

**MD**

**MILJØVERNDEPARTEMENTET**

*Royal Ministry of the Environment*

# **NORWAY'S ACTION PLAN FOR REDUCING MERCURY RELEASES**



*Cover photo: Detail of the Mercury Fountain by Alexander Calder at the Miró Museum, Barcelona, Spain*

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## 1. SUMMARY

Mercury is an extremely dangerous pollutant and currently represents a threat to the environment and human health both in Norway and globally. Mercury and mercury compounds are highly toxic to people and animals. The nervous system of fetuses and children is particularly vulnerable to mercury damage. Mercury is not degradable; it accumulates in food chains and ends up on our own plates, particularly in fish. In Norway, nationwide advisories on the consumption of large predatory freshwater fish have been issued because of high levels of mercury.

Global releases of mercury are rising, and the pollution does not stop at national borders. In the Arctic, where there are no local sources of mercury, current levels of mercury pollution are a threat to health and the environment, and the pollution load is increasing.

Norway has set ambitious targets for mercury releases:

- 1) Mercury releases are to be substantially reduced from the 1995 level by 2010.
- 2) The use and releases of mercury are to be eliminated within one generation, i.e. by 2020.

By 2002, Norway's releases had been reduced by just over 58 per cent since 1995. Further action will be required to ensure that the national targets are achieved. Mercury pollution in Norway is caused both by national emissions and by long-range transport of pollution. Thus, to reduce the total pollution load in Norway, both international efforts and steps to reduce Norwegian releases are necessary. In addition, it is important to learn more about the effects of mercury in the environment and of the sources of mercury releases.

The Norwegian Government has drawn up this action plan to intensify action to deal with mercury pollution and will take a number of steps to eliminate mercury releases as far as possible, both in Norway and internationally.

### **10 important actions to eliminate mercury releases**

*Norway will reduce mercury releases at national level by*

- 1) considering the introduction of a general ban on the use of mercury in products, with the possible exception of particularly important applications, in the course of 2005
- 2) continuing strict controls on mercury releases from manufacturing industries
- 3) reducing mercury releases from waste incineration and landfilling and increasing the proportion of waste containing mercury that is collected and delivered to approved facilities
- 4) considering whether to introduce a requirement for all dental surgeries that install new amalgam separators to collect at least 95 per cent of amalgam waste
- 5) obtaining more information on the effects of mercury and on the sources of mercury releases.

*Norway will take part in efforts to reduce global releases by*

- 6) working towards a legally binding global instrument on mercury, i.e. a new convention or a protocol
- 7) providing bilateral assistance to developing countries to help them reduce mercury releases
- 8) taking part in continued monitoring of mercury pollution in the Arctic

- 9) advocating an ambitious mercury policy in the EU
- 10) contributing to action relating to mercury in the new EU member states, using funding from the EEA financial mechanisms.

## **2. EFFORTS TO REDUCE MERCURY RELEASES IN NORWAY**

The threats that mercury poses to health and the environment have been recognised for quite some time. Nevertheless, serious problems remain to be dealt with. Despite large cuts in emissions since the 1980s, there are still significant releases of mercury in Norway. New knowledge also shows that mercury in the environment is even more dangerous than previously realised. This is underscored, for example, by the fact that Norway has found it necessary to issue nationwide advisories on the consumption of some types of freshwater fish. Thus, there is no reason to give any less priority to efforts to reduce mercury pollution, even though a great deal has already been done to reduce emissions in Norway. On the contrary, the authorities will redouble their efforts to reduce emissions from Norwegian sources.

### **2.1 Norway's targets**

Mercury is on Norway's priority list of hazardous substances, and it is a national target to reduce mercury releases substantially from the 1995 level by 2010. By 2002, Norway's releases had been reduced by just over 58 per cent since 1995. Another of Norway's targets is to eliminate the use and releases of mercury within one generation, i.e. by 2020. Further action will be required to ensure that these targets are achieved. In addition, it is important to learn more about the effects of mercury in the environment and of the sources of mercury releases.

### **2.2 Mercury in products**

*The authorities will:*

- consider the introduction of a general ban on the use of mercury in products
- focus on products that contain mercury in efforts to ensure that environmental considerations are taken into account in public procurement

Even though mercury is already prohibited in many products,<sup>1</sup> it is currently used for example in dental amalgam, light sources (e.g. fluorescent lamps) and measuring equipment. Dental amalgam accounts for ca 18 per cent of Norway's total emissions. New uses and products may also arise that the authorities are not currently aware of. Mercury may be released to the environment from products both during their use and when they are discarded as waste or discharged to waste water.

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<sup>1</sup> The use of mercury and mercury compounds is prohibited or strictly restricted in mercury thermometers, anti-fouling preparations, impregnating agents, imported cars, batteries, and electrical and electronic equipment (with some exceptions, e.g. light sources). A certain mercury content is permitted in some types of button cell batteries. These must be labelled as containing mercury, and dealers are required to accept spent batteries free of charge. The Directorate for Health and Social Affairs has issued guidelines on the use of dental restoration material. These recommend that the use of amalgam should be restricted as much as possible for environmental reasons and to prevent possible injury to health.

