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Policy issues: State of the environment

STATE OF THE GLOBAL ENVIRONMENT AND CONTRIBUTION OF THE UNITED NATIONS ENVIRONMENT PROGRAMME TO EFFORTS TO ADDRESS ENVIRONMENTAL CHALLENGES

Report of the Executive Director

Addendum

Global Mercury Assessment

The present document has been prepared pursuant to Governing Council decision 21/5 of 9 February 2001 on the mercury assessment. It is submitted herewith for the Council's consideration. Chapters II to V of the text have been reproduced as submitted without any formal editing.

* Reissued for technical reasons.

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I. PROGRAMME OF WORK TO IMPLEMENT GOVERNING COUNCIL DECISION 21/5

1. In order to initiate the process of a global assessment of mercury and its compounds, as stipulated in decision 21/5 of 9 February 2001, the United Nations Environment Programme (UNEP) developed a work plan and timetable that were circulated to Governments and to intergovernmental and non-governmental organizations in April 2001. At the same time, they were invited to submit any information in their possession that might be relevant to the global assessment to be prepared by UNEP. By 14 September 2002, 81 Governments, 10 intergovernmental organizations and five non-governmental organizations had responded to the invitation to submit information.

2. With a view to ensuring that the process remained open, transparent and inclusive, UNEP invited Governments and intergovernmental and non-governmental organizations to nominate members to serve on a global mercury assessment working group. In addition, consultations were held on several occasions during the process with the member organizations of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC).

3. With a view to promoting openness and transparency even further, the global mercury assessment web site was established. All relevant documents, comments and input from Governments and intergovernmental and non-governmental organizations, together with the meeting documents and the draft assessment report developed by the secretariat, were made publicly available on the web site.

4. A general trust fund in support of the preparation of a global assessment of mercury was also established by UNEP. As of 1 October 2002, financial pledges and contributions had been received from the Governments of Burkina Faso, Canada, Denmark, France, Malta, Norway, Sweden, Switzerland and the United States of America, to a total of $690,963. Actual and projected expenditure to the end of 2002 amounts to $464,260. This leaves a surplus of $226,703, which could be used for further work, subject to the approval of donors. The Government of the United States provided an extra financial contribution in order to enable the secretariat to hire an additional staff member to support the assessment.

5. A first draft of the global mercury assessment was circulated to Working Group members, attracting comments from 24 Governments and five intergovernmental and five non-governmental organizations. Following incorporation of these comments, the Working Group met in Geneva from 9 to 13 September 2002 to consider the draft text of the global mercury assessment and prepare an outline of possible options to be forwarded to the Governing Council for its consideration. The meeting was attended by 66 Governments, five intergovernmental organizations and nine non-governmental organizations. The full report of the meeting is available to the Governing Council as document UNEP/GC.22/INF/2.

6. During the meeting the Working Group reviewed and finalized the global mercury assessment report and identified some key findings. Based on these findings, the Working Group concluded that, in its view, there was sufficient evidence of significant adverse impacts of mercury and mercury compounds globally to warrant international action to reduce the risks to human health and the environment arising from the release of mercury into the environment. It also agreed on an outline of possible options for measures to address the adverse impacts of mercury at local, regional, national and global levels. The options include risk-reduction measures such as reducing or eliminating the production and consumption of mercury, substituting other products and processes, developing a legally-binding treaty, establishing a non-binding global programme of action, and strengthening cooperation among Governments on information-sharing, risk communication, assessment and related activities. The Working Group also recommended certain immediate measures such as the establishment of contacts with highly vulnerable groups, such as pregnant women, the provision of technical and financial support to developing countries and countries with economies in transition, and support for increased research, monitoring and data-collection on the health and environmental aspects of mercury and on environmentally friendly alternatives to mercury.

7. The outcome of the Working Group’s discussion, as forwarded to the Governing Council for consideration, is described in detail in the following chapters.

II. WORKING GROUP'S CONCLUSIONS ON THE SIGNIFICANT ADVERSE IMPACTS OF MERCURY GLOBALLY

8. The Working Group finalized the global mercury assessment report for submission to the Governing Council at its twenty-second session. The full version of the global mercury assessment report is available to the Governing Council as document UNEP/GC.22/INF/3. The key findings, as contained in the assessment report, are provided in the annex to the present note. The Working Group considered the information in the global mercury assessment report and concluded that, in its view, there was sufficient evidence of significant global adverse impacts of mercury to warrant international action to reduce the risks to human health and the environment arising from the release of mercury into the environment. The reasons for their conclusion are summarized below.

1. Hazardous properties of global relevance

9. Mercury and its compounds are highly toxic substances. The potential toxicity of mercury for humans and other organisms varies widely depending on the chemical form, the pathway of exposure, the amount, and the vulnerability of the person exposed.

10. An important factor about mercury is its ability to build up in organisms (bioaccumulate) and move up in the food chain (biomagnify). This is of particular relevance with respect to methylmercury, which accumulates to a greater extent than other forms of mercury and thus methylmercury is the primary species of concern.

11. Once mobilized, mercury persists in the environment where it circulates in air, water, sediments, soil and biota in various inorganic and organic forms. It is capable of being transported over long distances, and releases on one continent can be deposited in other continents and elsewhere. Depending on local mercury pollution load, substantial additional contributions to the intake of total mercury can occur through air and water.

2. Human populations and ecosystems most at risk

12. The general population is primarily exposed to methylmercury through diet and to elemental mercury through dental amalgam. Other routes of exposure include environmental releases and occupational activities. Exposure to mercury might also occur through the use of mercury-containing products, including vaccines containing mercury preservatives (Thimerosal/Thiomersal) and certain cosmetics.

13. Some populations are especially vulnerable to mercury contamination. These include pregnant women, the newborn, children and indigenous people exposed to methylmercury through the consumption of contaminated fish, and communities dependant on foods that may contain high levels of methylmercury, such as fish and marine mammals. Workers who may be occupationally exposed to high levels of mercury are also at risk.

14. There are also particularly vulnerable ecosystems and wildlife populations. These include top predators in aquatic and terrestrial food webs (e.g., fish-eating birds and mammals), Arctic ecosystems, wetlands, tropical ecosystems and soil communities.

