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**Conference of the Parties to the
Minamata Convention on Mercury
Third meeting**
Geneva, 25–29 November 2019
Item 5 (a) (ii) of the provisional agenda*

Matters for consideration or action by the Conference of the Parties: mercury-added products and manufacturing processes in which mercury or mercury compounds are used: proposal to amend Annex A

Proposal to amend Annex A to the Minamata Convention on Mercury

Note by the secretariat

1. On 8 May 2019, the Secretariat received a communication from a group of African countries submitting a proposal to amend Annex A to the Minamata Convention on Mercury. The proponents, namely Botswana, Chad, Gabon, Guinea Bissau, the Niger and Senegal, requested that the proposed amendment be considered by the Conference of the Parties at its third meeting.

2. Paragraph 2 of Article 26 of the Convention provides that the text of any proposed amendment shall be communicated to the parties by the Secretariat at least six months before the meeting at which it is proposed for adoption, and that the Secretariat shall also communicate the proposed amendment to the signatories to the Convention and, for information, to the depositary.

3. Accordingly, the Executive Secretary sent a letter to the parties and signatories to the Convention on 24 May 2019 communicating the text of the proposed amendment to Annex A to the Convention. The communication included an annex with additional explanatory information as submitted by the proponents. The letter was also sent, for information purposes, to the depositary.

4. The proposed amendment and relevant additional explanatory information are reproduced in the annex to the present note, without formal editing.

Suggested action by the Conference of the Parties

5. The Conference of the Parties may wish to consider the proposed amendment.

* UNEP/MC/COP.3/1.

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Annex

Proposal by Botswana, Chad, Gabon, Guinea Bissau, the Niger and Senegal to amend Annex A of the Minamata Convention on Mercury

ANNEX A

Proposal to Move Dental Amalgam out of Part II and place it in Part I. The proposal therefore repeals Part II of Annex A by bringing amalgam into being a Part I product.

The language of the proposal is the following:

Part I: Products subject to Article 4, paragraph 1and paragraph 3

Mercury-added products	Date after which the manufacture, import or export of the product shall not be allowed (phase-out date)
Dental amalgam for use in deciduous teeth, children under 15 years, pregnant women, and breastfeeding women.	2021
Dental amalgam, except where no mercury-free alternatives are available.	2024

Additional/Explanatory information

Mercury-Free Dentistry Is an Idea Whose Time Has Come

With the amalgam phasedown period, 2013-2019, being such a worldwide success, it is time to put this mercury product on a par with the others, and set a phase-out date. Twenty-first century dentistry is mercury-free dentistry! A phase-out is feasible because – in both developing and developed nations – success stories abound of ending amalgam for children, in government programs, in the military, in hospital systems, in public programs, etc. Civil society, as evidenced by the Declarations of Abuja, Dhaka, Berlin, Chicago, and Montevideo, and by intense engagement of dental associations across Africa and Asia, is all in for phasing out amalgam.

But *phasedown* continues to be a halfway solution, meaning it is not a long-run solution. Continuing amalgam in some nations means amalgam sales would avoid customs bureaus in many nation; it would mean rogue sales of dental mercury to the gold fields; it would allow the ignominy that occurred in lead paint where the West ended lead paint sales but shipped it for an entire generation to Africa, Asia, and Latin America. The solution to amalgam, as with all other major mercury products, is a phase out date. Success stories make clear that the best route is in two stages, ending amalgam for children soon, then adopt the full phase-out at a most distant date.

Parties and other countries have focused intensely on amalgam reduction

In the Minamata Initial Assessments, many Parties have put great emphasis on amalgam. Nigeria, Africa's largest economy, rates addressing amalgam use as its 2d highest priority among all Minamata implementation activities.

Parties and other countries are showing the way to zeroing out amalgam use in government programs, in hospitals, in military services, and in private dentistry, and even adopting plans for its phase out date. Many factors have combined to bring about these amalgam reductions: major technology improvements in alternatives which make equal or superior technically to amalgam; a quantum leap in the number of mercury-free dentists, updating dental school programs, and major gains in consumer awareness that has resulted in consumer rejection of mercury in the mouth.