It will be difficult to achieve the target of eliminating the use and emissions of mercury by 2020 if mercury is still being used in products that generate widespread releases to the environment. The Ministry of the Environment will therefore consider the introduction of a general ban on the use of mercury in products, with the possible exception of particularly important applications. This would reduce mercury use in, and releases from, products and also reduce pollution from products that are discarded as waste or discharged to waste water. Denmark has already introduced a general ban on the use of mercury, and Sweden is considering whether to do so. If Norway introduces a general ban on the use of mercury in products, this will mean that it regulates the use of mercury more strictly than the EU.

As long as no general ban on the use of mercury is in effect, it is important to provide more information on mercury in products for purchasers. The authorities will focus particularly on products that contain mercury in their efforts to ensure that environmental considerations are taken into account in public procurement.

### 2.3 Manufacturing industries and the offshore oil and gas industry

*The authorities will:*

- continue their strict controls on mercury releases from manufacturing industries
- seek to achieve further reductions of mercury releases from weighting materials in drilling fluids, and evaluate the need for new instruments to ensure zero discharges of mercury from offshore activities

In 2002, manufacturing industries accounted for 37 per cent of Norway's mercury releases, and sources included the metallurgical industry and secondary steel manufacturing based on scrap containing traces of mercury. Since 1995, mercury emissions from land-based industry have been reduced by about 15 per cent. The large cuts in emissions from this sector were largely made before 1995. Releases from the offshore industry were reduced by about 95 per cent in the period 1995–2002. In 2003, releases from the offshore industry made up about 3 per cent of Norway's total releases of mercury.

Emission limits in discharge permits issued pursuant to the Pollution Control Act are the most important tool for reducing releases from the manufacturing sector. Compared with other EU and EFTA countries, Norway has made good progress in reducing mercury emissions from manufacturing industries. The Norwegian chlor-alkali industry has already phased out mercury-cell technology, and waste from this industry that contains mercury is stored in landfills that meet standards for long-term environmentally sound management. Conditions laid down in discharge permits for ferro-manganese producers require them to install equipment to control mercury emissions if the ore they use has too high a content of mercury. There are no corresponding requirements in EU countries. Strict mercury emission limits have been laid down for secondary steel manufacturing. However, in order to ensure that they enjoy equal conditions of competition with actors in the same industry in the EU, these requirements have not yet entered into force. Treatment facilities for end-of-life vehicles are required to remove components that contain mercury from all vehicles. This reduces the amount of mercury in scrap iron and steel and thus emissions from secondary steel manufacturing. The authorities will also seek to ensure that techniques for end of pipe mercury removal are considered to be BAT (best available techniques) for secondary steel manufacturing i.a. when EU guidelines (BREFs) are revised. Emissions of mercury from the secondary steel industry should be examined systematically on a European basis, with emphasis on the variations of the mercury content in the scrap, see section 3.2, Action in the

EU and EFTA countries. Releases of mercury from manufacturing industries are still a problem, and the environmental authorities will therefore continue their strict controls on emissions from this sector.

The discharge permits issued to offshore companies under the Pollution Control Act also include emission limits for mercury. In addition, a target of zero discharges of environmentally-hazardous substances (including mercury) to the sea has been set for the industry, to be achieved by the end of 2005. In consultation with the offshore companies, the environmental authorities will seek to achieve further reductions of mercury discharges from weighting materials in drilling fluids. After 2005, there will be an evaluation of the degree to which the target of zero discharges has been achieved for mercury, and of whether further action is needed.

## **2.4 Waste incineration and landfilling, municipal waste water, crematoria, etc. (other point sources)**

*The authorities will:*

- introduce stricter emission limits for mercury emissions from waste incineration plants from 2006
- take steps to reduce the environmental risks associated with landfills and improve the statistics on mercury in leachate from landfills
- consider further action to increase the proportion of waste light sources containing mercury that are collected and delivered to approved facilities
- consider whether to introduce a requirement for all dental surgeries that install new amalgam separators to collect at least 95 per cent of amalgam waste
- carry out awareness-raising campaigns and information activities targeting dental health services, inspections of amalgam separators and a pilot project to clean service pipes in order to reduce mercury discharges from dental surgeries to municipal waste water

Mercury is released by incineration and landfilling of waste containing mercury. The use of dental amalgam results in releases of mercury to municipal waste water and emissions from crematoria. In 2002, waste incineration plants, landfills, crematoria, the municipal waste water sector, etc. accounted for 13 per cent of Norway's mercury releases. Releases from all these sources together were reduced by 80 per cent in the period 1995–2002.

