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Introduction

In October 2013, nearly six decades after health officials first noted victims suffering from unregulated discharges of methylmercury in Minamata, Japan, parties signed the Mercury Convention.[1] An international treaty designed to protect human health and the environment from anthropogenic releases and emissions of mercury and mercury compounds, the Minamata Convention on Mercury is the newest multilateral environmental agreement registered with the United Nations.[2] Currently, the Convention has 96 signatories and only one ratified party, the United States.[3] When it enters into force, however, the costs and difficulty of implementation may dilute the benefits of this new global monitoring system. This feature describes the origins of the Convention and potential implementation problems and concludes that despite these difficulties, the creation of a global risk assessment for mercury, if properly implemented, will be invaluable in protecting environmental health worldwide.

Origins

The negative human health effects of mercury contamination and poisoning have been well-documented since the 1970s.[4] But not until the occurrence of large-scale public health catastrophes did the global community gain awareness of this issue. The emergence of a strange and un-diagnosable ailment in the fishing village of Minamata, Japan in 1956 which came to be known as "Minamata disease" was the first and most well-known of the mercury-caused public health emergencies that emerged over time.[5] For many years, however, the cause of this "disease" was unknown; there is much controversy regarding the Japanese government's response to the outbreak of this "disease." It was not until 25 years after the first outbreak that the Japanese government finally acknowledged that releases of an unwanted byproduct (methylmercury) of chemicals manufacturing offshore into the ocean by the Shin Nippon Chisso Hiryo chemical plant were the source of the mysterious ailments that afflicted the community.[6]

Victims of Minamata disease who ingested the methylmercury—a potent neurotoxin now known to accumulate into highly toxic doses in the food chain[7] and cause brain damage and birth defects[8]—have struggled to get the Japanese government to recognize the pollution disaster as well as obtain compensation from the polluting chemical facility.[9] As of March 2001, 2,265 victims have been officially recognized by the Japanese government (of whom 1,784 have died) and over 10,000 people received financial compensation from Chisso.[10] The number of victims, however, varies widely between reporting in government sources and the studies conducted by the local community. Further, calculating the number of victims to begin with is even more difficult because symptoms of mercury poisoning often do not manifest until later in life, and varying degrees of affliction result from varying levels of exposure.[11]

In the village of Minamata two different museums documenting and memorializing the public health catastrophe portray vastly different pictures of Minamata disease, one reflecting the government perspective, the other the villagers'.[12] Further evidence of the distance between local and government perspectives on mercury poisoning in Minamata is the fact that the Japanese government lobbied aggressively to have the new mercury treaty bear the name of the village, whereas the villagers in Minamata vehemently opposed including their city's name in the title.[13]

Future Research and Data Collection

The Minamata Convention on Mercury is a multilateral environmental agreement designed to regulate and reduce anthropogenic emissions and releases of mercury primarily to prevent public health catastrophes like that which occurred in Minamata, Japan.[14] The treaty's goals include "curbing mercury emissions from coal-fired power plants and industrial facilities, phasing out by 2020 many consumer products that contain mercury, "phasing down" the use of mercury in dental amalgams, and closing all mercury mines within 15 years after the convention takes effect."[15] Many of the convention's goals, however, are essentially voluntary, qualified by the phrase "where feasible,"[16] which may prevent attainment of these goals. Going forward, the Convention does place significant emphasis on research and information sharing among parties with emphasis on clarifying how mercury enters and moves through the environment.[17] Recently emerging scientific evidence that global climate change and ozone depletion compound the effects of methymercury concentration further complicates this question.[18]

Minimata: A Global Risk Assessment Tool?

