

9 Initiatives for controlling releases and limiting use and exposure

9.1 Overview

728. Chapter 9 responds to the request of the UNEP Governing Council to describe ongoing actions and compile information about future plans at the national, sub-regional or regional levels for controlling releases, and limiting use and exposures, including waste management practices. It is divided into 4 sections, covering:

- National initiatives for controlling releases and limiting use of and exposure to mercury;
- International agreements and instruments and their relevance to mercury;
- International organizations and programmes and their relevance to mercury;
- Sub-regional and regional initiatives and their relevance to mercury.

729. The first section on national initiatives examines the issue from several angles. First, a general overview of the main types of measures that have been implemented and a brief status of their implementation is given. Thereafter, a more detailed description of the various types of actions used to reduce or eliminate specific uses in products or releases from point sources are described and concrete examples from different countries that have taken action are given. Finally, three national examples of coordinated approaches to obtaining a set goal of reducing or eliminating uses and releases of mercury, involving extensive national regulation of the use and handling of mercury in the society are described in detail, together with an indication of the reductions in mercury consumption and use that have been obtained through these initiatives.

730. The last 3 sections provide a catalogue of information on international agreements and instruments, international organizations and programmes and sub-regional and regional initiatives and their relevance to mercury. Only some of these initiatives are legally binding on participating countries, however, these initiatives are valuable supplements to national initiatives, and facilitate awareness-raising, information exchange and the setting of reduction goals.

731. It should be noted that, as a supplement to this chapter, a more detailed compilation of national initiatives, including legislation, in each individual country is contained in an appendix to this report, entitled "Overview of existing and future national actions, including legislation, relevant to mercury". The Appendix is published in a separate document. The information compiled therein has been extracted from the national submissions received under this project and is organized along the same lines as this section, thus making it possible to identify additional examples for most of the types of measures described in this section.

732. The chapter shows that the environmental authorities in many countries consider mercury to be a high-priority substance with recognised adverse impacts. They are aware of the potential problems caused by use and release of mercury and mercury compounds, and therefore have found it necessary to protect health and the environment from its adverse impacts by implementing measures at national level to limit or prevent certain uses and releases. However, it is also clear that because of mercury's persistence in the environment and the fact that it is transported over long distances by air and water, crossing borders and often accumulating in the food chain far from its original point of release, a number of countries have concluded that national measures are not fully sufficient. These countries have initiated measures at regional, sub-regional and international level to identify common reduction goals and ensure coordinated implementation.

733. With regard to the information contained in this chapter, if no specific reference is mentioned, the information on national initiatives and regulatory measures is based on that found in the national

submissions to this project. Information on international, sub-regional and regional initiatives is based, in addition to that found in the individual submissions to this project, on information available in the public websites of the organizations or initiatives described.

9.2 National initiatives

9.2.1 Overview of existing national initiatives

734. Table 9.1 gives an overview of types of implemented measures of importance to management and control of mercury, as related to its production and use life cycle, and an indication of their status of implementation. As can be seen from the table, existing types of measures cover most phases in the lifecycle of mercury products and processes. See also chapter 8 for additional information on prevention and control technologies for reducing mercury releases.

9.2.2 Common features of existing national initiatives

735. A number of countries have implemented national initiatives and actions, including legislation, to manage and control releases and limit use and exposures of mercury within their territories.

736. Legislation provides an impetus and a framework for the safe management of chemicals, including mercury and mercury compounds. It may take the form of laws, decrees, orders, regulations, rules, standards, norms and similar written statements of national policy and requirements for behaviour. National legislation is often composed of one or more general or “umbrella” laws, implemented by specific subsidiary regulations. Countries rarely have a single law to cover chemicals, including mercury, instead separate pieces of legislation and separate ministries are commonly involved, highlighting the need for cooperation between government ministries in the development, implementation and enforcement of legislation on chemicals.

737. Although legislation is the key components of most initiatives, safe management of mercury may also include efforts to reduce the volume of mercury in use by developing and introducing safer alternatives and cleaner technology. It may also include other national measures, such as the use of subsidies to support substitution efforts and voluntary agreements with industry or users of mercury.

738. Such initiatives have stimulated significant reductions in mercury consumption in a number of countries, and corresponding reductions of releases have been attained. To date, available overviews of national initiatives, including legislation, addressing mercury have been limited mainly to countries within the OECD. The national information submitted to the Global Mercury Assessment from all regions of the world has cast some new light on this issue.

739. The overall aims of existing initiatives on mercury are to reduce/prevent the release of mercury to the environment and avoid direct/indirect impacts on human health and the environment. Many common features can be found among the countries that have submitted information to this project. The initiatives can generally be grouped as follows:

- A. Environmental quality standards, specifying maximum acceptable mercury concentrations for different media such as drinking water, surface waters, air, soil and for foodstuffs such as fish;
- B. Environmental source actions and regulations that control mercury releases into the environment, including limits on air and water point sources and promoting use of best available technologies and waste treatment and waste disposal restrictions;
- C. Product control actions and regulations for mercury-containing products, such as batteries, cosmetics, dental amalgams, lighting, paints/pigments, pesticides, pharmaceuticals, etc.;
- D. Other standards, actions and programmes, such as regulations on exposures to mercury in the workplace, requirements for information and reporting on use and releases of mercury in industry, fish consumption advisories and consumer safety measures.

Table 9.1 Overview of implemented measures of importance to mercury, as related to its production and use life cycle, and an indication of status of implementation, based on information submitted for this report.

TYPE AND AIM OF MEASURE		STATE OF IMPLEMENTATION
Production and use phases of life cycle		
P O I N T S O U R C E S	Prevent or limit the intentional use of mercury in processes	General bans implemented in very few countries
	Prevent or limit mercury from industrial processes (such as chlor-alkali and metallurgic industry) from being released directly to the environment	Implemented in many countries, especially OECD countries
	Apply emission control technologies to limit emissions of mercury from combustion of fossil fuels and processing of mineral materials	Implemented in some OECD countries
	Prevent or limit the release of mercury from processes to the wastewater treatment system	Implemented in some OECD countries
	Prevent or limit use of obsolete technology and/or require use of best available technology to reduce or prevent mercury releases	Implemented in some countries, especially OECD countries
P R O D U C T S	Prevent or limit products containing mercury from being marketed nationally	General bans implemented in a few countries only. Bans or limits on specific products are more widespread, such as batteries, lighting, clinical thermometers
	Prevent products containing mercury from being exported	Only implemented in a few countries
	Prevent or limit the use of already purchased mercury and mercury-containing products	Only implemented in a few countries
	Limit the allowable content of mercury present as impurities in high-volume materials	Only implemented in a few countries
	Limit the allowed contents of mercury in commercial foodstuffs, particularly fish, and provide guidance (based on same or other limits values) regarding consumption of contaminated fish	Implemented in some countries, especially OECD countries. WHO guidelines used by some countries.
Disposal phase of life cycle		
Prevent mercury in products and process waste from being released directly to the environment, by efficient waste collection		Implemented in many countries, especially OECD countries
Prevent mercury in products and process waste from being mixed with less hazardous waste in the general waste stream, by separate collection and treatment		Implemented in many countries, especially OECD countries
Prevent or limit mercury releases to the environment from treatment of household waste, hazardous waste and medical waste by emission control technologies		Implemented or implementation ongoing in some countries, especially OECD countries.
Set limit values for allowable mercury contents in sewage sludge spread on agricultural land		Implemented in a number of countries
Restrict the use of solid incineration residues in road-building, construction and other applications		Implemented in some OECD countries
Prevent the re-marketing of used, recycled mercury		Only implemented in a few countries

740. As far as can be seen, no country has so far developed one comprehensive legislation covering the lifecycle of mercury. Many countries have a number of actions and regulations covering specific uses or releases - in a few of these countries the implemented actions in total cover the full lifecycle of mercury. Often, legislation related to production, marketing and use of mercury and mercury-containing products are specific to mercury, whereas legislation on releases and the disposal of wastes are often more general, and include other heavy metals and specific inorganic and organic pollutants.

741. It should be noted that considerable variation exists between countries and regions with regard to the types and numbers of uses and releases controlled. Some countries have reported that they have no legislation covering mercury at all, while for example Sweden has a number of regulations which in total aim to phase out, as far as possible, most uses of mercury in the country by 2003 (see section 9.2.4 SWEDEN for details). It must also be kept in mind that the existence or not of initiatives and legislation on mercury in a country must be seen in connection with the use and release patterns of that country and the need to address specific risks to health and the environment posed by these uses or releases.

9.2.3 Common types of national initiatives

742. This section contains a summary of some of the most common types of initiatives implemented within each of the 4 groups described above. It should be noted that the descriptions are general and that some countries might have even more restrictive measures in place.

743. A more detailed compilation of national initiatives, including legislation, in each individual country is contained in an appendix to this report, entitled "Overview of existing and future national actions, including legislation, relevant to mercury". The Appendix is published in a separate document. The information compiled therein has been extracted from the national submissions received from countries under this project and is organized along the same lines as this section, thus making it possible to identify additional examples for most of the types of measures described in this section.

A. Environmental media standards, specifying a maximum acceptable mercury concentration for different media

744. **Water, air and soil** - In order to limit the general population's exposure to mercury and mercury compounds, a number of countries have established standards setting maximum acceptable concentration limits for mercury in a number of different media, such as water (drinking water, surface waters, water to be used for irrigation, water for livestock, etc.), air (ambient air, indoor air, etc.) and soil. In contrast to source related regulations, which apply directly to individual sources, these environmental standards have an indirect effect on individual sources and releases. Often, they form the basis for regulation of individual sources. The limits vary from country to country, examples can be found in the Appendix mentioned above.

745. It should also be noted that WHO has developed guidelines for drinking water quality (WHO, 1993) and air quality (WHO, 1999) that provide a basis for protecting public health from adverse effects of air pollution and for eliminating, or reducing to a minimum, those contaminants that are known to be hazardous to human health and well being. Both of these guidelines also cover mercury. The guidelines provide background information for setting national quality standards. In moving from guidelines to standards, prevailing exposure levels and environmental, social, economic and cultural conditions in the country should be taken into account. In certain circumstances there may be valid reasons to pursue policies that will result in pollutant concentrations set above or below the guideline values.

746. **Foodstuffs** - In order to limit the general populations exposure to mercury and mercury compounds, a number of countries have established standards setting maximum acceptable concentration limits in a number of foodstuffs. The most common seems to be for fish and shellfish, although India also has reported limits for vegetables and milk. The standards vary from country to country, examples can be found in the Appendix mentioned above. See also section 4.2.1 for mercury limits in fish.

747. The FAO/WHO Codex Alimentarius Commission has also set guideline levels for methylmercury in fish, as follows:

All fish except predatory fish:	0.5 mg/kg;
Predatory fish (such as shark, swordfish, tuna, pike and others):	1 mg/kg.

Where the guideline levels are exceeded, governments are recommended to decide whether and under what circumstances, the food should be distributed within their territory of jurisdiction and what recommendations, if any, should be given as regards restrictions on consumption, especially by vulnerable groups such as pregnant women. (Codex Alimentarius, 1991)

748. **Consumption** – Some countries have issued consumption advisories with regard to foodstuffs that are known to contain high mercury concentrations. For example, Australia, Canada, Norway, Sweden, the United Kingdom and the United States have issued fish advisories to consumers containing recommendations on how to reduce exposures to mercury and other toxic chemicals through consumption of fish. Often, consumer groups especially at risk, such as pregnant women and women of child-bearing age, are covered by such advisories.

749. The US Food and Drug Administration has advised women of childbearing age to limit their consumption of shark, swordfish, tilefish and king mackerel based on methylmercury content. States, tribes and territories are responsible for issuing fish consumption advice for locally caught fish; many state health departments use 0.5 ppm methylmercury as a trigger for such advice. The authorities of Sweden recommend pregnant or lactating women and women planning to have children soon, not to consume species such as pike, perch, pikeperch, burbot and eel because of risk for increased methylmercury exposure. Since fish consumption in general is encouraged, the general population is encouraged to consume these species, but not more often than once a week on average. Another example is the Food Standards Agency in the United Kingdom, which in May 2002 advised that pregnant women, women who intend to become pregnant, infants and children under 16 years of age should avoid eating shark, swordfish and marlin. Occasional consumption of shark, swordfish or marlin as part of a balanced diet by any other adults is unlikely to result in harmful effects, however, on a precautionary basis, they were advised against eating more than one portion a week of either shark, swordfish or marlin.

750. **Exposure** - A tool used to assess the risk of mercury to the general population is dose-response assessments. The US EPA has for example established a “Reference dose” for methylmercury of 0.1 µg/kg body weight per day. The reference dose is an estimate of daily exposure to the human population that is likely to be without an appreciable risk of adverse effects during a lifetime. Canada recently set a temporary or provisional Tolerable Daily Intake (TDI) for mercury of 0.2 µg/kg body weight per day for women of child-bearing age and young children, based on health considerations for pre-natal exposure and during the period of early central nervous system development in childhood.

751. Also, the Joint FAO/WHO Expert Committee on Food Additives (JECFA) has established a provisional tolerable weekly intake (PTWI) for methylmercury of 3.3 µg/kg body weight per week. The tolerable intake represents the maximum acceptable level of a contaminant in the diet; the goal should be to limit exposure to the maximum feasible extent, consistent with the PTWI. (FAO/WHO, 1999)

B. Environmental source controls/regulations that control mercury releases into the environment

752. **Emission limits for air and water point sources** - Many countries have legislation prescribing maximum allowable releases of mercury (and other pollutants) from various types of industrial and other facilities (point sources) to air, water and soil/groundwater. Such legislation might require use of exhaust gas filters, wastewater treatment and handling of solid residues similar to that of household waste incinerators. Also, legislation has been implemented preventing or limiting the release of mercury from processes to the wastewater system in order to limit releases to the water recipient, to permit the use of the sludge as fertiliser on agricultural land and to reduce treatment costs. Legislation limiting emissions of a number of pollutants from combustion of fossil fuels is also common in a number of countries, however, legislation covering mercury emissions from coal-fired power plants (a major source) appears to be rare.

753. **Best available techniques**²⁸ - For certain types of potentially heavily polluting industries, for example the chlor-alkali industry, legislation might not be limited to setting emission limits to air, water and soil, but might also require the use of specific, less polluting production methods and pollution prevention technologies or “best available techniques”.

²⁸ As contrasted with “best available technologies,” “best available techniques” (BAT) is a wider term that includes best available technologies but also considers other techniques such as process change, etc. BAT is increasingly used in regional (e.g. EU) and global (e.g. the Stockholm Convention and the Aarhus Protocol to the LRTAP Convention) forums, where it is well defined and well accepted.

754. For example, under the Clean Air Act Amendments of 1990 the US EPA regulates Hazardous Air Pollutant Emissions by industrial source categories using Maximum Achievable Control Technology (MACT) standards for each "major source" in any source category. A MACT standard is defined based on an analysis of existing control technology among the best-controlled sources in a given source category. Another example is the European Community Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control. It requires the application of best available techniques (BAT) to prevent or reduce pollution of the air, water and land from a number of industrial activities in order to achieve a high level of protection of the environment taken as a whole. As part of implementation of the Directive, reference documents on best available techniques (BREF) are developed for different sectors. See section 9.2.4 EUROPEAN COMMUNITY for more details.

755. **Waste incineration** - Legislation prescribing maximum allowable releases of a number of pollutants, including mercury, from incineration facilities for household and hazardous wastes respectively, to the atmosphere and wastewater, as well as specifications on the deposit of solid incineration residues exist in a number of countries. Indirectly, such legislation might dictate the use of a limited number of emission control technologies, which are capable of complying with the emission requirements. For example, some countries have extensive exhaust gas filtering on all waste incineration facilities (hazardous, medical and household waste), holding back a major part of the otherwise emitted mercury.

756. **Use of solid incineration residues** - Legislation is also found prescribing maximum allowable concentrations of mercury, often together with other pollutants, in ashes and slag from waste incineration and fossil fuel combustion that can be used for construction purposes (roads, etc.), as well as in wastewater sludge to be used as fertiliser on agricultural land.

757. For example, Belarus reports that accounting, storage conditions, collection and utilization of mercury-containing wastes are governed by the normative document "Regulations on the procedure of accounting, storage, collection of mercury and mercury-containing wastes", approved by the Ministry of Economy, Ministry of Natural Resources and Environment Protection, Ministry of Public Health and Ministry for Extreme Situations. In Switzerland, for example, the Ordinance on Substances (1986) sets a maximum level of 5 mg/kg of mercury in sewage sludge (OECD, 1994), while in Finland sludge from wastewater treatment plants may be used as fertilizers in agriculture only if the concentration of mercury in the pre-treated sludge is under 1 mg/kg dry weight.

758. **Waste treatment** – In a number of countries, especially those within the OECD, legislation exists prescribing separate collection and waste treatment of products and process waste containing mercury – for example batteries, fluorescent light tubes and dental amalgam filter residues. The aim of such legislation is to prevent or minimise the diffuse spreading of mercury-containing products and prevent dumping of process waste in the environment, as well as limiting the amounts of mercury-containing waste in the general household waste stream (where it causes significant mercury emissions and increases waste treatment costs).

C. Product control regulations for mercury-containing products

759. Regulatory measures limiting or preventing a large range of products containing mercury from being marketed nationally, and in some cases also prohibiting import and export, have been implemented in a large number of countries through the world.

760. **Batteries** – As alternatives have become increasingly available, many countries have in recent years implemented legislation setting permissible levels of mercury in batteries and accumulators, effectively prohibiting use of mercury oxide batteries and severely limiting the use of mercury-containing button cell batteries. Such legislation might also require the separate collection of mercury containing batteries.

761. In Switzerland, for example, the Ordinance relating to Environmentally Hazardous Substances, amended in 1998 and which also deals with batteries, limits the mercury and cadmium contents of batteries sold in articles of any kind to < 0.001 percent (w/w). Exceptions require special approval. It also defines consumers' duty to return used batteries and traders' duty to accept returned batteries of all

kinds. In addition, the annex defines producers' obligation to pay a fee to the respective organization, when commercializing batteries and battery-containing articles. This fee covers the cost of adequate waste treatment.

762. In Mauritius, mercury batteries are no longer used and have been replaced by nickel/cadmium batteries. A national campaign was launched to collect all mercury cells a few years ago. There is, however, still a problem with disposal/recycling. There is an ongoing awareness programme for the collection of mercury button cells until a policy decision is taken regarding their safe disposal.

763. Some countries have dealt with the issue of mercury in batteries through voluntary measures. The Canadian Household Battery Manufacturers' Association eliminated the deliberate addition of mercury to household alkaline, zinc-carbon and zinc-chloride batteries as of January 1997. The only major type of mercury-containing battery available in Canada may be mercury-oxide batteries.

764. **Cosmetics** – Legislation also exists limiting or prohibiting mercury in cosmetic products. An example is European Community Directive 76/768/EEU (and its amendments 2000/6/EU and 2000/11/EC) on the approximation of the laws of the member states relating to cosmetic products. This Directive stipulates that mercury and its compounds may not be present as ingredients in cosmetics, including soaps, lotions, shampoos, skin bleaching products etc. (except for phenyl mercuric salts for conservation of eye make-up and products for removal of eye-make-up in concentrations not exceeding 0.007 percent weight to weight).