### *Waste*

Stricter emission limits for mercury from waste incineration plants were laid down in new regulations in 2003. For plants that were already in operation, the new limits apply from 1 January 2006. New legislation on landfills has been in effect since 2002, including requirements on their design to reduce leaching of pollutants, including mercury. The environmental authorities will ensure that landfills that do not meet the statutory environmental standards are closed by 1 January 2006. The new legislation for landfills will also help to improve the statistics on leaching of mercury from landfills, which are currently inadequate.

Waste mercury and products containing mercury are defined as hazardous waste, and must be delivered to the hazardous waste management system. The environmental authorities will evaluate further measures to increase the proportion of waste light sources containing mercury (such as fluorescent lamps and mercury vapour lamps) that are collected and delivered to

approved facilities. It is prohibited to export waste containing mercury from Norway to non-OECD countries.

#### *Waste water and crematoria (mercury released from amalgam)*

Norway has introduced requirements on the treatment of waste water containing dental amalgam and limits on mercury emissions from crematoria.

The authorities will consider whether to introduce a requirement for all dental clinics that install new amalgam separators to collect at least 95 per cent of amalgam waste. In addition, the authorities will carry out awareness-raising campaigns and information activities targeted towards dental health services, inspections of amalgam separators, and a pilot project to clean service pipes in order to reduce mercury discharges from dental clinics to municipal waste water. To improve the data on releases of mercury to municipal waste water and sewage sludge, the authorities will consider the introduction of new rules for systematic measurements of pollutants, including mercury, in municipal waste water.

## **2.5 Road traffic, shipping, fuelwood use, etc (diffuse emissions to air)**

### *The authorities will:*

- consider whether to introduce requirements for measurement of concentrations of PAHs and heavy metals, including mercury, in air

Exhaust from road traffic and shipping and fuelwood use accounted for about 28 per cent of Norway's mercury emissions in 2002. Mercury emissions from these sources rose by ca 14 per cent in the period 1995–2002, mainly because of rising emissions from diesel vehicles and fuelwood use. Mercury emissions to air from these sources are to a large extent associated with particulate matter.

Emission limits for particulates from wood-burning stoves were included in the technical regulations under the Planning and Building Act in 1998. Stricter limits on particulate matter in exhaust from vehicles have been included in the Motor Vehicle Regulations, and will apply from 2005 (for type approval) and 2006 (for licensing of new vehicles). Further differentiation of fuel taxes was introduced from 1 January 2005: this will increase sales of sulphur-free fuels and at the same time reduce emissions of particulate matter. The differentiation of the road tax for heavy vehicles according to their emissions, which from 2005 applies to buses as well, also provides an incentive to replace the oldest vehicles so that emissions of particulate matter are reduced.

The authorities will consider whether to introduce requirements for measurements of the concentrations of PAHs and heavy metals, including mercury<sup>2</sup>, in air. This would improve our knowledge of mercury dispersal to air. The measurements would also include dry and wet deposition of mercury.

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<sup>2</sup> In the case of mercury, a requirement for indicative measurements will be considered. The difference between these and fixed measurements is that the time coverage is lower.

## 2.6 Improving the knowledge base

It is important to learn more about the effects of mercury in the environment and about the sources of mercury releases. The environmental authorities will therefore:

- obtain more information on mercury in the environment, for example through the following monitoring programmes:
  - annual monitoring of mercury loads in marine organisms along the coast of Norway, combined with analyses of time trends in the biota
  - monitoring of direct (industrial) and riverine<sup>3</sup> inputs to Norwegian coastal waters
  - weekly monitoring of air and precipitation at Lista (near the southernmost tip of mainland Norway) and continuous atmospheric measurements at Ny-Ålesund in Svalbard
  - nationwide monitoring of sediments in lakes, including measurements of mercury concentrations (at roughly 10-year intervals). Samples will be taken in 2004–2005, and earlier series of samples were taken in the mid-1980s and mid-1990s
- survey mercury concentrations in mosses in 2005
- continue surveys of mercury concentrations in bottom sediments from harbours and near shipyards
- carry out a project in Lake Mjøsa to obtain better data on the proportions of mercury inputs originating from long-range atmospheric transport and from leaching from local sources. The purpose is to find out whether the lake differs from similar Scandinavian lakes with respect to long-range atmospheric transport of mercury. If this is found to be the case, further data will be collected as a basis for possible local action
- evaluate and harmonise the methodology for calculating critical loads of mercury in the Nordic countries, under the auspices of the Nordic Council of Ministers
- improve the statistics on mercury in products
- give priority to mercury in research relating to substances that are hazardous to health and the environment.

## 3. INTERNATIONAL EFFORTS TO REDUCE MERCURY EMISSIONS

The rising global emissions of mercury result in substantial long-range transport of mercury to Norway. Today, inputs from long-range transport are estimated to be at least twice as large as the total national emissions. International efforts to reduce long-range transport of mercury are a very important means of reducing the total mercury pollution load in Norway. The environmental authorities will therefore give high priority to these efforts.