Regional conferences jointly sponsored by UN Environment and the World Alliance for Mercury-Free Dentistry were held in 2015 in Abidjan for Francophone Africa, then in 2016 in Bangkok for South, Southeast, and East Asia. National stakeholder conferences, with full participation of dental associations, have been held in every region, and here is a partial list: in Latin America (Paraguay, Peru), in West Africa (Benin, Cote d'Ivoire, Ghana, Nigeria, Senegal, Togo), in Central Africa (Cameroun, Congo-Brazzaville), in East Africa (Tanzania, Burundi, Kenya), in Arab States (Lebanon, Tunisia), in South Asia (Bangladesh, India, Nepal, Pakistan), in East Asia (China), in Southeast Asia (Indonesia, Vietnam), in Island States (Madagascar, Mauritius).

Civil society has jumped in with both feet. African civil society wrote the Abuja Declaration for Mercury-Free Dentistry for Africa in 2014, with 40 CSOs quickly signing on. It was followed by the Dhaka Declaration for Mercury-Free Dentistry for Asia (2015); then came three more declarations for mercury-free dentistry: the Declaration of Berlin for the European Union (2017), the Declaration of Chicago for the United States (2018), and the Declaration of Montevideo for Latin America (2018). A close working relationship between NGOs, dental societies, and dental schools has developed throughout the developing world. In Nigeria the path is being blazed by the two flagship dental school, LUTH and LASUTH.

Success stories abound about the transition to mercury-free dentistry

Amalgam phase-out is feasible in any nation, in both private dentistry and public dentistry. Indonesia stopped paying for amalgam in its public health program in 2014, switching entirely to composite and glass ionomers. Vietnam ended amalgam for children in April 2019, and is writing its road map for ending amalgam for all as of 1/1/2021. Bangladesh and India both ended amalgam use in their Armed Forces, and Benin in its military hospital. The Cameroun Baptist Convention ended amalgam for its entire hospital and clinic network – back in 2007! Several Pakistani hospitals ended amalgam use after research showed the harm to dental workers of the vapors. Nepal's dental association announced this year that amalgam use would end for children, then for all. Bangladesh's dental society and the NGO Environment and Social Develop Organisation signed a Memorandum of Understanding that ended amalgam for children in 2018, then phasing it out for all on a strict timetable.

The European Union, the world's third most populous jurisdiction, is at midpoint of a three-year timetable: In 2018, amalgam ended for children under 15 and for pregnant and breastfeeding women;

in 201ç, each Member State submits its plan for further amalgam use reduction; and in 2020 the European Commission will recommend up or down whether to phase out amalgam.

The determinant for who does the transition to mercury-free dentistry is not economics, it is national willpower.

Amalgam phase out is necessary to protect the public health

First, mercury ostensibly shipped for amalgam is being unscrupulously diverted to the gold fields for use in small-scale mining. Such action is illegal, harmful to these communities, and is against the spirit of Minamata. Second, as with all products containing mercury, each country has limits on what it can accomplish alone, due to the bypassing of import controls. Third, amalgam cannot be addressed as a waste issue, because the mercury is implanted in human beings and cannot be retrieved, and because the expenses of waste facilities massively outweighs the cost of shifting to mercury-free dentistry.

Africa Region and its 54 countries are proud that it led the way to addressing amalgam use reduction in the Convention, proposing the blueprint for action. Large numbers of African nations have succeeded by leapfrogging in technology, and are convinced that the solution to amalgam is to *leapfrog to mercury-free dentistry*. They invite Parties and others from Asia, the Americas, Europe, and Island States to join them in supporting this Amendment.

End amalgam for children first!

Here is where the emerging worldwide consensus exists: *end amalgam for children first*. Sweden and Norway followed that route to a phase-out. The island state of Mauritius ended amalgam for children years ago, before the European Union did so. Pakistan ended amalgam for children, pregnant women, and breastfeeding women in 3/4 of its provinces. Vietnam ended amalgam for children in 2019, and Nigeria will do so 1/1/20, following the lead of its model state for mercury-free dentistry, Edo State, which did so 1/7/2018.

The Amendment follows the route of the European Union and the priority of nations across the globe, starting with the phase out of amalgam use in children (and hence, including pregnant and breastfeeding women). Its language copies that of the European Union's 2017 Mercury Law. Children everywhere are equally important to the children of Europe; hence ending amalgam for children is put on a rapid timetable.