765. In Cameroon, an inter-ministerial Order bans the importation, marketing and use of cosmetic products containing more than 2 percent mercury. Under this order, twelve soaps and thirteen creams were banned.

766. **Dental amalgam** – A number of countries have put in place measures to reduce or even phase out the use of mercury in the dental sector. In addition to the use of amalgam separators to substantially reduce the amount of mercury discharges through wastewater from dental clinics (combined with appropriate service to maintain the effectiveness of these systems), some countries are also promoting the substitution of mercury-containing amalgam fillings, especially among sensitive populations including pregnant women, children and those with impaired kidney functions.

767. Denmark and Sweden are perhaps among those countries that have gone the farthest in attempting to eliminate the use of mercury-containing amalgam. The Swedish Government's overall goal to phase-out mercury also includes dental amalgam. In Sweden the consumption of mercury for dental use has decreased significantly after a policy decision by the Parliament in 1994 to phase out the use of dental amalgam. Up to now dental amalgam has been subject primarily by voluntary phasing out measures. In Denmark, dental amalgam is allowed only in molar teeth, where the filling is worn, but the Government is ready to ban the remaining use of dental amalgam, whenever the Danish National Board of Health is satisfied that the non-mercury alternatives have full substitution capabilities. Currently, Norway is developing a directive on the use of dental filling materials, which will encourage dentists to reduce the use of amalgam as much as possible. The directive is expected to take effect 1 January 2003.

768. In New Zealand, a "Practice guideline - controlling dental amalgam waste and wastewater discharges" has been adopted, describing a code of practice on the use, storage, collection and disposal of mercury in New Zealand dental surgeries. It recommends that amalgam scrap should be collected, stored and sent for recycling or for disposal at an approved landfill when collection for recycling is not available. Amalgam scrap should be stored under water in an airtight container to reduce mercury vapour levels. Also, amalgam scrap and contaminated particulate amalgam waste should not be disposed of in any medical waste to be incinerated. Dental surgeries should use systems to reduce amalgam discharge to wastewater - in regions where reductions in total mercury discharge to wastewater are required by territorial local authorities, amalgam separators should be installed and serviced appropriately to maintain the effectiveness of these systems. In addition, the Ministry of Health commissioned an extensive review of dental amalgam and human health in early 1997 and found that no new scientific evidence had emerged to indicate present or future public health problems associated with the use of amal-

gam in dental fillings. It has issued precautionary advice for dentists and pregnant women. It recommends that amalgam still be used but with informed consent from patients and is advising dentists to avoid using or removing any tooth filling material in pregnant women, where clinically reasonable.

769. **Electric equipment** – Within the European Community, a proposal for a new directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment involving mercury is currently under discussion in the European Council and Parliament. The proposed Directive requires the substitution of mercury in electrical and electronic equipment by 2008. In the proposal, switches and other electrical control devices are included, whereas fluorescent lamps up to certain limits (10 mg mercury/lamp) and certain other mercury-containing lamps are exempted. In Sweden, mercury-containing measuring and control instruments, as well as electric and electronic components are banned for manufacture and sale since 1993.

770. **Lighting** – Also with regards to lighting containing mercury there are national initiatives ongoing both to reduce the amount of mercury used in such products, to recycle the mercury contained in spent products and to find acceptable non-mercury substitutes for such products. See also section 8.2 on substitution.

771. In Trinidad and Tobago, a certain replacement of devices that contain mercury has taken place. Currently, a major manufacturer of lighting fixtures has switched to low-mercury fluorescent lamps containing up to 3 mg mercury per lamp. The lamps are classified as non-hazardous waste in the United States, and can be disposed of in municipal landfills. These low-mercury fluorescent lamps are available in Trinidad and Tobago, and their use is one means of controlling mercury.

772. The Canada-wide Standard for mercury-containing lamps takes a pollution prevention approach by reducing the mercury content of lamps sold in Canada. The standard is a 70 percent reduction by 2005 from a 1990 baseline, and an 80 percent reduction by 2010 in the average content of mercury in all mercury-containing lamps sold in Canada. The average mercury content in fluorescent lamps has fallen from 48.2 mg in 1985 to 27 mg in 1995, with an industry target to further reduce mercury content to 15 mg.

773. Belarus reports that there are three organizations engaged in rendering spent mercury-containing lamps harmless and one that renders them harmless and removes the mercury from mercury-containing wastes. The total capacity of all four organizations is about 3.5 million lamps per year and 10 metric tons of mercury-containing wastes. About 1.2 million spent mercury-containing lamps are disposed of each year.

774. Switzerland reports that there is still very significant use of mercury-containing fluorescent lamps, however, there are also an increased recycling rate. The Swiss heavy metal recycling organization is specialized in treating batteries and other mercury-containing waste. Between 1999 and mid-2001, it took in a yearly average of 154 metric tons of mercury-containing waste, of this ~32 metric tons of broken fluorescent lamps.

775. In Denmark, mercury-containing products are generally banned, however, special light sources (fluorescent tubes, including low-energy bulbs, for analysis apparatus and for graphic operations) are allowed until further notice, since satisfactory substitutes are not yet available.

776. **Packaging and packaging waste** – A few countries have in recent years set limits on the content of some heavy metals, including mercury, in packaging materials, in order to limit the flow of mercury into the waste stream. The EU packaging directive is, among others, aimed at promoting packaging materials recycling/energy recovery and limiting the flow of heavy metals to waste treatment and resulting environmental releases. The Directive sets limits on allowed concentrations of mercury present as impurities in packaging materials. See section 9.2.4 EUROPEAN COMMUNITY for details.

777. **Paints/pigments** – Mercury was previously used extensively as a biocide in paints, however, such use has now been substantially reduced or eliminated in a large number of countries. For example,

Mauritius reports that mercury is no longer used in paints. In Trinidad and Tobago, mercury was used in paints as a fungicide, but today on the whole, mercury has been replaced by other biocides.

778. In Costa Rica, the regulation on the content of lead and mercury in paints sets a maximum limit of mercury in paints to 0,005 percent. Also, Thailand reports that less than 25 percent of the factories in Thailand still use mercury as an additive in the process and in quantities of not more than 0.5 percent by total weight. Some paint industries in Thailand have no mercury involved in their processes since 1991, and are certified "green label".

779. **Pesticides** - Sale and use of pesticides containing mercury for plant protection purposes and as a seed dressing have been severely restricted or prohibited/discontinued in a large number of countries throughout the world, although certain limited uses remain allowed in some countries. Lesotho has reported that two mercury-based pesticides, used as a dip for potatoes and as a seed dressing for seed-borne diseases in grain crops, have been discontinued. In Colombia, registration of fungicides for agricultural use based on mercury compounds was cancelled. Presently, no registration has been granted for any mercury-based pesticide.

780. In Australia, two products containing mercury are registered for use on sugarcane and horses. One liquid fungicide product contains 120 g/l of mercury as methoxy-ethyl mercuric chloride to control pineapple disease in sugarcane setts, which are dipped in or sprayed with a dilute solution before planting. Another product for horses contains mercuric chloride at 3 g/l and is used topically to treat leg injuries, soreness and musculoskeletal conditions.

781. **Thermometers** – Mercury-containing thermometers is a product consumers all over the world are familiar with. In Sweden, the import, professional manufacture and sale of clinical mercury thermometers were prohibited from 1 January 1992. Professional manufacture, import and sale of thermometers, level switches, pressure switches, thermostats, relays, electrical contacts and other measuring instruments has been banned since 1993. A few exemptions still exist, mainly for spare parts, however, a time-schedule for phase-out is stipulated for each exemption. In addition, in order to promote collection of mercury thermometers, economic incentives have been used to persuade households to turn in their mercury thermometers. In Denmark, there is a general ban on sale of mercury containing thermometers. Exemptions from this ban are primary EU approved thermometers.

782. **Thermostats** - As a voluntary measure, the industry-funded Thermostat Recycling Corporation (TRC) launched a programme in 1997 to recycle mercury-switch thermostats in nine states. It has since been expanded to 48 states in the USA, and in 2001 collected 48,215 thermostats and 402 pounds of mercury, for a total of more than 120,000 thermostats and 1,000 pounds of mercury since the programme's inception.

783. **Vehicles** – European Community Directive 2000/53/EC of 18 September 2000 on end-of life vehicles, lays down measures that aim at prevention of waste from vehicles and promotion of reuse, recycling and other forms of recovery of end-of life vehicles and their components so as to reduce the disposal of waste, as well as at the improvement in the environmental performance of all of the economic operators involved in the life cycle of vehicles. According to Article 4 of this Directive, mercury is restricted in materials and components of vehicles. Materials and components of vehicles put on the market after 1 July 2003 shall not contain mercury.

784. In the United States, the use of mercury-containing light applications in vehicles is gradually being phased out through voluntary initiatives by the auto manufacturing industry. See section 9.2.4 UNITED STATES for details.

785. **Pharmaceuticals - Vaccines** - Thiomersal (also known as thimerisol, thimerosal or mercuriothiolate) is a mercury-containing compound used in trace amounts to prevent bacteria and other organisms from contaminating vaccines, especially in opened multi-dose vials. According to WHO, none of the "live" vaccines, including measles, MMR, oral polio, yellow fever, and BCG contain thiomersal. Many of the other vaccines in single-dose vials do not contain thiomersal either. However,

multi-dose formulations of triple vaccine (DTP), diphtheria and tetanus toxoids (DT and Td), tetanus toxoid (TT) and some hepatitis B vaccines on the global market contain thiomersal. According to WHO, there are other chemicals such as 2-phenoxy-ethanol used as vaccine preservatives, however, thiomersal is currently the best alternative. (WHO, 2001) (For more information, see <http://www.who.int/vaccines-surveillance/ISPP/hotQAthiomersal.shtml>.)

786. Only one country has provided information with regard to vaccines containing mercury. In the United States, under the Food and Drug Administration Modernization Act of 1997, FDA is required to assess the risk of all mercury containing food and drugs. Under this provision, FDA asked vaccine manufacturers to provide information about thimerisol content of vaccines. Based on this information, the Public Health Service, the American Academy of Pediatrics, and vaccine manufacturers agreed that thimerisol-containing vaccines should be removed as soon as possible. Manufacturers have been asked for a clear commitment to eliminate mercury from vaccines, and FDA will do expedited reviews of resulting revisions to product license applications.

787. According to the Immunization Safety Office of the WHO, WHO continues to recommend the use of thiomersal-containing vaccines. These vaccines have been used safely throughout the world for decades, helping to save many millions of children's lives. Further, WHO emphasises that the new USA recommendations regarding thiomersal-containing vaccines were based on risk-benefit assessments conducted in the USA and therefore caution should be used in generalising those recommendations to other countries. The potential levels of exposure to thiomersal, and therefore to any health risks, will differ in different countries based on the recommended immunization schedule and the specific vaccines used in each country. (WHO, 2001)

788. **Other products** - A few countries also have regulations that prescribe aspects of user safety for private consumers, for example in toys, textiles, certain chemical preparations, etc. For example, the amount of mercury allowed in a consumer product is under the jurisdiction of Health Canada's *Hazardous Products Act*. Selling, advertising or importing toys, equipment or other products into Canada is prohibited if they may be in contact with children and have a decorative or protective coating containing any compound of mercury.

D. Other standards and programmes

789. **Occupational health and safety** - A number of countries have also implemented measures to ensure occupational safety and health of workers and regulate exposures to mercury in the workplace, often by establishing so-called Permissible Exposure Limits (PELs). Limits vary from country to country, examples can be found in the Appendix mentioned earlier.

790. **Information and reporting requirements** – Several countries have developed systems to collect and disseminate data on environmental releases and transfers of toxic chemicals from industrial facilities, often known as Pollutant Release and Transfer Registers (PRTRs). PRTRs have proven valuable, not only to track the environmental performance of industrial facilities and the effectiveness of government programmes and policies that apply to them, but also to stimulate voluntary initiatives by companies to reduce their releases and transfers of toxic chemicals.

791. An example of such a system is the United State's Toxics Release Inventory (TRI). Starting with the 2000 reporting year, the reporting threshold for mercury and its compounds has been lowered to 5 kilograms per year (the previous threshold was 4500 kilograms). Through this action, the United States will have a much more comprehensive picture of the amounts of mercury and its compounds that are released to the air, water, land, transferred off-site for disposal, transferred off-site for recycling or recycled on-site. Canada also has a PRTR equivalent, the National Pollutant Release Inventory (NPRI).

792. A third example is Australia's National Pollutant Inventory (NPI), which reports information, based on estimation techniques, on the types and amounts of certain chemicals being emitted to the environment. It provides the community, industry and local governments with access to consistent and reliable information about pollutant emissions in Australia. Reporting of emissions is mandatory if an industry surpasses various use thresholds. Reporting for the 1998-1999 and 1999-2000 reporting years

was voluntary, but from 2000-2001 onwards will be compulsory. Enforcement is the responsibility of the relevant Australian State or Territory.

793. **International and regional agreements** – A number of countries also participate in international and regional conventions and agreements, which might set supplementary reduction goals with regard to mercury releases. Such conventions and agreements relevant to mercury are described later in section 9.3.1.

9.2.4 Examples of comprehensive national initiatives to reduce or eliminate uses and releases of mercury

794. The previous section clearly shows that mercury is addressed at national level through a large number of different measures, often aimed at limited specific uses or releases and often involving different ministries and institutions. However, there are some examples of coordinated approaches to obtaining a set goal of reducing or eliminating uses and releases of mercury, involving extensive national regulation of the use and handling of mercury in the society. Descriptions of the national approaches currently being implemented within the European Community and in Sweden and the United States are given below, together with an indication of the reductions in mercury consumption and use that have been obtained through these initiatives. The information in these sections has mainly been extracted from the national submissions (European Community - sub40gov; Sweden – sub28gov, USA – sub23gov). The summary for the USA has been supplemented with information from US EPA - GLNPO (1999).

EUROPEAN COMMUNITY

795. The European Community legislation is of interest in that it must be implemented in all of its 15 Member States, representing a significant part of the mercury consumed in Europe.

796. **Water point sources** - Several Community Directives exist, which together limit mercury pollution of inland surface, territorial and internal coastal waters and set Community-wide standards regarding discharges of mercury for a considerable number of industrial sectors. Also, the new Water Framework Directive has been approved, laying down an integrated EU strategy for harmonised water quality standards and controls. Mercury is one of the "priority hazardous substance" covered, and releases in the aquatic environment are to be phased out within 20 years. Necessary measures will be elaborated by the end of 2003.

797. **Waste incineration** - Also, a Community Directive exists on the incineration of waste. The aim of this Directive is to prevent or limit as far as possible the negative effects on the environment, in particular pollution by emissions to air, soil, surface water and groundwater, and the resulting risks to human health, from the incineration and co-incineration of waste. The Directive sets out air emission limit values for waste incineration and co-incineration plants and for discharges of wastewater from the cleaning of exhaust gases. The provisions apply to new installations as from 28 December 2002 and for existing installations as from 28 December 2005.

798. **Integrated pollution prevention and control** - An important Directive of relevance to its efforts to reduce mercury pollution within the Community is EC Council Directive 96/61/EC concerning integrated pollution prevention and control. The aim is to achieve integrated prevention and control of pollution arising from activities such as energy industries, production and processing of metals, mineral industry, chemical industry, waste management and other activities like intense livestock farming, pulp and paper industry and tanneries. The Directive requires such industries to apply best available techniques (BAT) to prevent or, where that is not practicable, to reduce pollution of air, water and land, including measures concerning waste, in order to achieve a high level of protection of the environment as a whole. The Directive includes mercury and its compounds. The requirements apply to new or substantially changed installations by 30 October 1999 and for existing installations after 30 October 2007. As part of implementation of the Directive, reference documents on best available techniques (BREF) are developed for different sectors.

799. **Chlor-alkali production** - There is also a BREF on chlor-alkali production. According to this BREF, best available techniques specific to mercury cell plants include conversion to membrane cell technology - during the remaining life of mercury cell plants, all possible measures should be taken to protect the environment as a whole. The chlor-alkali producers within the EC have expressed their support for the measures set out in this BREF. As a further step they have presented relevant authorities with voluntary commitments²⁹ made with a view to facilitating the transition away from the mercury-based chlor-alkali process. The producers have renewed their earlier 1995 commitment not to use mercury technology for new plants, not to transfer redundant equipment to third parties for re-use, to further reduce emissions according to a quantified schedule, to ensure transparency in detailed plant-by-plant data reporting, to close or convert the existing plants when they reach the end of their economic life and to ensure the environmentally sound management of metallic mercury from the shutdown cells.

800. **Batteries** - Community-wide directives regulating a number of mercury-containing products exist. The Battery Directive (Directive 91/157/EEC) regulates the permissible amount of mercury in batteries and also mandates separate collection of batteries containing mercury and other heavy metals. The limits on mercury content were tightened further by an amendment to the directive in 1998 (directive 98/101/EC) which requires that member states prohibit, as from 1 January 2000 at the latest, the marketing of batteries and accumulators containing more than 0.0005 percent of mercury by weight, including batteries and accumulators incorporated in appliances. Button cells and batteries composed of button cells with a mercury-content of no more than 2 percent by weight are exempted from this prohibition.

801. **Certain dangerous substances and preparations** - The directive 76/769/EEU on the approximation of the laws, regulations and administrative provisions of the member states relating to restrictions on the marketing and use of certain dangerous substances and preparations prohibits the use of mercury substances in marine anti-fouling paints, wood preservatives, for textile treatment and in industrial water treatment. This “use and marketing” Directive gives a framework and a simplified legislative procedure through which the EU may ban or restrict hazardous chemicals by adding the substances and controls to an annex to the directive. Additions of chemicals and preparations to the legislation have been done in several amendments.

802. **Cosmetics** - According to Directive 76/768/EEU (and its amendments 2000/6/EU and 2000/11/EC) on the approximation of the laws of the member states relating to cosmetic products, mercury and its compounds may not be present as ingredients in cosmetics, including soaps, lotions, shampoos, skin bleaching products, etc. (except for phenyl mercuric salts for conservation of eye make-up and products for removal of eye-make-up in concentrations not exceeding 0.007 percent weight to weight) that are marketed within the European Community.

803. **Packaging and packaging waste** – Directive 94/62/EC of 20 December 1994 on packaging and packaging waste aims to harmonize national measures concerning the management of packaging and packaging waste in order to prevent any impact thereof on the environment of all Member States as well as of third countries and also to ensure the functioning of the internal market and to avoid obstacles to trade within the Community. The Directive lays down measures aimed, as a first priority, at preventing the production of packaging waste and, as additional fundamental principles, at reusing packaging, at recycling and other forms of recovering packaging waste and, hence, at reducing the final disposal of such waste. Article 10 of the Directive sets a specific reduction plan for heavy metals present in packaging - the sum of concentration levels of lead, cadmium, mercury and hexavalent chromium present in packaging or packaging components shall not exceed specific, set levels within a time period of 5 years, starting with 600 ppm by weight by 30 June 1998, at the latest, and going down to 100 ppm by weight by 30 June 2001, at the latest.