### 3.1 Action at global level, in the ECE area and in the Arctic

*Norway is seeking to ensure:*

- that mercury emissions are eliminated as far as possible through a legally binding global instrument, for example a new convention or a protocol. The UN Environment

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<sup>3</sup> 10 main rivers (12–16 times a year) and 36 tributaries (4 times a year).

Programme, UNEP, is to consider the development of a binding global agreement in 2005

- that targets are agreed for phasing out the use of mercury and other heavy metals as part of the strategic approach to international chemicals management being developed under the auspices of UNEP
- that technical guidelines for environmentally sound management of waste containing mercury are drawn up under the Basel Convention
- bilateral assistance to developing countries to help them reduce mercury releases, for example by eliminating the use of mercury in gold mining
- that the current revision of the LRTAP Convention includes the introduction of stricter emission limits for industry and products
- that monitoring of mercury pollution in the Arctic is continued, for example by supporting activities under the auspices of the Arctic Council

Various international initiatives have already been taken to reduce mercury emissions globally. UNEP has carried out a thorough global mercury assessment and concluded that there is sufficient evidence to warrant further international action. So far, UNEP has established a global mercury programme to facilitate action to reduce mercury emissions. However, existing measures are not sufficient to ensure the necessary reduction of global releases of mercury. The main priority is to develop a new, legally binding agreement at global level to deal with the remaining problems associated with mercury.

Waste containing mercury is classified as hazardous, and comes within the scope of the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal. The central objective of the Basel Convention is to ensure environmentally sound management of hazardous waste. To achieve this, technical guidelines have been drawn up for priority types of hazardous waste, including waste containing persistent organic pollutants. Guidelines should also be drawn up for waste containing mercury, because this will clarify which types of waste management are regarded as environmentally sound, and provide support for other global work on mercury.

Norway is a party to the protocol on heavy metals under the LRTAP Convention<sup>4</sup>, which entered into force in 2003. Under the protocol, the parties are required to reduce their total annual emissions of mercury to the atmosphere below the 1990 level. The parties are also required to apply the best available techniques (BAT), and to ensure that certain sources of emissions comply with the limit values set out in the protocol. The protocol also includes certain product management measures. The protocol is an important instrument for reducing overall European releases of mercury and long-range European and transatlantic transport in the atmosphere and will therefore be important in reducing long-range inputs to Norway and the Arctic.

The Arctic Council monitors the state of the environment in the Arctic and is focusing particularly on mercury.

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<sup>4</sup> Convention on Long-range Transboundary Air Pollution under the UN Economic Commission for Europe (ECE). The Convention applies to European states, Russia and other former Soviet republics, the US and Canada.

### 3.2 Action in the EU and EFTA countries

*Norway is seeking to ensure:*

- that the requirements Norway has introduced for the collection of amalgam from waste water at dental clinics and for control of mercury emissions from crematoria are also introduced in the EU
- that the requirements for mercury removal that have been laid down for the metallurgical industry in Norway are considered to be BAT (best available techniques) under the IPPC Directive in the EU and EFTA countries, and also that requirements for control of emissions of mercury to air from secondary steel production are considered to be BAT
- that the EU considers whether the currently available tools for control of mercury emissions from manufacturing industries are adequate: for example, whether emission limits should be introduced at Community level for certain industries that generate large releases of mercury
- that action relating to mercury is taken in the new EU member states using funding from the financial mechanisms for the reduction of social and economic disparities in Europe
- agreement on the overall objective of phasing out the use of mercury in products in the EU and EFTA countries
- that surplus mercury is disposed of in landfills that meet standards for long-term environmentally sound management. This should also be the case for residual mercury from the chlor-alkali industry
- that there is less recycling of mercury from waste
- that exports of mercury to the global market are eliminated
- that a better overview of sources of mercury releases in EU and EFTA states is obtained. Norway is seeking the development of a better system for the exchange of information on mercury releases between the countries in the region, including surveys of mercury in scrap iron and steel

EU policy and controls on mercury are of key importance for Norway, both because EU legislation sets the framework for the application of policy instruments in Norway, particularly as regards products, and because a substantial proportion of the long-range transport of mercury to Norway originates in the EU. Norway is seeking to influence EU policy and emission levels in various ways. By setting strict limits for Norwegian emissions, it is possible to exert some influence on standards and policy in the EU. Assistance for mercury-related action in the new EU member states in Eastern Europe contributes directly to lower emission levels in the EU. Norway also provides input to the development of legislation and policy in the EU.

With the enlargement of the EU and EEA on 1 May 2004, two new financial mechanisms were established. Through these, Norway is contributing EUR 1.134 billion (nearly NOK 10 billion) in the period 2004–2009 for investment and development projects in the 10 new member states (and Greece, Portugal and Spain). These funds can be used for various purposes, including environmental measures such as action to reduce mercury emissions, but only if some of the new member states apply for funding for such projects.

