3. In fact, economics in general is notably absent from the debates over the OLPC programme in developing countries.
4. Although those responsible for the OLPC project repeatedly claim that the goal is to reach *all* primary school children (this is what happened in Peru and Uruguay for example), the aim of the Indian version is much more limited, namely, to reach the 25 million students who are not privileged enough to benefit from the traditional computing and education (OLPC, India). This would of course substantially reduce the burden of the programme on the education budget, but it is entirely unclear how the figure (of 25 million) was actually reached. The same report notes, more generally, that the private sector has been active in some countries in supporting low-cost computing initiatives (known as one-to-one computing).
5. The OLPC model is based on a constructionist theory of learning which assumes that pupils tend to be able to learn on their own[6]. The Peru case discussed suggests that this is little more than wishful thinking.
6. See James[7] for the calculation.
7. Certainly Warschauer and Ames[6] feel that the expenditure on laptops under the OLPC project could be better spent on more basic (and proven) items such as books and teachers.
8. For a full discussion, see James[8].

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Legally binding Minamata Convention on Mercury: politics and science behind

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Mercury is a naturally occurring element having widespread uses globally. It is highly toxic, persists in the environment and has global ramifications on humans, wildlife and environment. Post the dreadful Minamata incident caused due to mercury contamination, there had been international endeavours to address this issue on a global level. The Minamata Convention on Mercury is a gallant global effort towards a legally binding instrument to protect human health and the environment from mercury contamination. Political and scientific factors played a major role in shaping the provisions of the Minamata Convention. This article addresses such factors including the rationale of adopting a legally binding approach instead of much-pushed voluntary measures and why did India, despite its active participation in the meetings, which shaped the Convention, refuse to sign it?

10 October 2013 was a historic day, not only for Japan, but also for the rest of the world. More than 1,000 participants from over 140 countries, intergovernmental and non-governmental organizations (IGOs and NGOs) gathered in Kumamoto, Japan to adopt the first ever international legally binding Convention on Mercury, following decades of increased awareness regarding the toxicity of mercury and mercury-related compounds. Named the Minamata Convention on Mercury, the agreement was a response to the realization that mercury pollution is a global problem and no single country can solve it alone. Naming and venue the Convention could not be more appropriate, as it was a memorial to local history where the first case of Minamata disease was identified in 1956.

Minamata incident

Minamata, a part of Kumamoto Prefecture, is located approximately 1,000 km from Tokyo, the capital of Japan. During 1950s, in Minamata, the outbreak of an unknown neurological illness was first reported among the fishing families of the area. They were diagnosed with a mysterious ailment, which was attributed to contaminated seafood due to discharge of untreated chemical waste from a local chemical factory owned by Chisso Corporation. Chisso Corporation started as a hydroelectric power company in 1908. It eventually began producing chemical fertilizers, and became Japan's major chemical company. The company used mercury as a catalyst to produce acetaldehyde, which was then used to produce acetic acid and vinyl chloride. The people living in the vicinity of the Minamata Bay experienced severe neurological damages such as visual, auditory, and sensory disturbances, numbness, and difficulty in walking. In 1956, scientists gave the ailment a name: Minamata disease. Mercury was understood to be the primary reason behind the disease.

The responsible contaminant was then eventually identified as mono methyl mercury (CH_3Hg), formed from mercury by action of anaerobic sulphate-reducing bacteria. Mono methyl mercury is a potent neurotoxin. It affects people and wildlife through bioaccumulation at multiple levels in the food chain. People were exposed primarily through consumption of seafood contaminated with methyl mercury, particularly those

having high levels of fish consumption. According to an official estimate of the Government of Japan, more than 900 people died due to mercury-related poisoning and others lived with long-term disabling conditions. Even after six decades of the dreadful Minamata disaster, scientists are only beginning to understand the adverse impacts of mercury contamination on humans, wildlife and environment.

Mercury, a global peril

Human activities are estimated to have released around 1,900 metric tonnes of mercury into the atmosphere and at least around 1,000 metric tonnes into the water during 2010, according to a 2013 report by the United Nations Environment Programme (UNEP). Burning of coal is the largest anthropogenic source of mercury air emissions, accounting for 45% of total emissions, while 18% comes from gold mining, as mercury helps separate gold from the rock and other sediments[1].

