
  - ➢ **Extra costs for importers and competent authorities are considered low**
  - ➢ **MI option also requires procedure of written consent and certification → higher administrative effort for MI**

- **Environment and health impacts**
  - ➢ **EU level: Positive effect due to reduced supply and use of mercury (lower releases). Higher effect of BMC scenario.**
  - ➢ **Global level: two possible scenarios related to BMC**
    (1) positive impact: lower production and less releases at global level
    (2) negative impact: lower prices outside the EU and increased consumption e.g. in regions and sectors with low control (e.g. ASGM) and potentially increased releases (possibly more likely?)

Conclusion

- **Has to be drawn in the context of a possible restriction/prohibition of recycling; see options**
  MC11(3)-2: recycling only for uses allowed and
  MC11(3)-1: prohibition of recycling
- **Import prohibition: cut of supply by approximately 100 t/y**
- **Recycling prohibition: cut of supply by approximately 150 to 200 t/y**
- **Prohibiting both: complete cut of supply**
- **As a consequence either imports or recycling can be prohibited; if continued mercury use is desired, supply can be ensured from the corresponding remaining source.**
- **Conclusion?**

...follows below

MC Article 11(3): Mercury waste

Mercury waste: Recycling (Draft Final Report section 4.11)

Alexander Potrykus, BiPRO GmbH

Minamata Convention provisions

- ***Article 11(3) on mercury waste***

  "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."*

EU legislation coverage (legal baseline)

- **Specific 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 be "disposed of" in accordance with the Waste Framework Directive → no re-use and no recovery is admissible, but only disposal.

- **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.**

Options selected for assessment

- **Option MC11(3)-2 addressing MC11(3b) (MI scenario)**

  Ensuring that reclaimed/recycled mercury is only used for allowed uses under the MC, or for environmentally sound disposal as defined under the MC.

- **Option MC3(11)-1 addressing MC11(3b) (BMC scenario)**

  Ensuring that other waste types, not currently covered by Reg. 1102/2008 are covered by EU Law, meaning that recycling/recovery would be fully prohibited within the EU.

Baseline conditions – Mercury waste (1)

- Generation of mercury waste and thus supply of mercury from waste is directly related to its use in products and processes (as discussed above in the slides on mercury supply)
- Latest available estimate on supply is 250 to 300 t/y
  - EU supply from imports ~ 100 t/y (possible import ban to be considered)
  - EU supply from internal recycling ~100 t/y
  - EU supply from recycling of waste from outside the EU 50 to 100 t/y
  - Both sources (import and recycling) are elastic under specific conditions
- Supply expected to be reduced according to decreasing demand (see above)
- Global level: Mercury surplus 700 to 1,150 t/y (from 2010 to 2050)

Baseline conditions – Mercury waste (2)

Two categories of mercury waste origin:

- **Category 1: listed in Article 2, Reg. 1102/2008 (to be disposed of since 2011; not available for recycling; not an effect of MC implementation)**