²⁹ “Voluntary Commitments by each Western European Chlor-Alkali Producer (Mercury cells)”, submitted to OSPAR in 1999 and subsequently strengthened. Although submitted in the context of discussions with OSPAR, the commitments are made individually by every producer in Western Europe, including all producers in the EC.

804. **Pesticides** - The sale and use of pesticides for plant protection based on mercury compounds are prohibited by Directive 79/117/EEU and its amendments. This also applies to seed treatment. Export of such preparations to countries outside the European Community is not covered by the Directive.

805. **Vehicles** - European Community Directive 2000/53/EC on end-of life vehicles was adopted 18 September 2000. It lays down measures that aim at prevention of waste from vehicles and promotion of reuse, recycling and other forms of recovery of end-of life vehicles and their components so as to reduce the disposal of waste, as well as at the improvement in the environmental performance of all of the economic operators involved in the life cycle of vehicles. According to Article 4 of this Directive mercury, inter alia, is restricted in materials and components of vehicles. Materials and components of vehicles put on the market after 1 July 2003 shall not contain mercury.

Additional measures and initiatives under consideration within the European Community

806. Within the Fourth Framework Programme (1994-1998), the European Commission initiated work to evaluate the appropriateness of EU heavy metals policy to human and environmental risks, especially considering third countries indirectly affected by European Union policy, the so-called EUPHEMET project. The project was also to propose a modified strategy at European Union level, as well as appropriate policies and/or institutions at the international level, with special attention to realising the full potential of existing international institutions. After submission of the report to the European Commission, it has been transformed into a "Handbook for sustainable heavy metals policy and regulation", published in December 2001 by Kluwer Academic Publishers in its book series Environment & Policy. The handbook also contains case studies on mercury, lead and cadmium.

807. Recently, the European Commission released the "Ambient air pollution by mercury (Hg) - Position Paper". This is a technical report prepared by a number of experts nominated by Member States as part of a working group on mercury. It fulfils the requirement of the Council Directive on Ambient Air Quality Assessment and Management, better known as the Framework Directive (FD) and is aimed to support the preparation of Daughter Directives (DD). The position paper is based on state-of-the-art knowledge of European sources and major processes/ mechanisms that influence the cycle of mercury in Europe and in the global environment, and should be considered as a "snapshot" of current understanding. It recommends that a long-term strategy for the reduction of the methylmercury levels in fish from European waters should be adopted. As a part of this strategy, the working group proposes a specific action plan for reduction of the atmospheric input of mercury to terrestrial and aquatic ecosystems in Europe which includes reductions of mercury emissions from major anthropogenic sources and a complete phase-out of the use of mercury in major goods.

808. **Products** - The European Commission is currently investigating further potential regulatory actions on products containing mercury, in preparation of potential amendments to the marketing and use directive (directive 76/769/EEC). Among others, the following mercury-containing products are reported to be under consideration: Button cell batteries, industrial and control instruments, lighting and thermometers (OSPAR, 2000c). Within these considerations, it is also under discussion whether a full substitution is justified, taking into account the ongoing reduction of mercury use within the European Community versus the substantial mercury emissions from non-product sources like coal combustion (OSPAR, 2001).

809. **Electrical equipment** - A proposal for a new directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment involving mercury is currently under discussion in the European Council and Parliament (RoHS COM, 2000, final). The proposed Directive requires the substitution of mercury in electrical and electronic equipment by 2008. To take into account new scientific evidence, a review of the substitution requirement is envisaged for 2004. The list of exemption could therefore be amended reflecting future technical developments. Switches and other electrical control devices are included, whereas fluorescent lamps up to certain limits (10 mg mercury/lamp) and certain other mercury-containing lamps, are exempted.

SWEDEN

810. Risk reduction of mercury has been an item of high priority in Sweden since the 1960's. In the early 1990's it was concluded that the substantial reduction of mercury releases achieved at point sources would not be sufficient to reduce the environmental load beyond critical levels. It was estimated that mercury content in fish in about 40,000 lakes (i.e. about half of the Swedish lakes) exceeded the limit value of 0.5 mg/kg recommended by the FAO/WHO Codex Alimentarius Commission. In the Government Bill 1990:91/90 "En god livsmiljö" (A living environment), a numerous set of legislative and voluntary actions were proposed, with the ultimate aim of a total phase-out of mercury use. Since then, the set of actions has several times been re-approved and strengthened in various government bills and parliament decisions.

811. Table 9.2 presents some of the major initiatives on mercury use that have been implemented in Sweden as a result of the 1990 overall goal of total phase-out of mercury. It should be noted that Sweden is a Member State of the European Community since 1 January 1995, and is required to implement all Community legislation that applies to mercury, as described in the section on the European Community. However, some of the measures taken in Sweden exceed this legislation.

Table 9.2 Major initiatives on mercury use in Sweden, as reported by Sweden.

Year	Type of release/use	Major initiatives on mercury use in Sweden
1979	Dental releases	There is a voluntary agreement in Sweden since 1979, which requires that all dental clinics are equipped with amalgam separators.
1979	Seed dressings	The use of mercury-containing seed dressings is banned (SFS 1979:349).
1985	Biocides	Import, sale, transfer and use of mercury and mercury compounds as biocides are not approved (SFS 1985:836).
1990	Goal setting - phase-out	Government Bill 1990:91/90 proposed a numerous set of legislative and voluntary actions, with the ultimate aim of a total phase-out of mercury use.
1991	Dental amalgam	The overall goal of a phase-out of mercury also included dental amalgam. This led to a voluntary reduction of new amalgam fillings in children's teeth from 30 to 1.5 percent between 1991 and 1995. The use in adult's teeth decreased from 32 to 15 %. Since then, total annual sale of mercury in amalgam has levelled off. A further decrease of mercury in fillings for children and teenagers is expected, as a precautionary measure to minimise the exposure of these groups to metal mercury vapour. Dental care compensation ceased to be paid for amalgam fillings in 1999, which has made it more expensive to use amalgam. Although it is still slightly cheaper for most patients to use amalgam than alternative materials, the changed price structure should lead to an additional reduction in use of amalgam.
1992	Clinical thermometers	The import, professional manufacture and sale of clinical mercury thermometers were prohibited from 1 January 1992.
1992	Export of waste	Export of mercury waste and products containing mercury was banned.
1993	Thermometers, measuring instruments and electrical equipment	Professional manufacture, import and sale of thermometers, level switches, pressure switches, thermostats, relays, electrical contacts and other measuring instruments has been banned since 1993. (Ordinance 1991:1290) Some exemptions, mainly for spare parts, still exist. (Ordinance 1998:944). Time-schedule for phase-out is stipulated for each exemption. (Regulation 1998:8)
1993	Goal setting – timing of phase-out	Government Bill 1993/94:163 set a goal of phase-out of mercury and mercury-containing products by the year 2000. When entering the next century, mercury should be offered for sale only in vital products and for uses to which no alternative techniques are known or fully developed.
1998	Batteries	The European Community battery directive that also applies in Sweden was amended in 1998. Batteries with mercury content in excess of 0.0005 % by weight are defined as dangerous for the environment and may not be marketed as such or incorporated into appliances. Button cells with a mercury content of no more than 2 % by weight are exempted. The new rules mean that mercury oxide batteries may no longer be sold – such batteries accounted for 700 of the 800 kg of mercury in batteries in 1997. The new rules have led to a sharp reduction in sold quantities of mercury in batteries - in 1999, the amount of mercury in batteries sold is estimated to approximately 100 kg.

Year	Type of release/use	Major initiatives on mercury use in Sweden
1998	Sewage sludge	In Ordinance 1998:944 the contents of heavy metals in sewage is regulated in cases where sewage sludge is sold or conveyed for agricultural purposes. Regulations for when, where and how much sludge may be used in agriculture are found in SNFS 1994:2 (changed SNFS 1998:4). At present the maximum content of mercury allowed in sludge is 2.5 mg/kg DM (dry matter) and the maximum application is 1.5 g/hectare and year.
1998	Export of mercury	In line with the strict Swedish mercury policy, as of 1 January 1999 metal mercury and chemical compounds and preparations containing mercury may not be exported (Ordinance 1998:944).
2000	New products containing mercury Production processes	Bill 2000/01:65, Chemical Strategy for a Non-Toxic Environment requires that new goods put on the market should be, as far as possible, free from mercury by 2003, at the latest. Also, mercury should not be used in production processes, unless the producer can prove that neither human health nor the environment would be harmed.

Additional measures and initiatives under consideration in Sweden

812. **Chlor-alkali industry** - There are two chlor-alkali plants in Sweden that still use the amalgam process. The more environmentally friendly membrane process is used at one site. In line with OSPAR Decision 90/3, the Swedish government has in several bills stated that the amalgam process should be out of use by 2010. To further assure the realisation of this object on the national level, the Swedish government is considering the inclusion of a ban in Ordinance 1998:944.

813. **Waste products** - As far as waste disposal is concerned, there are separate collection systems and already existing efforts for the collection of batteries, fluorescent lamps, amalgam waste etc. Collected batteries are currently stored awaiting the decision on pre-treatment before it is put in a terminal storage facility for mercury.

814. **Dental amalgam** - The overall goal to a complete phase out of mercury also includes dental amalgam. The consumption of mercury for dental use has decreased significantly after a policy decision by the Parliament in 1994 to phase out the use of dental amalgam. Up to now dental amalgam has been subject primarily to voluntary phasing out measures in Sweden. A voluntary agreement not to use amalgam fillings in the teeth of children and youth up to nineteen has resulted in an almost complete phase out. The Swedish Government is continuously investigating further possibilities to reduce the use of dental amalgam.

815. **Laboratory chemicals** - Mercury-containing chemicals for analysis and reagents are mainly used in the environmental control, by its use of mercury sulphate in COD (chemical oxygen consumption) analyses. Information activities have not been effective to phase-out this particular use. The Swedish government is therefore considering an amendment of Ordinance 1998:944, by which the use of mercury in chemicals for analysis and reagents would be banned from 1 January 2004.

816. **Lighting** - There is at present no commercially available, mercury free alternative to linear fluorescent lamps and compact fluorescent lamps. In order to minimise the environmental impacts from the use of mercury in these products, maximum permitted mercury contents should preferably be established. Such regulations will most likely be introduced in the coming EC Directive on Restrictions of Hazardous Substances in electric and electronic equipment.

817. **Collection of used products and goods** - Recognising that mercury releases from products in use or forgotten "on the user's shelves" would continue for many years, the Government developed an action programme for a more effective and comprehensive collection of used products and goods containing mercury. The action programme included projects dealing with the collection of clinical thermometers, inventories and collection of mercury at different places, clearing out of mercury in schools, universities and colleges and providing information and raising awareness. In projects for the collection of mercury thermometers, economic incentives were used to invite household to turn in their mercury thermometers. Another project consisted of the identification of hidden "technical" mercury in techni-

cal goods and products within about 70 industries. The work involved tracking mercury with the world's first mercury dogs.

818. A total of 10-11 metric tons of mercury have been identified through the action programme, 6-7 of which have been collected and 3.5-4 of which have been labelled for proper disposal once it is not in use anymore. The Government estimates that there are still a number of metric tons of mercury in industry (technical goods, stored metal mercury, etc.), in households (for example in thermometers, antique barometers, doorbells, etc.), in agriculture (old and stored pesticides) and in pipes in the sewage system, especially in pipes from old dental clinics.

819. **Final disposal of mercury** - Mercury is a substance that remains a threat to human health and the environment in perpetuity, and for this reason it should not be recycled. Instead, mercury-containing waste must be dealt with permanently in a safe and environmentally acceptable way. In a report to the Government, the Swedish Environmental Protection Agency in 1997 proposed terminal storage of waste containing mercury in a deep rock facility. A governmental committee has recently submitted its final report on how to dispose waste containing more than 0.1 percent (by weight) of mercury. It is proposed that a mandatory requirement for permanent storage deep down in rock should be in force within five years.

Reductions in mercury consumption and use in Sweden

820. Sweden has conducted evaluations of the efficiency of the legislation and regulation on mercury-containing products. As shown in figure 9.1, the quantified consumption in 1997 of products containing mercury had fallen to approximately one fourth of the consumption in 1991/1992. The reductions in consumption are closely linked to increased use of substitutes to mercury. Possibilities for substitution are described in section 8.2 on substitution. It should be noted that besides legislation, improvements in technological performance have most likely also been an important driving force behind the substitution of mercury in many uses.

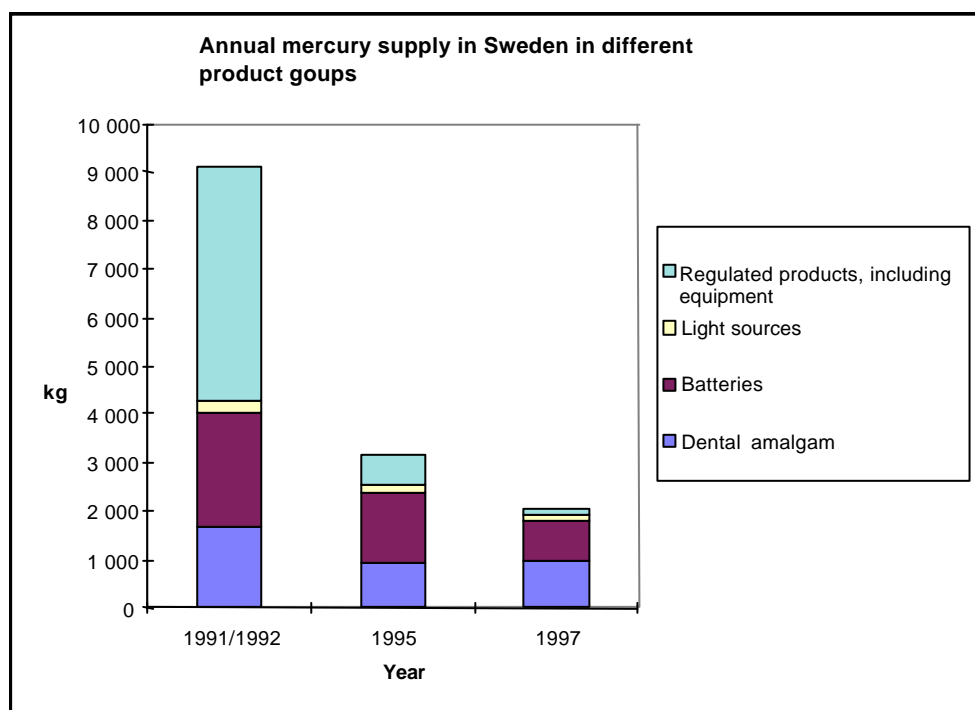


Figure 9.1 Amounts of mercury sold in Sweden in products, including batteries, light sources and dental amalgam, 1991/92, 1995 and 1997, kg/year (KEMI, 1998; original figure presented courtesy of the Swedish Chemicals Inspectorate). Please note that sales of mercury metal (for chlor-alkali production etc) are not included.

UNITED STATES OF AMERICA

821. The United States has been actively addressing the risks posed by exposure to mercury for many years, both through implementation of regulatory activities and voluntary reduction programmes. For example, already in 1991 the US EPA initiated the "33/50 Program", a special programme to help reduce releases of mercury and 16 other toxic substances into the environment. The goal of the programme was to encourage companies to commit to voluntarily reduce their releases of some or all of these toxics by 33 percent by 1992, and 50 percent by 1995. As a result, between 1988 and 1991 environmental releases of mercury were reduced by 38 percent and transfers of mercury for off-site treatment or disposal were reduced by 30 percent (OECD, 1995).

822. Understanding the characteristics and magnitude of mercury releases is critical to the design of effective risk management strategies. The Clean Air Act, as amended in 1990, required US EPA to prepare an assessment of the magnitude of USA mercury emissions by source, the health and environmental effects of the emissions, and the cost and availability of control technologies. The resulting report, *Mercury Study Report to Congress*, was published in December 1997. As the state-of-the-science for mercury is continuously and rapidly evolving, it represents a "snapshot" of current understanding of mercury in the USA. The report is a comprehensive document consisting of eight volumes.

823. The US EPA's Office of Research and Development (ORD) in September 2000 published its *Mercury Research Strategy*, intended to guide the mercury research programme through 2005. The Strategy identifies the key scientific questions of greatest importance to the Agency, and then describes a research programme to answer those questions. The goal in addressing the questions is to reduce scientific uncertainties limiting US EPA's ability to assess and manage mercury and methylmercury risks. An integral part of the strategy involves study of the atmospheric mercury transport, transformation and fate.

824. To address cross media issues, the US EPA has established a Mercury Task Force to consider strategies for coordinating various programmes for use, management and disposal of mercury. A wide range of options, within a multi-media framework, advocating common-sense pollution prevention programmes are being considered. Some areas which the Task Force will explore include evaluation and information transfer of ongoing prevention and control efforts at local, national and international levels, consideration of pollution prevention ideas including product substitution and innovation, recycling and disposal options and coordination within US EPA for consistent mercury regulatory programmes, as well as coordination with other federal agencies managing mercury.

825. The US EPA is now preparing a National Action Plan for Mercury, based on the findings of the Mercury Study Report to Congress. The Action Plan summarizes major actions to assess and manage mercury problems in the United States, as well as to address the global nature of mercury. It also provides information regarding US EPA's goals regarding mercury, its positions on numerous mercury issues, its priority actions and brief descriptions of activities it is currently taking and scheduled to take over the next several years. The Plan will likely be available mid-2003.

Ongoing and planned actions to reduce mercury pollution in the United States

826. The United States' approach to designing effective risk management strategies for mercury comprise both specific regulatory limits on releases and voluntary efforts with industry to reduce mercury use, implemented by a number of agencies at both federal and state levels. The most important are summarized below.

827. **Stockpiles of mercury** – The United States government maintains a supply of mercury as part of the National Defence Stockpile, established at the end of World War I to maintain adequate supplies of materials deemed critical to national defense. The Defense Logistics Agency (DLA), a unit of the Department of Defense, manages the stockpile. The Strategic and Critical Materials Stockpile Act regulates mercury that the DLA sells from the national stockpile. In July 1994, DLA suspended future mercury sales pending analysis of the environmental consequences. An Environmental Impact Statement to determine the disposition of the stockpile is currently being conducted and sales remain sus-

pending completion. In the meantime, a complete review of the four facilities across the USA currently storing its mercury and inspection of all the mercury containing flasks to ensure proper and safe storage is being undertaken.

828. **Water point sources** - Mercury is listed as a toxic pollutant under the Clean Water Act. The Clean Water Act regulations specify technology-based effluent limits for mercury discharges from different industries, and describe the circumstances in which states may require effluent limits or monitoring requirements more stringent than technology-based standards. States must set water quality standards for pollutants including mercury. The Clean Water Act relies on a permit system, known as the National Pollutant Discharge Elimination System to regulate direct discharges to surface water bodies. Facilities are assigned a specific mercury discharge limit, and/or are required to monitor their discharge for mercury. Facilities report actual discharge levels in Discharge Monitoring Reports, which serve as the basis for determining compliance. A large number of industry point sources are covered, such as chlor-alkali, steam electric power generation, battery manufacturing etc.