The EU Commission has recently presented a coherent community strategy concerning mercury. The strategy discusses actions targeted at the entire mercury cycle, from production to use, waste management, releases and exports. The strategy also provides a basis for EU

input to UNEP on mercury. Norway has advocated an ambitious mercury strategy in the EU, and this was reflected in Norway's input to the strategy. In Norway's view, the EU has a special responsibility for stopping inputs of mercury to the global market. The new strategy is a good basis for further efforts to reduce mercury emissions in the EU and the supply of mercury to the global market.

## ANNEX: MERCURY – EFFECTS AND SOURCES

### Effects of mercury on health and the environment

Mercury is a highly toxic and dangerous pollutant, and currently represents a threat to the environment and human health both in Norway and globally. Mercury releases to air and water are transported over long distances with ocean currents and in the atmosphere, thus polluting areas far from sources of emissions. Mercury is not degradable and accumulates in food chains and ends up in our own food, particularly in fish. Mercury is as serious a global problem as the most dangerous persistent organic pollutants (POPs) such as PCBs, dioxins and brominated flame retardants.

Because they are so toxic, mercury and mercury compounds can harm both people and animals. Dietary intake of and contact with various mercury compounds can cause permanent brain damage, particularly in the fetus. Mercury exposure can also increase heart rate and blood pressure, and thus cause cardiovascular disease. Inorganic mercury can cause kidney damage. Exposure to mercury can also lead to contact allergy and cause acute poisoning. The nervous system of fetuses and children is particularly vulnerable to mercury damage, see box 1.

#### **Box 1: Children and fetuses particularly susceptible to mercury exposure**

The Joint FAO/WHO Expert Committee on Food Additives, JECFA, has carried out studies on the Faroe Islands and the Seychelles. These showed that an excessive dietary intake of mercury can cause more serious fetal damage than previously believed. Neuropsychological deficits were seen particularly in children from the Faroe Islands, where whale meat, which contains high levels of mercury, is a normal part of the diet. The recommended dietary limit for methylmercury for pregnant women was therefore reduced from 3.3 to 1.6 micrograms per kg body weight per week. The Norwegian Food Safety Authority has incorporated the new limit into its dietary recommendations.

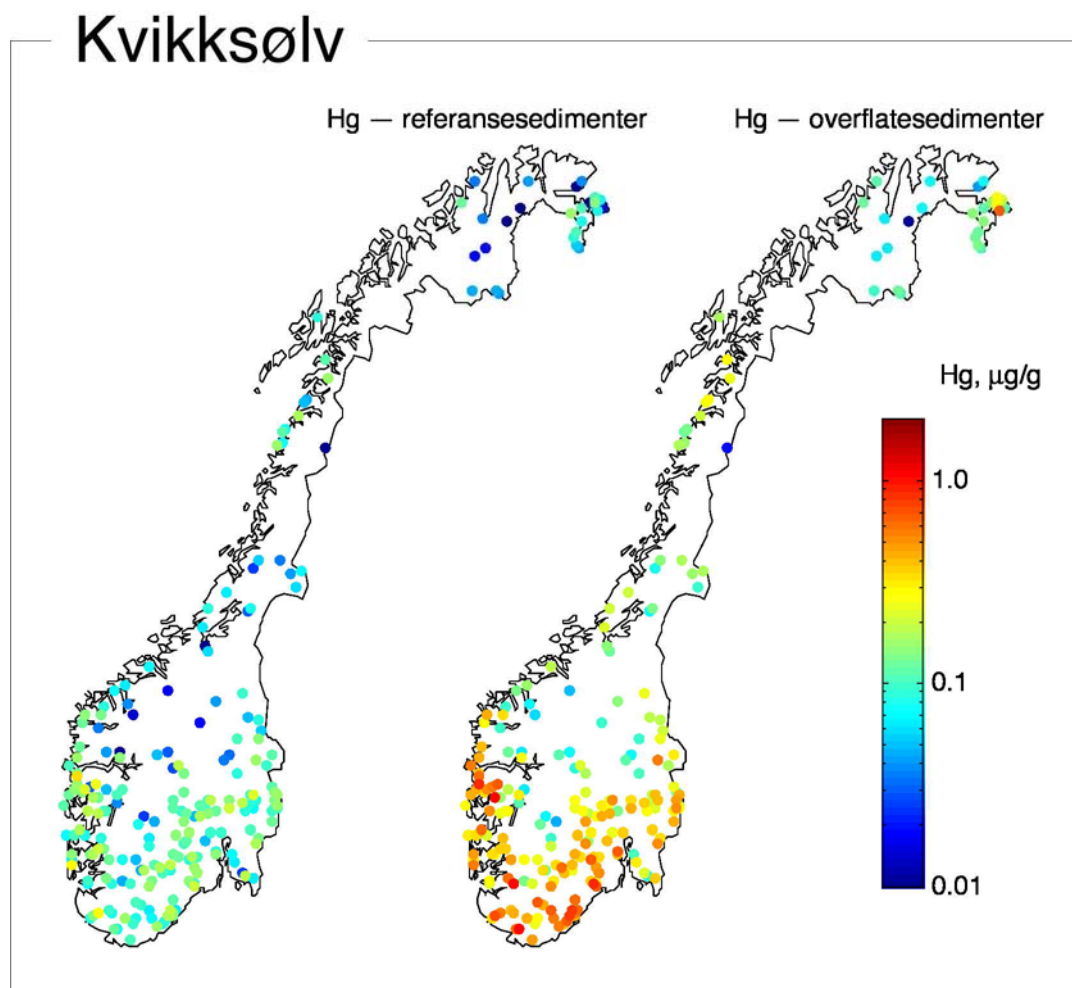
Studies in the US have shown that one in six women of childbearing age have blood mercury levels that are high enough to cause adverse effects on fetal development. One reason why the proportion is so high is that the mercury concentration in a fetus is 1.7 times higher than in the mother's blood.