The blueprint for ending amalgam for children was put together at the World Workshop in Bangkok in 2018 co-sponsored by UN Environment and the World Alliance for Mercury-Free Dentistry. The report of the workshop is entitled *Promoting Dental Amalgam Phase-Down Measures Under the Minamata Convention and Other Initiatives, For "Especially Women, Children and, Through Them, Future Generations",* https://mercuryfreedentistry.files.wordpress.com/2018/06/workshop-report.pdf

What happened with lead paint must never happen again

Sadly, voices continue to be heard that ending amalgam use in Europe is a good idea, but that Africans should continue to accept this neurotoxin in their mouths, their workplaces, and their food for another generation. Those voices clearly are not familiar with the "leapfrogging" of technologies for which Africa is famous. African governments are ready for mercury-free dentistry, and so are its dentists and its consumers and parents. So too for Asia. So too for Latin America. So too for Small Island Developing States.

Almost two generations ago, the developed nations ended use of lead in paint – but continued to sell it throughout the developing world. The lead paint episode was intolerable and must never be repeated. Amalgam use must end, on a timetable, worldwide.

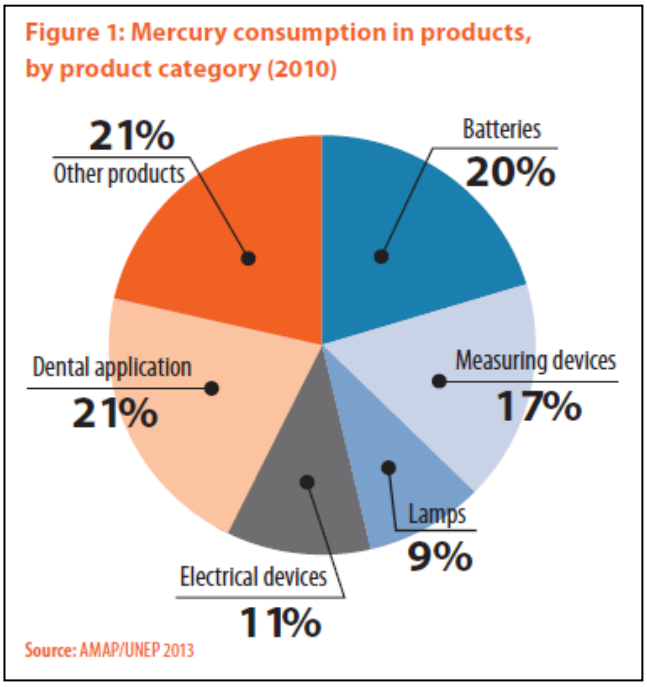
Let us end the mercury era of dentistry, and step boldly into the era of mercury-free dentistry!

Rationale for Amendment

1-Amalgam is one of the largest uses of mercury in products

Mercury is used in dental amalgam, a restorative material that is approximately 50% mercury.i Between 270 and 341 tonnes of dental mercury is used around the world annually, accounting for 21% of global mercury consumption.ii

Many products that consume less mercury than dental amalgam – including lamps, electrical devices, and batteries[iii] – are already included in Part 1 of Annex A.