829. **Air point sources** - Mercury and mercury compounds are considered Hazardous Air Pollutants (HAPs) under the Clean Air Act. US EPA established National Emission Standards for Hazardous Air Pollutants (NESHAPs) for mercury emissions based on risk under the pre-1990 version of the Clean Air Act. Under the Clean Air Act Amendments of 1990 US EPA regulates Hazardous Air Pollutant Emissions by source categories using Maximum Achievable Control Technology (MACT) standards for each "major source" in any listed source category. A MACT standard is defined based on an analysis of existing control technology among the best-controlled sources in a given source category.

830. **Chlor-alkali industry** - Emissions from mercury ore processing facilities and mercury cell chlor-alkali plants are limited to a maximum of 2,300 grams/24 hours. US EPA is developing a rule that would further limit mercury emissions from plants that produce chlorine using the mercury cell method. The rule will include emissions limits based on MACT and on management practices, and will shift from the current standard that applies equally to all facilities, regardless of size, to one normalized for production levels.

831. In addition, as a voluntary measure, the Chlorine Institute, on behalf of USA mercury cell chlor-alkali facilities, committed in 1997 to reduce mercury use 50 percent by 2005 and to report annually on progress. In April 2002, the Chlorine Institute provided its fifth annual report, which indicated that mercury consumption by US chlor-alkali factories has declined by 81 percent between 1995 and 2001, or a 75 percent reduction after adjusting for decreases in production capacity. This is a decline from an initial baseline of about 154 metric tons per year to about 28 metric tons during 2001.

832. **Energy production** - The largest anthropogenic source of mercury emissions in the USA is currently coal-fired power plants. On December 14, 2000, the EPA announced the decision that it is appropriate and necessary to regulate hazardous air pollutant emissions (including mercury) from electric utility power plants. A regulation is currently scheduled for proposal by December 15, 2003 and promulgation by December 15, 2004. In order to ensure optimal alternatives are available to reduce mercury emission, the US EPA, the Department of Energy, electric industry groups and some electric companies are working to identify, develop and demonstrate both new and modified technologies for controlling mercury emissions. Working together, these organizations are testing and evaluating the most promising options in the field. Results from this research will be used to support development and implementation of mercury MACT regulation. Moreover, the USA is also considering a proposal from the Bush Administration (called the Clear Skies Initiative) that, if adopted, would achieve significant reductions in mercury emissions from electric power plants as part of a multi-pollutant strategy that would also reduce emissions of sulfur dioxide and nitrogen oxides from these plants through a cap and trade programme.

833. **Waste treatment including incineration** - Prior to 1995, municipal waste combustors and medical waste incinerators were the largest identifiable source of mercury emissions to the atmosphere. Regulations which have been finalized for municipal waste combustors and medical waste incinerators

will, when fully implemented, reduce emissions from these source categories by an additional 90 percent over 1995 levels.

834. As a voluntary measure, US EPA and the American Hospital Association in 1998 signed a memorandum of understanding committing to work together to significantly cut hospital wastes by 2005. The agreement envisions the virtual elimination of mercury-containing hospital wastes and a one-third reduction in total hospital wastes by 2005.

835. In December 1995, the US EPA finalized New Source Performance Standards (NSPSs) and Emission Guidelines (EGs) applicable to **municipal waste combustor (MWC) units** with a capacity greater than 227 metric tons per day (i.e. large MWCs). The mercury air emissions standard for new and existing MWCs is 0.08 milligrams per day standard cubic meter (mg/dscm) at 7 percent oxygen (7 percent O₂). All 167 large MWCs that are subject to the regulations that came into compliance by December 2000 and mercury emissions (based on year 2000 stack test compliance data) from this source category have been reduced by about 95 percent from 1990 levels. The typical performance level was 0.02 mg/dscm. A companion rule (NSPSs and EGs) for a small MWC unit (32 to 227 metric tons per day) was adopted in December 2000 with retrofit required by December 2005. The same mercury emissions limits apply and the same control technology is expected to be used.

836. The USA EP finalized new Source Performance Standards and Emission Guidelines for **Medical Waste Incinerators** (62 FR 48348) in September 1997. The guidelines establish standards that limit emissions from new incinerators. The standards are expected to reduce mercury emissions by 45 to 75 percent. The emission guidelines also require states to develop regulations that limit emissions from existing medical waste incinerators. The emission guidelines are expected to reduce emissions from existing incinerators by 93 to 95 percent. They also require training and qualification of operators, incorporate siting requirements, specify testing and monitoring requirements to demonstrate compliance with the emission limits, and establish reporting and record keeping requirements.

837. Several states, including New York, California and Texas have adopted relatively stringent regulations in the past few years limiting emissions from medical waste incinerators. The implementation of these regulations has brought about very large reductions in emissions of mercury in those states. It has also significantly reshaped how medical waste is managed in those states. Many facilities have responded to state regulations by switching to other medical waste treatment and disposal options to avoid the cost of add-on pollution control equipment. The two most commonly chosen alternatives have been off-site contract disposal in larger commercial incinerators and on-site treatment by other means (e.g., steam autoclaving).

838. **Hazardous waste incinerators** – On February 14, 2002, US EPA promulgated interim emission standards for hazardous waste incinerators, hazardous waste burning cement kilns, and hazardous waste burning lightweight aggregate kilns under joint authority of the Clean Air Act and Resource Conservation and Recovery Act (RCRA). The standards limit emissions of chlorinated dioxins and furans, other toxic organic compounds, toxic metals (including mercury), hydrochloric acid, chlorine gas, and particulate matter. US EPA will issue final standards for these three categories of hazardous waste burning facilities by 2005; in addition, the Agency will develop emission standards for hazardous waste burning industrial boilers and hydrochloric production facilities.

839. **Waste disposal** – The RCRA regulations outline specific classification and disposal requirements for products and wastes that contain mercury. RCRA regulations are waste-specific, not source-specific, and thus may apply to any facility that generates mercury-containing wastes. RCRA regulations describe specific disposal requirements for individual wastes. All mercury-bearing wastes are subject to land disposal restrictions. That is, the mercury concentration in these wastes must be below the regulatory concentration level before the wastes may be land-disposed. For some types of waste, the regulations require a specific treatment, such as recovery of the mercury or incineration. In other cases, only a maximum mercury concentration is required, and any treatment method may be used.

840. RCRA regulations also influence product disposal and recycling options for mercury containing products. Discarded products considered hazardous wastes are subject to storage, transportation, and permitting requirements. Currently, thermostats and fluorescent lamps are included in a "universal waste rule" that eases RCRA restrictions on hazardous waste management and enables states to set up special collection programmes. US EPA issued the universal waste rule (UWR) in 1995. It is designed to reduce the amount of hazardous waste in the municipal solid waste stream, encourage the recycling and proper disposal of some common hazardous wastes, and reduce the regulatory burden on businesses that generate these wastes. Universal wastes are items commonly thrown into the trash by households and small businesses. Although handlers of universal wastes must meet less stringent standards for storing, transporting, and collecting wastes, the waste must comply with full hazardous waste requirements for final recycling, treatment, or disposal. This management structure removes these wastes from municipal landfills and incinerators. In July 1999, US EPA added mercury-containing lamps to the UWR, which already covered batteries, thermostats, and pesticides. In 2002, EPA proposed adding other mercury-containing wastes to the universal waste rule.

841. **Recreational mining** - There is no active mercury mining in the USA. There is also no use of mercury in large-scale gold mining in the USA. There has been minor recovery of mercury by recreational miners in California, but the mercury is recovered as elemental free mercury in stream bottoms as a by-product from historical use. The mercury is incidentally recovered on the sluices of recreational portable dredge operators. The US EPA and California are working on ways to set up collection points for waste mercury to ensure that recreational miners do not dump their waste mercury in streams.

842. **Foodstuffs** – The Food and Drug Administration (FDA) regulates mercury in food, drugs, and cosmetics. FDA sets an action level of 1 ppm methylmercury in fish, shellfish and other aquatic animals, and may remove from commerce foods that violate this action level. FDA has advised women of childbearing age to limit their consumption of shark, swordfish, tilefish and king mackerel based on methylmercury content. States, tribes and territories are responsible for issuing fish consumption advice for locally-caught fish; many state health departments use 0.5 ppm methylmercury as a trigger for such advice. Some States also issue advice on limiting consumption of non-local commercial species (e.g. canned tuna). Comprehensive information about state fish advisories is available at <http://www.cfsan.fda.gov/list.html>.

843. **Mercury in products** - Mercury-containing products are regulated in several different ways. At a federal level, mercury product regulation has generally centered around health-based reasons to eliminate mercury from products, using the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetic Act (FFDCA) regulations. In recent years, many states have taken a different approach. Restrictions on mercury-containing products, once used sparingly by the federal government, are increasing rapidly at the state level. Certain USA States have initiated a variety of initiatives aimed at reducing mercury releases from the use and disposal of products. These initiatives include notification and labeling requirements to gain information on the mercury content of particular products and inform purchasers that products contain mercury; prohibitions on the sale of a variety of products for which alternatives were deemed readily available such as fever thermometers, dairy manometers, novelty items (toys, shoes), switches in automobiles, and thermostats in residential and commercial applications; concentration limits on other products such as batteries and packaging; restrictions on product disposal so that the products must be segregated from the solid waste stream and ultimately recycled; and state-sponsored collection programmes for items such as fever thermometers, historic dental inventories, and products found in schools.

844. **Batteries** – Between late 1989 and early 1991, all USA manufacturers converted production so that mercury content, except in button and "coin" cells, did not exceed 0.025 percent mercury by weight. A federal law called the Mercury-Containing and Rechargeable Battery Management Act went into effect May 13, 1996. The Act prohibits the sale of:

- 1) alkaline-manganese batteries containing mercury (alkaline-manganese button cell batteries are limited to 25 mg mercury per button cell),
- 2) zinc carbon batteries containing mercury,

- 3) button cell mercuric-oxide batteries for use in the USA, and
- 4) any mercuric-oxide battery unless the manufacturer identifies a collection site that has all required federal, State, and local government approvals, to which persons may send batteries for recycling and disposal.

The Act contains labelling requirements and encourages voluntary industry programmes by eliminating barriers to funding the collection and recycling or proper disposal of used rechargeable batteries. The Act also grants states the authority to add other batteries to the recycling programme. This federal law followed the lead of several states that passed legislation in the early 1990's limiting the mercury content of batteries.

845. **Cosmetics** – According to the Federal Food, Drug, and Cosmetic Act (FFDCA), mercury use as a preservative or anti-microbial is limited to eye-area cosmetics or ointments in concentrations below 60 ppm. Yellow mercuric oxide is not recognized as a safe and effective ophthalmic anti-infective ingredient.

846. **Dental amalgam** – The Food and Drug Administration (FDA) also regulates dental amalgam under FFDCA. Dental mercury is classified as a Class I medical device, with extensive safety regulations on its use. Dental amalgam alloy is classified as a Class II device, subject to additional special controls.

847. **Electric switches** – Voluntary efforts are underway jointly with appropriate industry and associations to reduce mercury used in electric switches. Several USA States have also enacted or are considering legislation to require end-of-life vehicle handlers and auto manufacturers to establish and maintain a mercury switch removal programme to address the problem of existing switches in vehicles already on the road.

848. **Lighting** – Of the 500-600 million mercury-containing lamps sold in the United States annually, approximately 96 percent are fluorescent lamps. It is estimated that approximately the same number of lamps are disposed of on an annual basis. Mercury releases due to mercury-containing lamps are expected to decrease in the future for a number of reasons. One reason is that states are beginning to view recycling as a viable option to decrease mercury releases. There is presently a bill in Massachusetts that would require every manufacturer of mercury-containing products that may be sold or offered for sale to ensure that proper recycling of these products occurs by funding a collection system. In addition, there have been technological advances in the manufacture of fluorescent lamps. Since the mid-1980's, electrical manufacturers have reduced the average amount of mercury in each fluorescent lamp from an average of 48.2 mg to an average of 11.6 mg/lamp in 1999. A certain amount of mercury is needed, however, in order to maintain desirable properties. A recent survey by the National Electrical Manufacturers Association showed that the average 4-foot (1.22 m) lamp in 2001 contained 8.3 mg of mercury.

849. **Paints** - As of May 1991, all registrations for mercury biocides used in paints were voluntarily canceled by the registrants, thus causing a drastic decrease in the use of mercury in paint. In addition to the paint industry reformulating its paints to eliminate mercury, US EPA banned the use of mercury in interior paint in 1990 and in exterior paint in 1991.

850. **Pesticides** - The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) covers the sale and use of pesticides, including registration of chemicals that meet health and safety tests. Earlier, several mercury compounds were registered as pesticides, bactericides, and fungicides, however, registrations of the last mercury-based pesticides for use to control pink and grey snow mold were voluntarily cancelled by the manufacturer in November 1993.

851. **Thermometers** – Voluntary efforts are underway jointly with appropriate industry and associations to reduce mercury in thermometers through mercury free substitutes. Several USA States have banned the use of mercury fever thermometers, and most major retailers no longer sell them.

852. **Thermostats** - As a voluntary measure, the industry-funded Thermostat Recycling Corporation (TRC) launched a programme in 1997 to recycle mercury-switch thermostats in nine states (see www.nema.org/index_nema.cfm/664/). It has since been expanded to 48 states in the USA, and in 2001 collected 48,215 thermostats and 402 pounds of mercury, for a total of more than 120,000 thermostats and 1,000 pounds of mercury since the programme's inception. Recognizing that the capture rate for the TRC programme is relatively low, two USA States (Maine, Oregon) will prohibit the sale of new mercury thermostats for residential and commercial applications effective January 2006.

853. **Vaccines** - Under the Food and Drug Administration Modernization Act of 1997, FDA is required to assess the risk of all mercury containing food and drugs. Under this provision, FDA asked vaccine manufacturers to provide information about thimerisol content of vaccines. Based on this information, the Public Health Service, the American Academy of Pediatrics, and vaccine manufacturers agreed that thimerisol-containing vaccines should be removed as soon as possible. Manufacturers have been asked for a clear commitment to eliminate mercury from vaccines, and FDA will do expedited reviews of resulting revisions to product license applications.

854. **Vehicles** - The use of mercury-containing switches in vehicles is being gradually phased out through voluntary initiatives. The US EPA's Environmental Accounting Project is a cooperative effort with business, academia and others to promote sound management accounting and capital budgeting practices that better address environmental costs. The project encourages and motivates business to understand the full spectrum of environmental costs and integrate these costs into decision-making. A car manufacturer in the United States is now removing or replacing all mercury switches that have been traditionally used in its under-hood convenience light applications. By applying the principles of environmental accounting, the company determined that it could cost-effectively replace the mercury switches with a rolling ball switch or remove the switches altogether. For the first group of cars on which the company tested the feasibility of substitution and removal, it determined that it could avoid USA\$ 40,000 in costs. Most of those costs were associated with the documentation of the removal of mercury switches from the vehicle before disposal, and with the potential liability for any mercury that enters the environment following vehicle disposal. After conducting their own total cost analyses, other auto manufacturers are now following suit and are actively removing mercury switches from their own automobiles. The auto industry has stated that it will cease production of vehicles with mercury switches in 2002. However, a significant quantity of mercury switches remains in vehicles still in use. Some states have instituted programmes to remove switches, either voluntarily or as a requirement for auto dismantlers.

855. **Occupational safety and health** - The Occupational Safety and Health Administration has responsibility for maintaining safe workplace conditions. OSHA sets permissible exposure levels for elemental mercury in workplace settings. Mercury is listed as a neurotoxin capable of causing behavioral changes, decreased motor function and other effects on the nervous system. OSHA mercury standards also recommend that skin contact should be avoided.

856. Workplace standards may influence the types of processes used at a facility. For example, when OSHA tightens its standards for a particular substance, it may force users of that substance to modify their processes or eliminate use of that substance entirely in order to meet these new standards. Workplace air concentration levels for exposure to elemental mercury: Section 29 CFR 1910.1000 sets the permissible exposure limit (PEL) for an 8-hour time weighted average (TWA) of 0.1 mg/m³.

857. **Information and reporting requirements** - Under the USA Toxics Release Inventory (TRI), starting with the 2000 reporting year, the reporting threshold for mercury and its compounds has been lowered to 5 kilograms per year (the previous threshold was 4500 kilograms). Through this action, the United States will have a much more comprehensive picture of the amounts of mercury and its compounds that are released to the air, water, land, transferred off-site for disposal, transferred off-site for recycling or recycled on-site within industrial facilities.

858. **Transportation** - The Department of Transportation regulates hazardous materials transport under the Hazardous Materials Transportation Act. Mercury and mercury compounds are hazardous substances subject to packaging, shipping and transportation rules for hazardous materials.

859. **Regional cooperation** - In 1997, the United States and Canada signed the Great Lakes Binational Toxics Strategy. The goal of the strategy is to seek, by 2006, a 50 percent reduction in the deliberate use of mercury and a 50 percent reduction in the release of mercury caused by human activity. The goal applies to all mercury releases nationwide as well as all direct discharges to the Great Lakes Basin. The USA is also co-operating with Mexico and Canada in the North American Regional Action Plan on sound management of chemicals, in which mercury is a priority substance. These regional initiatives are described in more detail later in section 9.5.

Reductions in mercury consumption and use in the United States

860. Figure 9.2 shows the trends in the reported mercury consumption in the USA distributed among industrial sectors as presented by Sznoppek and Goonan (2000). The figure shows a decrease in consumption of about 75 percent since the 1970's. The total reported consumption fell by more than 50 percent from a 711 metric tons in 1990 to 372 metric tons just six years later in 1996. According to Sznoppek and Goonan (2000), the two major causes of this reduction were the elimination of mercury in batteries by regulation and technological advancements, and elimination of mercury-based fungicides in paints by regulation. Possibilities for substitution of mercury are described in section 8.2 on substitution.