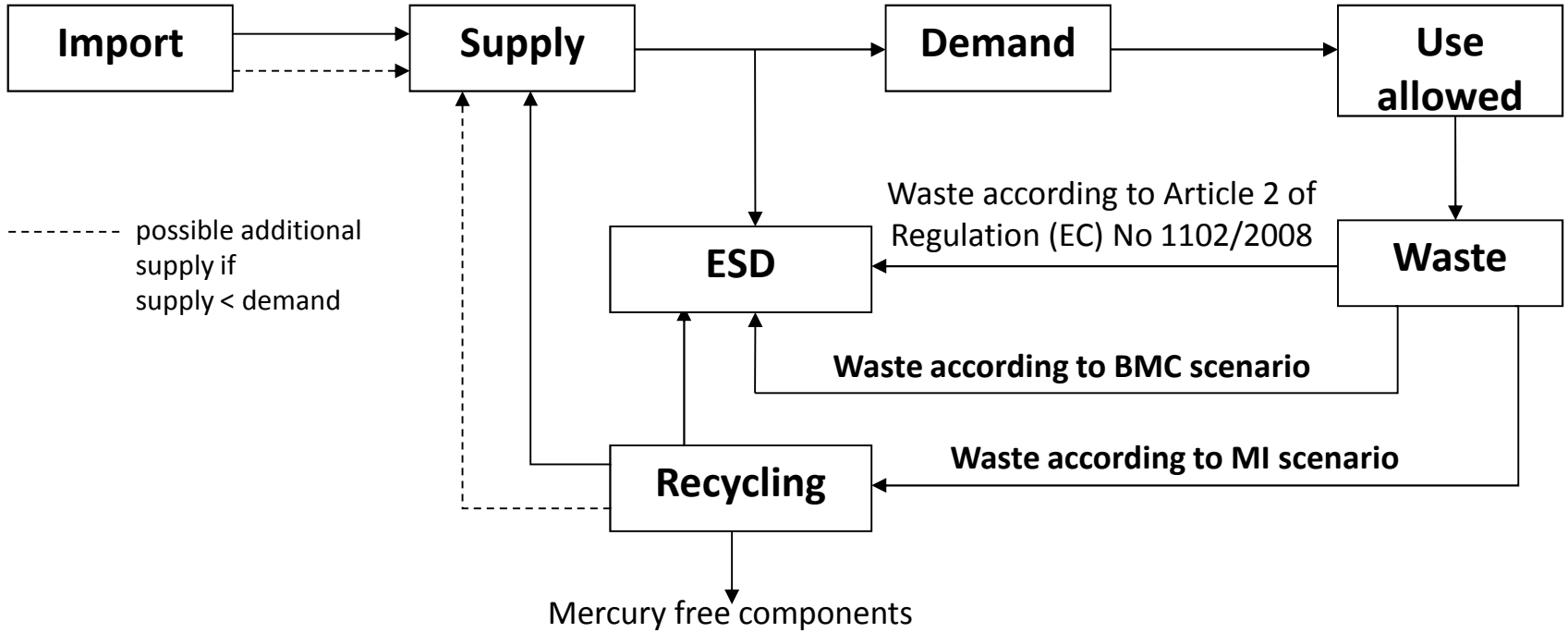
- **Category 2: other wastes generated from applications in products and processes (available for recycling for uses allowed under MI, but not under BMC scenario) such as waste from**
  - **dental application**
  - **miscellaneous uses**
  - **light sources**
  - **Batteries**
  - **measuring equipment**
  - **switches and relays**
  - **mercury chemicals**

Quantity of mercury in different waste types listed under category 2 in the EU 2007

Origin of waste	Total (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.

Baseline conditions – Mercury waste (3)

- **Flows of waste related mercury, and metal mercury, for the EU concerning the BMC and the MI Scenario (ESD = Environmentally Sound Disposal):**



MI: recycling only for uses allowed or ESD → supply from recycling and imports

BMC: recycling prohibited → supply only from imports

Imports banned and BMC: recycling and imports prohibited → no relevant supply

Baseline conditions – Mercury waste (4)

- **Information on the (1) type and the (2) quantity and volume of waste disposed of is scarce**

- **Differentiation between waste with**

  - **"*low to moderate concentrations of mercury*"**
    - **disposal costs 80 to 250 €/t**
    - **may be significantly higher 100 to 2,700 €/t (gate fees Hg waste in DK)**
    - **no specific information on the quantity disposed of**

  - **"high *concentrations of mercury*"**
    - **disposal costs 900 to 4,700 €/t**
    - **rough estimate of the quantity of excess mercury from category 2 waste to be disposed is about 115 t/y (BMC scenario)**

- **Is specific information on quantities available?**

Impacts of proposed options (economic)

- **Economic impacts**
  - **Recyclers: lower sales of recycled mercury**
    - **MI: 0-4 million €/y or**
    - **BMC: 2 - 7.8 million €/y**
    - **Compensating growth in mercury imports would be expected to meet demand, leading to increased revenues at mercury importers.**
  - **Additional waste disposal costs for high concentration mercury:**
    - **MI: 0 to 235,000 €/y**
    - **BMC: 90,000 to 470,000 €/y**
  - **Additional waste disposal costs for low to moderate concentration mercury waste which otherwise would be recycled:**
    - **Difficult to assess (no specific info on quantities; wide range of disposal costs)**
    - **May be significant**
  - **Additional waste disposal costs will be costs for waste owners but revenues for waste treatment/disposal facilities**

Impacts of proposed options (social, administrative, environmental)