The Norwegian Food Safety Authority and the Norwegian Institute of Public Health have recently investigated the dietary intake of mercury in Norway. The results show that for the vast majority of women of childbearing age, it is well below the tolerable weekly intake recommended by WHO.

The health and environmental problems associated with mercury are mainly a result of bacterial conversion of inorganic mercury to the extremely toxic organic compound *methylmercury*. This process takes place in aquatic systems, and explains why methylmercury is found particularly in fish. Most of the methylmercury is stored in the muscle tissue of fish, in other words, in the parts of the fish that we eat. In Norway, there are nationwide advisories on the consumption of certain species of fish because they contain high concentrations of methylmercury. Large predatory fish (large specimens of trout, Arctic char, perch and pike)

should not be eaten more than once a month, and women who are pregnant and breastfeeding mothers should avoid them altogether. In marine waters, mercury concentrations are lower, except in some fjords where there are known to be local sources of mercury. However, studies of the inner Oslofjord have shown rising concentrations of mercury in cod.

The overall emissions of mercury to air are resulting in rising concentrations of mercury in the atmosphere. Mercury is gradually deposited with rain and snow on soils and water surfaces, often far away from the pollution sources. In the northern hemisphere, the rate of mercury deposition from the atmosphere is 2–5 higher than in pre-industrial times. Figure 1 shows how this has contributed to higher levels of mercury pollution in Norwegian lakes. The figure shows the differences between mercury concentrations in deeper sediment layers from pre-industrial times, and those in surface sediments, which give an indication of mercury deposition from the atmosphere in the period 1985–1995<sup>5</sup>.



*Figure 1 Mercury in sediments*  
(Kvikksølv = Mercury, referansesedimenter = reference sediments, overflatesedimenter = surface sediments)

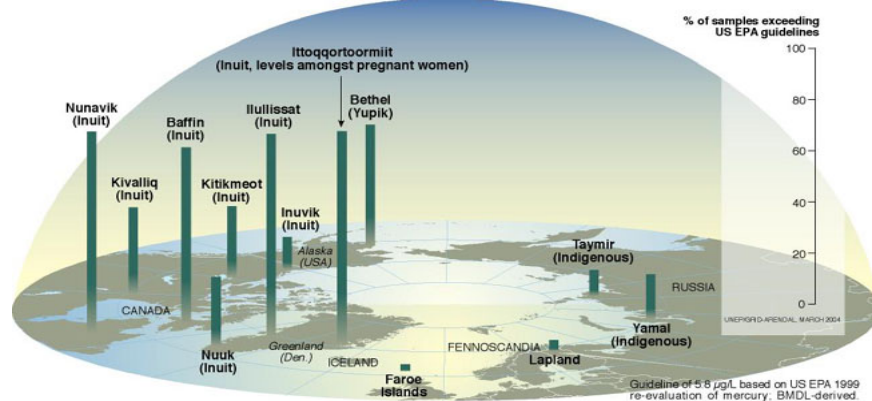
<sup>5</sup> Figure 1. The data (n =231) are from a national survey of sediments carried out in 1996 (Rognerud et al., 1999). Surface sediments are the layer 0-0.5 cm from the surface, mainly deposited in the period 1985-1995. Reference sediments are deeper layers from pre-industrial times, probably deposited about 1400. Note: the scale is logarithmic.

Today, elevated mercury concentrations are found throughout the world in the environment and in foodstuffs, especially fish. Fish are an important source of food globally, and mercury pollution is therefore a threat to supplies of fish and food in all parts of the world.

The mercury pollution load in the Arctic is increasing. Current levels of pollution are a threat to animals and people in Arctic areas. Mercury represents a particularly serious health risk for Arctic peoples because fish and marine mammals make up such a large proportion of the diet of certain groups, see box 2. Environmental conditions in the Arctic also make the region particularly vulnerable.