In terms of coal-based emissions, China is the biggest emitter followed by the United States and India. Emissions from China are three times the combined emissions of the US and India. According to UNEP, mercury emissions have started reducing from Europe and North America, but a considerable amount of Asian emissions end up in Europe and the US. Mercury tends to linger in the environment; as mercury emissions can travel far from their original sources on winds and ocean currents. A recent modelling study estimated that half the mercury pollution in the surface layer of the ocean today came from emissions prior to 1950, when the US and European contributions exceeded those from Asia[2].

The problem of mercury is transboundary and global in nature. The global perils of mercury pollution were first addressed in the United Nations Conference on the Human Environment, held in Stockholm during 1972. It was not until 2001, during the 21st session, that UNEP's Governing Council (GC) decided to initiate a process to undertake a global assessment of heavy metals contamination, including mercury. The UNEP Secretariat was asked to prepare a report with special emphasis on its effects on human health and environment.

Towards an agreement

Since 2003, there had been an international agreement within UNEP to endeavour an international action on the serious environmental and health problems posed by mercury, but the major challenge was to identify the best approach to deal with the problem. Traditionally, the negotiators were aligned in two camps. For years, the US, India and China were against a legally binding instrument, while Australia and Canada took a more reserved position. The European Union (EU), African countries, Norway, Switzerland, and some Latin American and Caribbean countries were strongly supportive of a legally binding approach (LBA). Japan favoured stronger binding measures on mercury due to its experience from the Minamata incident, where several hundred Japanese suffered from serious effects of mercury poisoning resulting from industrial pollution.

The US, during the Bush administration, was forcing for a voluntary approach; however, when Barack Obama entered the White House in January 2009, the US announced it would move ahead with negotiations toward a legally binding instrument. Nevertheless, this was what slowed the international process until the UNEP GC quite surprisingly agreed to go for a legally binding approach in 2009. It was agreed that a mercury convention ought to be negotiated by 2013. The US policy reversal indicates that the arguments in favour of the pro-voluntary approach were rhetorical, designed only to showcase the ideological position of the Bush administration rather than expressing substantial effectiveness concerns[3].

In 2009, the UNEP GC directed UNEP to convene an Intergovernmental Negotiating Committee (INC) to begin work on a legally binding mercury treaty. The scope of the mandate covered uses, trade and potential sources of mercury emissions, including mercury in products and processes, and mercury-containing wastes. The mandate focused only on mercury, notwithstanding attempts by the EU and some other countries to include a mechanism that would allow for the treaty to include other heavy metals of concern in the future. Although the number of parties favouring LBA was gradually growing and opposition to LBA from key stakeholders like India and China had softened in line with domestic policy development, the agreement reached at the 2009 meeting came as a great surprise to most of the observers. There is no doubt that the US weighed heavily in tilting the process toward consensus on the LBA. Still, the question of what made the increasingly powerful emerging countries like India and China turn into supporters of the LBA remains only partially answered.

Major contention behind the voluntary approach was in terms of its effectiveness. A voluntary approach was considered the best way of getting things done on the ground. In contrast, it was argued that the LBA took more time to negotiate; it was far more costly and may prove less effective in the long run. India was also strongly against LBA, stressing its right to develop economically and also arguing that it had successfully dealt with the problem at home largely through voluntary measures. India argued that these voluntary measures had already cut domestic emissions by 80%, and further cuts were unlikely by either type of instrument. There had been a reduction from 321 metric tonnes in 2000 to 241 metric tonnes in 2004 in industrial mercury emissions in India[1]. India was not a major player before the 2009 GC meeting. In 2009, the Central Pollution Control Board (CPCB) set 2012 to phase out mercury from two large domestic mercury sources: chlor alkali plants and externally 'donated' e-waste. Both sources were hard to control, the costs of new technologies were considered high, and industry wanted more time for its compliance. As in the case of China, India's opposition to LBA was softened over time due to internal policy development. A binding international treaty would actually be used by CPCB to put pressure on the reluctant domestic industries.