15. Mercury also gives rise to socio-economic effects on countries dependant on fisheries as an important activity, and may have impacts on agricultural production and land and aquatic uses.

3. Sources

16. There is clear evidence that mercury impacts on the environment have considerably increased globally due to human activities. The most significant environmental releases of mercury are air emissions, but mercury is released in other ways, including discharges from various sources to water and land. The relative contributions to the releases of mercury from different source types vary between countries.

17. Some examples of major sources of anthropogenic releases of mercury are:

(a) Releases from mobilization of mercury impurities:
- Coal-fired power and heat production (largest single source to atmospheric emissions)
- Energy production from other fossil carbon fuels
- Cement production (mercury in lime)
- Mining and other metallurgic activities involving the extraction and processing of virgin and recycling mineral materials, for instance production of:
  - iron and steel
  - ferromanganese
  - zinc
  - other non-ferrous metals
- Petroleum production

(b) Releases from intended extraction and use of mercury:
- Mercury mining
- Small-scale gold mining (amalgamation process)
- Chlor-alkali production
- Use of fluorescent lamps, instruments, dental amalgam fillings etc.
- Manufacturing of products containing mercury, for example:
  - thermometers
  - manometers and other instruments
  - electrical and electronic switches
- Biocides (e.g. seed-dressing, pesticides and slimicides)
- Use of other products, such as batteries, fireworks and laboratory chemicals

(c) Releases from waste treatment, cremation, etc. (originating from both impurities and intended use of mercury):
- Waste incineration (municipal, medical and hazardous wastes)
- Landfills
- Cremation
- Cemeteries (release to soil)
- Recycling and storage

18. Concern was expressed that highly contaminated industrial sites and mining operations continue to release mercury. It was also noted that land, water and resource management activities such as forestry and agricultural practices and flooding can make mercury more bioavailable. Methylation and bioaccumulation are also influenced by high levels of nutrients and organic matter in water bodies. Frequent extreme weather events can contribute to release of mercury through flooding and soil erosion. Concern was also raised regarding potential releases from surplus stocks of mercury and the need for proper storage.

19. As uses are phased out in some parts of the world, mercury waste and recycling of mercury are on the increase. In this context, concerns have been identified regarding the export of mercury waste to other regions and the possible transfer of outdated technology to developing countries and countries with economies in transition.

4. Magnitude of the threat

20. Mercury pollution has significant impacts at the local, national, regional and global levels. These impacts should be addressed through a range of actions at each of these levels, targeting both the supply of and demand for mercury.

21. Mercury and its compounds have caused a variety of documented, significant global adverse impacts on human health and the environment throughout the world. Exposure studies from numerous geographic areas indicate that a significant portion of humans and wildlife throughout the world are exposed to methylmercury at levels of concern. Elevated methylmercury levels also have been measured in numerous freshwater and marine species throughout the world. Even areas with minimal local and national mercury releases, such as in the Arctic, are adversely affected due to the transcontinental and global transport of mercury.

22. Some effects of mercury are linked to long-range transport while others are more local in character. Exposure through long-range environmental transport occurs where mercury released into air or water circulates and is transformed into methylmercury, which then comes into contact with humans and wildlife (e.g., through consumption of mercury-contaminated fish and mammals). By comparison, high exposures to inorganic mercury can occur through contact with mercury or mercury vapours at or near the source of use or release.

III. WORKING GROUP'S CONCLUSIONS ON POSSIBLE OPTIONS FOR ADDRESSING SIGNIFICANT GLOBAL IMPACTS OF MERCURY

23. After having concluded that there is sufficient evidence of significant global adverse impacts of mercury to warrant international action to reduce the risks to human health and the environment arising from the release of mercury into the environment, the Working Group discussed and finalized an outline of various options to address the global adverse impacts identified and outlined some additional aspects that might be taken into consideration. Its conclusions on the issue are given below.

Part A – Outline of options for addressing any significant global impacts of mercury

24. The outline below lists possible options for recommendation on measures to address global adverse impacts of mercury at the global, regional, national and local levels. They can correspond to short, medium and long-term goals. Specific options may be adopted at different times in different countries or can be applied sequentially. In deciding which measures are most appropriate and effective at global, regional or national levels, varying socio-economic impacts should also be taken into account.

A. Measures to reduce and/or eliminate the use, emissions, discharges and losses of mercury and its compounds

1. Substituting products and processes

25. Measures that involve substituting products and processes that contain or use mercury might include:

(a) Limiting or preventing use of mercury in products where alternatives exist and promoting development of appropriate alternatives for remaining essential uses;

(b) Limiting or preventing the intended use of mercury except in artisanal mining activities until appropriate and affordable technology is transferred to the said sector;

(c) Limiting or preventing use of obsolete technology and requiring use of best available techniques and best environmental practices to reduce or prevent mercury emissions into air and water;

(d) Gradual phasing out of mercury already in use and mercury-containing products, after promoting the development of effective and affordable mercury substitutes and alternative technology.

2. Reducing mobilization of new mercury into the biosphere

26. Measures to reduce production of raw materials and products that generate mercury emissions might include:

(a) Reutilization of recovered or recycled mercury for essential use in a strictly controlled manner as opposed to mining and smelting of virgin mercury and careless use and discharge of mercury;

(b) Limiting or preventing the content of mercury present as impurities in fuels;

(c) Reducing and, where feasible, phasing out the mining of virgin mercury.

3. Reducing consumption

27. Measures to reduce consumption of raw materials and products that generate mercury releases might include:

(a) Limiting or eliminating content of mercury present as such or as impurities in high volume materials, (for example, packaging);

(b) Limiting or preventing products containing mercury from being marketed nationally;

(c) Limiting or preventing products (for example, batteries, pharmaceuticals, cosmetics, etc.) containing mercury from being exported and imported;

(d) Limiting or preventing the marketing of used or commodity-grade mercury;

(e) Establishing a “mercury bank” in order to keep account of the use of virgin mercury, recovered or recycled mercury in a strictly controlled system.