## Box 2: The growing threat of mercury in the Arctic

It is estimated that global emissions result in the annual deposition of 150–300 tonnes of mercury in the Arctic. Some mercury is carried to the Arctic with rivers and ocean currents, but much less than by long-range atmospheric transport. The Arctic Monitoring and Assessment Programme (AMAP) has found rising mercury concentrations in the Arctic. Current pollution levels already represent a severe health risk for the population. The figure below shows that mercury levels are excessive in many women of childbearing age; this will be a particularly serious threat to their children. *The figure shows blood mercury levels in indigenous peoples in the Arctic. The height of the columns indicates the proportion of women of childbearing age with excessive levels of mercury.*



Source: AMAP

Mercury represents a particularly serious risk to health and the environment in developing countries. Mercury use and releases are rising in these countries, whereas in industrialised countries, both use and emissions have been reduced. There are particularly serious health and environmental risks associated with the use of mercury in small-scale gold mining, see box 3. The use and emissions of mercury are also less strictly regulated in developing countries, and the legislation may be less strictly enforced. This adds to the risks.

## Box 3: Use of mercury in gold mining

The use of mercury in small-scale gold mining is a particularly high-risk activity, since children and adults often work with mercury without any protection. According to UN (UNIDO) figures, about 6 million people throughout the world (Asia, Africa and South America) are engaged in small-scale gold mining. This number is likely to rise.



## Sources of mercury pollution in Norway

Mercury pollution in Norway is caused both by national emissions and by long-range transport of pollution. Inputs from long-range transport are estimated to be at least twice as large as the total national emissions.

*Global sources*

The most important source of mercury releases globally is the combustion of coal containing mercury as an impurity in coal-fired power plants. Other important sources are gold mining, mercury mining, chlor-alkali production using mercury-cell technology, metal production, cement production, cremation, and waste treatment. In addition, mercury is released from products such as fluorescent lamps, dental amalgam, thermometers and electrical switches. Globally, mercury releases are mainly to air, but some is also released to water and soil. Anthropogenic emissions are almost four times releases due to natural mobilisation of mercury, for example through volcanic activity.

In 2004, global anthropogenic releases of mercury totalled more than 2 100 tonnes. More than 50 per cent of global mercury releases are generated in Asia. And global releases of mercury are rising: from 1990 to 2000, global emissions to air rose by 20 per cent. This is partly because for many years, large supplies of mercury have been available on the global market at very low prices, and partly because of a lack of regulation at global level. In Asia in particular, emissions are rising as a result of rapid industrial growth and the rising use of energy generated from coal and wood.

#### *Sources of mercury pollution in the EU*

In the EU, mercury emissions to air were reduced by 60 per cent from 1990 to 2000, and this trend is expected to continue. The largest sources of mercury releases in the EU are combustion of coal, emissions from land-based industry and dental amalgam. The EU as a whole is a net exporter of mercury to the global market from the Almaden mercury mine in Spain. The total mercury supply to the global market is about 3 600 tonnes per year, and EU exports make up about 1 000 tonnes of this. The European chlor-alkali industry is currently phasing out the mercury-cell technology, which will result in a large surplus of decommissioned mercury (12 000–15 000 tonnes).

#### *Norwegian sources of mercury pollution*

In 2002, mercury releases to air, soil and water from Norwegian sources totalled about 1 100 kg. Thus, Norwegian releases are relatively modest in the global context.

The most important sources of mercury releases in Norway are land-based manufacturing industries including secondary steel production, road traffic, waste incineration plants and crematoria, waste water and products such as dental amalgam. Figure 2 indicates the relative importance of different sources of mercury releases in Norway in 2002. More than 80 per cent of mercury releases in Norway are to air, 14 per cent to soil<sup>6</sup> and 6 per cent to water.

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<sup>6</sup> Of this, ca 80 per cent is released to soil in cemeteries from dental amalgam.

