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500 years of mercury production: global annual inventory by region until 2000 and associated emissions

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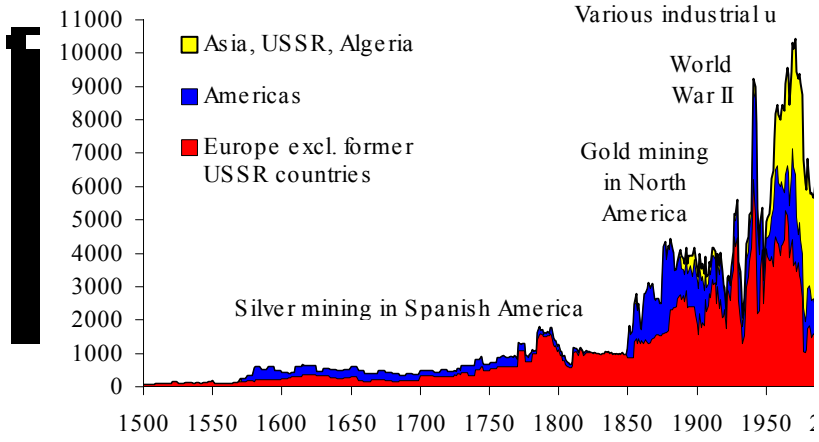
Global, historical production of primary Hg

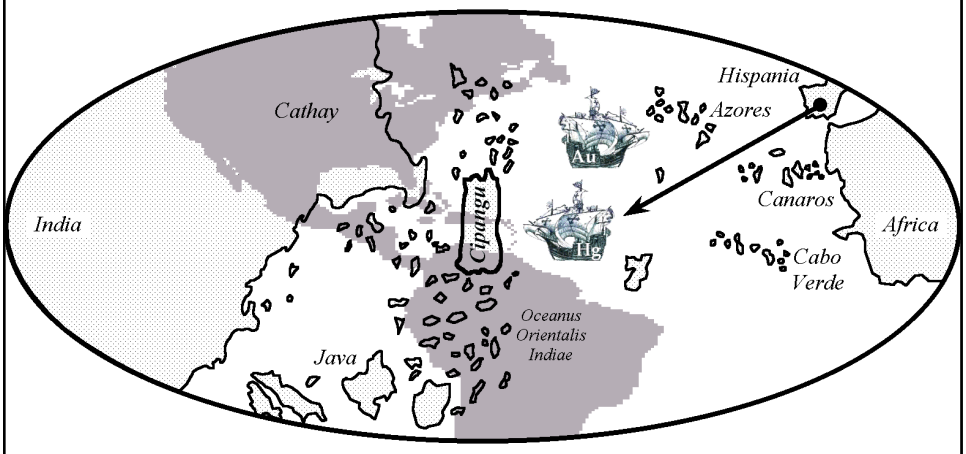


and the European contribution.

(Hylander & Meili, 2003. *Sci. Total Environ.)*

Hg

Columbus' assumptions about the location of east Asia and his venture in 1492 of sailing west to Japan (Cipangu), “the country glimmering in gold” east of China (Cathay)…



resulted in an exchange of Hg for gold and silver from the New World, which entailed that mercury became an early global pollutant.

(Hylander & Meili, 2003. *Sci. Total Environ.)*

☿
Hg

The main mining sites in Europe are
Almadén in Spain,
Idrija in present-day Slovenia,
and Monte Amiata in Italy,

☿
Hg

accounting for 99 % of all primary Hg historically mined in Europe.

☿
Hg

Almadén has contributed to one third of globally mined Hg…

and is still selling Hg to gold miners! (Minas de Almadén y Arrayanes SA, MAYASA)

Hg

Owned by the Spanish government, the Hg mine has been run at economic losses for more than a decade.

Hg

MAYASA has a well organized selling organization for Hg,

☿ Hg

with selling offices in Spain, UK, Peru, India, and the Philippines.

Close to areas where Hg is abused in ARTISANAL GOLDMINING and industry!

Ex. Hindustan Lever Limited (HLL, subsidiary of Unilever) thermometer factory in Kodaikanal, India.

☿ Hg

ARTISANAL GOLDMINING

* now the largest? consumer of mined Hg

* taking place in countries with no or poor health and environmental protection

* resulting in large emissions of Hg to air, water and soil

So let's sniffing into it!

Hg

Goldminer in Amazonas

using the amalgamation method by massaging the milled ore into Hg covered sheets with his bare hands.

Hg

Gold amalgam is put on a spade, heated by a gas burner, and Hg evaporates, leaving pure gold behind.

☿ Hg

Why is Hg used?

Technically easy

Mix, stir, wash, and burn!

Economically profitable

1 g Au buys about 1 kg Hg

Physically possible

Melting point –39 °C (cf. Au 1065)

”Dissolving” gold

Boiling point 357 °C (cf. Au 3700)

☿ Hg

Options to combat Hg emissions from amalgamation

Develop Hg free, suitable technologies.

Reduce the demand for gold.

Reduce the availability of Hg,
e.g. by restricting international trade.