- **Social impacts**
  - **Decrease in recycling partly outweighed by increase in waste disposal business (less revenue from disposal vs recycling)**
    - **MI: no major changes in waste handling business expected**
    - **BMC: moderate loss of jobs possible**
- **Administrative impacts**
  - **Only in MI scenario at recyclers and authorities for documenting and controlling that mercury is only sold for uses allowed; expected to be minimal.**
- **Positive environment and health impacts**
  - **short term: reduced releases from mercury recycling activities**
  - **long term: reduced mercury circulation in society (final disposal; stimulation of substitution of mercury e.g. in dental use or porosi-/pycnometry; making less mercury available on the global market)**
  - **Impacts more significant for BMC option**
  - **Impacts depend on global supply situation**

Impacts of proposed options (interaction recycling/imports)

- **Impacts influenced by decision on mercury imports**
  - **A general import ban AND prohibition of recycling (BMC scenario) will have the consequence that there will be no remaining source to satisfy EU mercury demand**
- **Conclusion, in order to enable necessary supply: either**
  - **(A) General import ban (see Option MC3(8)-2) AND recycling restriction according to MI scenario (only for uses allowed or environmentally sound disposal), or**
  - **(B) Conditional import restriction (see Option MC3(8)-1) AND recycling prohibition according to BMC scenario (prohibition of recycling)**

Conclusion

- A total recycling ban could have higher beneficial environmental impacts than a total import ban:
  - Severe mercury recycling restriction in the EU → disposal of a higher quantity of mercury → reduction of accumulated mercury stocks and added benefits (due to potentially higher mercury prices) of
    - (1) stimulating substitution in dental amalgam use (a major EU use) and
    - (2) stimulating alternatives in porosimetry and pycnometry (another major EU use), while
    - (3) drawing mercury from the global mercury market and reducing mercury demand and associated releases outside the EU
  - Potentially larger dependence on external sources of mercury to be taken into account
- A total import ban could have negative environmental impacts at global level (as mentioned above):
  - lower prices outside the EU and increased consumption e.g. in regions and sectors with low control (e.g. ASGM) and potentially increased releases

Final disposal of metal mercury

Mercury wastes (Draft Final Report section 4.13)

Alexander Potrykus, BiPRO GmbH

Final disposal of metal mercury – Background (1)

- **Basic question: Can metal mercury be finally disposed of as elemental liquid mercury or should it be stabilised prior to disposal?**
- **BiPRO 2010: Economic and environmental assessment of disposal options of metallic mercury; three recommendable options:**
  1. **Permanent disposal of liquid mercury in salt mines**
  2. **Stabilisation + permanent disposal of stabilised mercury in salt mines**
  3. **Stabilisation + permanent disposal of stabilised mercury in hard rock formations**
  4. **Above ground storage not recommended**
  5. **Acceptance criteria and facility related requirements***
- **However, uncertainties concerning disposal of liquid mercury in salt mines:**
  - **What happens in case of severe incidents like flooding of the storage site?**
  - **What about long term safety?**

*** Decision basis for Directive 2011/97/EU amending Directive 1999/31/EC as regards specific criteria for the storage of metallic mercury considered as waste**

Final disposal of metal mercury – Background (2)

- **Hagemann et al. 2014: Study investigating the risks for operational and long-term safety of underground storages of metallic mercury in salt formations and their potential mobilisation by saline solutions**
  - **"Neither elemental mercury nor mercury sulphide exhibit properties that threaten the long-term safety of an underground landfill"**
  - **"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."**
  - **Above ground storage will lead to mercury releases in the long term**
  - **Specific requirements for the permanent storage are proposed to reduce risks**
- **Consequence: uncertainties clarified, results confirmed:**
  - **Long term safety for storage in salt rock is given**
  - **Incidents like flooding do not affect the option to store liquid mercury in salt rock**
  - **Above ground storage is not an appropriate option**
  - **Specific requirements to be considered**

Final disposal of metal mercury – Conclusion

- **Answer to basic question:**

  - **Stabilisation not required for disposal of liquid mercury in salt mines**

  - **Stabilisation required for disposal in hard rock formations should be mandatory**

- **Result from the environmental and economic assessment in the light of the new information; The proposed options**

  1. **Permanent disposal of liquid mercury in salt mines,**
  2. **Stabilisation + permanent disposal of stabilised mercury in salt mines and**
  3. **Stabilisation + permanent disposal of stabilised mercury in hard rock formations**

  are all environmentally sound final disposal options.

  Option 1. is considered economically most advantageous.