One important benefit of a global monitoring system for methylmercury assessment is that data from less developed or poorer countries will be taken to bear when determining global risk of pollutant exposure.[19] For instance, impacts on fishermen in small villages like Minamata where methylmercury accumulation in fish and ocean sediment cause greater instances of poisoning will be incorporated into risk assessments by national governments and larger chemical corporations. Additionally,

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a global risk assessment will bring many different sources of pollution together in one analysis. For methylmercury, this is particularly important since initial emissions (such as the discharge of effluent waste by the Shin Nippon Chisso Hiryo chemical plant) is often less detrimental than the re-emission of accumulated pollutants from the atmosphere or ocean sediment.[20] Last, a global assessment would address the interplay of global problems like climate change and the deterioration of the earth's ozone layer with methylmercury pollution.[21] As global warming and ozone deterioration compounds methylmercury issues, a global assessment can better address the accumulation of methylmercury pollution.[22]

The largest problems Parties of the Mercury Convention will face are those of implementation.[23] First, Party-states must supply all data collected under the forthcoming regime to a secretariat of the Convention, after which the data must be verified.[24] This "trust but verify" implementation has the advantage of a dual layer of accountability, but has the disadvantage of redundancy.[25] The consequent implementation of national monitoring systems and then a second layer of independent, unbiased monitoring will vastly increase its cost. Further, many of the existing data collection systems are outdated even in developed countries or simply do not yet exist in poorer countries.[26] Adapting existing monitoring technology, as well as developing new technologies where they are lacking will come at a significant cost.[27] Moreover, though the Convention includes language that calls on wealthier nations to assist poorer ones to aid in developing their data-gathering capacities, as of yet there is no concrete fund-sharing program.[28]

The final disadvantage of the Minamata Convention's global assessment lies in determining what the new data-collection regime will actually measure.[29] Which *populations* it should measure requires choosing between poor populations with high exposure rates where data collection is expensive and already established collection centers in developed countries.[30] Additionally, which *sources* of mercury pollution should be measured range from volcanoes, direct pollution like the effluent from the Shin Nippon Chisso Hiryo chemical plant in Minamata, and even more nebulous re-emissions.[31] Finally, further research regarding the *type* of human measurements is necessary.[32] Choices range from more invasive blood collection and analysis, to less invasive breast milk and urine sampling.[33] In all instances, however, Convention implementers must choose and then employ collection methods uniformly. And although the implementing Parties of the Convention can look to other successful pollutant-based conventions for guidance, like the Stockholm Convention on Persistent Organic Pollutants which addresses ozone depletion, mercury pollution presents unique issues all its own which will require even more uniquely tailored responses.[34]

Conclusions

The benefits of the Minamata Convention's global monitoring system are few but important when compared to the difficulty and expense of implementation. Access to a global risk assessment is essential in determining a sound, science-based global policy on mercury pollution. If the expense and difficulties of implementation can be overcome, a global assessment is a valuable tool for creating policy, particularly one that must be streamlined across the globe in order to be effective. Reflecting on the global data-collection regime of the Stockholm Convention, the significant successes of such a global risk assessment reflect that future use of such a tool, if properly and effectively implemented, is invaluable.

Effective global implementation of the Minamata Convention, however, will also need to rely on state-specific and local policy development which may be obscured in a global risk assessment. Proper implementation cannot discount the importance of state-specific responses to pollution on a local level. Combining both local data collection and a global risk assessment will be essential for the Parties to effectively implement the global data collection and assessment regime envisioned by the Minamata Convention.

Endnotes: The Minamata Convention on Mercury: Past, Present, and Future Environmental Health

1 *Minamata Convention Agreed by Nations: Global Mercury Agreement to Lift Health Threats from Lives of Millions World*-Wide, United Nations Env't Programme News Centre (Jan. 19, 2013), http://www.unep.org/newscentre/default.aspx?DocumentID=2702&ArticleID=9373.

2 *See generally* Int'l Inst. for Sustainable Dev., *Summary of the Fifth Session of the Intergovernmental Negotiating Committee to Prepare a Global Legally Binding Instrument on Mercury: 13-19 January*, Earth Negotiations Bulletin, Jan. 21, 2013, *available at* http://www.iisd.ca/mercury/inc5.

3 The United States is currently the only party to have ratified the Convention primarily because during negotiations it lobbied aggressively for the Convention to mirror its already existing internal domestic laws regulating mercury. Thus, when the United States signed the Convention, it was already in compliance with all of the treaty's obligations. *See Global Treaty on Mercury Pollution Gets Boost from United States*, Minamata Convention on Mercury (Nov. 7, 2013), http://www.mercuryconvention.org/News/GlobalTreatyonMercuryPollutionGetsBoostfrom/tabid/3524/Default.aspx.

