

Enhancing Collaborative Efforts: Global Approaches to Mercury

In 2003, the United Nations Environment Programme (UNEP) Governing Council concluded that there was sufficient evidence of significant global adverse impacts to warrant further international action to reduce the risks due to releases of mercury. At the same time, the GC established the UNEP Global Mercury Program to address global mercury pollution, with a long-term objective of facilitating national, regional and global actions to reduce or, where feasible, eliminate uses and releases of mercury and a short-term objective of encouraging all countries to adopt goals and take actions to identify exposed populations, minimize exposures through outreach efforts, and reduce anthropogenic releases.

With regard to specific activities, the current UNEP Mercury Program is largely focused on raising awareness of global mercury pollution, developing guidance materials to help countries evaluate and address mercury pollution, serving as an information clearinghouse, and facilitating technical assistance and capacity building activities. The current activities are important steps in addressing mercury from a global perspective. The February 2005 Governing Council meeting provides a significant opportunity to move beyond the initial phase of the UNEP Mercury Program to reduce the risks of mercury and, where feasible, facilitate reductions in the use and emissions of mercury. In response to this opportunity, the United States supports an approach to this issue that will expand and complement the activities already established in the UNEP mercury program.

This document proposes a direction for this next phase of action on mercury, calling for international collaborative action to effectively reduce the risks from mercury. This proposed direction aims to build on the UNEP's Mercury Program by describing both an overarching approach and a list of partnerships and collaborative activities for consideration by all stakeholders, including governments, international organizations, industry, and non-governmental organization, to reduce mercury uses and releases.

Addressing mercury globally could best be accomplished by taking a holistic approach that would build on and support the objectives and experiences of many governments, UNEP, and other organizations. The approach incorporates collaborative efforts to achieve the following six objectives:

1. *Enhance international risk communication.* Work under this objective would seek to enhance international awareness and understanding of mercury sources, including through the development and dissemination of important health messages and methods for determining human exposure from dietary sources (e.g., fish consumption advisories, testing methods and protocols for determining the level of mercury in fish) and non-dietary sources (e.g., consumer products) and when to use alternatives.

2. Improve global understanding of international emissions sources, releases, and transport mechanisms. Activities under this objective would encourage collaborative work on transport and fate research; production, use, sources, and emissions data; trends monitoring, modeling, and measuring mercury levels in water bodies and fish.

3. Reduce emissions from point sources. Mercury is emitted to the air via combustion of coal, metal production, mining, crematoria, mercury-cell chlor-alkali plants, waste incinerators, metal smelters, and other point sources. The proposed approach for this objective would build on a number of existing techniques to reduce mercury emissions from point sources by sharing information and expertise on best management practices, air control technologies, and multi-pollutant approaches.

4. Address use in products and processes. Mercury is used in a variety of products and industrial processes which may have efficacious and cost-effective alternatives available. This objective could be addressed by developing several sector-oriented activities involving the sharing of information, best management practices, training, and other methods to reduce demand and emissions of mercury.

5. Reduce supply. A global mercury surplus is expected before 2020, which could keep the price of mercury low and potentially discourage a reduction in use, the implementation of best management practices, and safe management. A component of this objective could include discouraging the subsidization of new mercury mining.

6. Manage waste and surplus. Municipal, hazardous, and medical waste management systems are not uniformly capable of separating mercury from the waste stream. In addition, the global supply of commodity-grade mercury is expected to increase as various secondary sources of mercury overtake the shrinking demand. As a result, there will be an increasing need to safely manage mercury waste and supplies for the long term. Activities to address this objective could involve the sharing of information, best management practices, training, and other methods.

These objectives complement the activities identified in the 2003 UNEP GC Decision 22/4 and its Annex and will accelerate the progress made by the current UNEP Mercury work program. To achieve these objectives, the United States suggests a collaborative approach for Global Mercury Action.

By taking a targeted global approach to the opportunities listed below to control mercury use and emissions in key sectors, a large portion of the global anthropogenic atmospheric sources of mercury can be addressed, improving health and environment conditions in the near-term both locally and globally. The following represent opportunities for global partnerships. Countries and other stakeholders may wish to participate in these partnerships or may wish to develop other activities to address other mercury issues. More detailed descriptions of these proposed partnerships are attached.