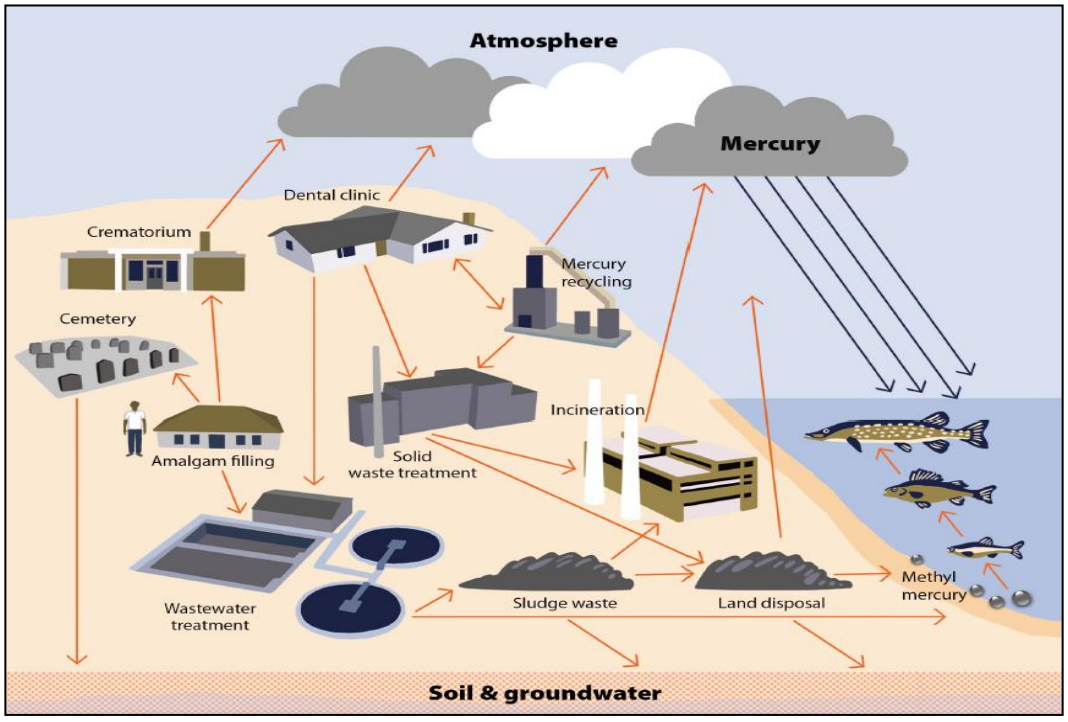


Dental amalgam should be moved to Annex A, Part I to better reflect amalgam's greater contribution to the pool of mercury that can enter our environment.

2-Amalgam releases and emissions are among the most difficult to manage

Dental mercury enters the three main environmental media via many different pathways. For example, dental mercury pollutes:

- ***AIR*** via cremation,[iv] dental clinic emissions,[v] municipal waste incineration, and sewage sludge incineration[vi]
- ***WATER*** via dental clinic releases,[vii] landfill runoff and human waste[viii]
- ***LAND*** via landfills,[ix] burials,[x] and sewage sludge used as fertilizer.[xi]



Because dental amalgam's mercury enters the environment via so many different pathways, it is impossible to control and among the most difficult to manage. For example:

It is not feasible to control dental mercury releases and emissions because:

- ***Too many pathways:*** An amalgam separator (a device designed to capture mercury from dental clinic wastewater) is not sufficient to address the whole range of mercury releases from the amalgam life cycle, as shown in the graphic above.[xii] For example, as explained in the European Commission BIOIS report, separator installation is not sufficient to address "the whole range of mercury releases from the dental amalgam life cycle (it does not address mercury releases from the natural deterioration of amalgam fillings in people's mouths, from cremation and burial, and residual emissions to urban WWTPs)."[xiii] Dentists who do not understand this might actually increase their amalgam use because they incorrectly believe that separators are sufficient to prevent all dental mercury pollution.
- ***Lack of infrastructure:*** Many developing countries lack the infrastructure and resources to collect, transport, and store mercury waste from amalgam.
- ***High Costs:*** It falls on governments to pay the high costs of trying to adopt and enforce regulations and ensure proper maintenance, including the cost of awareness-raising and inspections at dental clinics. For example, a 2012 study for the European Commission calculated that ensuring separator installation and proper maintenance would take approximately 35,000 hours annually in the EU-27 and 1 million euros per year in labor cost for public authorities.[xiv]

As a result, the only way to effectively address dental mercury pollution is to move dental amalgam into Annex A, Part I.

3-Superior mercury-free alternatives are available, especially for children

Mercury-free dental fillings have been developed and studied for over fifty years.xv These mercury-free fillings offer many advantages that make them more effective – and more affordable – than dental amalgam. For example:

