European Environmental Bureau initial input to the *Study on potential for reducing mercury pollution from dental amalgam and batteries*, carried out by BIO Intelligence Service for the European Commission

30 September 2011

The European Environmental Bureau (EEB) appreciates the invitation and opportunity to provide input to the Study on potential for reducing mercury pollution from dental amalgam and batteries, carried out by BIO Intelligence Service for the European Commission. With our comments, EEB would like to underline the importance of a continuously robust EU Mercury policy. We welcome the decision for the present study to be carried out and call upon the European Commission, as a follow up, to recommend the adoption of relevant specific legislative and regulatory measures to tackle mercury pollution from these sources, as soon as possible.

Mercury is a global pollutant that travels long distances. Its most toxic form – methylmercury - accumulates in large predatory fish and is taken up in our bodies through eating fish, with the worst impacts on babies *in utero* and small children. Mercury is also used and traded indiscriminately around the globe, and results in pollution far from the source.

On mercury releases from dental amalgam, a lot of studies exist, have already been discussed and show the impact in health and nature from this source; on the other side safe mercury-free alternatives are available. As mentioned during the consultation meeting for the EU mercury strategy review, we would like to underline that a phase out of mercury use in dental amalgam is possible in Europe; we do support the phasing-down mercury use in the sector at global scale, as also supported by WHO, but the EU is much more advanced in terms of alternatives available and services provided and could go further. In addition, the Nordic countries have already demonstrated that this is a viable approach, and the lessons learned from there could be readily and easily adopted by the EU Member States in a relatively short time period.

With respect to mercury containing button-cells, mercury-free button cell technology has advanced and expected environmental benefits are high considering that banning mercury button-cell batteries from the EU market, will give a strong signal to other countries such as China which are major exporter of such products, with global repercussions and such a voluntary phase out has already been endorsed by mult-national battery companies, some of which service the EU.

Please find below initial input for the study relevant to mercury in dental amalgams and batteries.

Thank you in advance for considering our comments and recommendations.

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EEB Initial input to the BIOS study

1. Mercury in dental amalgam

EEB welcomes the fact that BIOS is building up on previous reports including the EEB/Concorde 2007 report 'Mercury in dental use: environmental implications for the EU'., and corrigenda. This report is indeed the main EEB input relevant to most of the questions addressed in the BIOS questionnaire.

Some further relevant input and references can also be found on the Report from the Conference 'Dental Sector as a sector of mercury contamination', EEB organised where the above study was presented (October 2007).

Apart from the above we would like to summarise our proposals for policy measures that should be taken at EU level, along the lines they were addressed during the EU mercury strategy review process.

1. Phase out the use of dental amalgam. Justified, time limited exemptions could be considered.
2. Mercury emissions from crematoria should be further investigated, including relevant technologies or other effective approaches, for eventual control at EU level. Emission limit values for this source should be proposed by the European Commission as soon as possible. Crematoria should be included in the scope of IED (Annex I) so that BAT in relation to mercury emissions prevention/control get applied. New crematoria should be subject to more stringent requirements.
3. Those EU Member States which currently lack legislative and regulatory measures for amalgam separators requirements should be required to do so within a two year period, as the technology for doing so is proven, readily available and cost effective. Those failing to do so should be identified as priorities for follow-up administrative action by Commission staff.
4. This should include the introduction of obligatory measures ensuring implementation of best management practices and that highly efficient amalgam separators are installed in dental clinics. Requirements should include verification of installation, annual maintenance of such systems, reporting requirements to local authorities to ensure that these devices meet a high standard.
5. In addition, the Commission should ensure that mercury-laden pipes and plumbing fixtures (i.e. nearly all wastewater systems serving dental practices) are cleaned and/or replaced since they have long accumulated mercury wastes and constitute an ongoing source of mercury release. Other dental-related activities should include: ensuring historic supplies of elemental mercury currently stored at dental offices are appropriately managed, and ensuring that mercury-laden solid wastes from dental offices are handled as hazardous waste, in accordance with law, so that they are removed from the economic cycle rather than improperly disposed of, or combusted in medical or municipal waste incinerators.