☿ Hg

Hg by-production and related Hg sources

Potential Hg emissions from **non ferrous** metallurgical industry **20 000** t Hg /year (Mukherje, 1999).

Estimated Hg emissions from mining & metallurgical industry **267** t Hg /year (Pirrone et al., 1996).

☿ Hg

Production of Hg as a by-product for sale:

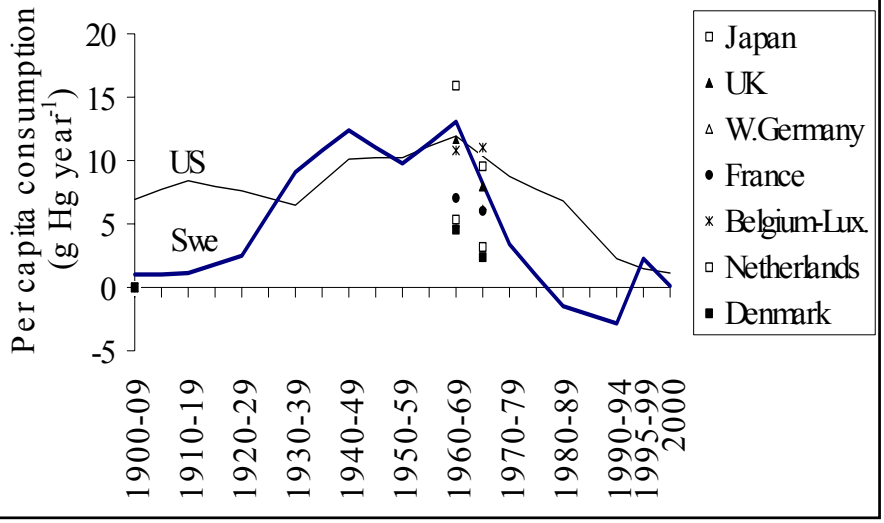
* Finland (Zn) ≈50 t Hg /year.
* USA (Au) ≈70 t Hg /year + ≈50 t Hg /year from Peru.

Hg by-production is considered **toxic waste** in Sweden:

* Boliden (Cu) ≈20 t Hg /year

Hg

Per capita consumption of primary Hg peaked in the 1960's.



Hg

The large consumption of Hg has resulted in large stocks of Hg in products still in use.

Examples:

Chemical industry

Teeth

El- industry

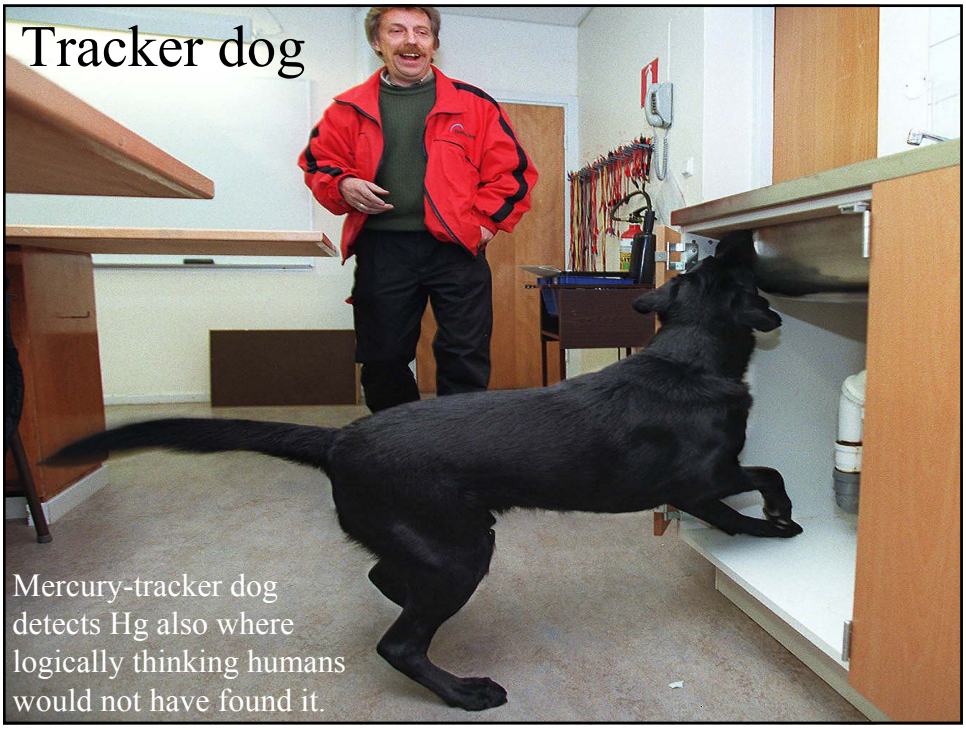
(switches, fluorescent tubes, car bulbs, PC:s)

Stocks of Hg *(tonnes)* used in society

	Sweden		EU + EFTA
Usage	**1992**	**2002**	**2002**
Chlor-alkali factories	400	400	12 000 - 15 000
Teeth	40-60	30-50	1 300 - 2 200 *
Electrical app. & instr.	10-30	3-5	430 – 1 300 *
Thermometers	5-10	2.5-5	215 - 430 *
Dry and button cells	3-5	-	-
Laboratory chemicals	2-4	1	90 - 180 *
Fluorescent tubes	~0.6	1	~60 *
Sum	**460-500**	**438-462**	**14 095 - 19 170**

* If per capita amalgam fillings and use in the other countries are in parity with Sweden before Hg laws were implemented.