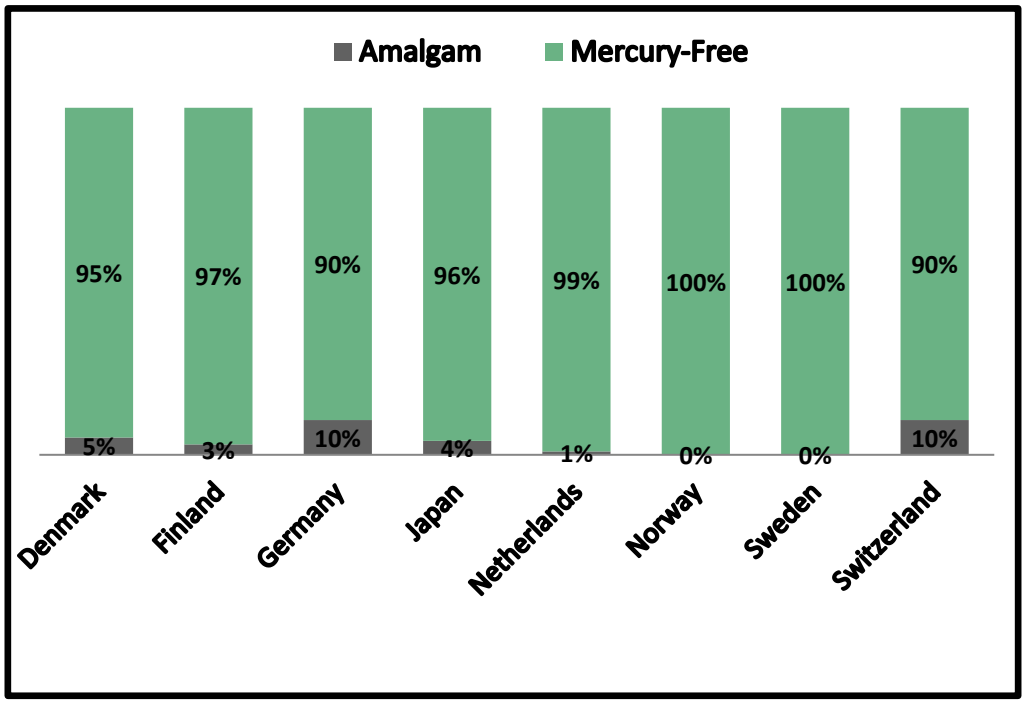
- **Environment-friendly:** Composites and glass ionomers are mercury-free, and there is no evidence of environmental toxicity.[xvi] However, as Swedish professor Hylander *et. al.* (2006) observes, "*amalgam fillings are considered to be economic while they de facto are more expensive than most, possibly all, other fillings when including environmental costs*."[xvii] Hence, Member States can avoid significant environmental and societal costs by promoting the use of mercury-free fillings.
- **Preserve the tooth structure:** Modern dentistry recognizes the principle of minimally invasive dentistry, which is basically the removal of the least possible amount of healthy tooth tissue. Contrary to this, the need for dental amalgam to be mechanically anchored in the tooth requires the drilling of an appropriate hole and the removal of often substantial healthy tooth tissue, consequentially leading to additional and more expensive repairs over time.[xviii] The World Health Organization states that "*Adhesive resin materials [like composite] allow for less tooth destruction and, as a result, a longer survival of the tooth itself.*"[xix] In addition to preserving tooth structure, due to their binding properties composites can strengthen and enhance the biomechanical properties of the restored tooth.[xx] As the European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) stated in a 2015 report: mercury-free dental fillings *"have facilitated a radical change in the concept of restorative dentistry through the introduction of more minimally invasive techniques and the associated retention of more tooth substance when treating caries."*[xxi] Hence, Member States can save their citizens the added costs associated with weakened tooth structure – and lost teeth – by promoting mercury-free fillings.
- **Prevent caries:** Glass ionomers release fluoride, which might help prevent tooth decay.[xxii] Composite placement also can also incorporate preventive measures, including sealing of adjacent pits and tooth fissures.[xxiii] Hence, mercury-free fillings maintain or exceed the preventive properties associated with amalgam.
- **Easier repairs:** Composite filling materials permit localized repairs whereas amalgam requires replacement of the total filling. Opdam *et. al.* found that composites are also typically repaired more successfully than amalgam, explaining that *"The annual failure rate (AFR) after 4 years for repairs of amalgam restorations was 9.3%, while the AFR of repaired composite restorations was 5.7%."*[xxiv] Hence, Member States can save when it comes to filling repairs.