4. Controlling and monitoring emissions and releases

28. Monitoring strategies should be defined with particular attention to the technical and economic capacities of countries. Each country may take measures to control mercury emissions and releases including through:

(a) Limiting or preventing mercury from processes from being released directly into the environment, air, water and soil through emission control techniques (for example, industrial point sources, including the chlor-alkali industry, oil and gas production, metallurgic industry, etc., other sources such as municipal and medical waste incinerations, and activities such as small-scale mining);

(b) Limiting or preventing emissions of mercury from combustion of fossil fuels and processing of mineral materials by emission control technology, or by regulatory measures;

(c) Limiting or preventing the release of mercury from processes into the wastewater treatment system (in order to limit releases to the water recipient and to permit use of sludge);

(d) Controlling, confirming and improving the efficiency of measures for limiting or preventing mercury emissions and releases through end-of-pipe technology and to that end establishing emission standards and suitable cost-effective environmental monitoring.

5. Waste management

29. Measures to reduce and/or eliminate mercury in wastes through mercury waste management might include:

(a) Limiting or preventing mercury in products and process waste from being released directly into the environment, by efficient waste collection;

(b) Limiting or preventing mercury in products and process waste from being mixed with less hazardous waste in the general waste stream, by separate collection and treatment;

(c) Limiting or preventing mercury releases into the environment through treatment of household waste, hazardous waste and medical waste, by emission control technology;

(d) Limiting the mercury content in sewage sludge spread on agricultural land and limiting the use of solid incineration residues containing mercury in road-building, etc.;

(e) Limiting or preventing remarketing of wastes containing mercury;

(f) Retiring excess mercury through long-term waste management (terminal storage);

(g) Preventing mercury releases into the environment through the management of obsolete and waste pesticides and chemicals containing mercury;

(h) Promoting legal commitments among producers of mercury containing products to take responsibility for adequate waste treatment and final disposal of their products;

(i) Limiting or preventing the incineration of mercury containing products, materials and waste.

B. International cooperation

30. International cooperation might be improved through:

(a) Promoting increased participation in existing regional and international conventions and agreements that deal with mercury and mercury compounds;

(b) Exchanging information regularly among international organizations, including the member organizations of the Inter-Organization Programme for the Sound Management of Chemicals, to ensure coordination of activities relevant to mercury and avoid duplication of efforts and waste of available resources;

(c) Supporting long-term monitoring and modelling initiatives at national, regional and international levels to ensure availability of comparable data and precise information that can guide policies and programmes aimed at reducing levels of mercury in the environment throughout the world;

(d) Exploring collaboration with regional and subregional centers, such as those of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and supporting collaborative research programmes and initiatives to improve understanding of mercury sources, impacts on human health and the environment impacts on the fishing industry, fishing groups and people dependant upon fish for their livelihood and cycling in the environment;

(e) Supporting studies and clean-up programmes through international funding or financing initiatives for developing countries and countries with economies in transition;

(f) Filling information needs to assist developing countries and countries with economies in transition in targeting and prioritizing national or regional actions and strategies to reduce mercury use and releases (e.g. source and emissions inventory assistance), including through possible use of the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade;

(g) Promoting surveys and information exchanges to identify international uses of mercury and to enhance our understanding of flows within and among countries from production through consumption and end-of-life storage or disposal;

(h) Establishing an international plan for the prevention of illegal import of mercury and mercury compounds as a raw material and/or as a hazardous waste.

C. Risk communication

31. Risk communication relevant to the adverse effects of mercury and mercury compounds might be enhanced through:

(a) Raising awareness among policy and decision makers with regard to the adverse effects of mercury and mercury compounds;

(b) Promoting public information, awareness and education on the health and environmental effects of mercury and mercury compounds and the alternatives available to reduce exposure and reduce or eliminate releases and emissions of mercury especially to those vulnerable populations such as indigenous people, women and children, workers and communities living around industrial and mining activities, etc.;

(c) Promoting curricula development in schools and training programmes for workers involved in mercury processing and handling;

(d) Establishing a clearing house for information relevant to mercury, for example, information on risk management strategies, appropriate alternatives and related costs, and ensuring easy access to this information, especially for developing countries and countries with economies in transition;

(e) Establishing a network among Governments and other actors involved to exchange information on ongoing initiatives and efforts at national, regional and international levels to reduce or eliminate the adverse effects of mercury;

(f) Providing, for the general population, awareness of exposure risks to mercury through effective fish consumption advisories and other information dissemination methods. Enhancing, for vulnerable populations such as indigenous people, pregnant women and children, outreach and risk communication about mercury exposure;

(g) Promoting the awareness of the risks associated with the mobilization of mercury from geological sources and its accumulation in the biosphere;

(h) Promoting the awareness of the persistence of mercury and its ability to be transported, transformed and accumulated in food chains.

D. Additional measures to support the reduction or elimination of uses, emissions, discharges and losses and limit the adverse impacts on human populations and the environment

32. In addition to the measures listed in the previous section, which aim directly at reducing emissions and releases of mercury, a broader range of measures and management tools exist that supplement the regulatory infrastructure and support implementation of agreed reduction strategies and policies.

1. National, regional and international action

33. The development of national, regional and international action plans to address the use and release of mercury might be promoted through:

(a) Developing inventories of uses, releases and possible global adverse impacts of mercury and mercury compounds as well as of existing sites polluted by mercury and mercury compounds to serve as a baseline for considering action on mercury globally, particularly in developing countries and countries with economies in transition;

(b) Developing and implementing an action plan setting out the policies necessary within each sector to reduce uses and releases of mercury through multi-disciplinary approaches and involving major stakeholders;

(c) Developing monitoring programmes including standardized measures linked to other international programmes through international networks, including training programmes and the exchange of expertise between on the one hand, developed and on the other, developing countries and countries with economies in transition;

(d) Promoting studies on socio-economic effects of different measures related to varying national conditions;

(e) Developing effective environmental policy tools based on integrated methodologies to assist in the management of mercury polluted sites resulting from anthropogenic activities;

(f) Exploring collaboration with the Basel Convention to develop guidelines for affordable waste management options for mercury wastes and research into methods for definitive storage and encourage and promote research into the search for viable alternative technologies and substitutes;

(g) Establishing a task force to coordinate and implement mercury action to resolve some of the uncertainties involving various issues.