- < Chlor-alkali factories: Some older chlor-alkali plants, which produce chlorine and caustic soda, use mercury-cell technologies. Significant mercury use and emissions reductions can be achieved through the sharing of best management practices at these facilities, while non-mercury technologies in new construction can eliminate the need for mercury in this sector over time.
- < Coal combustion: By sharing information and demonstrating various approaches for mercury emissions reduction from utility and industrial boilers, countries will be better able to tailor cost-effective approaches to their specific national needs.
- < Gold mining: Small-scale gold mining results in direct occupational exposures to mercury and significant releases to the environment. Simple management practices can reduce these exposures and releases.
- < Products: Mercury is used in many products, including household appliances, switches, batteries, dental amalgam, thermometers, fungicides, and paints. Where there are efficacious and cost-effective alternatives available to mercury components, reducing mercury use will be highly beneficial in preventing releases in manufacturing and waste combustion.
- < Risk Communication: National efforts to accurately identify and protect public health from mercury risks need to include a sound understanding of how to assess exposures and how to communicate risk prevention information, such as through fish advisories.
- < International mercury fate and transport research: Over the last few years, we have learned a great deal about how mercury cycles and deposits globally. Further cooperation is needed to understand these global cycling dynamics such that we can better target efforts to reduce mercury's health and environmental effects.

We invite governments, NGOs, businesses, and other interested parties to join in this effort.

Global Mercury Partnership with the Chlor-alkali Sector

The Challenge

The chlor-alkali industry is one of the principal users of mercury, with some 80% of this use probably occurring in developing countries. Using data presented in the 2002 United Nations Environment Program Global Mercury Assessment, EPA has calculated that mercury-cell chlor-alkali factories are one of the largest sources of mercury releases to the global environment. EPA estimates there may be 135 - 170 mercury-cell factories globally, half located in developing countries.

The mercury-cell production technology can generate mercury vapor in various ways and these air emissions at many factories in developing countries may not have been regulated. Therefore, some factories, particularly in developing countries, could benefit from information on practical techniques for the responsible management of mercury including through adoption of improved operational practices and component upgrades to reduce mercury releases.

Progress toward achieving reductions in releases can be tracked using the “outcome indicator” of replenishment mercury (this is the amount of mercury that must be added to production equipment to make up for mercury that is consumed during the production process). Using the outcome indicator, factories can track trends in annual consumption rates of commodity-grade mercury.

Because chlor-alkali releases can result in both local and global impacts, all countries can benefit from sharing information on techniques for responsible management that builds on the successful experiences of others.

The Partnership

This partnership promotes reductions in releases from mercury-cell chlor-alkali facilities worldwide, and brings together governments, industry and non-governmental organizations to advance this goal. The stakeholders should take the following actions:

1. Make available information on public policy experiences for improving the environmental performance of mercury cell factories;
2. Make available useful operational information for factories;
3. Develop guidelines for factories for calculating mercury consumption;
4. Facilitate reductions in mercury consumption by encouraging adoption of best management practices; and
5. Assist governments and industry in obtaining reliable reporting from facilities of mercury consumption on an annual basis, providing a comprehensive “outcome indicator.”

Mercury Reductions from the Coal-Fired Power Sector

The Challenge

While there is no comprehensive inventory of global mercury emissions, the coal-fired power sector is estimated to be a significant source of worldwide mercury emissions, contributing to mercury deposition both domestically and internationally. With growing economies and increasing energy demands in much of the world, global mercury emissions from the power sector could increase.

There is general recognition that coal combustion is a major contributor to various air pollution issues (particulate matter, smog, acid rain), however, there seems to be less awareness/attention to mercury emissions from this sector. Control measures (to reduce PM, SO₂, NO_x emissions) are in place, or being considered in many countries. Some control approaches primarily aimed at reducing releases of these pollutants have co-control benefits; that is they also achieve reductions in mercury emissions. The degree of mercury emissions reductions, and the control technology choice, depends on the facility design, type of coal burned, and the existing control equipment. In addition, mercury specific and multi-pollutant control technologies are being developed and evaluated which can provide additional control options.