ARTICLE 5(3) + 5(6) ON RESTRICTING MERCURY USE IN PRODUCTION PROCESSES

Sodium/potassium – methylate/ethylate (alcoholates) production with mercury

JAKOB MAAG, COWI – JAM@COWI.DK

ICF INTERNATIONAL bipro GARRIGUES COWI

Minamata Convention provisions

- **Article 5(3) MC:**
  - *"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."*
  - VCM, polyurethanes, alcoholates
- **Part II, Annex B (alcoholates):*"Measures to be taken by the Parties shall include but not be limited to*:***
  - *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. 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."*

Minamata Convention provisions

- **Possibility for exemptions for extra 5 years (and with COP's approval yet another 5 years; Article 6 MC)**

EU legislation coverage and options

- **General, but not specific coverage under the IE Directive**
  - LVOC BREF (large volume organic chemicals)
  - OFC BREF (organic fine chemicals)

- **Proposed options:**
  - Baseline 2: Minimum implementation (MI): 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" ("- *as fast as possible and within 10 years of the entry into force of the Convention*"). 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 (BMC) : Implement restrictions stipulated by MC Article 5(3) via new regulation, including a ban of alcoholates production using mercury cells within 10 years.

Baseline situation

- **Four specific alcoholates are targeted:**
  - Sodium methylate: REACH registered in 100,000 – 1,000,000 t/y volume band
    - Catalyst, primarily for biofuel production
  - Sodium ethylate: REACH registered in 1,000 – 10,000 t/y volume band
    - Catalyst for various organic synthesis
  - Potassium methylate: REACH registered in 1,000 – 10,000 t/y volume band
    - Catalyst, primarily for biofuel production
  - Potassium ethylate: Not REACH registered, meaning consumption <100 t/y (is pre-registered)
    - Catalyst for organic synthesis
- **New: Sodium dithionite (a sodium salt of hydrosulfite) is also currently produced with the mercury process**
  - Alternative production processes are available, but with slightly lower product quality
    - Produced in excess of 10,000 t/y with mercury process

Sodium methylate

- **Current EU production: 250,000 - 300,000 t/y (of 30% sodium methylate solution in methanol)**
- **Market value about 180 – 260 million EUR/y**
- **EU consumption: 160,000 - 200,000 t/y solution**
- **The rest is exported (mercury based)**
- **EU companies are world market leaders**
- **About 10% of EU production is based on an alternative (non-mercury) process**
- **All production outside the EU is based on non-mercury technology**
- **Several alternatives are available, but production ~20% more expensive**
  - Partly offset by small units closer to users = reduction of transport costs

Other targeted alcoholates

- **Sodium ethylate: Alternative process available and used outside EU**
- **Potassium methylate: Alternative process available and used by biofuel producers**
- **Potassium ethylate: Alternative production process exists on lab scale, but is not deemed technically and economically feasible for full scale production (by mercury-using producers)**

Impacts assessment

- **Economic impacts: Very rough estimates extrapolated from data for sodium methylate substitution:**
- **BMC scenario:**
  - Investments: 60-160 million EUR
  - Annual operational costs: 10-40 million EUR
  - = total annualised costs of approx. 20 to 65 million EUR/year
- **MI scenario: Total annualised costs of 2 to 65 million EUR/year**
  - Minimum: Only research costs; maximum: full substitution
- **BMC + MI: Costs for emission reductions are difficult to assess quantitatively**
  - Partly side-effect of Hg-cell chlor-alkali cessation on same cite, partly additional Hg management practices

Impacts assessment

- **Social impacts: Uncertain, but based new data, likely minimal**
- **Environment and health effect indicators:**
  - Atmospheric emission reduction: 0.1 – 0.2 t mercury/year
  - Mercury input:
  - BMC scenario: Unknown, but likely 0.3 – 1 t mercury/year
  - MI scenario: Likely 0 – 1 t mercury/year
- **Administrative efforts (authorities): Minimal incremental impacts**

Data gaps

- Information on available alternatives to potassium ethylate (in the processes where this substance is used)
- Information on impacts on downstream users in case the production of potassium ethylate should be terminated.
- Data on costs for reduction of emissions and releases from the mercury process
- New: Information on availability of alternative production processes for sodium dithionite
- Any of these data available from stakeholders?