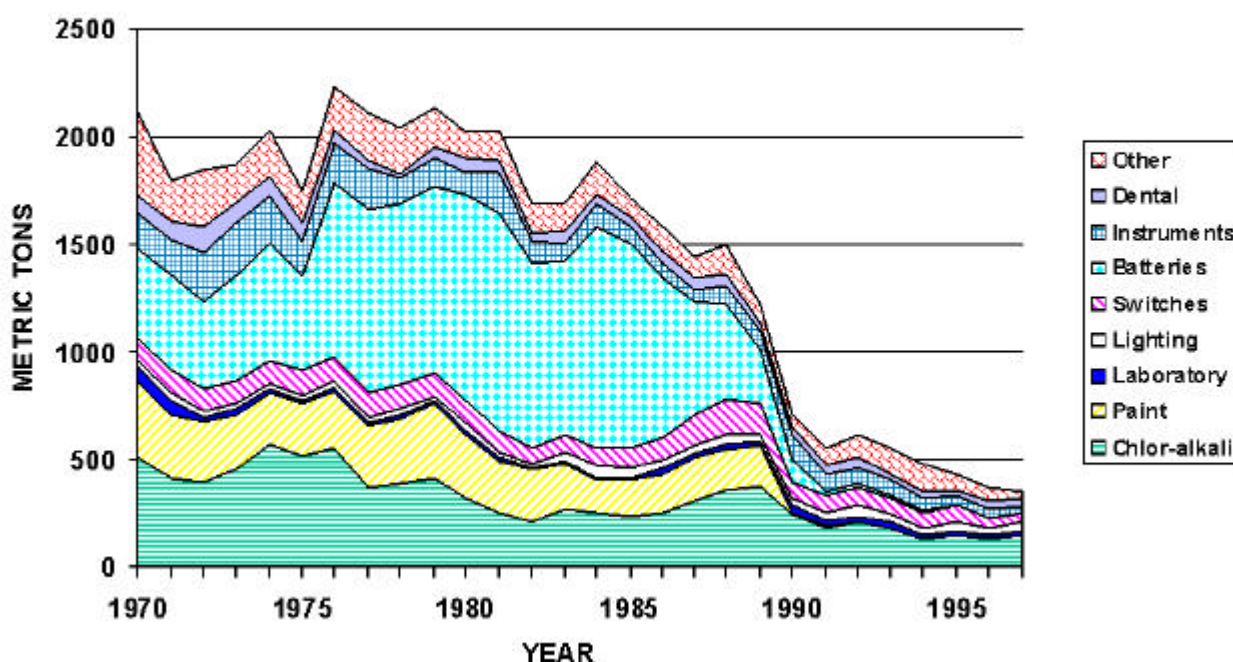


Figure 9.2 US industrial reported consumption of mercury in the period 1970-1997, distributed among industrial sectors (Sznoppek and Goonan, 2000; original figure presented courtesy of US Geological Surveys).

9.3 International agreements and instruments

861. There are also a number of international agreements and instruments that contain provisions to manage and control releases and limit use and exposures of mercury. The instruments often define reduction goals or require implementation of specific measures at national level, which supplement national initiatives in the participating countries. An overview of such international initiatives identified in this project and their main characteristics are given in table 9.3. In the following sections are presented summaries of the individual agreements and instruments and their relevance to mercury. The general description of each agreement or instrument has mainly been taken from UNEP (2001). The description of the LRTAP Convention has been supplemented with information from associated websites.

Table 9.3 – Overview of international agreements/instruments containing provisions relating to mercury.

Section	International agreement or instrument	Geographic coverage of agreement or instrument	Agreement or instrument's relevance to mercury	Types of measures addressing mercury set out in the agreement or instrument
9.3.1	LRTAP Convention and its 1998 Aarhus Protocol on Heavy Metals	Central and Eastern Europe, Canada and the United States of America	Addresses mercury and mercury compounds in releases, products, wastes, etc.	Goal definition, binding commitments on release reductions and recommendations, monitoring
9.3.2	OSPAR Convention	North-east Atlantic including the North Sea (including internal waters and territorial sea of Parties)	Addresses mercury and mercury compounds in releases, products, wastes, etc.	Goal definition, binding commitments on release reductions, recommendations, monitoring, information
9.3.3	Helsinki Convention	Baltic Sea (including entrance of the Baltic Sea and drainage areas to these waters)	Addresses mercury and mercury compounds in releases, products, wastes, etc.	Goal definition, binding commitments on release reductions, recommendations, monitoring, information
9.3.4	Basel Convention	Global	Any waste containing or contaminated by mercury or its compounds is considered a hazardous waste and covered by specific provisions	Binding commitments regarding international transport of hazardous waste, procedure for information and approvals on import/export of hazardous waste
9.3.5	Rotterdam Convention	Global	Addresses inorganic mercury compounds, alkyl mercury compounds, alkyl-oxyalkyl compounds and aryl mercury compounds used as pesticides	Binding commitment regarding import/export of those mercury compounds covered, procedures for information exchange and export notification
9.3.6	Stockholm Convention	Global	Mercury compounds are NOT addressed by the Convention	-

9.3.1 The Convention on Long-Range Transboundary Air Pollution and its 1998 Aarhus Protocol on Heavy Metals (LRTAP Convention)

862. The objective of the Convention on Long-Range Transboundary Air Pollution is to protect man and his environment against air pollution and to endeavour to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution. The Convention sets up an institutional framework, bringing together policy and research components. It establishes a number of co-operative programmes for assessing and monitoring the effects of air pollution.

863. The Convention requires Parties to develop policies and strategies that will serve as a means of combating the discharge of pollutants, by means of exchanges of information, consultation, research and monitoring. Parties are also required to co-operate in the conduct of research into and/or development of technologies for reducing emissions of major air pollutants, instrumentation and other tech-

niques for monitoring and measuring emission rates and ambient concentrations of air pollutants, improved models for understanding the transmission of long-range transboundary air pollutants, the effects of major air pollutants on human health and the environment and education and training programmes related to the environmental aspects of pollution by major air pollutants. Implementation of the Convention has already contributed successfully in reducing sulphur emissions across Europe, and there has also been progress in reducing emissions of nitrogen oxides and volatile organic compounds.

Geographic coverage and entry into force of the protocol

864. The Convention and its protocols are open to member States of the United Nations Economic Commission for Europe (UNECE), as well as States having consultative status with the UNECE and regional economic integration organizations, constituted by sovereign States Members of the UNECE. The UNECE has 55 member States, mainly from Central and Eastern Europe, but also includes Canada and the United States of America as members. (see <http://www.unece.org/oes/eceintro.htm> for the list of UNECE member States).

865. The Convention entered into force on 16 March 1983 and had 49 Parties as of 1 October 2002. Since its entry into force, it has been extended by eight protocols, of these the 1998 Aarhus Protocol on Heavy Metals is especially relevant to mercury.

866. The Aarhus Protocol will enter into force on the ninetieth day following the date on which the sixteenth instrument of ratification, acceptance, approval or accession has been deposited with the Depository. As of 2 October 2002, it had 13 Parties (Canada, Czech Republic, Denmark, Finland, France, Luxembourg, Netherlands, Norway, Republic of Moldova, Sweden, Switzerland, United States of America and the European Community). It has not yet entered into force.

867. The Executive Secretary of the UNECE provides the Secretariat for the Executive Body of the Convention. It does so within the UNECE Environment and Human Settlements Division.

The 1998 Aarhus Protocol on Heavy Metals, and its relevance to mercury

868. The Executive Body of the Convention adopted the Protocol on Heavy Metals on 24 June 1998 in Aarhus, Denmark. It targets three particularly harmful metals: cadmium, lead and mercury, and requires Parties to the Protocol to reduce their releases for these three metals. It aims to cut emissions from industrial sources (iron and steel industry, non-ferrous metal industry), combustion processes (power generation, road transport) and waste incineration. It lays down stringent limit values for emissions from stationary sources and suggests best available techniques for these sources. The Protocol requires Parties to phase out leaded petrol and introduces measures to lower heavy metal releases from other products. Emission levels must be reported using as a minimum methodologies specified by the Steering Body of EMEP, the Cooperative Programme for Monitoring and Evaluation of Long-range Transmission of Air Pollutants in Europe.

869. Article 3 describes the basic obligations set out in the Protocol, below is a summary of those especially relevant to mercury.

A) Reduction of total annual emissions of mercury into the atmosphere, compared to the reference year for the Party (1990, or an alternative year between 1985 and 1995 set when becoming a Party), through application of best available techniques, product control measures or other emission reduction strategies.

B) Use of best available techniques for stationary sources - for new plants within 2 years, for existing plants within 8 years. The standards for best available techniques are given as examples in Annex III to the Protocol, and include both cleaning technology and substitution of mercury based technology, for example in chlor/alkali plants.

C) Application of limit values to control emissions from major stationary sources, both new and existing - Limit values for a number of sources are specified in Annex V of the Protocol, for example

for particulate emissions from combustion plants, mercury emissions from chlor-alkali plants and mercury emissions from municipal, medical and hazardous waste incineration.

D) Application of product control measures concerning mercury – The Protocol requires Parties to achieve specific mercury levels in alkaline manganese batteries within 5 years, or 10 years for Parties with economies in transition. Alkaline manganese button cells and batteries composed of button cells are exempted from this obligation. In addition, Parties should consider applying additional product control measures as described in Annex VII of the Protocol. Recommendations are given for mercury-containing products such as electric equipment, electrical components (thermostats, switches), measuring devices (thermometers, manometers, barometers), fluorescent lamps, dental amalgam, pesticides including seed dressings, paints and batteries other than alkaline manganese batteries, and include prohibition of specific products, voluntary agreements and recycling programmes.

Monitoring and Evaluation of Long-Range Transmission of Air Pollutants in Europe

870. Associated with the LRTAP-process, the main objective of the EMEP programme (Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air pollutants in Europe) is to regularly provide Governments and subsidiary bodies under the LRTAP Convention with qualified scientific information to support the development and further evaluation of the international protocols on release reductions negotiated within the Convention. Initially, the EMEP programme focused on assessing the transboundary transport of acidification and eutrophication; later, the scope of the programme has widened to address other issues covered by the Convention, such as POPs, heavy metals, including mercury, and particulate matter.

871. The EMEP programme relies on three main elements: (1) collection of emission data, (2) measurements of air and precipitation quality and (3) modelling of atmospheric transport and deposition of air pollution. Through the combination of these three elements, EMEP fulfils its required assessment and regularly reports on emissions, concentrations and/or depositions of air pollutants, the quantity and significance of transboundary fluxes and related exceedances to critical loads and threshold levels. The combination of these components provides also a good basis for the evaluation and qualification of the EMEP estimates.

872. The EMEP programme is carried out in collaboration with a broad network of scientists and national experts that contribute to the systematic collection, analysis and reporting of emission data, measurement data and integrated assessment results. Three different Task Forces - on measurements and modelling, on emission inventories and projections and on integrated assessment modelling - provide for a for discussion and scientific exchange.

873. The coordination and intercalibration of chemical air quality and precipitation measurements are carried out at the Chemical Coordinating Centre (CCC). The storage and distribution of reliable information on emissions and emissions projections is the task of the Meteorological Synthesizing Centre–West in Oslo, Norway. The modelling development for heavy metals and POPs is the responsibility of the Meteorological Synthesizing Centre -East (MSC-E) in Moscow, Russian Federation. In 1999, the Executive Body of the Convention decided to include integrated assessment into the core activities of EMEP and to establish a Center for Integrated Assessment Modelling (CIAM) building on past modelling work, in particular the RAINS (Regional Acidification, Information and Simulation) model.

Application of effects-based approaches when implementing the obligations of the Convention - Critical loads and critical levels

874. The LRTAP Convention also encourages the development and possible application of effects-based approaches to implement the provisions of the Convention in an effective manner, i.e. approaches that take into consideration the exposure man or the environment can be exposed to without experiencing direct adverse effects. One effects-based approach used is based on critical loads³⁰ and critical

³⁰ **Critical load** (deposition) has been defined as "a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according

levels³¹. The Coordination Center for Effects (CCE) in the Netherlands, established in 1990, is part of the International Cooperative Programme on Modelling and Mapping of Critical Levels and Loads and Air Pollution Effects, Risks and Trends under the LRTAP Working Group on Effects.

875. The CCE scientifically assesses the risks expressed as critical thresholds to forests, lakes and other ecosystems in Europe caused by (long-range) air pollution. This information, which is also summarised in maps of critical thresholds, is useful to understand how national air pollution abatement measures can reduce these risks to ecosystems anywhere in Europe. It also contributes in a novel manner to the scientific support of European air pollution reduction policies. In addition to data on national emissions and costs of emission reductions, now also benefits – in terms of the reduction of risks to ecosystems - can be quantified. The use of this information in integrated assessment models such as RAINS enables the policy analysis of cost-effective emission reductions in Europe. Since the late 80's, methods have been developed to compute and map critical loads of acidity (sulfur and nitrogen based) and of eutrophication (nitrogen based). Attempts at developing critical loads and critical levels for heavy metals, including mercury, are ongoing.

9.3.2 The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention)

876. The objectives of the 1992 OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic are to take all possible steps to prevent and eliminate pollution and take the necessary measures to protect the sea area against the adverse effects of human activities and to safeguard human health and to conserve marine ecosystems and, where practicable, to restore marine areas which have been adversely affected. The Convention contains annexes addressing different sources of pollution, such as prevention and elimination of pollution from land-based sources; prevention and elimination of pollution by dumping or incineration (which prohibits incineration); prevention and elimination of pollution from offshore sources; assessment of the quality of the marine environment and protection and conservation of the ecosystems and biological diversity of the maritime area.

Geographic coverage and entry into force

877. The OSPAR Convention is open to Parties to the "Oslo" and "Paris" Conventions (i.e., the Convention for the Prevention of Marine Pollution from Land-Based Sources and the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft), any other coastal state bordering the maritime area, any state located upstream on watercourses reaching the maritime area or any regional economic integration organisation having a member state that qualifies. The maritime area covers the north-east Atlantic including the North Sea and comprises the internal waters and the territorial sea of Parties, the sea beyond and adjacent to the territorial sea under the jurisdiction of the coastal state, and the high seas. Other States or regional economic organisations that do not satisfy the criteria may be invited unanimously by the Parties to accede to the Convention.

878. The OSPAR Convention came into force on 25 March 1998. It replaced the Paris and Oslo Conventions. However, Decisions, Recommendations, and other agreements adopted under the two previous Conventions continue to be applicable, unaltered in their legal nature, unless they are terminated by measures adopted under the OSPAR Convention. The OSPAR Convention currently has 16

to present knowledge". Thus, a critical load is an indicator for sustainability of an ecosystem in that it provides a value for the maximum allowable deposition of a pollutant below which the risk of damage is reduced. Establishing a relationship between the biology and the physico-chemical properties of an ecosystem, its sensitivity to a pollutant's deposition, i.e. the critical load, can be calculated from its physical and chemical properties. This information on ecosystem sensitivity can be compared with deposition data to determine which areas receive deposition levels exceeding the critical loads in that area.

³¹ Parallel to the development of critical loads, **critical levels** (concentrations) have been developed, which are defined as "concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge". In contrast to critical loads, a single critical value is derived for every type of ecosystem (crops, forests, semi-natural vegetation), independent of site characteristics.

Parties (Belgium, Denmark, European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom of Great Britain and Northern Ireland).

879. The OSPAR Commission, with representatives of each of the Parties, is the governing body of the Convention. The Commission meets annually, sometimes at ministerial level.

The OSPAR Strategy with regard to Hazardous Substances, and its relevance to mercury

880. In 1998 at Sintra, Portugal, the first ministerial meeting of the OSPAR Commission adopted, among others, a Strategy with regard to Hazardous Substances, with a view to the further implementation of the OSPAR Convention, which had just come into force. The objective of the Strategy is to prevent pollution of the maritime area by continuing to reduce discharges, emissions and losses of hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances.

881. The Strategy also includes a timeframe, setting out the basis for OSPAR's work for achieving the objective - every endeavour will be made to move towards the target of cessation of discharges, emissions and losses of hazardous substances by the year 2020.

882. To this end, a process has been established to identify the OSPAR list of chemicals for priority action. This list was revised in 2001, and currently contains 42 substances or groups of substances, including mercury and organic mercury compounds. These chemicals are being addressed by preparing (for those in use in the OSPAR area) background documents for each substance or group specifying the sources of inputs of them to the marine environment, the threat posed and possible measures. Such measures are then considered. An OSPAR Background Document on Mercury and Organic Mercury Compounds (OSPAR Commission, 2000) was endorsed by OSPAR in 2000 and the actions recommended there are taken into account, as appropriate, in the work of OSPAR.

883. There are several measures applicable under OSPAR to control mercury emissions, discharges and losses from specific sectors, e.g. the measures related to the chlor-alkali industry and *PARCOM Decision 85/1 on Limit Values and Quality Objectives for Mercury Discharges by Sectors other than the Chlor-alkali Industry*. Furthermore, OSPAR measures on Best Available Techniques (BATs) for various industrial installations and the offshore gas and oil installations will also help to limit discharges, emissions and losses of mercury.

884. With regards to the **chlor-alkali sector**, there are a number of measures applicable as regards the control of mercury in discharges to water and emissions to air. In *PARCOM Decision on New Chlor-Alkali Plants Using Mercury Cells, 1982* the Commission decided that authorisations for new chlor-alkali plants might be granted by Parties only if such authorisations were based on application of best technical means available for preventing discharges of mercury. Best technical means available at that time made it possible to limit discharges of mercury using the recycled-brine process to less than 0.5 g/metric ton of installed chlorine production capacity. Furthermore, the Commission agreed that when the construction of new plants was being considered, the use of mercury-free technology, in particular membrane cells should be encouraged whenever circumstances permitted.

885. In *PARCOM Decision 90/3 on Reducing Atmospheric Emissions from Existing Chlor-Alkali Plants*, adopted on 14 June 1990, the Parties agreed that existing mercury based chlor-alkali plants would be required to meet by 31 December 1996 a standard of 2g Hg/t Cl₂ capacity for emissions to the atmosphere, unless there was a firm commitment that the plant would be converted to mercury-free technology by the year 2000. It also agreed that mercury in hydrogen released to the atmosphere, or burnt, would be included in this standard. They also recommended that existing mercury cell chlor-alkali plants be phased out as soon as practicable and set the objective of complete phase-out by 2010. The chlor-alkali producers within the OSPAR area have met the emissions reduction requirements of *PARCOM 90/3*. In order to make progress towards the other recommendations within this decision they have presented six voluntary commitments with OSPAR. The details are provided in section 3.2.4 EUROPEAN COMMUNITY in the description on chlor-alkali production.

886. The main tools for controlling releases of **mercury from products** are the placing of restrictions on the marketing and use of the products, or the development of products containing non-hazardous substitutes for mercury.

887. **Mercury discharges from the dental sector** - Several PARCOM Recommendations relating to the reduction of mercury discharges from dental sources are applicable under OSPAR. In 1981, the Paris Commission recommended the installation of special filters in dental surgeries and clinics to collect the residues of mercury amalgams. *PARCOM Recommendation 89/3 on Programmes and Measures for Reducing Mercury Discharges from Various Sources* urges that alternative materials to dental amalgams should be used where appropriate and where excessive cost can be avoided. Surplus or old amalgam should be trapped and separated efficiently, then sent for recovery of the mercury content. *PARCOM Recommendation 93/2 on Further Restrictions on the Discharge of Mercury from Dentistry* states that equipment should be installed to separate water and amalgam to enable collection of the amalgam as from 1 January 1997.

888. **Mercury in batteries** - *PARCOM Decision 90/2 on Programmes and Measures for Mercury and Cadmium-Containing Batteries* lays down various measures dealing with the recovery, disposal and marketing and use of certain mercury and cadmium batteries.

889. **Pesticides containing mercury** - PARCOM Recommendation 89/3 also proposed measures on restricting the use of biocides and pesticides containing mercury.