Justifications for those demands can be found below:

1.1 Mercury use in dental amalgam

No measures have been taken at EU level so far, apart from asking the opinion of the EU scientific committees on the environment and health effects of dental amalgam.

The COWI, Concorde SA 2008 report analysed extensively the issue and concluded that: '*Substitution of dental amalgam is no doubt effective as it would eliminate the total input of mercury to this sector, and thus eliminate in a few decades the adverse impacts of mercury releases resulting from this activity. As the table shows, the cost level - however roughly estimated only - indicate a rather substantial cost for the substitution of dental amalgam with composite fillings, the most widely used alternative today. This should however be consider in perspective of a number of cost elements which have not been possible to quantify within this study. Expected benefits from reduced adverse effects of mercury releases and reduced costs for mercury waste management in all associated flows in society are expected to be major contributions. Both are however complicated to estimate. Current estimates of health benefits per gram mercury reduced are considered very uncertain and imply the risk of serious misinterpretations. The costs of emission reduction of one kg mercury in crematoria is in the same range as the lower estimate of the costs of substitution of dental amalgam.*

It is clearly indicated that applying high efficiency filters and maintenance requirements is a quite cost effective measure, with a price per kg mercury release reduction of only 1/10 of the costs of reduction the releases from crematoria.

Because of the large quantities of mercury accumulated in the teeth of the population, substitution and "end-of-pipe" measures are, in the short term, not so much possible alternatives; rather both measures are necessary at the same time. Over the longer term, of course, the "end-of pipe" measures would no longer be needed as dental mercury no longer reaches any waste stream in significant quantities.[1]'

Furthermore, EEB organised a conference in May 2007 *'Dental sector as a source of mercury contamination'*. Results of the conference[2] included the following:

- In the EU, mercury use for dental amalgams is estimated to be more than 90 tonnes, the second biggest use after mercury-cell chlor-alkali plants. Mercury use in the EU is significant in dental applications, most of which appears to eventually be deposited in the environment. Such releases are quite diffuse, and controlling them is costly. Once mercury is released, it may transform into methylmercury, its most toxic form.
- There are various pathways where mercury from dental amalgams may be released and where it can be controlled (dental clinics, waste water, crematoria, cemeteries etc.). Much mercury waste is sent into the solid waste stream, although a good amount goes into the waste water treatment stream including mercury in people's mouths released at home, while a certain amount ends up in sludge waste. Crematoria also release mercury into the atmosphere, although when people are buried it might end up in the soil or ground water.
- Approximately 500 million citizens (50-75% of individuals in the EU) have fillings in their mouths. The average mouth with fillings in the EU seems to contain 3 to 4 grams of mercury. A 'human inventory' of around 1,100 tonnes can be found in people's mouths in the EU, which is huge when one considers it will all end up in the environment.
- Experts estimate that the amount of mercury newly introduced into people's mouths in the EU is between 110 and 150 tonnes annually. However, this estimate does not include the mercury waste carved away by dentists. Yet, three grams per person are still released into the atmosphere by cremation or into the soil by burials every year. The cremation rate in the EU is also increasing by 1% a year.
- On the basis of different assumptions, it is estimated that the annual mercury releases which end up in various environmental outlets are distributed mainly into soil (30 tonnes),

[1] p.220 of COWI, Concorde SA 2008, report for DG Environment.
[2] http://www.zeromercury.org/EU_developments/Dental_Conference_Report_May07.pdf

the atmosphere (23 tonnes), surface water (14 tonnes) and groundwater (10 tonnes)[3]. In these environmental media the mercury may be expected to continuously circulate in the biosphere, partially methylate, enter the food chain and detrimentally affect wildlife and human health.