ARTICLE 8(3+4) + 8(3+5) ON AIR EMISSIONS FROM TARGETED SOURCE CATEGORIES

JAKOB MAAG, COWI – JAM@COWI.DK

ICF INTERNATIONAL bipro GARRIGUES COWI

Minamata Convention provisions

- **Source categories targeted (Article 8(1) MC + Annex D):**
  - Coal-fired power plants;
  - Coal-fired industrial boilers;
  - Smelting and roasting processes used in the production of lead, zinc, copper and industrial gold;
  - Waste incineration facilities;
  - Cement clinker production facilities

- **Article 8(2) MC: "Relevant sources":**
  - *"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"*

Minamata Convention provisions

- **Article 8(3) MC:**
  - *"A Party with relevant sources shall take measures to control emissions and may prepare a national plan….."*
- **Article 8(4) MC states for <u>new</u> sources:**
  - *"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."*
  - General MC BAT definition is close to EU BAT definition, but not yet further specified (guidance to be developed under COP)

Minamata Convention provisions

- **Article 8(5) MC stipulates for existing sources:**
  - *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.*

Minamata Convention provisions

- **Interpretation issues:**
  - The basis for "75%" (Article 8(2) MC) is not defined; will be defined later by the COP.
  - "Coal-fired industrial boilers" are not defined further:
    - any minimum size size considered relevant?
    - are e.g. district heating plants "industrial"?
  - " Waste incineration facilities" (do they also cover co-incineration?)
  - *".....taking into account its national circumstances, and the economic and technical feasibility and affordability of the measures,…*" leaves some flexibility for implementation
    - though it may have primary focus on developing countries

EU legislation coverage

- **The following source categories are expected to already be covered by the IE Directive, as it is assumed that no significant emissions would originate from facilities below the thresholds set in the IED activity descriptions:**
  - Coal-fired power plants
  - Non-ferrous metal smelting and roasting
  - Waste incineration
  - Cement clinker production facilities

EU legislation coverage

- **For the mentioned source categories the IE Directive delivers:**
  - *BAT*; general as well as specifics considered relevant
  - A *multi-pollutant control strategy* (in many cases)
  - and/or *quantified goals* or *emission limit values* for mercury

EU legislation coverage and options

- **<u>Coal fired industrial boilers:</u>**
- **Part of the coal fired industrial boilers are covered by the IE Directive:**
  - Those >50 MW
  - Combustion plants that are part of other IE Dir. installations
- **MCP Directive as proposed will supply "*A multi-pollutant control strategy* " for <50MW plants**
  - If MCPs below 50MW will be targeted (to be specified under COP)
    - perhaps unlikely

Baseline situation

- **MCP Directive as proposed sets limit values for PM (and SO_2)**
  - For coal fired MCP's PM limits can only be met with ESP/FF PM filters
  - ESPs ass well as FF are multi-pollutant controls providing some mercury retention
  - An estimated 40% of MCP's (of all sizes) are considered covered by the IE Directive already
  - 15 Member States have some kind of regulation for MCPs already
    - Possibly with PM/multi-pollutant requirements (not investigated in detail)

Impacts assessment

- Existing sources: No incremental impacts from the Minamata Convention, as the MCP Directive will provide a multi-pollutant strategy
- New sources: There will only be Minamata Convention-related impacts if MC BAT goes beyond MCP Directive proposal (not expected)
- New: As the MCP Directive is expected to cover MC requirements, no BMC scenario is assessed

Data gaps

- **Data on how much, relatively, of the mercury emissions (or as a proxy, production volume) are currently covered by the IE Directive for each of the following source categories :**
  - coal-fired power plants
  - 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.**
- **Any of these data available from stakeholders?**

New products and processes

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

Alexander Potrykus, BiPRO GmbH

Minamata Convention provisions – Article 4(6)

- **Article 4(6) on the discouragement of the manufacture and the distribution in commerce of new mercury-added PRODUCTS**

  *"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."*

- **Firm law obligation**

- **The term "discourage" intends to make clear that this is a "best endeavour" provision**

Minamata Convention provisions – Article 5(7)

- **Article 5(7) on the discouragement of the development of new facilities using other mercury-based manufacturing PROCESS**

  *"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.***"*

- **Firm law obligation**

- **The term "discourage" intends to make clear that this is a "best endeavour" provision**

EU legislation coverage (legal baseline)

- **Article 4(6) MC related to products:**
  - ➢ **No specific EU obligation to discourage new products containing mercury.**
- **Article 5(7) MC related to processes:**
  - ➢ **No specific EU legislation to discourage new products**