890. **Industrial, laboratory and medical control instruments and electrical equipment** - PARCOM Recommendation 89/3 also proposes measures on recycling mercury used in such equipment and encouraged the use of equipment not containing mercury, whenever replacements become available at comparable costs. Some Parties have initiated actions for example to limit the use of mercury thermometers, to encourage the development of low-mercury lighting and to establish recycling and special collection schemes.

9.3.3 The Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention)

891. The objectives of the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area, adopted on 9 April 1992, are to take all appropriate measures, individually or by means of regional co-operation, to prevent and eliminate pollution in order to promote the ecological restoration of the Baltic Sea Area and the preservation of its ecological balance.

892. The Convention establishes fundamental principles and obligations, as set out in Article 3, whereby Parties are obliged to:

- Take all appropriate legislative, administrative and other measure to prevent and eliminate pollution in order to promote the ecological restoration of the Baltic Sea Area and the preservation of its ecological balance;
- Apply the precautionary principles;
- Promote the use of Best Environmental Practice and Best Available Technology;
- Apply the polluter-pays principle;
- Ensure that measurements and calculations of emissions from point sources and of inputs from diffuse sources are carried out in a scientifically appropriate manner in order to assess the state of the marine environment and ascertain the implementation of the Convention; and
- Use their best endeavours to ensure the implementation of the Convention does not cause trans-boundary pollution in areas outside the Baltic Sea Area, nor lead to unacceptable strains on the environment or increased risk to human health.

Geographic coverage and entry into force

893. The Helsinki Convention is restricted to the States and the European Community that participated in the 1992 Helsinki Conference and have ratified the Convention. Others can become a party

upon invitation by all the Parties. The Convention covers the Baltic Sea and the entrance of the Baltic Sea and the drainage areas to these waters. Internal waters are included.

894. The 1992 Helsinki Convention replaces the 1974 Convention on the Protection of the Marine Environment of the Baltic Sea Area. It entered into force on 17 January 2000. As of October 2002, the Helsinki Convention had 10 Parties (Denmark, Estonia, European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden).

895. The governing body of the Convention is the Helsinki Commission - Baltic Marine Environment Protection Commission (HELCOM). HELCOM meets annually and, from time to time, meetings are held at ministerial level.

The HELCOM Strategy to Implement its Objective with regard to Hazardous Substances, and its relevance to mercury

896. In 1998 HELCOM established an objective with regard to hazardous substances and a strategy to implement the objective, through the adoption of HELCOM Recommendation 19/5. The objective is to prevent pollution of the Convention Area by continuously reducing discharges, emissions and losses of hazardous substances towards the target of their cessation by the year 2020, with the ultimate aim of achieving concentrations in the environment near background values for naturally occurring substances and close to zero for man-made synthetic substances. A total of 42 chemicals have so far been selected by HELCOM for immediate priority action, including mercury and its compounds.

897. HELCOM has adopted a number of recommendations specifically relating to mercury:

- HELCOM Recommendation 6/4 (adopted 13 March 1985): Recommendation concerning measures aimed at the reduction of mercury resulting from dentistry.
- HELCOM Recommendation 13/4 (adopted 5 February 1992, under revision): Atmospheric pollution related to the use of scrap material in the iron and steel industry.
- HELCOM Recommendation 14/5 (adopted 3 February 1993, under revision): Reduction of diffuse emissions from used batteries containing heavy metals (mercury, cadmium, lead).
- HELCOM Recommendation 16/8 (adopted 15 March 1995): Limitation of emissions into atmosphere and discharges into water from incineration of household waste
- HELCOM Recommendation 17/6 (adopted 12 March 1996): Reduction of pollution from discharges into water, emissions into the atmosphere and phosphogypsum out of the production of fertilizers
- HELCOM Recommendation 18/2 (adopted 12 March 1997): Offshore activities.
- HELCOM Recommendation 19/5 (adopted 26 March 1998): HELCOM objective with regard to hazardous substances.
- HELCOM Recommendation 23/4 (adopted 6 March 2002, superseding 18/5): Measures aimed at the reduction of mercury pollution resulting from light sources and electrical equipment
- HELCOM Recommendation 23/6 (adopted 6 March 2002, superseding 6/3): Reduction of emissions and discharges of mercury from chlor-alkali industry.
- HELCOM Recommendation 23/7 (adopted 6 March 2002, superseding 16/6): Reduction of discharges and emissions from the metal surface treatment.
- HELCOM Recommendation 23/11 (adopted 6 March 2002, superseding 20E/6): Requirements for discharging of waste water from the chemical industry.
- HELCOM Recommendation 23/12 (adopted 6 March 2002, superseding 16/10): Reduction of discharges and emissions from production of textiles.

898. The HELCOM strategy on hazardous substances, including mercury, in many areas parallels the work implemented within the context of the OSPAR Convention.

9.3.4 The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention)

899. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, adopted on 22 March 1989, strictly regulates the transboundary movements of hazardous wastes and establishes obligations for its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner. The main principles of the Basel Convention are:

- transboundary movements of hazardous wastes should be reduced to a minimum consistent with their environmentally sound management;
- hazardous waste generation should be reduced and minimised;
- hazardous wastes should be treated and disposed of as close as possible to their source of generation; and
- efforts should be made to assist developing countries and countries with economies in transition with the environmentally sound management of hazardous and other wastes they generate.

900. The Basel Convention provides a comprehensive framework to assure the environmentally sound management of hazardous wastes, which includes a control regime for the monitoring and control of transboundary movements of such wastes. Imposed restrictions on transboundary movements include the prohibition of shipment with non-Parties, and the need to receive a written confirmation from the relevant authorities in the country of import accepting the import.

901. A decision to amend the Convention was adopted in September 1995 in order to ban exports of hazardous wastes for final disposal, recovery or recycling from countries listed in a new Annex VII (Parties and other States which are members of OECD, EC, Liechtenstein) to non-Annex VII countries.

Geographic coverage and entry into force

902. The Basel Convention is open to all States and political and/or regional economic integration organisations.

903. The Convention entered into force on 5 May 1992. As of 25 September 2002, there are 152 Parties to the Convention (see <http://www.basel.int> for individual Parties) and 32 Parties had ratified the amendment, which requires 62 ratifications to enter into force.

904. The Conference of the Parties (COP) is the governing body of the Basel Convention. Subsidiary bodies have been established, such as the Technical Working Group responsible for the preparation of technical guidelines for the environmentally sound management of hazardous wastes, the classification and hazard characterisation of wastes and other tasks. Another subsidiary body is the Legal Working Group which addresses legal matters such as those related to illegal traffic, bilateral and multilateral agreements, settlement of disputes, monitoring of compliance and liability and compensation for damage resulting from transboundary movements of hazardous wastes and their disposal. The fifth meeting of the Conference of the Parties also established a Working Group for Implementation to monitor implementation of the Convention.

The Basel Convention's relevance to mercury

905. According to Article 1, paragraph 1 (a) of the Convention, any waste containing or contaminated by mercury or its compounds is considered a hazardous waste and is covered by the provisions of the Convention.

906. More precisely, Annex VIII provides a list of wastes characterized as hazardous wastes under the Basel Convention Article 1.1(a), not precluding the use of Annex III (list of hazardous characteristics) to demonstrate that a waste is not hazardous. Hazardous wastes containing mercury may be found under the following Annex VIII categories (the list below is not meant to be considered exhaustive):

- A1010 - Metal wastes and waste consisting of alloys of any of the following: (...), Mercury, (...);

- A1030 - Wastes having as constituents or contaminants any of the following: (...), Mercury; mercury compounds, (...);
- A1150 - Precious metal ash from incineration of printed circuit boards not included on list B;
- A1180 - Waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on list B B1110);
- A4020 - Clinical and related wastes; that is wastes arising from medical, nursing, dental, veterinary, or similar practices, and wastes generated in hospitals or other facilities during the investigation or treatment of patients, or research projects

Obligations of the Basel Convention applicable to mercury containing wastes

907. The transboundary movements of mercury containing wastes that can be considered falling within the scope of the Basel Convention would need to be controlled according to the obligations of the Convention. This applies to hazardous wastes containing mercury that are exported for reuse, recovery, recycling and/or for final disposal.

908. In addition, the general obligations of the Basel Convention concerning the need to manage in an environmentally sound manner hazardous wastes would apply to such wastes, including those not being shipped abroad for recovery or disposal operations, but requiring to be managed locally (examples include hazardous wastes from the chlor/alkali process, gold mining, discarding of end-of-life equipments, etc).

9.3.5 The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention)

909. The objectives of the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, adopted on 10 September 1998, are:

- To promote shared responsibility and co-operative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm; and
- To contribute to the environmentally sound use of those hazardous chemicals, by facilitating information exchange about their characteristics, by providing for a national decision-making process on their import and export, and by disseminating these decisions to Parties.

910. The Convention establishes the principle that export of a chemical subject to the Convention can only take place with the prior informed consent of the importing party. It establishes procedures for formally obtaining and disseminating the decisions of importing countries as to whether they wish to receive future shipments of specified chemicals and for ensuring compliance to these decisions by exporting countries. It also contains provisions for the exchange of information among Parties about potentially hazardous chemicals that may be exported and imported.

911. The Convention establishes a specific procedure to identify and include chemicals in the Convention, based on actions taken by Parties to ban or severely restrict the use of a pesticide or industrial chemical or a Party is experiencing problems with a severely hazardous pesticide formulation under conditions of use. The Convention initially covers 22 pesticides (including five severely hazardous pesticide formulations) and five industrial chemicals, but many more are expected to be added in the future.

912. For each chemical subject to the Convention, a “decision guidance document” (DGD) containing information concerning the chemical and the regulatory decisions to ban or severely restrict the chemical for health or environmental reasons and information on alternatives, is circulated to importing

countries. These countries are given nine months to respond concerning the future import of the chemical. The response can consist of either a final decision (to allow import of the chemical, not to allow import, or to allow import subject to specified conditions) or an interim response. Decisions by an importing country must be trade neutral (i.e., apply equally to domestic production as well as to imports).

913. The decisions of the importing country Parties are circulated semi-annually via a PIC Circular, and exporting country Parties are obligated under the Convention to take appropriate measure to ensure that exporters within its jurisdiction comply with the decisions.

Geographic coverage and entry into force

914. The Rotterdam Convention is open to all States and regional economic integration organisations. It builds on the existing voluntary PIC procedure, operated by UNEP and FAO since 1989, and takes into account experience gained during the implementation of the voluntary procedure (as set out in the London Guidelines for the Exchange of Information on Chemicals in International Trade and the FAO International Code of Conduct on the Distribution and Use of Pesticides).

915. The Convention will enter into force 90 days after the 50th instrument of ratification, acceptance, approval or accession has been deposited with the Depositary. As of 23 October 2002, the Convention had 34 Parties (Austria, Belgium, Bulgaria, Cameroon, Canada, Czech Republic, El Salvador, Gambia, Germany, Guinea, Hungary, Italy, Jamaica, Jordan, Kyrgyzstan, Libyan Arab Jamahiriya, Luxembourg, Malaysia, Mongolia, Netherlands, Nigeria, Norway, Oman, Panama, Samoa, Saudi Arabia, Senegal, Slovenia, South Africa, Suriname, Switzerland, Thailand, United Arab Emirates, United Republic of Tanzania). It has not yet entered into force.

916. The Convention establishes a Conference of the Parties (COP) to oversee implementation and a Chemicals Review Committee to review notifications and proposals from Parties and make recommendations on which chemicals should be subject to the Convention. It also establishes a Secretariat, whose functions are to be performed jointly by UNEP and FAO.

917. During the interim period before the Convention enters into force, the provisions of the Convention will be implemented on a voluntary basis by participating governments. The Intergovernmental Negotiating Committee that negotiated the Convention will oversee the implementation of the interim PIC procedure, including the addition of new chemicals on an interim basis. The COP will, at its first meeting, decide on the inclusion in the Convention of chemicals that have been added to the PIC procedure during the interim period.

The Rotterdam Convention's relevance to mercury

918. The Rotterdam Convention's provisions apply to two categories of chemicals: pesticide and/or industrial chemical. At present, inorganic mercury compounds, alkyl mercury compounds, alkyl-oxyalkyl compounds and aryl mercury compounds used as pesticides are covered by the Convention. It does not apply to these mercury compounds if they are intended for industrial use. The Convention does not make any specific recommendations with regards to reducing or eliminating use of these mercury compounds as pesticides, however, it ensures that international trade does not take place if an importing Party decides to prohibit use of these compounds as pesticides in the country.

9.3.6 The Stockholm Convention on Persistent Organic Pollutants (Stockholm Convention)

919. The objective of the Stockholm Convention, adopted on 22 May 2001, is to protect human health and the environment from persistent organic pollutants, mindful of the precautionary approach as set forth in Principle 15 of the Rio Declaration on Environment and Development.

920. The Convention creates legally binding obligations for Parties to prohibit and/or take the legal and administrative measures necessary to eliminate the production and use of nine POPs (aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, PCBs and toxaphene) and to restrict the

production and use of DDT. In addition, Parties are obliged to take measures to reduce releases from anthropogenic sources of dioxins, furans, PCB and HCB, with the goal of minimisation and, where feasible, ultimate elimination of these POPs. Parties should also take measures to reduce or eliminate releases from stockpiles and wastes. Furthermore, the Convention establishes a register for country-specific exemptions.

921. The Convention covers pesticides, industrial chemicals and by-products that share the characteristics of POPs, i.e., persistence, bioaccumulation, potential for long-range transport, and toxicity. Initially, 12 chemicals are covered. The Convention contains provisions for adding substances to the Convention through a stepwise procedure initiated by a Party submitting a proposal for adding a substance. The candidate substance is first screened against agreed criteria and then further evaluated in depth by a subsidiary body, the POPs Review Committee. The Review Committee makes a recommendation to the Conference of Parties, who decides on whether to include the substance or not.

922. Annex D of the Convention sets out the screening criteria upon which a decision to include a chemical in the Convention must be based. The criteria include persistence, bio-accumulation, potential for long-range environmental transport, evidence of adverse effects to human health or to the environment, toxicity or ecotoxicity data that indicate the potential for damage to human health or to the environment and the need for global control.

Geographic coverage and entry into force

923. The Stockholm Convention is open to all States and regional economic integration organisations.

924. The Convention will enter into force 90 days after the 50th instrument of ratification, acceptance, approval or accession has been deposited with the Depositary. As of 4 October 2002, the Convention had 23 Parties (Austria, Botswana, Canada, Czech Republic, Democratic People's Republic of Korea, Fiji, Finland, Germany, Iceland, Japan, Lesotho, Liberia, Nauru, Netherlands, Norway, Rwanda, Saint Lucia, Samoa, Slovakia, South Africa, Sweden, United Arab Emirates, Viet Nam). It has not yet entered into force.

925. The Convention establishes a Conference of the Parties (COP) to oversee implementation and a Persistent Organic Pollutants Review Committee to review proposals from Parties for adding substances to the Convention. The Convention also establishes a Secretariat, whose functions are to be performed by UNEP.

926. During the interim period before the Convention enters into force, the Intergovernmental Negotiating Committee (INC) that adopted the Convention will continue to meet to oversee implementation during the interim period and to prepare for the first COP. The focus during the interim period will be on activities that facilitate a rapid entry into force and effective implementation of the Convention.

The Stockholm Convention's relevance to mercury

927. Mercury is not among the chemicals covered by the Stockholm Convention as adopted. During the interim period before the Convention enters into force, States have been encouraged to do preparatory work for listing of additional substances in the Convention. However, the subsidiary body that will make recommendations to the COP on whether to include a substance or not, will not be established until the Convention enters into force. New chemicals will thus only be added once the Convention enters into force.

9.3.7 Main references for this section

928. The main references used in this section are, in addition to those submitted by the organisations:

- UNECE website - http://www.unece.org/env/lrtap/hm_h1.htm;
- EMEP website - <http://www.emep.int/index.html>;

- Coordination Center for Effects (CCE) website - <http://www.rivm.nl/cce/>;
- OSPAR Commission website at <http://www.ospar.org>, OSPAR Commission (2000): OSPAR Background Document on Mercury and Organic Mercury Compounds;
- PARCOM Decisions at <http://www.ospar.org/eng/html/welcome.html>;
- HELCOM website – <http://www.helcom.fi>, Recommendations - <http://www.helcom.fi/helcom/recommendations.html>;
- Basel Convention website – <http://www.basel.int>;
- Rotterdam Convention website – <http://www.pic.int>;
- Stockholm Convention website – <http://www.pops.int>.

9.4 International organizations and programmes

929. A number of international organizations and programmes also have activities aimed at addressing the adverse impacts of mercury on health and the environment. An overview of such international organizations and programmes are given in table 9.4. In the following sections are presented summaries of the organizations and programmes and their relevance to mercury. The general description of each organization or programme has mainly been taken from UNEP (2001).

Table 9.4 - Overview of international organizations and programmes with activities addressing the adverse impacts of mercury on health and the environment.

Section	International organization or programme	Geographic coverage	Organization or programme's relevance to mercury	Types of activities addressing mercury
9.4.1	IARC	Global	Addresses the evaluation of carcinogenic risk of chemicals, including mercury, to humans	Evaluations on individual chemicals, information, guidelines
9.4.2	ILO	Global	Addresses occupational health and safety issues linked with use of chemicals, including small-scale mining activities and mercury	Information, guidelines, capacity building
9.4.3	IPCS	Global	Addresses health and environmental aspects of mercury (including inorganic mercury and methylmercury)	Information (risk evaluations, scientific data and precautionary information)
9.4.4	OECD	OECD member States	Addresses mercury and mercury compounds in releases, products, wastes, etc.	Information, recommendations
9.4.5	UNEP GPA	Global	Addresses heavy metals, including mercury	Goal definition, guidelines
9.4.6	UNIDO	Global	Addresses environmentally sustainable industrial activities, including artisanal mining	Information, guidelines, capacity building
9.4.7	World Bank	Global	Addresses environmentally sustainable industrial activities, including artisanal mining	Information, guidelines, capacity building

9.4.1 The International Agency for Research on Cancer (IARC)

930. The International Agency for Research on Cancer (IARC) is part of the World Health Organization. IARC's mission is to coordinate and conduct research on the causes of human cancer, the mechanisms of carcinogenesis, and to develop scientific strategies for cancer control. The Agency is involved in both epidemiological and laboratory research and disseminates scientific information through publications, meetings, courses, and fellowships. The Agency's work has four main objectives - monitoring global cancer occurrence, identifying the causes of cancer, elucidation of mechanisms of carcinogenesis and developing scientific strategies for cancer control. An important aspect of IARC's work is the publication of the IARC Monographs series. The Monographs are authoritative independent assessments by international experts of the carcinogenic risks posed to humans by a variety of agents, mixtures and exposures. Since its inception in 1972, the series has reviewed more than 860 agents, and

the Monographs have become well-known for their thoroughness, accuracy and integrity. They are invaluable sources of information both for researchers and for national and international authorities.