- Amalgam separators, although they can recover quite a high percentage of dental amalgam waste, have not proven to be a real solution, since lack of maintenance or bad installation can reduce their efficiency, meaning that there will still be emissions of mercury into waste water through dental clinics. Moreover, as the presentation and report from the Commission made clear, the EU as a whole has a very low occurrence of separator installation in dental clinics, particularly 'retroactive' installation in existing clinics.
- Emissions from the crematoria sector increase both localised and national mercury levels through emissions and deposition. All mercury in teeth evaporates during cremation, with no traces of mercury found in the remaining ashes. Installation of filters in crematoria can be quite costly, and even then the abatement technology only removes 95% of mercury leaving the chimneys. In addition, mercury abatement is a form of end-of-pipe control and it would therefore be preferable for mercury to be controlled farther up the process chain.
- Mercury-free alternatives for dentistry exist, including composites, (resin-free) glass ionomer cements, ceramics etc. Some concerns were expressed about the potentially hazardous content of these alternatives (e.g. composites containing bisphenol-A), but hazard-free options are also available on the market. Dentists present at the conference confirmed practising amalgam-free dentistry, with the ability to restore all damaged teeth without amalgams.
- National strategies and/or advisories have been in place against the use of mercury in dental fillings (e.g. in Sweden, Denmark, Germany, Austria, France, Finland). Introduction of financial instruments (e.g. health insurance covering mercury-free amalgams only), practitioners' guidelines and awareness raising on the issue in different countries appears to have made a difference, all of which should be continued in light of the push to phase out the use of mercury in the dental sector and to stimulate a sustainable long-term solution.
- The price of an amalgam might be very low for the consumer if we compare it to the cost of alternatives; however, dental amalgams would be one of the most expensive materials if related environmental costs and (chronic) health effects caused by mercury were also taken into account. The real environmental and health costs should be included in the actual cost of the amalgams.
- Patients in Europe are not always informed about the different choices they have regarding dental fillings and what the effects or risks of one or the other material could be for their health and the environment. Some participants testified that their health deteriorated because of the use of dental amalgams and improved after their removal and detoxification therapy.
- There has been evidence that dental assistants have been seriously affected by the use of mercury while preparing dental amalgams, many reporting having children born with neurological problems. Studies presented from Norway showed dental assistants to have neurological and psychosomatic symptoms, problems with concentration, fatigue and sleep disturbance.
- There was general support for the idea that mercury use in dental amalgams can indeed be decreased or phased out in the coming years, since adequate alternatives are already available and research could provide for a wider range of even better performing materials.

[3] Concorde SA for EEB, 2007 ' MERCURY ERCURY IN DENTAL USE: ENVIRONMENTAL IMPLICATIONS FOR THE EUROPEAN UNION'
http://www.zeromercury.org/EU_developments/Maxson%20Dental%2014May2007%20-%20A5colour.pdf

In addition in March 2006, the European Parliament called on the Commission to bring forward a proposal to restrict the use of mercury in dental amalgam by the end of 2007.[4]

With respect to reducing the demand on dental amalgams, the European Commission requested the opinion of the relevant EU Scientific Committees to consider whether additional regulatory measures would be appropriate concerning the use of mercury in dental amalgam. The results of the respective opinions which were concluded in 2008, have been strongly criticised by the EEB and many other Environment, Health and Patients' non-governmental organisations[5].

We therefore hope that the present BIOS study will also fill in the claimed information gaps so far in terms of the environmental effect of mercury pollution from dental amalgams and lead to concrete legislative pollution reduction measures.

Action proposed

1. Phase out the use of dental amalgam. Justified, time limited exemptions could be considered.

1.2 Atmospheric Emissions from crematoria

As it can be see below, at global level the emissions of mercury from dental amalgam (crematoria), cannot be ignored.