Options selected for assessment

- **Options MC4(6)-2 and MC5(7)-3 (MI scenario or "soft" discouragement)**

  A general soft discouragement could be expressed as a statement towards the institutions and agencies at EU level and/or towards the Member States

- **Options MC4(6)-1 and MC5(7)-1 (BMC scenario or "firm" discouragement)**

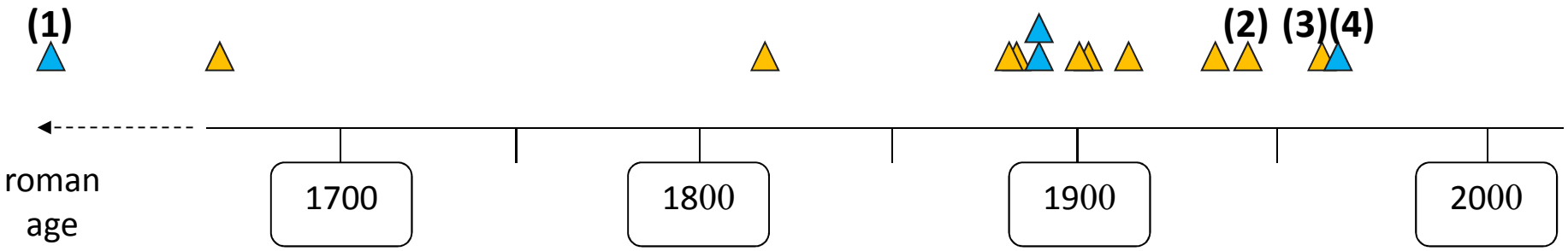
  A specific firm discouragement could be implemented in EU legislation

Baseline conditions – new products and processes (1)

- General challenge: we are dealing with products and processes which do not exist yet
- Previous studies assessed more than 60 mercury applications
- To avoid adverse environmental and health effects, many of the historic applications have been phased out and were substituted; appropriate non-mercury technologies exist for most uses
- However, major applications still remain (e.g. dental amalgam; pycno- and porosimetry)

Baseline conditions – new products and processes (2)

- **A look into history – basic inventions which enabled the commercial manufacturing and distribution of mercury-added products or manufacturing processes:**



(1) First inventions millennia ago: amalgamation for gold extraction

(2) and (3) Mercury switches (1946) and relays (1962)

(4) Use as catalyst for PU production (1965)

Baseline conditions – new products and processes (3)

- 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
- Research and lab uses are not covered by MC
- There are no indications on the current development of relevant products/processes involving mercury.
- Mercury has primarily been used due to its mechanical and electrical characteristics, and many of such uses have now been substituted
- In the light of the already heavily restricted use of 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 low, and if so, probably there will be alternative non-mercury technologies available.

- Is there other specific information available?

Impacts of proposed options

- **Economic impacts**
  - **Specific impacts: additional costs to examine whether the MC conditions for acceptance of the product/process are fulfilled: additional costs for industry 100,000 to 450,000 EUR for authorisation costs and fees per product/process (examination of environmental or human health benefits (and whether alternatives exist for processes)).**
  - **Possible further impacts depend on individual new product/process**
  - **It is uncertain which economic impacts arise for unknown products/processes; positive and negative economic impacts may outweigh each other.**
- **Social impacts**
  - **Depend on economic impacts**
- **Environmental impacts**
  - **A conditional ban (BMC) on the marketing/use of new applications would be a clear signal to industry developers which could avoid most potential novel uses and related risks**

Conclusion

- **The discouragement of new mercury uses in new products or processes can eliminate potential risks through mercury's lifecycle.**
- **Specific social and economic impacts can not be quantified; they may outweigh each other**
- **The impact of a „firm" discouragement (BMC scenario) is considered more significant, with potentially stronger signal value.**

ARTICLE 4(1): PROHIBITION OF MANUFACTURE, IMPORT AND EXPORT OF TARGETED MERCURY-ADDED PRODUCTS

Export of products

JAKOB MAAG, COWI – JAM@COWI.DK

ICF INTERNATIONAL bipro GARRIGUES COWI

Minamata Convention provisions

- **Article 4(1) MC:**
  - "*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.*"