931. The Monographs represent the first step in carcinogenic risk assessment, which involves examination of all relevant information in order to assess the strength of the available evidence that certain exposures could alter the incidence of cancer in humans. The second step is quantitative risk estimation. Detailed, quantitative evaluations of epidemiological data may be made in the Monographs, but without extrapolation beyond the range of the data available. The Monographs may assist national and international authorities in making risk assessments and in formulating decisions concerning any necessary preventive measures. The evaluations of IARC working groups are scientific, qualitative judgments about the evidence for or against carcinogenicity provided by the available data. These evaluations represent only one part of the body of information on which regulatory measures may be based. Other components of regulatory decisions may vary from one situation to another and from country to country, responding to different socioeconomic and national priorities. Therefore, no recommendation is given with regard to regulation or legislation, which are the responsibility of individual governments and/or other international organizations.

932. In 1993, IARC published Volume 53 of the IARC Monographs, which also covered mercury and mercury compounds. In its overall evaluation of carcinogenicity to humans, methylmercury compounds were classified in Group 2B (possibly carcinogenic to humans) and metallic mercury and inorganic mercury compounds in Group 3 (not classifiable as to their carcinogenicity to humans). (IARC, 1993)

9.4.2 International Labour Organization (ILO)

933. The International Labour Organization, ILO, was founded in 1919 and is the UN specialised agency that seeks the promotion of social justice and internationally recognised human and labour rights. Within the UN system, the ILO has a unique tripartite structure in which workers and employers participate as equal partners with governments in the work of its governing organs. The ILO formulates international labour standards in the form of conventions and recommendations, setting minimum standards of basic labour rights. It provides technical assistance in a range of areas, including occupational safety and health. It promotes the development of independent employers' and workers' organisations and provides training and advisory services to those organisations.

934. With respect to chemical safety, the long-term objective of ILO is to enhance the capacity of government institutions, employers, workers and their representative organisations, as well as non-governmental organisations, to enable them to participate in the design, implementation and evaluation of policies and programmes to improve working conditions and the working environment and to reduce the number of occupational accidents and work-related diseases. In the field of chemicals control, there have been a number of conventions, recommendations and guidance materials issued, including the Convention concerning the Prevention of Major Industrial Accidents (No. 174) and accompanying Recommendation (No. 181), adopted in 1993 and the Convention concerning Safety in the Use of Chemicals at Work (No.170) and its accompanying Recommendation (No. 177), adopted in 1990. The purpose of the last Convention is to protect workers from risks associated with the use of chemicals at their workplace. It sets out responsibilities of employers, suppliers, and workers. States ratifying the Convention are required to work out a national policy for safety in the use of chemicals at work in accordance with specified principles, adopt classification and labelling systems for all such substances, and introduce chemical safety data sheets.

935. Other standards and guidance documents concerned with chemical safety include a number of other conventions and recommendations addressing the risks of specific toxic substances including asbestos, white lead, and benzene. In addition, ILO has published Occupational Exposure Limits For Airborne Substances Harmful to Health: A Code of Practice (1991) and Guidelines on Occupational Safety and Health Management Systems (2001).

936. ILO is also active in the field of small-scale mining and how best to support it as a safe, healthy, productive and sustainable activity. In 1999 it published a report – *Social and labour issues in small-scale mining* – that focuses on some of the major issues within this activity. The first chapter sets the scene, putting small-scale mining in context in terms of production and employment, and addresses the issues in general terms. The subsequent chapters on occupational health and safety, women in mining and child labour illustrate some of the problems that exist and are being dealt with. Although the report mainly deals with social and labour issues at a more general level, use of mercury in small-scale mining is emphasized as a major problem within gold production. The report gives examples of how some of the issues are being and might be addressed. By discussing and clarifying the role of governments, the social partners and the ILO, it is hoped that the profile of small-scale mining within the ILO and among the social partners will be raised, leading to increased assistance in providing the means for small-scale mining to ensure safe and productive employment. This will inevitably contribute to the achievement of higher productivity and remuneration, improved working conditions and health and safety, better resource management and lessening of its environmental impact.

9.4.3 International Programme on Chemical Safety (IPCS)

937. The International Programme on Chemical Safety, IPCS, was established in 1980 as a co-operative programme of WHO, ILO and UNEP to provide internationally evaluated assessments of the risks caused by chemicals to human health and the environment, which countries may use in developing their own chemical safety measures and to strengthen national capabilities for preventing and treating harmful effects of chemicals and for managing the health aspects of chemical emergencies.

938. The evaluation of chemical risks to human health and the environment, and the preparation and publication of documents on the health and environmental risks of specific chemicals, is a major focus of IPCS work. The documents, prepared by internationally renowned experts and peer-reviewed by leading independent experts, are designed to be used by readers with different levels of technical expertise and include the following:

- Environmental Health Criteria (EHC) monographs - extensive documents designed for scientific experts responsible for the evaluation of risks posed by chemicals;
- Concise International Chemical Assessment Documents (CICADs) - concise documents that provide summaries of the relevant scientific information concerning the potential effects of chemicals on human health and/or the environment;
- Health and Safety Guides (HSG) - provide concise information for decision-makers on risks from exposure to chemicals, with practical advice on medical and administrative issues; and
- International Chemical Safety Cards (ICSC) - summarize health and safety information for individuals at the workplace, including symptoms of poisoning, safety procedures and first aid;
- Data Sheets on Pesticides - contain basic information for their safe use.

939. IPCS has published the following documents relevant to mercury:

- EHC 1 (1976): Mercury;
- EHC 86 (1989): Mercury - environmental aspects;
- EHC 101 (1990): Methylmercury;
- EHC 118 (1991): Mercury, inorganic.

940. In addition, the Joint FAO/WHO Expert Group on Food Additives and Contaminants evaluated methylmercury in 1999, and the evaluation was published in the *WHO Technical Report series 896*, pp 87-93 (WHO, 2000). These documents are all available on the IPCS website at http://www.who.int/pcs/pcs_pubs.html. IPCS has recently re-evaluated the health and environmental hazards from elemental mercury and inorganic mercury compounds in the CICAD-series (WHO/IPCS, 2002). This document includes an evaluation of the hazards and risks from exposure to mercury from amalgam fillings in teeth and will be available in print in the near future at the website mentioned above.

9.4.4 The Organization of Economic Co-operation and Development (OECD)

941. The Organization of Economic Co-operation and Development, OECD, is an inter-governmental organisation bringing together 30 Member countries in a forum for governments to compare experience, discuss issues of concern, and seek and design solutions including, where appropriate, common or co-operative actions. The Member countries (from Europe, North America, Asia and the Pacific) share a commitment to the market economy, pluralistic democracy, and respect for human rights. The OECD's fundamental mission is to enable Members to consult and co-operate with each other so as to achieve the highest possible sustainable economic growth, improve the economic and social well-being of their populations, and contribute to development worldwide.

942. The Environment Programme, one of many areas of work within the OECD, addresses a wide range of issues of concern to Member countries. Of particular interest to this publication is the Environment, Health and Safety Programme, which includes the Chemicals Programme, as well as work on pesticides, chemical accidents, harmonisation of regulatory oversight in biotechnology, Pollutant Release and Transfer Registers and food safety. The Chemical Programmes main activities are to:

- Assist Member countries in identifying, preventing and managing the risks of chemicals;
- Promote the public's right to know about the potential risks of chemicals;
- Prevent unnecessary distortions in the trade of chemicals;
- Facilitate the optimal use of national resources available in government and industry for chemicals management;
- Assist Member countries in working towards an integrated chemicals management approach that incorporates economic, social and environmental policy considerations, in support of achieving the objectives of sustainable development, and in particular those of UNCED's Agenda 21, Chapter 19;
- Facilitate that globalisation of the chemical industry leads to positive impacts on human health and the environment in OECD Member countries, as well as in non-OECD countries; and
- Promote the development of, and implementation in, Member countries of new and innovative technologies, policies and practices that prevent pollution from the manufacture, transport, use and disposal of chemicals.

943. In 1973, the OECD Council adopted *Recommendation C (73) 172/Final on Measures to Reduce all Man-Made Emissions of Mercury to the Environment*, recommending all member countries to adopt measures to reduce all man-made releases of mercury to the environment to the lowest possible levels. The immediate targets set were elimination of alkyl-mercury compounds in agriculture, elimination of mercury compounds from use in the pulp and paper industry and the maximum possible reduction of discharges of mercury from mercury chlor-alkali plants. The Council also invited member countries to report on the quantities of mercury being used in the agricultural and industrial sectors and on total national consumption.

944. In 1993, Denmark hosted a workshop on risk reduction of mercury to collect relevant information and identify possible future risk management activities. Based on the responses to a questionnaire, and the material discussed at the workshop, a monograph on mercury was published in 1994, entitled *Risk Reduction Monograph No. 4: Mercury – Background and National Experience with Reducing Risk*. It provides a summary of information regarding releases of mercury to the environment, the ensuing environmental and human exposures and the way OECD Member countries perceived the risks associated with exposure to mercury and describes the actions Member countries and industry had taken, or contemplated taking to reduce risks associated with exposure to mercury. The document provides a "snapshot" of the most recent thinking concerning the different activities within the field of mercury consumption and pollution. It may assist in evaluating the effectiveness of national risk reduction strategies for mercury by identifying common trends in setting criteria, standards or national policies.

945. In 1996, OECD member countries agreed to cease further work on mercury within the OECD context.

9.4.5 United Nations Environment Programme - The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (Global Programme of Action)

946. The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) was adopted in November 1995 at an intergovernmental conference in Washington, DC. The 108 governments and European Commission declared their commitment to preserve the marine environment and called upon UNEP, the World Bank, UNDP, regional development banks and all agencies within the UN system to support and strengthen regional structures for the protection of the marine environment. UNEP was asked to lead the co-ordination effort and establish a GPA Co-ordination Office.

947. The GPA seeks to prevent the degradation of the marine environment from land-based activities by facilitating realisation of the duty of States to preserve and protect the marine environment. It is designed to be a source of conceptual and practical guidance to be drawn upon by national and regional authorities in devising and implementing sustained action to prevent, reduce, control and/or eliminate marine degradation from land-based activities. Specifically, the GPA aims to facilitate identification and assessment of problems; establishment of priorities for action; setting of management objectives for priority problems; identification, evaluation and selection of strategies and measures; and development of criteria for evaluating effectiveness of strategies and measures.

948. The programme has a special section for recommendations regarding heavy metals, including mercury. The objective/proposed target is to reduce and/or eliminate anthropogenic emissions and discharges in order to prevent, reduce and eliminate pollution caused by heavy metals. Although there are no specific goals set with regards to mercury, the programme provides detailed guidance on possible/proposed steps in the pursuit of reduced environmental effects from heavy metals and other pollutants. Proposed activities at national, region and international level include, among others:

- Establishment of assessment and monitoring programmes;
- Development of programmes for emission reductions (respecting the precautionary principle, best available techniques (BAT), best environmental practice (BEP) and integrated pollution prevention and control (IPPC));
- Establishment of waste management schemes;
- Promotion of cleaner technology and emission control technology;
- Implementation of awareness campaigns and information activities;
- Formation and strengthening of national and international co-operation; and
- Provision of financial and technical assistance to countries with special needs.

949. The implementation of the GPA is primarily the task of Governments, in close partnership with all stakeholders. UNEP and its partners facilitate and assist Governments in their tasks.

9.4.6 United Nations Industrial Development Organization (UNIDO)

950. The United Nations Industrial Development Organization, UNIDO, was created in 1967 and, since 1985, has been a specialised agency of the United Nations dedicated to promoting sustainable industrial development in developing countries and countries in economic transition. UNIDO brings together representatives of government, industry and the public and private sector, providing a forum for consideration of issues related to sustainable development. UNIDO is also involved in work related to environmental management in various industrial sectors and related to monitoring, treatment, recycling, and disposal of toxic and hazardous chemical wastes and remediation of contaminated sites.

951. Since 1990, UNIDO has been involved in identifying measures to address the complex problems related to artisanal gold mining. It has implemented a number of projects designed to replace high mercury consuming and discharging processes with cost-effective environmentally safe and high-yield gold extraction alternatives that sharply reduce or eliminate the use and discharge of mercury. Projects

providing assistance in assessing and reducing mercury pollution emanating from artisanal gold mining have been carried out in Ghana and the Mindanao area in the Philippines.

952. The Global Environment Facility (GEF) which funds projects in developing countries that address issues such as climate change, biological diversity and international waters, has allocated USA\$ 350,000 to UNIDO for formulating a global action plan for countries located in key transboundary river/lake basins affecting international waters with mercury from artisanal mining. Six countries from three continents will participate: Brazil (Amazon River), Lao People's Democratic Republic (Mekong River), Indonesia (marine environment, especially Java Sea), Sudan (Nile River), Tanzania (Lake Victoria) and Zimbabwe (Zambezi River). The UNIDO-GEF global action plan will identify what steps should be taken in order to remove barriers to the introduction of cleaner artisanal gold mining technologies.

953. As a follow-up, a full project has been developed to help the governments of six countries, namely Brazil, Indonesia, Lao PDR, Sudan, Tanzania and Zimbabwe, where artisanal gold mining activities threaten international waters with mercury releases. The long-term objective of the project is to minimize negative environmental impacts from the artisanal mining sector. This will be achieved by assisting the recipient countries to promulgate a legal framework and design appropriate regulations for the mining sector, and develop institutional structures. In particular, the project will develop the capabilities of recipient countries to assess the extent of mercury pollution from current activities, manage the regulatory mechanisms, and introduce cleaner gold mining and extraction technologies that minimize or eliminate mercury releases. Similar individual projects are being developed within the context of UNIDO's integrated country programmes in Chad, Ghana, Indonesia, Mali, Mozambique, Niger, Philippines, Venezuela, and Vietnam.

9.4.7 The World Bank Group

954. Founded in 1944, the World Bank Group is one of the world's largest sources of development assistance. The Bank, which provided USA\$ 17.3 billion in loans to its client countries in fiscal year 2001, is now working in more than 100 developing economies, bringing a mix of finance and ideas to improve living standards and eliminate the worst forms of poverty. For each of its clients, the Bank works with government agencies, nongovernmental organizations, and the private sector to formulate assistance strategies and increase understanding of development issues.

955. The World Bank is pursuing new initiatives to ensure that the benefits of incorporating sustainability into all its activities are felt on a global scale and for the long-term. The World Bank's Board approved a new Environment Strategy on July 17, 2001, which places emphasis on developing country priorities. The objectives of the strategy are *improving the quality of life* — people's health, livelihood and vulnerability affected by environmental conditions; *improving the quality of growth* — by supporting policy, regulatory, and institutional frameworks for sustainable environmental management and by promoting sustainable private development; and *protecting the quality of the regional and global commons* such as climate change, forests, water resources and biodiversity.

956. The World Bank's portfolio of projects with clear environmental objectives currently amounts to USA\$ 16 billion. Some of the activities of relevance to mercury are:

Pollution prevention and abatement within industrial activities - emphasizing integrated environmental management, rather than just pollution control and using a broad mix of incentives and pressures to achieve sustainable environmental improvements. The Bank has also published a Pollution Prevention and Abatement Handbook (1998) that can be accessed through their web site.

Environmentally sustainable artisanal and Small-Scale Mining – promoting the engagement of relevant communities and groups through information and education, while using the legal and regulatory framework, as well as direct agreements with the mining company, to establish appropriate environmental performance as well as acceptable work conditions. Key to mitigating environmental risks is setting and monitoring appropriate standards.

957. Some projects currently under implementation are:

- The Liao River Basin Project (China) will assist in the environmental recovery of, and enhance water quality management for an integrated river basin management approach, in the Liaoning Province. One of the components of the project is construction of a chlorine production facility, based on modern ion membrane cell technology. Remedial measures to recover mercury will be taken into account and an action plan for demolition of the mercury electrolysis facility will be developed.
- The Urgent Environmental Investment Project (Azerbaijan) aims to direct action in four areas identified in the Azeri National Environmental Action Plan, which are critically important for Azerbaijan's environment and economy. The project has 5 components; component 2 demonstrates mercury cleanup technologies and procedures by decontaminating one heavily polluted area. It tests pilot-scale sludge treatment; develops and applies a low-technology method for mercury recovery; transports wastes; constructs a safe, new landfill; designs and implements a monitoring programme for mercury releases; and does a follow-up assessment.
- The Mining Sector Reform Project (Madagascar) will (a) complete sector reforms aimed at establishing an enabling environment to both promote foreign direct investment in mining and integrate small-scale and artisanal activities into the formal economy; (b) build institutional capacity to effectively enforce laws and regulations, administer mining titles, monitor sector developments, and make geological information available to potential investors; (c) establish capacity in the country, by means of pilot projects, to identify and address environmental as well as social impacts from mining; and (d) identify and adopt appropriate mechanisms to facilitate development of small-scale mines and to improve the social, welfare, health, and environmental conditions of artisanal miners.

958. The World Bank also hosted a seminal meeting on small-scale and artisanal mining in 1995. One of the key conclusions of this conference was the need for integrated solutions to the problems of the sector and improved cooperation between the various institutions. Further meetings respectively convened by UNIDO and ILO involving bi/multilateral institutions reiterated the need for a coordinated approach towards the artisanal and small-scale mining sector if significant progress to be made. In response to this, the World Bank developed a proposal to establish a Consultative Group for Artisanal and Small Scale Mining (CASM). The goal is to establish a forum that would provide a coordinated approach to assessing and addressing some of the problems with this sub-sector as opposed to a piecemeal approach. CASM would be responsible for developing policy guidelines, providing advice, disseminating best practices and experiences, raising funds and project/programme implementation. It would examine and fund proposals for assistance to the artisanal and small-scale mining sectors according to pre-established criteria. In September 1999, a forum was held bringing together bi- and multi-lateral donors, private companies, NGOs, and knowledgeable experts to explore the possibility of establishing this CASM. The Bank is currently working, in consultation with the participants, to convert this proposal into reality.

9.4.8 Main references for this section

959. The main references used in this section are, in addition to those submitted by the organizations:

- IARC website - <http://www.iarc.fr/>
- ILO web site – <http://www.ilo.org>,
ILO, Geneva, Switzerland (1999): Social and labour issues in small-scale mining - <http://www.ilo.org/public/english/dialogue/sector/techmeet/tmssm99/tmssmr.htm>;
- IPCS web site - <http://www.who.int/pcs/index.htm>;
- JECFA website - http://www.who.int/pcs/jecfa/JECFA_publications.htm
- OECD web site – <http://www.oecd.org>;
- UNEP Global Programme of Action web site - <http://www.gpa.unep.org>;
- UNIDO website – <http://www.unido.org>.
- World Bank website - <http://www.worldbank.org/html/fpd/mining/default.html>

9.5 Sub-regional and regional initiatives

960. Finally, a number of governments have found it beneficial to cooperate across national borders in order to address the adverse impacts of mercury on health and the environment in a specific sub-region or region. An overview of such sub-regional and regional initiatives identified in this project that have activities relevant to mercury are given in table 9.5. In the following sections are presented summaries of those initiatives and their relevance to mercury.

Table 9.5 - Overview of sub-regional and regional initiatives addressing the adverse impacts of mercury on health and the environment.