Sector	2005 emissions tonnes	% of 2005 emission
Fossil fuel combustion for power and heating	878	45.6
Metal production (ferrous and non-ferrous excluding gold)	200	10.4
Large scale gold production	111	5.8
Artisanal and small-scale gold production	350	18.2
Cement production	189	9.8
Chlor-alkali industry	47	2.4
Waste incineration , waste and other	125	6.5
Dental amalgam (cremation)	26	1.3
TOTAL	**1930**	**100**

Source: UNEP 2008 report 'The Global Atmospheric Mercury assessment: sources emissions and transport' p. 17

Emissions from crematoria are not covered by Community law, but are regulated in several Member States, and are also the subject of OSPAR Recommendation 2003/4. Although mercury emissions from crematoria was discussed at the Extended Impact Assessment carried out for the 2005 EU mercury strategy, no actions were proposed and implemented at EU level.

Our comments from our 2005 publication are still relevant[6].

[4] http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P6-TA-2006-0078+0+DOC+PDF+V0//EN
[5] http://www.zeromercury.org/indexDental.html
[6] http://www.zeromercury.org/Zero_Mercury_Policy_Paper_EN.pdf, p.59

It has been estimated that there are between 2 and 3.5 tonnes of mercury released annually from crematoria. In the UK crematoria are responsible for 16% of mercury emissions and, without controls, will be the largest source of mercury pollution by 2020. Legislation on crematoria is already in place in Denmark, the Netherlands, Germany and the UK and should be compared and evaluated as part of this investigation. The relevant OSPAR recommendation covers only 12 of the 25 EU Member States and no sanctions are foreseen in cases of non-implementation[7]. Reports on emissions from crematoria, from the OSPAR parties were due by September 2005 but we have not been able to find any relevant reports.

Special measures have been taken with respect to mercury emissions from crematoria in the UK[8]. Best Available technique measures appear to be implemented. Furthermore industry itself created the Crematoria Abatement Mercury Emissions Organisation (CAMEO) scheme, a crematoria abatement system scheme[9]. This is a burden-sharing scheme where all members pay per cremation, then receive payment per abatement. This scheme also enabled a phased approach which was not in government recommendations with targets: by 2008, 10% of cremations abated, by 2010, 20% and by 2012, 50%.

Further to that mercury emissions from crematoria are discussed in the COWI, Concorde SA 2008 report which concludes that *'the costs of emission reduction of one kg mercury in crematoria is in the same range as the lower estimate of the costs of substitution of dental amalgam. It is clearly indicated that applying high efficiency filters and maintenance requirements is a quite cost effective measure, with a price per kg mercury release reduction of only 1/10 of the costs of reduction the releases from crematoria. Because of the large quantities of mercury accumulated in the teeth of the population, substitution and "end-of-pipe" measures are, in the short term, not so much possible alternatives; rather both measures are necessary at the same time. Over the longer term, of course, the "end-of-pipe" measures would no longer be needed as dental mercury no longer reaches any waste stream in significant quantities.'*

Action proposed

2. Mercury emissions from crematoria should be further investigated, including relevant technologies or other effective approaches, for eventual control at EU level. Emission limit values for this source should be proposed by the European Commission as soon as possible. Crematoria should be included in the scope of IED (Annex I) so that BAT in relation to mercury emissions prevention/control get applied. New crematoria should be subject to more stringent requirements.

1.3 Mercury containing-waste

A significant proportion of mercury release into the environment still comes from European dental clinics in the form of waste or directly into the waste water system. [10]

Under the Waste framework directive (2008/98/EC) and Decision 2000/532/EC establishing a list of wastes, waste containing mercury, and therefore dental amalgam waste, are considered hazardous and should be separately collected and disposed of accordingly. As a result all dental clinics - usual source of dental mercury waste, should have been equipped with dental