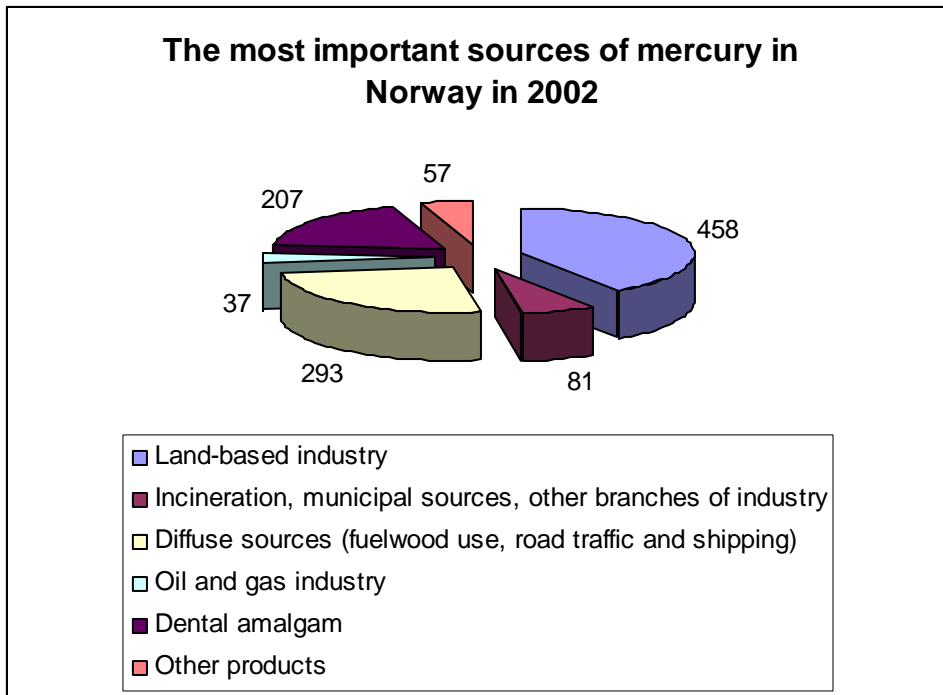


Figure 2 The most important sources of mercury releases in Norway in 2002

A number of products that are on the market in Norway contain mercury. These include dental amalgam, electric lighting, measuring equipment and laboratory chemicals. Figure 3 shows the quantities of mercury on the market in different product types.

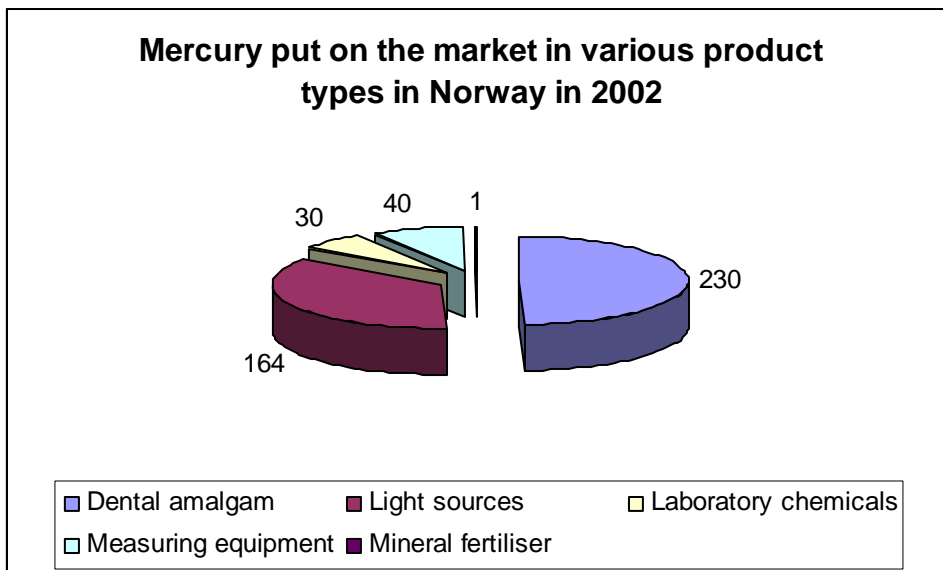


Figure 3 Mercury put on the market in various product types in Norway in 2002

In the past 20 years, Norway has made a great deal of progress in reducing releases of mercury, especially as a result of action taken by the manufacturing industries. Total emissions have been reduced by 58 per cent since 1995 and by 79 per cent since 1985. Figure 4 shows how mercury releases have dropped in the past 20 years.

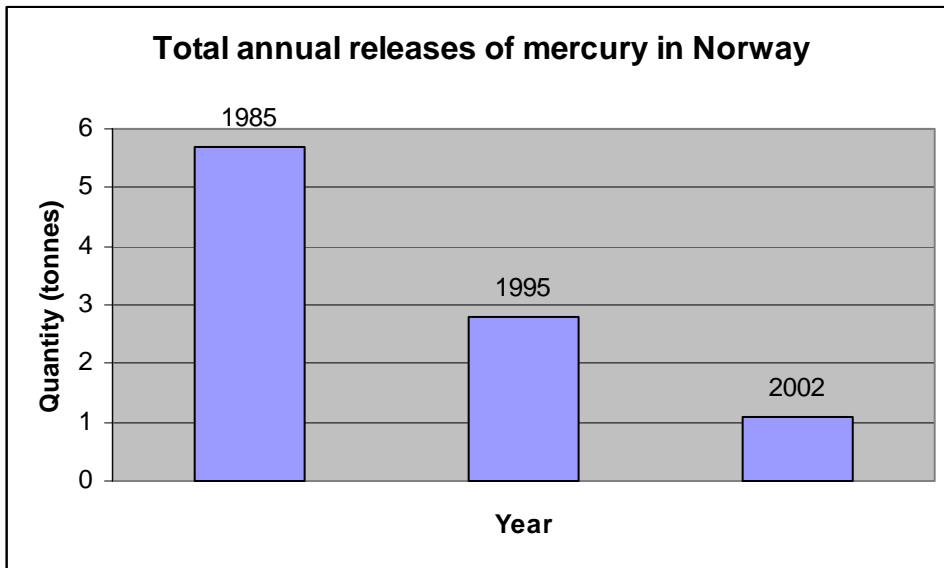


Figure 4 Mercury releases in Norway in the past 20 years