The Convention

In October 2013, a new international convention to phase out mercury was opened for signing at Kumamoto, Japan. Named the Minamata Convention on Mercury, the agreement is a response to the realization that mercury pollution is a global problem that no single country can solve alone. With more than 140 nations agreeing by consensus to a final text in January 2013, the Convention aims to protect human health and the

environment from anthropogenic emissions and releases of mercury and mercury compounds. The countries also agreed to control and 'where feasible' reduce emissions of mercury and mercury compounds (i.e. 'total mercury') to the atmosphere through measures to control emissions from point-source categories such as coal-fired power stations and non-ferrous metal smelters (e.g. aluminum smelters). Representatives from 92 countries formally signed the Minamata Convention. To come into effect, the treaty has to be ratified by 50 countries. A time-period of 90 days is required to come into effect from the date of ratification. Parties would then need to enact or harmonize relevant legislations in conformity with the provisions of the Convention. The US became the first and is the only country to ratify the Convention, till date.

The Convention included a number of controls regarding mercury mining, import and export, storage, disposal and reducing mercury emissions. The treaty also includes commitments to health promotion and education, healthcare capacity building, technical assistance and technology transfer with special consideration for least developed countries. The most powerful provisions of the treaty are the institution of a global ban on the import and export of certain products containing mercury (including batteries, switches/relays, fluorescent lamps, soaps/cosmetics) set to commence in 2020 (ref. 4). However, scientific uncertainty came into play in a number of instances, particularly with regard to mercury-containing thiomersal vaccine and the use of mercury in dental amalgams exempted from the 2020 ban. Incidentally, the treaty also does not focus much on the emission levels of mercury from industries nor does it specify any threshold for emissions. Thiomersal vaccine was a contentious issue as the World Health Organization supported continued use of the vaccine, claiming that there were no scientific data to prove that its use was a health issue and that restricting access would lead to restrictions on who could benefit from vaccines[5]. Vaccines containing thiomersal as a preservative, such as diphtheria, tetanus, pertussis and influenza vaccine, were excluded from the list of banned products in the Convention, partly in light of the extensive studies supporting the safety of minute amounts (<50 μg/dose) of thiomersal, but also because of the population-level risks of removing thiomersal[6].

The Minamata Convention has many positive elements supported by healthcare professionals that have the potential to improve global oral health and address the environmental impact of mercury-related disposal. These include strengthening oral health through national prevention programmes, investment in research and development for alternative materials, development of economic incentives for the use of alternatives, promotion of environmental waste and disposal controls, and training and education of dental health professionals. However, the absence of binding and measurable requirements may pose challenges in effectively implementing the intent of the treaty and ensuring harmonized, environmentally sound management.

Scenario in India

It is almost impossible to ascertain the quantum of mercury released in India and the number of people affected or likely to be affected by mercury poisoning. Interestingly, India too had witnessed a near Minamata-like disaster almost a decade ago. In 2001, environmental groups and villagers exposed a thermometer manufacturing factory owned by a major multinational, Hindustan Lever Limited, now Hindustan Unilever Limited (HUL), dumping several tonnes of toxic mercury-bearing waste in a scrapyard in a densely populated part of Kodaikanal, a leading tourist destination in Tamil Nadu. The broken thermometers were dumped on land behind the factory, resulting in the mercury leaching into the soil. Following the incident, Kodaikanal was branded as India's Minamata. Faced with the evidence and HUL's admission of breach of law, the factory was forced to close. Ultimately, the company had to arrange for the remediation of contaminated soil. In the backdrop of the Minamata disaster and with lax monitoring and regulatory arrangements, we may be on the brink of another Minamata-like disaster. Despite approval of the Union Cabinet on the text of the Minamata Convention and given its active participation in the INC meetings, India's sudden change of stand on the Convention is unjustifiable for adopting the Minamata Convention on Mercury. Also, the government's inexplicable decision to skip such a historic event has resulted in the loss of opportunity to take global leadership in phasing out mercury. The Minamata disaster shows us that we must not ignore the past. The more we study and learn about it, the more it teaches us lessons about living, such as the value of the environment and health.

The Minamata Convention on Mercury is a gallant effort towards a global and legally binding instrument to protect human health and the environment from mercury emissions. It builds on years of efforts to document and start to address the problem of mercury. Importantly, the Convention recognizes that the provisions identified cannot happen overnight, and these will need to be realized at different paces depending on the resources and capacities of individual countries.

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