[7] Belgium, Denmark, Germany, Finland, France, Ireland, Iceland, Luxembourg, Netherlands, Norway, Portugal, Spain,
Sweden, Switzerland, United Kingdom, and European Union, http://www.ospar.org/fr/html/cp/welcome.html
[8] http://www.zeromercury.org/EU_developments/Dental_Conference_Report_May07.pdf
[9] http://www.fbca.org.uk/cameolink.asp
[10] Dental sector as a source of mercury contamination, European Environmental Bureau, May 2007, page 7

amalgam separators. Nevertheless the interpretation and implementation of such a measure varies greatly within Member States. In 2005, the European Commission (EC), DG Environment, sent a questionnaire to Member States related to the environmentally sound management and treatment of dental amalgam waste. This information was presented by DG Environment at a relevant EEB conference[11] organised in 2007 and commented in the COWI/Concorde SA report carried out for DG Environment in 2008 with specific focus on whether dental amalgam separators were installed and used in dental clinics. In the conference report, it is mentioned: ' *The situation may have changed in these countries during the last two years, but at the time of the questionnaire below, it was clear that no more than 30-40% of EU dental clinics had installed functioning amalgam separators*'[12]. As a result, it is evident that no adequate measures are taken with respect to dental amalgam waste at EU level.

Transposition of EU legislation to the Member State level, not to mention enforcement, has not been consistent. In 2004 the Commission notified the UK that amalgam filters, as a minimum, are necessary to comply with Article 4 of the Waste Framework Directive. This followed an investigation that "revealed weaknesses in the UK's implementation of the Waste Framework and Hazardous Waste Directives in relation to this type of waste," and in which the Commission discovered that dental amalgam was not being treated as a hazardous waste in the UK, but rather released directly into the environment by most dental clinics. The Commission's Mercury Strategy consultation document indicated that many other Member States were similarly lax in addressing the collection and disposal of amalgam waste at dental practices[13]

In September 2008[14] - when a relevant question was raised at the European Parliament - the EC responded that although the (above mentioned) review carried out showed that implementation of adequate measures (obligatory installation of amalgam separators and recycling schemes) were not applied uniformly throughout the Community: *'The Commission will insist on the importance of the issue in the appropriate expert groups and check that the issue of dental amalgam waste, and in particular its separation from waste water in dental healthcare facilities, is duly taken into account when the programmes of measures according to the Water Framework Directive are established*.'

The potential relevant measures through the Water Framework Directive (2000/60/EC), would refer to MS complying with the Quality Standards for mercury as defined under the Priority Hazardous Substances directive 2008/105/EC[15]; nevertheless the compliance with these directives is due much later, in 2015. [16]

In other words, instead of action towards Member States through the potential breach of the existing Waste Framework Directive (that should already be complied with by Member States), the European Commission appears to has simply postponed action related to dental amalgam waste management, to be taken later on under a directive compliance with which is not yet requested. This is clearly unacceptable and we would urge the Commission to ensure uniform compliance by Member States.

Mercury containing-waste are generally discussed by the COWI, Concorde SA 2008 (p.192) report; separate collection rates are rather low resulting in secondary emissions from landfills

[11] http://www.zeromercury.org/EU_developments/070525_EEB_Dental_Amalgam_conference.html
[12] "Options for reducing mercury use in products and applications and the fate of mercury already circulating in society" , p.58 http://ec.europa.eu/environment/chemicals/mercury/pdf/study_report2008.pdf
[13] http://www.zeromercury.org/EU_developments/Maxson%20Dental%2014May2007%20-%20A5colour.pdf
[14] http://www.europarl.europa.eu/sides/getAllAnswers.do?reference=E-2008-3980&language=EN
[15] http://ec.europa.eu/environment/water/water-dangersub/pri_substances.htm
[16] http://ec.europa.eu/environment/water/water-framework/info/timetable_en.htm

and waste incinerators. To that end several recommendations are provided and should be considered as a follow up to this study.