The Partnership

Significant opportunities exist for the reduction of Hg emissions from coal-fired power plants. A considerable body of information is now available on emissions and control of pollutants from this sector. The US is encouraging countries to form bilateral and regional partnerships with other governments, the private sector, and international organizations, to share information and experience, and to implement specific activities which assist countries to evaluate and address mercury emissions from coal combustion sources. This approach aims to achieve the following objectives:

1. Improve understanding of the magnitude, nature (speciation) and impact of mercury emissions from the coal fired powered sector by sharing technical information, supporting measurement and monitoring programs, assisting with inventory development, and outreach activities.
2. Raise awareness and knowledge of potential cost-effective multi-pollutant approaches (intended to reduce PM, SO₂, NO_x) and the effectiveness of these controls in reducing mercury emissions (co-control). Promote the evaluation, demonstration, and application of these technologies, as appropriate and feasible, considering special national situations (for example - coal types, facility configurations, existing control technologies, new vs. existing plants) thereby helping countries increase the cost effectiveness of their planned control activities.
3. Provide information on the applicability, effectiveness and cost of newly emerging mercury specific and multi-pollutant control technologies for various coal types and facility configurations. Promote the evaluation or demonstration of relevant technologies in countries where interest and funding is available.

The approach would be implemented by a range of activities including bilateral and multilateral cooperation, workshops, technology evaluations and demonstrations.

Global Partnership for Mercury Management in Gold Mining and Refining

The Challenge

Global production of gold from both artisanal or small-scale and large-scale gold mining operations increases as gold prices increase. While data is scarce, estimates of global environmental releases of mercury from artisanal mining range from 300 to 1000 tons per year, a large portion of which are atmospheric emissions. Mercury emissions from mining are not limited to artisanal mining. Industrial-scale gold mining and refining produces approximately 170 tons of global mercury emissions per year, which is roughly 7% of total global atmospheric emissions (UNEP Global Mercury Assessment, 2002).

In artisanal mining, mercury is used to amalgamate the ore. The mercury is burned off after the amalgamation process, typically in an open burner with no recapture of the mercury vapor. Often, large quantities of the remaining mercury-laden wastes remain on land and in water bodies at mining sites. An estimated 20-30 million people, including women and children, work in this sector worldwide and are at some risk of severe neurological impairment from mercury exposure. Simple practices for safe mercury capture and reuse can reduce occupational exposures and risks in the mining communities while also achieving significant reductions in mercury releases. Instituting safe practices can be complicated because artisanal mining can take place in the least developed and populated parts of countries, and in some cases the mining activities themselves are not legal in the country where they are occurring.

Industrial-scale gold production in countries where mercury sulfide is found with the gold ore may result in mercury releases if there is limited mercury capture from the refining process. Releases can be reduced through best management practices and cost-effective controls.

The Partnership

This partnership promotes global reductions in mercury releases from gold mining, and brings together governments, industry and non-governmental organizations to advance this goal. Partners would aim to achieve the following objectives:

1. Increase support for existing efforts to address mercury pollution from mining, such as the UNIDO Global Mercury Project. Encourage more countries to participate actively in the program.
2. Increase community outreach programs to educate mining communities about mercury risks and reduce occupational exposures and environmental contamination.
3. Improve information sharing among governments, private industry, expert groups, and mining communities. Support recommendation made at the UNEP Mercury Awareness Raising Workshop in Buenos Aires for UNEP to set up a virtual mining forum under the auspices of the Global Mercury Program. Ensure linkages with UNIDO program and other relevant programs.

4. Provide technical support for the development and implementation of a Plan of Action for Regional Cooperation on Mercury Contamination in the Amazon Basin, called for at the December, 2004 workshop hosted by the Brazilian Ministry of Environment and the Amazon Treaty Cooperation Organization. Cooperation could include activities related to inventories on mercury use and emissions, adverse effects, monitoring, inspection, capacity-building and training programs, and developing and adopting improved technologies.
5. Improve emissions monitoring, data collection and reporting of mercury use in artisanal mining.
6. Promote and transfer best practices and appropriate technologies to governments, local laboratories and miners through demonstration and introduction of cleaner, cost-effective technologies for artisanal gold extraction, such as recapture for reuse.
7. Exchange information through workshops and other activities for policy makers and industry representatives on cost-effective operational practices to reduce mercury emissions at large-scale mines where gold ores contain mercury sulfide.
8. Develop guidance materials for measuring mercury releases at industrial gold mining and refining operations.