2. Chemicals management

34. The use of life-cycle assessment and chemicals management tools and techniques for addressing uses and releases of mercury might be promoted through:

(a) Setting environmental quality standards for maximum acceptable mercury concentrations in different media, such as air, water, soil and foodstuffs, in order to limit exposure of human populations and the environment (including occupational settings and vulnerable populations or ecosystems at special risk);

(b) Using Pollutant Release and Transfer Registers to track the environmental performance of industrial facilities using mercury or generating mercury waste and to stimulate voluntary initiatives by companies to reduce their releases and transfers of mercury;

(c) Using life-cycle assessment tools, facilitating the development and implementation of codes of conduct for various industrial sectors and producers, and promoting recognized environmental management systems, such as ISO 14.001, etc.;

(d) Developing best environmental practices or guidelines for best available techniques for various industrial sectors;

(e) Using economic incentives and/or disincentives to promote substitution of products, methods of analysis and processes that contain or use mercury or mercury compounds;

(f) Developing a framework to manage the transboundary movement of mercury, its compounds and products containing mercury and technology in particular into developing countries and countries with economies in transition. This may be achieved by adopting the process used by the Montreal Protocol on Substances that Deplete the Ozone Layer, or through other models such as the Rotterdam Convention;

(g) Setting standards for maximum acceptable mercury emissions into the environment.

3. Voluntary measures

35. Voluntary commitments and reduction programmes at national, regional and/or international levels to limit the use and release of mercury might include:

(a) Promotion of voluntary commitments among producers of mercury containing products to take responsibility for ensuring appropriate handling and waste treatment of their products (for example, through information and training of users, product take-back schemes, etc.);

(b) Promotion of voluntary commitments among users of mercury containing products (for example, hospitals) to reduce or eliminate use and limit or avoid releases of mercury into the environment through appropriate handling and waste treatment;

(c) Promotion of voluntary reduction programmes within different private sector industries or activities to reduce and/or eliminate their uses and releases of mercury, thus stimulating the sector to identify and implement appropriate and effective solutions.

4. Technical and financial assistance

36. Measures to provide technical and financial assistance to enhance the capacity of Governments, especially developing countries and countries with economies in transition, to monitor and assess emissions and releases of mercury and implement appropriate control measures might include:

(a) Organizing training and capacity-building activities to support Governments in developing action plans and implementing the policies and strategies identified through the development of such plans;

(b) Establishing a mechanism for addressing the needs for capacity-building and technical and financial assistance of Governments, especially of developing countries and countries with economies in transition, taking into consideration the resources and assistance available from bilateral and multilateral assistance and partnerships through rigorous application of the principles and practice of needs assessment.

Part B – Additional aspects for consideration

37. When considering the possible options that might be applied to address the adverse effects of mercury, some additional aspects should be taken into consideration, such as efficacy of national and regional measures versus international measures and binding versus voluntary measures. Some considerations relevant to these aspects are given in paragraphs 38 to 51 below.

A. National and regional measures versus international measures

38. Chapter 9 of the global mercury assessment report documents a considerable range of measures that have been implemented at the national and regional levels to deal with mercury and mercury compounds. Through such measures, a number of countries have achieved substantial reductions in emissions and releases of mercury from products and industrial processes. In addition, a number of coordinated regional approaches, both binding and non-binding, such as the Convention on Long-range Transboundary Air Pollution, the Convention for the Protection of the Marine Environment of the North-East Atlantic and the North American Regional Action Plan on Mercury, have supported national measures and contributed to additional reductions beyond national borders.

39. Despite these successful national and regional initiatives, some countries consider that they might not be sufficient to ensure adequate protection of human health and the environment from the adverse effects of mercury, and are calling for the consideration of coordinated initiatives at the international level.

40. If it is found that there are global problems related to mercury that should be addressed, it might be essential to the effectiveness of any reduction measures for the substantive commitments to be discussed and agreed at the international level. Any specific regional or national considerations may be addressed taking into account common but differentiated responsibilities within the commitments agreed to. Should countries within a region consider it necessary to set more stringent requirements than those in an international instrument, provisions for such regional agreements might be incorporated into an international initiative.

B. Non-binding versus binding measures

41. As can be seen from the global mercury assessment report, both voluntary non-binding and binding measures have been implemented successfully to address the negative effects of chemicals. Both approaches represent positive steps towards obtaining environmental aims and should be considered complementary rather than mutually exclusive.

1. Non-binding measures

42. Examples of some non-binding measures specifically relevant to mercury are described in the global mercury assessment report. Other measures relevant to chemicals management that have been successfully implemented at national, regional and international levels include:

(a) Codes of conduct, such as the UNEP Code of Ethics on the International Trade in Chemicals (1994) and the Food and Agriculture Organization of the United Nations (FAO) International Code of Conduct on the Distribution and Use of Pesticides (amended 1989);

(b) Voluntary reduction programmes with set reduction goals, for example, the United States of America Chlorine Institute's measures to reduce mercury use within United States mercury cell chlor-alkali facilities and the Great Lakes Binational Toxics Strategy;

(c) Ministerial or high-level declarations setting reduction goals, such as the North Sea Ministerial Declarations of the North Sea Conferences and the Nordic Environmental Action Programme of the Nordic Council of Ministers;

(d) Action programmes setting out detailed recommendations for responsible mercury management and control, such as the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities and the North American Regional Action Plan on Mercury.

43. There might be some advantages to such non-binding measures. Binding instruments are often negotiated over a number of years, while non-binding instruments often may be adopted within a shorter time period. Because of their more flexible character, non-binding instruments can often be more ambitious in the goals they set. A non-binding instrument can incorporate measures to promote reporting, access to information, capacity-building and technical assistance. Although implementation is voluntary, States feel obliged to respect as far as possible the political commitments they have made. Non-binding instruments do not require a subsequent ratification or acceptance procedure and might contribute to a rapid implementation of commitments. Finally, participation in implementation might often be broader than for binding instruments that require ratification.