- **More accessible:** Glass ionomers, though less durable than composites or amalgam, have proven invaluable in clinical situations where they can be more accessible (easily placed in more humid environments) and less expensive than amalgam (for example, for treating children's milk teeth).[xxv] According to the BIOIS report for the European Commission, *"In Sweden, ART [atraumatic restorative treatment, a technique using glass ionomer] is used in public clinics and is considered as the treatment of choice for primary teeth."*[xxvi] (As noted in the report, "With regard to young children, longevity of the restoration is not a relevant concern since baby teeth will fall out long before the restoration fails."[xxvii]) The Pan American Health Organization further explains, *"The costs of employing the PRAT [procedures for atraumatic restorative treatment] approach [using glass ionomers] for dental caries treatment, including retreatment, are roughly half the cost of amalgam without retreatment. PRAT [using glass ionomer] as a best practice model provides a framework to implement oral health services on a large scale, and it can reduce the inequities for access to care services."*[xxviii] Hence, Member States can save considerable costs by using glass ionomer when appropriate.

- **Efficient to place:** According to a 2012 report prepared for the European Commission, *"it has been shown that the time needed to carry out a Hg-free [mercury-free] restoration has reduced significantly as dentists have gained more experience in the handling of Hg-free materials, so that there is currently no (or minor) time difference to perform Hg-free restorations compared to amalgam."*[xxix] Optimized restorative composites can now save even more time even when dealing with bigger cavities (these bulk-fill composites can be placed and cured up to 4 mm deep and deliver strength and low wear for good durability).[xxx] Hence, once dentists are adequately trained, on average there are no additional labor costs associated with placing mercury-free fillings.

- **Longevity:** As the 2012 BIOIS report explained, *"Given the results of recent studies comparing the longevity of different materials, in the present study it is considered that the longevity of Hg-free fillings is no longer a factor with significant effect on the overall cost difference between dental amalgam and composite or glass ionomer restorations."*[xxxi] A 2015 assessment by the European Commission's Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) further confirmed that *"dental restorative treatment can be adequately ensured by amalgam and alternative types of restorative material. The longevity of restorations of alternative materials in posterior teeth has improved with the continuing development of these materials and the practitioner's familiarity with effective placement techniques. … recent studies from the Netherlands, Sweden and Denmark showed very good long-term clinical effectiveness for posterior resin composite restorations with equal and better longevity than for amalgam."*[xxxii] Hence, mercury-free filling materials such as composites are associated with no additional costs related to the longevity of the material.

Because mercury-free dental fillings are already effective and affordable, a growing number of countries have already made significant progress in phasing down – as well as phasing out – dental amalgam use, as the below graphic shows.[xxxiii]



Many other countries have already successfully taken significant steps toward mercury-free dentistry, including ending amalgam use in children. For these reasons, UN Environment and the World Alliance co-sponsored a workshop on *Promoting Dental Amalgam Phase-Down Measures Under the Minamata Convention and Other Initiatives, For "Especially Women, Children and, Through Them, Future Generations"* in Bangkok on 14-15 May 2018. Experts hailing from twenty-one countries shared their wealth of experience in phasing down amalgam use – especially for children – in a variety of settings. The workshop report, a UN Environment publication, documented the following breakthroughs towards phasing out dental amalgam across the globe: [xxxiv]

- In South Asia, both the Bangladeshi Armed Forces and the Indian Armed Forces provide only mercury-free fillings for their soldiers, sailors, and airmen – and their families.
- In Central Africa, the Cameroon Baptist Convention ended amalgam use in its large hospital system and dental clinics that dot the nation more than a decade ago.
- In West Africa, the Nigerian federal Consumer Protection Council distributes a brochure urging parents and consumers to consider mercury-free fillings for themselves and their children.
- In South America, Uruguay's dental college has phased out teaching amalgam and started preparing all of its students for modern mercury-free dentistry.
- In both the large European Union and the tiny island nation of Mauritius, amalgam use for children has been effectively ended.

It's time to stop storing mercury in human mouths, especially that of children!

We accomplish this goal by moving amalgam where it belongs in the Minamata Convention: in the product phase-out section: Annex A, Part I.

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[i] U.S. FDA, *Final Rule, Dental Amalgam*, http://www.fda.gov/downloads/MedicalDevices/ProductsandMedicalProcedures/DentalProducts/DentalAmalgam/UCM174024.pdf, p.86.

[ii] UNEP/AMAP, *Technical Background Report to the Global Atmospheric Mercury Assessment* (2013), https://oaarchive.arctic-council.org/handle/11374/732 , p.103.