Sources: SOU 2001:58; Lindley, 1997; Naturvårdsverket, 1993; Rein and Hylander, 2000; SCB, 2002



Hg

Global co-operation necessary

How to include **China** and the former **USSR** countries in global efforts to reduce emissions of Hg?

How to include **Spain**?

Hg

The environmental costs of Hg
are HIGH
and are not included in the
raw material price

Hg

Cost-benefit analysis at Minamata

Was it profitable to neglect the environment? (1000 US$/y)

Investments to prevent pollution	Cost of damage	Loss
750	**79 000**	**78 250**

Specified costs: -victims' compensation 41 000
-costs to remove contaminated sediment 33 750
-compensation to the fishing industry 4 250

Source: Environment Agency of Japan, 1994.

Hg

A shift in paradigm from a resource to refuse.

"The quicksilver industry is in a depressed condition. The production has fallen off largely, but this has not had the effect of stimulating prices." USBM, *Present status of the industry.* **1885**.

Hg

Action plan for the future

1. Terminate all primary Hg mining immediately.

- Almadén in Spain (236 t in 2000, mine closed)
- Algeria (240 t)
- Kyrgyzstan (550 t, Exports to China stopped?)
- China (8 big, 50 small Hg mines in 2000. Terminated in 2001?)

Hg

2. Separation of Hg in metallurgical smelters should continue!

Reduces atmospheric emissions by 99.5 %

Present handling of by-product Hg

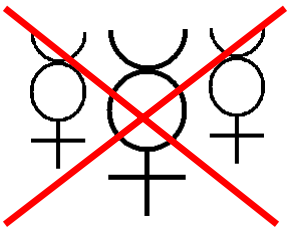
- Sweden. Temporally stored in a concrete silo. Waiting for final deep rock-bed deposition latest from 2015 (Prop 2002/03:117).

- Norway. Earlier sold, now returned into the mine at Odda for final deposition.

- Finland. Sold on the world market. Together with Chinese/Spanish Hg **sold to goldminers** in e.g. Brazil.

Hg

3. Inform about that Hg is NOT technically necessary



Replace Hg thermometers by digital or alcohol thermometers.

Replace Hg thermostats by digital or other Hg free ones.

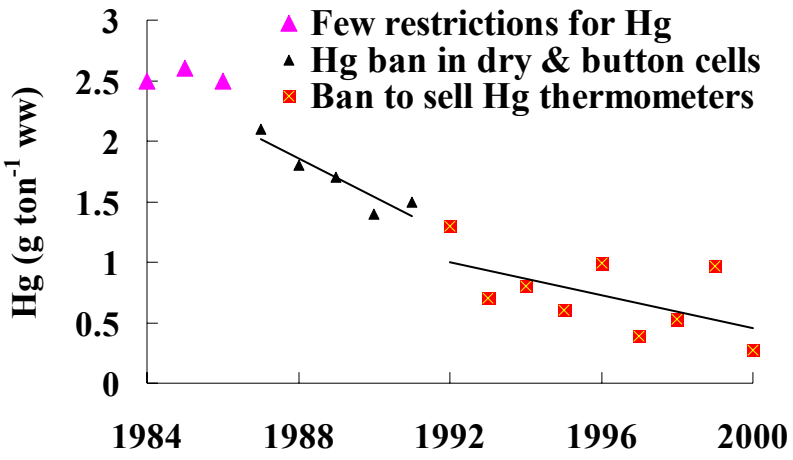
Hg

Best Available Technology
for production of chlorine and soda
is Hg free
and uses less energy
than Hg cells do.

Membranes are
BAT

Hg

4.Political actions are necessary



Mercury in waste in Uppsala, Sweden, related to legislation regarding products containing Hg.
(Hylander, et al., 2003. *Sci. Total Environ.)*

Hg

5. Investigate how to handle excess Hg

Best future solution from environmental and health points of view:

Deep rock-bed deposition!

Turn of millennium,

time to reverse the flow of Hg!

Send it back to Almadén.

Hg

Euro Chlor has already sent back some 1300 tonnes Hg.

Reselling this Hg must be hindered

for the sake of environment and health.

How to put Hg back into the mine?

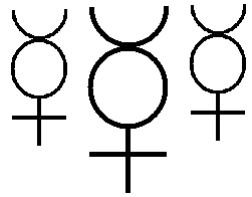
In a safe and responsible way!

The end

"developments prompted one British mercury dealer in early 1999 to dub Hg a '*dying metal*,' adding that most sales were to companies in developing nations with fewer environmental restrictions".

R.F. Manas, AMM News Services

Dead indeed



Still causing deaths
in developing countries