44. As mentioned before, binding and non-binding measures are complementary rather than mutually exclusive. Non-binding commitments might also be used to ensure rapid implementation of environmental goals in expectation of the development and entry into force of binding measures. An example is the voluntary prior informed consent procedure of the UNEP London Guidelines for the Exchange of Information on Chemicals in International Trade (amended 1989) and the FAO Code of Conduct on the Distribution and Use of Pesticides (amended 1989), which was implemented on a voluntary basis from 1989 until the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade was adopted in 1998. This voluntary implementation is being continued

during the interim period before the Convention enters into force, through the implementation of an interim prior informed consent procedure, based on the provisions of the Rotterdam Convention.

2. Binding instruments

45. A binding instrument establishes firm legal commitments for those countries that ratify it and contains mechanisms to support implementation in accordance with the instrument's requirements. A binding instrument also requires the establishment of the administrative and technical procedures and structures required at national level. A binding instrument will often also have some benefits incorporated into it, such as the promotion of capacity-building and technical assistance as well as access to information and advice on substitutes and appropriate technology that might promote broad participation. Furthermore, a binding instrument can include elements, which are more or less voluntary such as recommended measures and commitments to long-term goals.

46. When considering the advantages of a binding instrument, two options might be envisaged: developing a new instrument, or using an existing international instrument to address the adverse effects of mercury and mercury compounds. Some considerations relevant to these two options are:

(a) Option 1: Developing a new, binding instrument to address mercury

Negotiating a separate, new international instrument on mercury might allow for the detailed regulation of all aspects Governments would find necessary to address, but would also require the establishment of the necessary infrastructure at national and international levels to implement the provisions of the instrument. Negotiating an international, legally binding instrument often requires a number of years and substantial funding before the instrument can be adopted. Of the two most recently adopted international instruments regulating chemicals, the Rotterdam Convention took 30 months to negotiate and adopt (March 1996 to September 1998), while the Stockholm Convention on Persistent Organic Pollutants took 35 months (June 1998 to May 2001). Both conventions require 50 ratifications to enter into force, and neither has yet done so.

(b) Option 2: Using an existing international binding instrument to address mercury

Using an existing international instrument to address the adverse effects of mercury might present two possibilities: incorporating mercury and mercury compounds, in accordance with existing provisions, into an existing instrument, or developing a protocol covering mercury and mercury compounds under an existing instrument.

47. Relevant conventions, such as the Rotterdam Convention and the Basel Convention, aim at regulating transboundary trade in unwanted chemicals and hazardous wastes. The most recent international convention adopted and aimed at reducing releases from anthropogenic sources and minimizing or ultimately eliminating the use and production of certain chemicals is the Stockholm Convention. In addition, there are a number of binding instruments limited to a specific geographic area that address mercury, such as the Convention on Long-range Transboundary Air Pollution, the Convention for the Protection of the Marine Environment of the North East Atlantic and the Convention for the Protection of the Marine Environment of the Baltic Sea. Descriptions of all the above-mentioned instruments can be found in the global mercury assessment report.

48. This option is to be considerd thought should be given as to whether the overall objectives of the specific existing convention and the control measures stipulated therein are appropriate to address the concrete issues identified with regard to mercury.

IV. PROPOSALS FOR IMMEDIATE ACTION

49. Finally, the Working Group agreed to the need to submit to the Governing Council a range of possible immediate actions in the light of its findings on the impacts of mercury, and its conclusions in this regard are given below. In the context of the discussions on the issue the Working Group agreed that the mobilization of technical and financial resources referred to in the paragraph below, would occur on a voluntary basis.

50. The Working Group proposed that the Governing Council consider inviting multilateral financing agencies, Governments and other partners to mobilize technical and financial resources to support national and regional efforts and capacity-building in areas such as the following:

(a) Begin the process to establish national implementation plans to examine:

(i) Public awareness of the adverse effects of mercury and its compounds on health and the environment through training and workshops;
(ii) An inventory of uses and release of mercury and mercury compounds as well as existing polluted sites to serve as baseline information;
(ii) Establishment, where necessary, of legislation and regulations for enforcement;
(iii) Regional information exchange;

(b) Build capacity through:

(i) Training and workshops for a wide range of topics, including pollution prevention actions or key mercury use sectors (e.g., chlor-alkali facilities);
(ii) Technical assistance in the development of facilities for analysis and monitoring;
(iii) Provision of facilities for proper disposal of waste containing mercury including obsolete pesticides containing mercury;

(c) Promote awareness of alternative livelihood options and promote transfer of appropriate technology for the small-scale artisanal mining sector;

(d) Initiate one or more pilot projects in developing countries and countries with economies in transition to look at issues (a) to (c) mentioned above;

(e) Support research in order to better understand routes and nature of exposure and mercury cycling (transport and transformations, in particular the formation of methylmercury) in various environmental conditions in particular tropical and dry regions, for which limited information is available in developing countries and countries with economies in transition, and promote research on mercury (differentiation of natural and anthropogenic mercury in the air, in water and in soil, and in Arctic regions) in developed countries;

(f) Support research on the development of standardized analytical procedures and methods to support meaningful and cost-effective monitoring and modelling programmes (trends, health-related, hot spot monitoring and biomonitoring) as an essential component of mercury control measures;

(g) Assist countries in building broad based public awareness through incorporation of the subject “environmental education” in school curriculum;

(h) Establish a data bank regarding uses, sources, chemistry, import, export, health hazards, and research conducted in various areas of the world of mercury and its compounds. This data bank should be accessible to everyone;

(i) Undertake immediate research into best available environmentally friendly alternatives;

(j) Develop strategies for enhanced outreach and risk communication to reach sensitive populations (for example, pregnant women);

(k) Promote information exchange and collaboration, including scientific and technical information exchange on various topics such as long-range transport, monitoring and modelling, health and ecological risks, source characterization, source control technology, alternatives, pollution prevention techniques, nutrition and genetic factors among Governments in partnership with other public and private organizations.

51. In so doing, established organizations and existing international frameworks and infrastructure should be relied upon to the extent possible.

V. SUGGESTED ACTION BY THE GOVERNING COUNCIL ON THE GLOBAL MERCURY ASSESSMENT

The Governing Council may wish to consider the adoption of a decision along the lines suggested below.