- **Products targeted (specified further in MC):**
  - Batteries, switches and relays, compact fluorescent lamps (CFLs)
  - Linear fluorescent lamps (LFLs) for general lighting purposes
  - High pressure mercury vapour lamps (HPMV) for general lighting purposes
  - Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays
  - Cosmetics, pesticides, biocides and topical antiseptics
  - Barometers, hygrometers, manometers, thermometers, sphygmomanometers

EU legislation coverage and options

- **Covered: "Placing on the market (sales and import)**
- **Not covered for most of the products: Manufacture and export**
- **Proposed options:**
  - Baseline 2: Minimum implementation (MI): Restrict the export of mercury-added products listed in Annex A, Part I MC ("MC standard")
  - Beyond MC (BMC) : Restrict the export of mercury-added products for which placing on the market within the EU is already restricted ("EU standard")
    - Restricting export from the EU would in effect restrict manufacture also

Baseline situation

- **Today, all the products targeted by the MC, except mercury-added soaps, may be manufactured and exported in the EU**
- **Product types for which, the "EU standard" goes beyond the "MC standard":**
  - 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%
  - Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤ 30 watts with a mercury content between 2.5 and 5 mg per lamp burner
  - Linear fluorescent lamps of certain types
  - High pressure mercury vapour lamps (HPMV) for general lighting purposes with a mercury content above 0.1 % w/w
- **No aggregated data are available on the current export of mercury-added products for which placing on the market is restricted in the EU**

Impacts assessment

- **No quantitative impacts due to lack of data**
- **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.**
- **Risk that any such 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.**

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
- Any of these data available from stakeholders?

ARTICLE 4(3): DENTAL AMALGAM

JAKOB MAAG, COWI – JAM@COWI.DK

ICF INTERNATIONAL bipro GARRIGUES COWI

Minamata Convention provisions

- **Article 4(3) MC with Annex A, Part II:**
  - ***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) Setting national objectives aiming at dental caries prevention and health promotion, thereby minimizing the need for dental restoration;*
  - *(ii) Setting national objectives aiming at minimizing its use;*
  - *(iii) Promoting the use of cost-effective and clinically effective mercury free alternatives for dental restoration;*
  - *(iv) Promoting research and development of quality mercury-free materials for dental restoration;*
  - *(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;*
  - *(vi) Discouraging insurance policies, and programmes that favour dental amalgam use over mercury free dental restoration;*
  - *(vii) Encouraging insurance policies and programmes that favour the use of quality alternatives to dental amalgam for dental restoration;*
  - *(viii) Restricting the use of dental amalgam to its encapsulated form;*
  - *(ix) Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.*

EU legislation coverage and options

- Measure (ix) "*Promoting the use of best environmental practices in dental facilities to reduce releases*" is indirectly covered by EU waste legislation (defined as hazardous waste to be collected and treated separately)
- Otherwise, there are no EU-wide measures on dental amalgam currently in place (dental amalgam is currently under review at EU level)
- Several of the measures are adopted in Member State legislation/initiatives

Proposed options

- **Baseline 2: Minimum implementation (MI):**
  - 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:
    - *"(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"* (addressed already by EU waste regulation require collection and separate treatment of mercury amalgam waste)
- **Beyond MC (BMC): Union-wide ban on dental amalgam with technically specified exemptions**

Baseline situation

- **Alternatives are well established**
  - Same or slightly higher price for simple fillings
  - Higher price for complex filings (especially labour costs)
  - Somewhat lower durability
  - One type may have almost same functionality ("compomer"; but tested for fewer years)
- **Some MS have adopted amalgam ban with good results**
  - Amalgam consumption reduced to few percent
  - Acceptable dental care level (to my knowledge)
- **Latest Hg consumption figures (2007): 90-110 t/year in the EU**
  - Largest use after chlor-alkali sector
- **No real quantification of releases available (to my knowledge)**
  - Releases may be substantial

Impacts assessment

- **Impacts were only summarised in this study (is assessed in other EC activities)**
- **Economic impacts:**
  - MI scenario: Marginal
  - BMC scenario: 0.3-15 billion EUR/y
- **Social impacts:**
  - MI: Marginal
  - BMC:
    - Job intensity would rather rise than fall
    - Increased prices could have negative impacts on dental care level for low-income citizens.
- **Environment and health impacts:**
  - MI: Marginal
  - BMC: Releases from life cycle of 90-110 tonnes mercury/year can be almost eliminated


THANK YOU FOR YOUR ATTENTION!

COWI

bipro

GARRIGUES