[iii] UNEP, *Lessons from Countries Phasing Down Dental Amalgam Use* (2016), p.6

[iv] OSPAR Commission, *Overview assessment of implementation reports on OSPAR Recommendation 2003/4 on controlling the dispersal of mercury from crematoria* (2011)

[v] See KA Ritchie et. al., Mercury vapour levels in dental practices and body mercury levels of dentists and controls, BRITISH DENTAL JOURNAL Volume 197 No. 10 November 27 2004, http://www.nature.com/bdj/journal/v197/n10/pdf/4811831a.pdf ("One hundred and twenty two (67.8%) of the 180 surgeries visited had environmental mercury measurements in one or more areas above the Occupational Exposure Standard (OES) set by the Health and Safety Executive."); see also Mark E. Stone, Mark E. Cohen, Brad A. Debban, *Mercury vapor levels in exhaust air from dental vacuum systems*, Dental Materials 23 (2007) 527–532.

[vi] U.S. Geological Survey, *Changing Patterns in the Use, Recycling, and Material Substitution of Mercury in the United States* (2013), p.23

[vii] U.S. Geological Survey, *Changing Patterns in the Use, Recycling, and Material Substitution of Mercury in the United States*(2013), p.23 (see Figure 7)

[viii] Skare, I. &Engqvist, A. 1994. Human exposure to mercury and silver released from dental amalgam restorations. Arch. Environ. Health 49 (5): 384-394

[ix] U.S. Geological Survey, *Changing Patterns in the Use, Recycling, and Material Substitution of Mercury in the United States*(2013), p.23 (see Figure 7)

[x] Ibid.

[xi] A Cain, S Disch, C Twaroski, J Reindl and CR Case, Substance Flow Analysis of Mercury Intentionally Used in Products in the United States, *Journal of Industrial Ecology*, Volume 11, Number 3, copyright Massachusetts Institute of Technology and Yale University.

[xii] BIO Intelligence Service (2012), *Study on the potential for reducing mercury pollution from dental amalgam and batteries*, Final report prepared for the European Commission-DG ENV, p.108.

[xiii] BIO Intelligence Service (2012), *Study on the potential for reducing mercury pollution from dental amalgam and batteries*, Final report prepared for the European Commission-DG ENV, p.108.

[xiv] BIO Intelligence Service (2012), *Study on the potential for reducing mercury pollution from dental amalgam and batteries*, Final report prepared for the European Commission-DG ENV, p.89.

[xv] Jack L Ferracane, *Resin composite--state of the art*, DENTAL MATERIALS, Vol.27, issue 1, p.29-38 (Jan. 2011).

[xvi] Health Care Research Collaborative of the University of Illinois at Chicago School of Public Health, the Healthier Hospitals Initiative, and Health Care Without Harm, *Mercury in Dental Amalgam and Resin-Based Alternatives: A Comparative Health Risk Evaluation* (June 2012), p.6.

[xvii] Lars D. Hylander & Michael E. Goodsite, Environmental Costs of Mercury Pollution, Science of the Total Environment 368 (2006) 352-370, http://www.aikencolon.com/assets/images/pdfs/Nikro/MercuryVacuum/STOTENbestpaper.pdf

[xviii] DHSA (2003) – A National Clinical Guideline for the Use of Dental Filling Materials, Department for Municipal Health and Social Services, Directorate for Health and Social Affairs, Universitesgata 2, Oslo,Norway, ISBN 82-8081-031, December 2003,

[xix] World Health Organization, *Future Use of Materials for Dental Restoration* (2011), p.16.

[xx] Lynch et. al., *Managing the phase-down of amalgam: part I. Educational and training issues*, BR DENT J. (Aug. 2013).

[xxi] European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), *Final opinion on the safety of dental amalgam and alternative dental restoration materials for patients and users* (29 April 2015), http://ec.europa.eu/health/scientific_committees/emerging/docs/scenihr_o_046.pdf, p.69

[xxii]Mandari GJ, Mandari GJ, Frencken JE, Frencken JE, van't Hof MA, *Six-Year Success Rates of Occlusal Amalgam and Glass-Ionomer Restorations Placed Using Three Minimal Intervention Approaches*. CARIES RES 2003;37:246-253.

[xxiii] Lynch et. al., *Managing the phase-down of amalgam: part I. Educational and training issues*, BR DENT J. (Aug. 2013).