Section	Sub-regional or regional initiative	Geographic coverage	Initiative's relevance to mercury	Types of measures addressing mercury set out in the initiative
9.5.1	Arctic Council Action Plan (ACAP)	Arctic region (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and United States of America)	Addresses mercury and mercury compounds in releases, products, wastes, etc.	Goal definition, co-operative release reduction projects, information, monitoring
9.5.2	Great Lakes Binational Toxics Strategy	Canada and the United States of America	Addresses mercury and mercury compounds in releases, products, wastes, etc.	Goal definition, information, capacity building
9.5.3	New England Governors/ Eastern Canada Premiers Mercury Action Plan	Individual New England States (United States) and Eastern Canadian Provinces (Canada)	Addresses mercury and mercury compounds in releases, products, wastes, etc.	Goal definition, information, capacity building, education and outreach programmes
9.5.4	Nordic Environmental Action Programme	Nordic region (Denmark, Finland, Iceland, Norway and Sweden and Greenland, Faroe Islands and Åland)	Addresses heavy metals, including mercury	Goal definition, information, capacity building
9.5.5	North American Regional Action Plan on Mercury	North American region (Canada, Mexico and United States of America)	Addresses mercury and mercury compounds in releases, products, wastes, etc.	Goal definition, information, capacity building
9.5.6	North Sea Conferences	North Sea (Belgium, Denmark, France, Germany, Netherlands, Norway, Sweden, Switzerland, United Kingdom, European Commission)	Addresses heavy metals, including mercury	Goal definition, information
9.5.7	Coordinating Body on the Sea of East Asia – UNEP/GEF project on reversing environmental degradation trends in the South China Sea and Gulf of Thailand	South China Sea and Gulf of Thailand (Cambodia, China, Indonesia, Malaysia, Philippines, Thailand and Vietnam)	Addresses heavy metals including mercury contamination in sea water, sediment and marine organisms	Information, source reduction

9.5.1 Arctic Council Action Plan to Eliminate Pollution of the Arctic (ACAP)

961. The Arctic Council, established on 19 September 1996, is a high-level intergovernmental forum that provides a mechanism to address the common concerns and challenges faced by the Arctic governments and the people of the Arctic. Its member countries are those bordering the Arctic area: Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States of America. The Association of Indigenous Minorities of the North, Siberia and the Far East of the Russian Federation, the Inuit Circumpolar Conference, the Saami Council, the Aleutian International Association, Arctic Ath-

baskan Council and Gwich'in Council International are permanent participants in the Council. The Council meets at the ministerial level biennially.

962. The main activities of the Council focus on the protection of the Arctic environment and sustainable development as a means of improving the economic, social and cultural well-being of the north. In 1991, the Council launched its Arctic Environmental Protection Strategy, where member countries are committed to:

- Cooperating in scientific research to specify sources, pathways, sinks and effects of pollution, in particular, oil, acidification, persistent organic contaminants, radioactivity, noise and heavy metals as well as sharing of these data;
- Assessing potential environmental impacts of development activities; and
- Full implementation and consideration of further measures to control pollutants and reduce their adverse effects to the Arctic environment.

963. The Arctic Monitoring and Assessment Programme, AMAP, was established in 1991 to implement components of the Arctic Environmental Protection Strategy. AMAP's objective is "providing reliable and sufficient information on the status of, and threats to, the Arctic environment, and providing scientific advice on actions to be taken in order to support Arctic governments in their efforts to take remedial and preventive actions relating to contaminants".

964. In June 1997, AMAP report "*Arctic Pollution Issues: A State of the Arctic Environment Report*" was submitted to Arctic ministers under the Arctic Environmental Protection Strategy. This comprehensive report constitutes a compilation of current knowledge about the Arctic region, an evaluation of this information in relation to agreed criteria of environmental quality, and a statement of the prevailing conditions in the area. It contains a separate chapter on heavy metals, including mercury, describing the concentrations found in the Arctic area in terrestrial, freshwater and marine ecosystems.

965. The ministers agreed to a number of actions in response to the findings of AMAP. These included increasing efforts to limit and reduce releases of pollutants into the environment, and the promotion of international co-operation in order to reduce the identified pollution risks. In addition, an Arctic Council Action Plan to Eliminate Pollution of the Arctic (ACAP) was developed. In the plan a number of pollutants of special concern for the Arctic region – including mercury – have been prioritised for further action.

966. For mercury the planned activities include identification and quantification of major point sources of mercury in all member countries, with the subsequent aim of implementing concrete emission reduction pilot projects for a few emissions sources that would serve as examples of effective mercury reduction initiatives.

9.5.2 The Great Lakes Binational Toxics Strategy

967. The Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin, known as the Great Lakes Binational Toxics Strategy, provides a framework for actions to reduce or eliminate persistent toxic substances, especially those which bio-accumulate, from the Great Lakes Basin. The Strategy was developed jointly by Canada and the United States in 1996 and 1997 and was signed 7 April 1997.

968. The purpose of this binational strategy is to set forth a collaborative process by which Canada and the USA will work towards the goal of virtual elimination of persistent toxic substances resulting from human activity, particularly those which bioaccumulate, from the Great Lakes basin, so as to protect and ensure the health and integrity of the Great Lakes ecosystem. The Strategy establishes reduction challenges for an initial list of persistent toxic substances targeted for virtual elimination: aldrin/dieldrin, benzo(a)pyrene, chlordane, DDT, hexachlorobenzene, alkyl-lead, mercury and compounds, mirex, octachlorostyrene, PCBs, dioxins and furans, and toxaphene.

969. Although both Canada and the United States also have domestic virtual elimination strategies, a coordinated strategy was deemed necessary for the greatest reduction in toxic substances throughout the Great Lakes Basin. Recognizing the long-term nature of virtual elimination, the Strategy provides the framework for actions to achieve quantifiable reduction "challenges" in the timeframe 1997 to 2006 for specific toxic substances. Flexibility is provided in the Strategy to allow for the revision of challenges, timeframes and the list of substances. The challenges for mercury set in the strategy are as follows (considered as an interim reduction targets, to be revised, if warranted):

970. USA Challenge: Seek by 2006, a 50 percent reduction nationally in the deliberate use of mercury and a 50 percent reduction in the release of mercury from sources resulting from human activity. The release challenge will apply to the aggregate of releases to the air nationwide and of releases to the water within the Great Lakes Basin.

971. Canadian Challenge: Seek by 2006, a 90 percent reduction in the release of mercury, or where warranted the use of mercury, from polluting sources resulting from human activity in the Great Lakes Basin.

9.5.3 New England Governors/Eastern Canada Premiers Mercury Action Plan

972. In June 1998, the Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP) adopted the landmark Mercury Action Plan, which specifies actions to protect the region's citizens and its environment from the toxin mercury. The Plan provides the New England states and Eastern Canadian provinces with a coordinated and powerful set of tools to reduce anthropogenic releases of mercury in the region and remove mercury from the region's waste streams.

973. The Mercury Action Plan sets a long-term goal of virtual elimination of anthropogenic mercury emissions in the region. The plan also established an intermediate goal committing to actions to reduce regional mercury emissions by 50 percent by 2003. This intermediate goal has provided an important benchmark to motivate and track progress towards virtual elimination. In a recent development, the NEG/ECP in August 2001 adopted a second interim goal calling for 75 percent reduction of regional mercury releases by 2010. The new reduction goal should be challenging, but also feasible to achieve.

974. Since the adoption of the Plan, representatives of state and provincial environmental agencies on the Mercury Task Force, in conjunction with partnering organizations including the USA Environmental Protection Agency, Environment Canada, Northeast States for Coordinated Air Use Management (NESCAUM), the Northeast Waste Management Officials' Association (NEWMOA) and the Commission for Environmental Cooperation (CEC), have aggressively implemented the spirit and commitments of the Plan. As a result, the region is on target to meet and will likely exceed the 50 percent reduction target for 2003.

975. In the outreach and education area the jurisdictions have focused on such activities as increasing public awareness of fish consumption advisories, particularly with respect to sensitive populations; working with the healthcare sector, including hospitals and dental offices, to reduce mercury releases and use; increasing local efforts to divert mercury from the waste stream through source separation and recycling; and working with schools to eliminate mercury hazards in the classroom. Pollution prevention activities have focused on significant efforts to address the mercury content of consumer and commercial products through implementation of state legislation and through development of the country-wide standards. Mercury collection programmes and thermometer exchanges have also contributed to successful efforts to reduce the mercury burden in the solid waste stream as well as educate the public about mercury.

9.5.4 The Nordic Environmental Action Programme

976. Official Nordic co-operation is channelled through two organisations: the Nordic Council and the Nordic Council of Ministers. The Nordic Council, formed in 1952, is the forum for inter-parliamentary co-operation. The Nordic Council of Ministers, formed in 1971, is the forum for inter-

governmental co-operation. Five countries – Denmark, Finland, Iceland, Norway and Sweden - and three autonomous regions - Greenland, Faroe Island and Åland – participate.

977. Most of the Nordic ministers for specific policy areas meet their Nordic counterparts twice a year – the Council of Ministers for the Environment sets policies with regard to environmental cooperation. For a number of years, Nordic environmental cooperation has been based on an environmental strategy with a series of objectives. The Nordic Environmental Action Programme 2001-2004, which replaces the Nordic Environmental Strategy 1996-2000, is a political, targeted, result-orientated steering instrument establishing environmental priorities within the framework of Nordic cooperation in the field of nature and the environment. It entered into force on 1 January 2001. The action programme follows up on the Nordic environmental commitments contained in the Nordic strategy, “Sustainable Development - New Bearings for the Nordic Region”, and in an active manner, the programme takes up horizontal cooperation to achieve integration of environmental considerations into all sectors.

978. The strategy sets the following general objective with regards to chemicals:

“The use of chemicals must not entail any risk of negative impacts on human health and the environment, and discharges of chemicals constituting a threat to human health and the environment must be discontinued within one generation (25 years).”

979. In their cooperation, the Nordic countries will work to ensure that the generation objectives set under the OSPAR and Helsinki Conventions are made operational, that regulations and strategies leading to a higher level of protection within the European Union/European Economic Agreement are adopted and international, legally binding agreements which, to the widest possible extent, impose a ban or very stringent thresholds for the use and discharge of chemicals hazardous to human health and the environment are adopted. One of the planned activities, relevant to mercury, states that the Nordic countries will take action “to limit substances other than POPs (heavy metals) at global level through international agreements”.

9.5.5 North American Regional Action Plan on Mercury

980. The Commission for Environmental Cooperation (CEC) is an international organization created by Canada, Mexico and the United States of America under the North American Agreement on Environmental Cooperation (NAAEC). The CEC was established to address regional environmental concerns, help prevent potential trade and environmental conflicts, and to promote the effective enforcement of environmental law. The Agreement complements the environmental provisions of the North American Free Trade Agreement (NAFTA). The Council, the governing body of the CEC, is composed of the environment ministers (or the equivalent) of each country. It meets at least once a year to discuss CEC programmes and activities.

981. The Commission provided the mechanism for the three member countries to negotiate an agreement, Council Regulation #95-5 on the Sound Management of Chemicals, which was agreed to on 13 October 1995. The resolution sets out a framework, together with specific commitments, to work collaboratively in addressing the sound management of chemicals in the region. A Working Group was established to work with the CEC to implement the decisions and commitments made in the resolution. Since then, four North American Regional Action Plans, on DDT, chlordane, PCBs and mercury, have been developed and are now at various stages of implementation.

982. The ultimate goal of the Action Plan on Mercury is to achieve a reduction in the anthropogenic releases of mercury to the North American environment through appropriate national and international initiatives, to amounts that can be attributed to naturally occurring levels and fluxes. The Parties intent is to obtain this goal by seeking to reduce mercury releases from human activities, develop enhanced capacity to measure and manage mercury, assess impact and communicate concerns, establish an equitable implementation and compliance protocol and promote continued responsible mercury management initiatives on behalf of governments, industry and citizens through regulatory and voluntary/non-regulatory mercury management actions.

983. The plan sets out detailed recommendations for reducing emissions and releases of mercury from a large number of sources and activities. Examples of some of the specific recommendations made in the Action Plan are:

- Promoting **life cycle management practises** (tracking exports and imports, promoting recognized environmental management systems (such as ISO 14.000));
- Encouraging the timely adoption of **5 kilogram reporting threshold** for facilities that manufacture, process or use mercury on an annual basis through national pollutant release and transfer registers;
- Encouraging **substitution or phase-out of mercury in products or processes**. Where no substitutes available, promoting the use of recycled or recovered mercury;
- Encouraging development of **substitutes in the automotive vehicle industry** both for new and existing vehicles;
- Promoting measures that **reduce or eliminate the use of mercury** in other sectors such as battery manufacturing sector, electrical switches and relays sector, lamp manufacturing sector, health and dental care sector, cultural and artisanal uses and analytical, testing, measurement, calibration and education sector;
- Managing atmospheric emissions of mercury (goal of 50 percent reduction nationally in mercury emissions by 2006 from existing major stationary sources based on 1990 or equivalent emissions inventories);
- Monitoring the industry-developed voluntary/non-regulatory programme to **reduce mercury usage in the mercury cell chlor-alkali industry by 50 percent to 80 metric tons, by the year 2005** and ensuring that new chlor-alkali facilities constructed after 2000 meet a limit value of 0.01 g Hg/metric ton chlorine production capacity, or, where warranted, ban the mercury-cell process;
- Preventing **mercury in products and process waste** from being released directly to the environment, by encouraging efficient waste collection and preventing mercury in products and process waste from being mixed with less hazardous waste in the general waste stream, by encouraging separate collection and treatment;
- Considering development of an initiative to **promote mercury retirement** whereby emission sources that meet required standards but continue to emit residual amounts of mercury are able to counterbalance their residual emissions by removing and retiring an equal or greater amount of mercury from the North American pool;
- Encouraging development and use of effective mercury **waste-stabilization and disposal techniques** and methods;
- Developing consistent/comparable mercury-related data;
- Promoting collaborative research programmes and atmospheric modelling work.

984. Although the regional Action Plans under the Sound Management of Chemicals initiative are not legally binding upon any one or all of the Parties to the North American Agreement on Environmental Cooperation, there is a strong national commitment by each member country to ensure that the Action Plan on mercury results in significant reductions of mercury contamination to the environment. The implementation of the Action Plan will be ensured through the oversight of an Implementation Task Force.

9.5.6 The North Sea Conferences

985. The First International Conference on the Protection of the North Sea was held in Bremen 1984. The aim was to provide political impetus for the intensification of the work within relevant international bodies, and to ensure more efficient implementation of the existing international rules related to the marine environment in all North Sea States. It was thought that a political declaration from a North Sea perspective, would stimulate and bring further ongoing work within the existing international

conventions, such as the Oslo Convention on dumping at sea, the Paris Convention on pollution from land-based sources and the IMO Convention on shipping issues.

986. The Bremen Conference initiated a continuous process where focus is put on the protection of the North Sea at regular Ministerial Conferences. The Bremen Conference in 1984 was followed by the London Conference in 1987, the Hague Conference in 1990, the Esbjerg Conference in 1995 and the most recent Conference in Bergen in March 2002. The North Sea Conferences are political events where the ministers responsible for the protection of the environment meet for a broad and comprehensive assessment of the measures needed to protect the North Sea environment. The decisions of Ministers as recorded in the Ministerial Declarations are political commitments that have played an important role in influencing legally binding environmental management decisions both nationally and within the framework of competent international bodies. Belgium, Denmark, France, Germany, the Netherlands, Norway, Sweden, Switzerland, United Kingdom and European Commission take part in this cooperation.

987. The North Sea Conferences address a wide range of issues as regards the protection of the North Sea such as species and habitats issues, pollution by hazardous substances and nutrients, radioactive substances and pollution from ships and offshore installations. Due to the concern about the impact of fisheries on the commercially important fish stocks, on other fish stocks and on the marine ecosystem in general, fishery activities were introduced as a new issue during the 1990's.

988. In 1990, ambitious targets were agreed to reduce inputs of 36 hazardous substances, including mercury, by 50 percent and for substances that cause a major threat to reduce inputs by 70 percent. The long-term target agreed at the Esbjerg Conference in 1995 of continuously reducing discharges, emissions and losses of hazardous substances, thereby moving towards the target of their cessation within one generation, has now been adopted by the OSPAR Convention and has thus become legally binding. According to the Progress report for the 5th Conference in Bergen in March 2002, all the countries participating in the North Sea cooperation have met the reduction target of 50 percent for mercury, lead and cadmium releases to air and water. For mercury, the reductions in eight countries total at least 70 percent and one country has reported a 64 percent reduction.

9.5.7 Coordinating Body on the Sea of East Asia – UNEP/GEF project on reversing environmental degradation trends in the South China Sea and Gulf of Thailand

989. The UNEP/GEF project on “Reversing environmental degradation trends in the South China Sea and Gulf of Thailand” is a regional project for the East Asian seas. The project was approved at the 15th Meeting of the Coordinating Body on the Sea of East Asia (COBSEA) and is funded by the Global Environment Facility (GEF). This significant GEF project (32 million USA\$) represents the first attempt to develop regionally co-ordinated programmes of action designed to reverse environmental degradation particularly in the area of coastal habitat degradation and loss, halt land-based pollution and address the issue of fisheries over-exploitation. The participating countries include Cambodia, China, Indonesia, Malaysia, Philippines, Thailand and Vietnam. The Project Steering Committee, as the supreme decision-making body of the project, is composed solely of representatives of the countries participating in the project. UNEP, through its East Asia Seas Regional Coordination Unit acts as the Secretariat of the Committee. The project will be implemented during 5 years from 2001.

990. The overall goals of this project are to create an environment at the regional level, in which collaboration and partnership in addressing environmental problems of the South China Sea and Gulf of Thailand, between all stakeholders and at all levels, is fostered and encouraged; and to enhance the capacity of the participating governments to integrate environmental considerations into national development planning. Major outcomes will include a Strategic Action Programme including a targeted and costed programme of action and framework for regional co-operation in the management of the environment of the South China Sea and Gulf of Thailand; national and regional management plans for specific habitats and issues; pilot activities relating to alternative remedial actions to address priority trans-boundary pollutants and adopted water quality objectives and standards; a regional strategy for achiev-

ing long term benefits from continued sustainable use of the resources of the South China Sea and Gulf of Thailand; and demonstration management activities at sites of regional and global significance.

9.5.8 Main references for this section

991. The main references used in this section are, in addition to those submitted by the organizations:

- Arctic Council website - <http://www.arctic-council.org>; AMAP website - <http://www.amap.no/>;
- US EPA web site: Binational Toxics Strategy - <http://www.epa.gov/glnpo/bns/>;
- Commonwealth of Massachusetts' submission – <http://www.chem.unep.ch/mercury/gov-sub/sub18gov.pdf>; NEG/ECP web site - <http://www.cmp.ca/toc.htm>;
- Nordic Council website - <http://www.norden.org/start/start.asp>;
- CEC web site - <http://www.cec.org>.
- North Sea Conference website - <http://odin.dep.no/md/nsc/>
- UNEP East Asia Seas Regional Coordination Unit website - <http://www.unepscs.org>.