Global mercury assessment

The Governing Council,

Recalling its decision 21/5 of 9 February 2001 on mercury assessment,

Also recalling paragraph 22 (g) of the Plan of Implementation of the World Summit on Sustainable Development,[1] in which it was agreed that the risks posed by heavy metals that are harmful to human health and the environment should be reduced and that, to this end, a review should be made of the relevant studies such as the United Nations Environment Programme global assessment of mercury and its compounds,

Having considered the report of the Executive Director on the global mercury assessment,

Taking note of the key findings of the report of the Global Mercury Assessment Working Group[2] on the content of its first meeting and the global mercury assessment report,

1. Decides to continue the work of addressing the significant adverse impacts of mercury and mercury compounds globally;

2. Requests the Executive Director to undertake assessments of other heavy metals of possible global concern and to seek funding for these assessments;

3. Requests the Executive Director to present a report on the progress of the implementation of the present decision to the Council at its twenty-third session.

Annex

Key findings of the global mercury assessment report

WHY SHOULD WE BE CONCERNED AND CAN INTERVENTION RESULT IN CHANGE?

Mercury is Present throughout the Environment

1. Environmental mercury levels have increased considerably since the on-set of the industrial age. Mercury is now present in various environmental media and food (especially fish) all over the globe at levels that adversely affect humans and wildlife. Widespread exposures are occurring due to human-generated sources, and past practices have left a legacy of mercury in landfills, mine tailings, contaminated industrial sites, soils and sediments. Even regions with minimal mercury releases, such as the Arctic, are adversely affected due to the transcontinental and global transport of mercury.

Mercury is Persistent and Cycles Globally

2. The most significant releases of mercury pollution are emissions to air, but mercury is also released from various sources directly to water and land. Once released, mercury persists in the environment where it circulates between air, water, sediments, soil and biota in various forms. Current emissions add to the global pool– mercury that is continuously mobilised, deposited on land and water, and re-mobilised.

3. The form of mercury released varies depending on source type and other factors. The majority of air emissions are in the form of gaseous elemental mercury, which is being transported globally to regions far from the emissions source. The remaining emissions are in the form of gaseous inorganic ionic mercury forms (such as mercuric chloride) or bound to emitted particles. These forms have a shorter atmospheric lifetime and will deposit to land or waterbodies within roughly 100 to 1000 kilometers of their source. Elemental mercury in the atmosphere can undergo transformation into ionic mercury, providing a significant pathway for deposition of emitted elemental mercury.

4. Once deposited, the mercury form can change (primarily by microbial metabolism) to methylmercury, which has the capacity to collect in organisms (bioaccumulate) and to concentrate up food chains (biomagnify), especially in the aquatic food chain (fish and marine mammals). Methylmercury is therefore the form of greatest concern. Nearly all of the mercury in fish is methylmercury.

Mercury Exposure Has Serious Effects

5. Mercury has caused a variety of documented, significant adverse impacts on human health and the environment throughout the world. Mercury and its compounds are highly toxic, especially to the developing nervous system. The toxicity to humans and other organisms depends on the chemical form, the amount, the pathway of exposure and the vulnerability of the person exposed. Human exposure to mercury can result from a variety of pathways, including, but not limited to, consumption of fish, occupational and household uses, dental amalgams and mercury-containing vaccines.

6. Methylmercury is adversely affecting both humans and wildlife. This compound readily passes the placental barrier and the blood-brain barrier, and is a neurotoxicant, which may in particular cause adverse effects on the developing brain. Studies have shown that methylmercury in pregnant women's diets can have subtle, persistent adverse effects on children's development as observed at about the start of school age. Moreover, some studies suggest small increases in methylmercury exposure may cause adverse effects on the cardiovascular system. Many people (and wildlife) are currently exposed at levels that pose risks of these, and possible other adverse effects.

7. Some populations are especially susceptible to mercury exposure, most notably the fetus, the newborn, and young children because of the sensitivity of the developing nervous system. Thus, parents, pregnant women, and women who might become pregnant, should be particularly aware of the potential

harm of methylmercury. Moderate consumption of fish (with low mercury levels) is not likely to result in exposures of concern. However, indigenous populations and others who consume higher amounts of contaminated fish or marine mammals, as well as workers who are exposed to mercury, such as in small-scale gold and silver mining, may be highly exposed to mercury and are therefore at risk.

8. Besides their importance to many native cultures, fish are an extremely valuable component of the human diet in many parts of the world, providing nutrients that are often not available in alternative food sources. Mercury is a major threat to this food supply. Likewise, contaminated fish can bring serious economic problems to communities and regions dependent on fisheries for their economic survival.

9. There are also particularly vulnerable ecosystems and wildlife populations. These include top predators in aquatic food webs (such as fish-eating birds and mammals), Arctic ecosystems, wetlands, tropical ecosystems and soil microbial communities.

Intervention Can be Successful

10. Mercury pollution has significant impacts at local, national, regional and global levels. These impacts can be addressed through a range of actions at each of these levels, targeting reductions in uses, releases and exposures. Numerous actions implemented in Europe, North America and elsewhere have successfully reduced uses and releases of mercury. However, inventories are still incomplete in these regions, and some releases are still significant. The extent of decreases in environmental levels and ecosystem improvements in response to decreased releases of mercury will vary considerably depending on local ecosystem characteristics and other factors, and in some cases may take several decades. However, an evaluation of mercury levels in Swedish lakes indicates that, by reducing releases, environmental levels of mercury, such as in freshwater fish, may be reduced significantly in specific locations within one to two decades.

WHY IS LOCAL/REGIONAL ACTION, BY ITSELF, NOT SUFFICIENT?

Global Cycling of Mercury Increases the Problem

11. As described above, the origins of atmospheric mercury deposition are local and regional as well as hemispherical or global. Besides local sources of mercury releases (such as waste incineration and coal combustion facilities), the general global background concentrations (global pool) contribute significantly to the mercury burden at most locations. Similarly, virtually any local source contributes to the global pool. Also, rivers and ocean currents are media for long-range mercury transport.