[xxiv] Opdam NJ, Bronkhorst EM, Loomans BA, Huysmans MC, Longevity of repaired restorations: A practice based study, Journal of Dentistry 40 (2012) 829–835 states, *"The annual failure rate (AFR) after 4 years for repairs of amalgam restorations was 9.3%, while the AFR of repaired composite restorations was 5.7%. The log-rank test revealed a significantly superior performance of repairs of composite restorations (p = 0.001)... The results of the study as shown in Fig. 4 and the log-rank test indicating high significance suggest that a composite restoration can be repaired more successfully than an amalgam restoration."* The reason was that *"In the present study it was found that repaired restorations in case of tooth fracture, which is a common failure type among large amalgam restorations, have a worse prognosis then repaired restorations due to recurrent caries, which is more common among the composite resin restorations investigated. [As explained,] a repaired restoration in case of e.g. a cusp fracture (Fig. 2) will be subjected to the same forces that caused the same cusp fracture, leading to a second fracture soon. On the other hand, a secondary caries lesion in a large composite resin restoration that is repaired with a local box-type restoration (Fig. 3) is likely to survive longer due to the fact that a new secondary caries lesion needs at least three years to develop to a size making a new operative intervention necessary. Moreover, preventive measures taken may cause the demise of caries activity in the patient preventing new secondary caries lesions to develop."* See https://www.researchgate.net/profile /Niek_Opdam/publication/228441700_Longevity_of_repaired_restorations_A_practice_based_study/links/ 0c96052766a325245a000000.pdf

[xxv] Pan American Health Organization, *Oral Health of Low Income Children: Procedures for Atraumatic Restorative Treatment (PRAT)* (2006), p.xi.

[xxvi] BIO Intelligence Service (2012), *Study on the potential for reducing mercury pollution from dental amalgam and batteries*, Final report prepared for the European Commission-DG ENV, p.56.

[xxvii] BIO Intelligence Service (2012), *Study on the potential for reducing mercury pollution from dental amalgam and batteries*, Final report prepared for the European Commission-DG ENV, http://ec.europa.eu/environment/chemicals/mercury/pdf/Final_report_11.07.12.pdf, p.69

[xxviii] Pan American Health Organization, *Oral Health of Low Income Children: Procedures for Atraumatic Restorative Treatment (PRAT)* (2006),http://new.paho.org/hq/dmdocuments/2009/OH_top_PT_low06.pdf, p.xi.

[xxix]BIO Intelligence Service (2012), *Study on the potential for reducing mercury pollution from dental amalgam and batteries*, Final report prepared for the European Commission-DG ENV, p.67.

[xxx] Bulk fill restoratives are visible-light activated, restorative composites optimized to create fast and easy restorations and provide excellent strength and low wear for durability. The material can be placed and cured up to 4 mm deep, enabled by a stress-relieving resin system and optimized optical properties. "Dentists get composite restorative materials with strong physical properties which guarantee a permanent yet economical solution. It can be cured within 10 seconds." See VOCO, Three alternatives to amalgam fillings (2018) at https://www.voco.dental/en/service/press/press-area/three-alternatives-to-amalgam-fillings.aspx

[xxxi] BIO Intelligence Service (2012), *Study on the potential for reducing mercury pollution from dental amalgam and batteries*, Final report prepared for the European Commission-DG ENV, http://ec.europa.eu/environment/chemicals/mercury/pdf/Final_report_11.07.12.pdf, p.69

[xxxii] European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), *Final opinion on the safety of dental amalgam and alternative dental restoration materials for patients and users* (29 April 2015), http://ec.europa.eu/health/scientific_committees/emerging/docs/scenihr_o_046.pdf, p.8,10,77

[xxxiii] BIO Intelligence Service (2012), *Study on the potential for reducing mercury pollution from dental amalgam and batteries*, Final report prepared for the European Commission-DG ENV, p.190; Bio Intelligence Service/European Commission, *Review of the Community Strategy Concerning Mercury* (p.213-14), 4 October 2010; Federal Office for the Environment (Switzerland), *Letter* (8 August 2011); World Health Organization, *Future Use of Materials for Dental Restoration* (2011), pp.21, 23; UNEP, *Lessons from Countries Phasing Down Dental Amalgam Use* (2016), p.13.

[xxxiv] UN Environment & World Alliance, *Workshop report*, https://mercuryfreedentistry.files.wordpress.com/2018/06/workshop-report.pdf