Following above comments and recommendations from the 2008 study we would propose the following actions:

Action proposed

3. Those EU Member States which currently lack legislative and regulatory measures for amalgam separators requirements should be required to do so within a two year period, as the technology for doing so is proven, readily available and cost effective. Those failing to do so should be identified as priorities for follow-up administrative action by Commission staff.
4. This should include the introduction of obligatory measures ensuring implementation of best management practices and that highly efficient amalgam separators are installed in dental clinics. Requirements should include verification of installation, annual maintenance of such systems, reporting requirements to local authorities to ensure that these devices meet a high standard.
5. In addition, the Commission should ensure that mercury-laden pipes and plumbing fixtures (i.e. nearly all wastewater systems serving dental practices) are cleaned and/or replaced since they have long accumulated mercury wastes and constitute an ongoing source of mercury release. Other dental-related activities should include: ensuring historic supplies of elemental mercury currently stored at dental offices are appropriately managed, and ensuring that mercury-laden solid wastes from dental offices are handled as hazardous waste, in accordance with law, so that they are removed from the economic cycle rather than improperly disposed of, or combusted in medical or municipal waste incinerators.

2. Mercury in batteries

The current regulatory approach for restricting mercury use in batteries is outdated, and is contributing to confusion regarding the tracking and use of mercury in the battery production sector. While mercury use has been eliminated for standard primary batteries, European law still allows up to 2% mercury content in button cells, and much more than that for mercury oxide batteries used in unspecified “medical equipment” or “emergency” purposes. Based on the findings in the most recent COWI, Concorde SA 2008 these allowances for mercury use are not necessary in most cases, and may facilitate continued use of mercury in battery production both for EU consumption and export purposes.

First and foremost, mercury use in button cell production is no longer required, since a growing number of manufacturers are now producing mercury free versions of all various button cell types. Table 2-17 of the COWI Concorde report lists some of those manufacturers. Similar and additional information can be found in a recent report prepared by the State of Maine in the USA.[17] Indeed, Maine and Connecticut will ban the sale of mercury containing button cell batteries from mid 2011[18], consistent with the US battery manufacturer association’s voluntary commitment to produce mercury free button cells by 2011.

Many of the same manufacturers operate in both the EU and USA. Therefore, it is not surprising EU manufacturers like Sony are developing mercury-free button cells and making similar commitments and policy recommendations in the EU[19]. The revisions to the EU

[17] *http://www.maine.gov/dep/rwm/publications/legislativereports/pdf/buttonbatteriesreportjan09.pdf.*
[18] www.maine.gov/.../buttonbatteriesreportjan09.doc
[19] *Personal communication with SONY, April 2010.*

mercury strategy should embrace this technology advancement over the last 10 years and phase out mercury use in EU button cell production as soon as possible.

Simultaneously, the EU must carefully consider the remaining exemptions in the battery directive. The exemption for "medical equipment" is vague and overly broad, particularly if it includes hearing aid applications, since mercury free button cells are available for this application. Military applications also appear to be overly broad and ill-specified. As indicated in the COWI Concorde report, greater specificity and oversight of legitimate exemptions are desperately needed to avoid abuse of these provisions and ensure appropriate tracking of this sector.

Lastly, the battery sector exemplifies why a ban on exports of mercury products restricted in the EU is warranted, as discussed further elsewhere in these comments. Without such a ban, EU mercury use in this sector could continue, particularly for mercury oxide batteries containing very high levels of mercury. These batteries will frequently be exported to the developing world where the capability for safe management during use and disposal is seriously lacking. The EU should not be contributing to the global mercury pollution problem in this way.

Moreover, without the product export ban, the EU becomes a potential transit route for the global distribution of outdated mercury products, thereby impairing the EU's ability to track mercury consumption in the EU and the effectiveness of its regulatory measures, as the COWI Concorde report vividly reveals.

Expected environmental benefits are high considering that banning mercury button-cell batteries from the EU market, will give a strong signal to other countries such as China which are major exporter of such products, with global repercussions.

Action proposed

6. Ban the production and sale of mercury containing button cells by revising as soon as possible the EU batteries directive.
7. The remaining exemptions in the battery directive must be re-examined because they too are outdated, lack specificity, and may be subject to significant abuse.
8. The EC should take measures to further raise awareness and increase knowledge on the fact that certain products contain mercury, to ensure that for those products which relevant law is in place, these are collected separately and safely (e.g. lamps, batteries). Better labeling of products containing mercury will also facilitate separate collection.