12. In some nations, local and regional mercury depositions have gradually increased contamination levels to the point that countermeasures have been enacted in recent decades to reduce emissions. However, due to long-range transport, even nations with minimal mercury releases, and other areas remote from industrial activity, may be adversely affected. For example, high mercury levels are observed in the Arctic, far from the sources of any significant releases.

Mercury Has an Impact on Global Fishing

13. Many fish species in international waters migrate to remote and diverse locations. Moreover, after harvest, commercial fish are commonly exported to various nations throughout the world, to locations far removed from place of origin. Therefore, mercury contamination of lakes, rivers, and especially oceans is truly a global issue, affecting fishing industries and fish consumers around the world.

Mercury May Be More Problematic to Less-Developed Regions

14. As awareness of mercury's adverse impacts has increased, the uses of mercury have been reduced significantly in many industrialised countries. Alternatives are commercially and competitively available for most uses. However, these reductions in use have had the effect of lowering demand relative to the supply of mercury, which has kept mercury prices low and encouraged ongoing (and in some cases, increased) use of

mercury and outdated mercury technologies in less-developed regions or nations. As mercury regulations and restrictions are less comprehensive or less well enforced in many less-developed regions, these trends have contributed to the concentration, in these areas, of a disproportionate burden of some of the health and environmental risks that accompany mercury.

Mercury is Subject to Significant International Use and Commerce

15. Despite improved awareness of risks, mercury continues to be used in a variety of products and processes all over the world. Elemental mercury metal is used in small-scale mining of gold and silver; chlor-alkali production; manometers for measurement and control; thermometers; electrical switches; fluorescent lamps; and dental amalgam fillings. Mercury compounds are used in batteries; biocides in the paper industry, pharmaceuticals; paints and on seed grain; and as laboratory reagents and industrial catalysts.

16. There is significant ongoing trade in mercury and mercury-containing products, some of which is illegal, uncontrolled and/or unregulated. The most significant global movement of mercury that remains poorly understood is the flow of mercury through international commerce. While overall quantities of mercury traded (and mined) has diminished in recent years, significant amounts are still transported. The unabated demand in many developing nations is a particular concern. Mercury available on the world market is supplied from a number of sources, including, among others:

- Mining of mercury (extracted from ores within the earth's crust) either as the main product or as a by-product of mining and refining other metals (gold, zinc) or minerals;
- Private and government stocks (mercury in chloralkali plants, government reserves);
- Recycled mercury recovered from spent products and industrial wastes.

17. Even under current regulations and restrictions, many of the uses, and movements of mercury and mercury containing products are likely to eventually result in the release of mercury to the global environment. Meanwhile, large amounts of mercury that remain in mine tailings, landfills and sediments, as well as stockpiles, continue to present a threat of future release. Hence, actions to reduce, manage and address uses, stocks and trade may be useful at local, regional, national, and international levels to prevent or minimize future releases.

HOW DOES MERCURY GET INTO HUMANS AND WILDLIFE?

18. Although local conditions may affect mercury exposure in certain populations, most people are primarily exposed to methylmercury through the diet (especially fish) and to elemental mercury vapours due to dental amalgams and occupational activities. The toxicity of methylmercury is described above. Elemental mercury vapour is also toxic to the nervous system and other organs. While methylmercury is of greatest concern for general populations, elevated exposures to elemental mercury are also of concern.

19. Elevated methylmercury levels have been measured in numerous freshwater and marine fish species throughout the world. The highest levels are found in large predatory fish and fish-consuming mammals. Exposure studies from diverse geographic areas indicate that a significant portion of humans and wildlife throughout the world are exposed to methylmercury at levels of concern, primarily due to consumption of contaminated fish.

20. Depending on local mercury pollution load, substantial additional contributions to the intake of total mercury can occur through air and water. Also, personal use of skin lightening creams and soaps, mercury use for religious, cultural and ritualistic purposes, use in some traditional medicines and mercury in the home and working environment can result in substantial elevations of human exposure. Exposures also occur through the use of vaccines and some other pharmaceuticals containing mercury preservatives (such as Thimerosal/Thiomersal).

21. Elevated elemental mercury levels in the working environment have been reported in chlor-alkali plants, mercury mines, thermometer factories, refineries, dental clinics, and in mining and manufacturing of gold and silver extracted with mercury. The relative impacts from local pollution (such as former mining sites), occupational exposure and local traditions may vary considerably between nations and are known to be significant in some areas.

22. Numerous wildlife species that rely on fish as a large part of their diet can have elevated mercury levels that raise the risk of adverse effects. Animals with the highest mercury levels include otter, mink, raptors, osprey, and eagles, which are top predators in the aquatic food chain. For example, eggs of certain Canadian bird species have mercury levels that are a threat to reproduction. Moreover, mercury levels in Arctic ringed seals and beluga whales have increased by 2 to 4 times over the last 25 years in some areas of the Canadian Arctic and Greenland. In warmer waters, some predatory marine mammals are also at risk. In addition, recent evidence indicates that soils are adversely affected over large parts of Europe and potentially in many other locations. However, in some environments, even fairly heavy mercury loads have very little effect on organisms as either mercury is not efficiently bioaccumulated throughout the local food chain or the mercury is not easily methylated. In addition, the effects of watershed management practices in certain locations on methylmercury levels may be more significant than the direct or diffuse mercury inputs.

WHAT ARE THE PRIMARY SOURCES OF MERCURY RELEASES?

23. The releases of mercury can be grouped in four categories:

- Natural sources - releases due to natural mobilisation of naturally occurring mercury from the Earth's crust, such as volcanic activity and weathering of rocks;
- Current anthropogenic (associated with human activity) releases from the mobilisation of mercury impurities in raw materials such as fossil fuels – particularly coal, and to a lesser extent gas and oil - and other extracted, treated and recycled minerals;
- Current anthropogenic releases resulting from mercury used intentionally in products and processes, due to releases during manufacturing, leaks, disposal or incineration of spent products or other releases;
- Re-mobilisation of historic anthropogenic mercury releases previously deposited in soils, sediments, water bodies, landfills and waste/tailings piles.

24. A large portion of the mercury present in the atmosphere today is the result of many years of anthropogenic emissions. The natural component of the total atmospheric burden is difficult to estimate, although available data suggest anthropogenic activities have increased levels of mercury in the atmosphere by roughly a factor 3, average deposition rates by a factor of 1.5 to 3 and deposition near industrial areas by a factor of 2 to 10.