Global Partnership for Reducing Mercury Use in Products

The Challenge

Mercury can be found in numerous consumer and industrial products including household appliances, electronics, batteries, automobile switches, dental amalgams and thermometers. While the U.S. and some other countries have reduced overall mercury usage by phasing out mercury use in many products such as pesticides, fungicides, paints, and some batteries, other countries continue to use mercury in many of these product sectors. For most such products, there are effective alternatives to mercury.

The U.S. EPA and European Union estimate that global mercury usage in processes and products range from 2000-3300 metric tons/yr. Some estimate that battery production accounts for an estimated one third of global mercury use. A large portion of this battery production is for mercuric oxide button cell batteries, no longer produced in the United States.

Reducing mercury use in products is an important step toward preventing future mercury releases into the air, water, or land that may occur during use in manufacturing and industrial processes, and during the recycling or disposal of mercury-containing products and wastes. By decreasing mercury use in products, demand for commodity-grade mercury by product manufacturers is also decreased, thereby reducing demand for new mercury mining.

Partnership for Reducing Mercury Use in Products

This partnership would engage stakeholders from developed and developing countries in order to identify key countries and regions where this issue is of greatest importance. Successful approaches for mercury reduction and information on efficacious and cost-effective alternatives to mercury would be shared with these nations. Activities could include:

1. sharing information and successful approaches with respect to mercury reductions and substitutes in switches, thermostats, batteries, other household products;
2. developing country-specific use inventories and export and import data in key regions and countries; and
3. facilitating consideration of approaches such as the U.S. EPA's successful Hospitals for Healthy Environment program for reducing mercury use and waste in the health care sector in other countries.

Promoting development of messages about fish consumption that improve public health

Reducing mercury emissions on the international scale is expected in time to reduce harmful mercury concentrations in consumed fish, and provide greater margins of safety for reducing the potential health effects of mercury without the need to reduce fish consumption. However, until significant emission reductions are achieved and mercury levels decline in fish, governments may choose to publish appropriate and effective risk communication to enable people to make health-protective dietary choices in the face of conflicting and confusing risk and benefit messages concerning fish consumption.

The Challenge

Mercury is transported globally through the air. Both local and global trends in emission and deposition rates may be reflected in methyl-mercury concentrations in certain fish. Fish and shellfish are an important part of a healthy diet. Fish and shellfish contain high-quality protein and other essential nutrients, are low in saturated fat, and contain omega-3 fatty acids. A well-balanced diet that includes a variety of fish and shellfish can contribute to heart health and children's proper growth and development. So, women and young children in particular should include fish or shellfish in their diets due to the many nutritional benefits.

However, nearly all fish and shellfish contain traces of mercury. For most people, the risk from mercury by eating fish and shellfish is not a health concern. Yet, some fish and shellfish contain higher levels of mercury that may harm an unborn baby or young child's developing nervous system. The risks from mercury in fish and shellfish depend on the amount of fish and shellfish eaten and the levels of mercury in the fish and shellfish.

From the UNEP Global Assessment on Mercury, we understand, in certain circumstances, that fish consumption is a primary environmental pathway for human mercury exposure and is the pathway that affects the greatest segment of the world's population. The potential mercury risk and health benefit from fish consumption depends on a number of factors including fish type, genetics, diet, and exposures related to cultural norms and economic strata. One approach used by governments to promote public health is to issue fish consumption advice that presents the potential risks of exposure to mercury and other contaminants within the context of the many benefits of eating fish.

A clear understanding of the fish consumption and mercury exposure scenarios, including the cultural, geographic, and economic factors that may lead to and, in some cases, necessitate higher fish consumption, is essential to developing effective public health advice. This information includes:

- Species-specific consumption rates for fish, including particular attention to high consumption rates for cultural or economic reasons.
- Gender and age differences in consumption rates.
- Levels of methyl-mercury and other contaminants in fish consumed, particularly in predatory fish.
- Locations of the fisheries and water bodies from which fish are consumed.
- Availability of nutritionally equivalent alternative fish or other food sources for those who depend on fish.
- Cultural needs associated with fish.

Conflicting or confusing information about benefits and risks of fish consumption can lead to decisions about consumption that may increase health risk. It is therefore important to facilitate the development of

advice to consumers based on the best data and risk communication science that encourage consumers to move their diets in directions that improve public health.

Care needs to be taken in helping consumers to weigh the benefits of eating fish against the health concerns about the pollutants in the fish. It is also important to understand the potential economic impacts in regions where fish are virtually the sole source of protein or where alternatives are limited.

Possible Approach

One way to assist countries to address these issues is for the international community (through WHO and UNEP) to collect and synthesize the technical, social and economic issues involved. This involves working with the public health and environmental agencies of countries that have been actively involved with reducing human exposure to environmental pollutants through fish consumption to assess and summarize their experiences. This does not, of course, preclude pilot projects before development of finished guidance and assistance tools. This effort could include consideration of the following sorts of issues and approaches:

1. Determining the level of methyl-mercury in fish.
 - a. Transfer standardized sampling methodologies that maximize information while minimizing costs.
 - b. Provide technical assistance for analytical methods for measuring methyl-mercury levels.
 - c. Identify and recommend important fish monitoring locations not presently covered.
2. Determining the fish consumption patterns of their population and how that information should affect the advice that is given. Provide technical assistance in determining fish consumption levels for general population and high-risk consumers.
3. Developing the most effective exposure information and conveying it in ways that facilitate effective risk communication.
4. Developing a consistent approach to determining consumption advice that considers all factors essential to promoting and improving public health through the advice. This may be an appropriate area to cooperate closely with WHO to develop guidelines.

Following collection of information to develop better exposure assessments, provide technical assistance on the methodology for developing risk communication approaches that considers and balances the benefits of eating fish with the health concerns of pollutants in the fish.

Partnerships for Global Mercury Fate and Transport Research

The Challenge

At present, our ability to assess the effectiveness of global mercury emission control strategies is constrained by the considerable uncertainty concerning the global cycling of mercury in various compartments (atmosphere, oceans, land). Thus, the amount of mercury coming into and being transmitted from individual countries has significant associated uncertainty. This factor, together with often poor release inventories in high release areas of the globe and a lack of standardization of measurement methods and instrumentation, limits the accuracy of modeling predictions.

The study of global cycling is evolving rapidly. New information is challenging our existing conceptions; e.g., it suggests that cycling is occurring much more rapidly than previously believed. These discoveries raise questions that need to be answered in the context of the overarching task of improving the understanding of a global mass balance of mercury. Studies in these areas have been conducted by scientists from several nations, with those from the U.S., Canada, Italy, Germany and some Nordic countries having been among the most active. There is ongoing communication and some field collaboration on these topics among researchers within the global scientific community. UNEP's 2002 Governing Council Decision identified such research as important. Various regional organizations, e.g., UNECE's Convention on Long Range Transboundary Air Pollution (LRTAP) heavy metals protocol, are also undertaking mercury monitoring work to facilitate model evaluations.

Linkages of the scientific community with government organizations could be strengthened to help accelerate the development and dissemination of new knowledge that can provide policymakers the certainty needed for global mercury control strategy effectiveness.

General Approach

Accelerating the advance of such knowledge is possible through a public/private sector partnership approach in which governments, regional governmental organizations and private entities, e.g., industry, universities, cooperate to develop new scientific information that can be shared by all. The U.S., therefore, encourages such partnerships that would build on and augment the objectives and experience of UNEP and other organizations as well as existing partnerships among countries, e.g., the MSC-East (Russian-led) LRTAP-EMEP modeling intercomparison project. Possible UNEP roles could include: participating in/promoting partnerships; hosting workshops; acting as a clearinghouse for monitoring/modeling activities; and, facilitating inter-calibration activities (QA/QC) among different organizations. The approach would aim to achieve the following objectives:

1. Facilitating partnerships in conducting critical research, and, in particular, having them empower countries and regions to take speciated measurements (e.g., the Mediterranean countries are required under their regional strategy to take such measurements);

2. Raising awareness and information transfer of global cycling in risk management decision-making;
3. Facilitating harmonization of methods and modeling procedures that relate to cycling and transport among countries;
4. Facilitating scientist to scientist meetings; meetings that link scientists with policymakers; and ones that integrate modeling, monitoring and other disciplines, e.g., health;
5. Linking scientists in different countries through inter-laboratory exchanges of personnel;
6. Strengthening/augmenting existing mechanisms, e.g., UNEP, for sharing information;
7. Supporting the development of research strategies (national, regional, global) for addressing global cycling and transport; and
8. Facilitating coordination with the Global Earth Observation System of Systems (GEOSS), as it evolves.