25. Highly contaminated industrial sites and abandoned mining operations continue to release mercury. Also, land, water and resource management activities such as forestry and agricultural practices and flooding can make mercury more bioavailable. Methylation and bioaccumulation are influenced by high levels of nutrients and organic matter in water bodies. In addition, frequent extreme weather events can contribute to release of mercury through flooding and soil erosion.

WHAT ARE THE ANTHROPOGENIC SOURCES?

26. With regard to anthropogenic releases, the relative importance of releases associated with intentional uses versus mobilisation of mercury impurities vary between nations and regions, particularly depending on: extent of substitution of intentional uses (products and processes); reliance on fossil fuels, particularly coal, for energy; extent of mining and mineral extraction industry; waste disposal practices; and state of implementation of pollution control technologies. In nations where there is mercury mining or use of mercury for small-scale gold or silver mining, these sources can be quite significant.

27. Some of the more important anthropogenic processes that mobilise mercury impurities include: coal-fired power and heat generation; cement production; and mining and other metallurgic activities involving the extraction and processing of mineral materials, such as production of iron and steel, zinc and gold. Some important sources of anthropogenic releases that occur from the intentional extraction and use of mercury include: mercury mining; small-scale gold and silver mining; chlor-alkali production; (breakage during) use of fluorescent lamps, auto headlamps, manometers, thermostats, thermometers and other instruments; dental amalgam fillings; manufacturing of products containing mercury; waste treatment and incineration of products containing mercury; landfills; and cremation.

HOW CAN RELEASES BE REDUCED?

28. Reducing or eliminating anthropogenic mercury releases will require controlling releases from mercury-contaminated raw materials and feedstocks as well as reducing or eliminating the use of mercury in products and processes. The specific methods for controlling these mercury releases vary widely, depending upon local circumstances, but fall generally under four groups:

- Reducing mercury mining and consumption of raw materials and products that generate releases;
- Substitution of products and processes containing or using mercury;
- Controlling mercury releases through end-of-pipe controls; and
- Mercury waste management.

29. The first two of these are "preventive" measures – preventing some uses or releases of mercury from occurring at all. The latter two are "control" measures, which reduce (or delay) some releases. Preventive measures for reducing consumption of raw materials and products that generate mercury releases are generally cost-effective, and among the most viable means of eliminating mercury releases. Also, substitution of products and processes without mercury is an important prevention action.

30. Controlling mercury releases through end-of-pipe techniques, such as exhaust gas filtering, may be especially appropriate to processes using raw materials with trace mercury contamination - fossil-fueled power plants, cement production, extraction and processing of primary raw materials such as zinc, gold and other metals, and processing of secondary raw materials such as steel scrap. Existing control technologies that reduce sulphur dioxide (SO_2), nitrogen oxides (NO_x) and particulate matter (PM) for coal-fired boilers and incinerators, while not widely used in many countries, also yield some level of mercury control. Technology for additional mercury control is under development and demonstration, but is not yet commercially deployed. In the long run, integrated multi-pollutant (SO_2, NO_x, PM, and mercury) control technologies may be a cost-effective approach. However, end-of-pipe control technologies, while mitigating the problem of atmospheric mercury pollution, still result in mercury wastes that are potential sources of future emissions and should be disposed of or reused in an environmentally acceptable manner.

31. Mercury waste management has become more complex as more mercury is collected from a variety of sources, including gas filtering products, sludges from the chlor-alkali industry, ashes, and mineral residues, as well as used fluorescent tubes, batteries and other products that are often not recycled. The cost of acceptable disposal of mercury waste in some countries is such that many producers now investigate whether alternative non-mercury products exist. Proper management of mercury wastes is important to reduce releases to the environment, including those that occur due to spills (such as broken thermometers) or releases that occur over time due to leakage from certain uses (such as auto switches and dental amalgams) or releases through waste incineration and cremation. A well thought-out combination of prevention and control measures is necessary to optimize reductions in mercury releases.

32. Many nations have implemented actions to limit and prevent uses, releases and exposures, such as:

- Actions and regulations that control mercury releases into the environment;
- Product control actions and regulations for mercury-containing products;
- Environmental quality standards, specifying a maximum acceptable mercury concentration for different media such as drinking water, surface waters, air and soil and foodstuffs such as fish;

- Other standards, actions and programs, such as regulations on mercury exposures in the workplace, reporting requirements, fish consumption advisories and consumer safety measures.

33. Although legislation is a key component of most national initiatives, other efforts exist to reduce mercury use such as developing and introducing safer alternatives and cleaner technology, the use of subsidies and incentives to encourage substitution efforts, voluntary agreements with industry, and awareness raising.

34. Because of mercury's long-range cycling and persistence in the environment, a number of countries have already initiated measures at regional, sub-regional and international level to identify common reduction goals and ensure coordinated implementation among countries.

WHAT WOULD IMPROVE OUR UNDERSTANDING AND INTERNATIONAL COORDINATION?

35. Despite data gaps, sufficient understanding has been developed of mercury (including knowledge of its fate and transport, health and environmental impacts, and the role of human activity), based on extensive research over half a century, that international actions to address the global mercury problem should not be delayed. Nonetheless, further research and other activities would be useful to improve our understanding and coordination in a number of areas, including:

- Inventories of national use, consumption and environmental releases;
- Information on transport, transformation, cycling, and fate of mercury in various compartments;
- Assessment and monitoring of mercury levels in various media (such as air and air deposition) and biota (such as fish), and associated impacts on humans and wildlife, including impacts from cumulative exposures to different forms of mercury;
- Data and evaluation tools for human and ecological risk assessments;
- Additional measures to prevent and reduce releases from various sources;
- Collaboration among nations dealing with the spectrum of scientific and technical issues, including mercury waste management and remediation; and
- Information on the global commerce and trade of mercury and mercury-containing materials.

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[1] Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002 (United Nations publications, Sales no. E.03.II.A1) chap. I, resolution 2, annex.

[2] UNEP/GC.22/INF/3.