4 *See generally* Dennis Normile, *Mercury Pollution: In Minamata, Mercury Still Divides*, 341 Science 1446 (2013).

5 Bruce E. Aronson, *Review Essay: Environmental Law in Japan*, 7 Harvard Envt'l. L. Rev. 135, 136 n.6 (1983). Occurring later in 1965 and also in the Japanese prefecture of Kumamoto, the Niigata Minamata Disease was another outbreak of large-scale mercury poisoning. *Minamata Disease Archives: Cause and Damage of Minamata Disease*, Japan Ministry of Env't (2014), http://www.nimd.go.jp/archives/english/tenji/a_corner/ a01.html.

6 Normile, *supra* note 4, at 1446-47.

7 Bioaccumulation of highly toxic mercury in fish and shellfish in Minamata Bay and the Shiranui Sea resulted in mercury poisoning for the villagers of Minamata when they ate the contaminated fish. *See* David P. Krabbenhoft & Elsie M. Sunderland, *Global Change and Mercury*, 341 Science 1457, 1458 (2013). Furthermore, the bioaccumulation of mercury in the waters offshore of Minamata persists, and many villagers in the primarily fishing-based village

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for sub-Saharan Africa from 2015-2020; US $108 billion in IQ-based lost economic productivity due to children's exposures to lead in Africa, Latin America, and South East Asia; and US$ 634 million per year in lost productivity of commercial fisheries in China due to acute water pollution. *See Cost of Inaction Initiative*, UNEP, http://www.unep.org/hazardoussubstances/UNEPsWork/Mainstreaming/CostsofInactionInitiative/tabid/56397/Default.aspx (last visited Apr. 10, 2014).

[94] OECD, *supra* note 1, at 150; Oslo Manual, *supra* note 2, at 78.

[95] Andreas Kortenkamp et. al, State of the Art Assessment of Endocrine Disruptors 97 (2012), *available at* http://ec.europa.eu/environment/chemicals/endocrine/pdf/sota_edc_final_report.pdf (report comissioned by the Directorate-General for the Environment of the European Commission).

[96] REACH Innovation Report, *supra* note 41, at 77.

[97] REACH Innovation Report, *supra* note 41, at 66.

[98] REACH Innovation Report, *supra* note 41, at 19.

[99] REACH Innovation Report, *supra* note 41, at 36.

[100] Ashford & Heaton, *supra* note 37, at 136-37 (citing several studies from the 1970s).

[101] Ashford & Heaton, *supra* note 37, at 138.

[102] REACH Innovation Report, *supra* note 41, at 33.

[103] REACH Innovation Report, *supra* note 41, at 72.

[104] *See* REACH Innovation Report, *supra* note 41, at 71-75 (emphasis added).

[105] *See* REACH Innovation Report, *supra* note 41, at 76, 81.

[106] *See* REACH Innovation Report, *supra* note 41, at 16, 70.

[107] *See* REACH Innovation Report, *supra* note 41, at 36.

[108] *See* REACH Innovation Report, *supra* note 41, at 10.

[109] Our patent landscape study showed that from 1972-2011, most inventions went beyond the scope of laws to restrict the use of phthalates, including coating, paints, and resins, as well as polyvinyl chloride (PVC) and plastics generally.

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have lost their livelihoods. *Minamata Disease Archives: Pathway of Methylmercury from Factory to Human*, Japan Ministry of Env't (2014), http://www.nimd.go.jp/archives/english/tenji/a_corner/a06.html.

[8] *See generally* Nat'l Research Council, Toxicological Effects of Methylmercury 4-7 (2000), *available at* http://www.nap.edu/openbook.php?record_id=9899&page=R1.

[9] Normile, *supra* note 4, at 1447.

[10] Normile, *supra* note 4, at 1447.The Japanese government has recognized 2,265 victims of methylmercury poisoning; however, many people who suffered from smaller exposures to the toxin or have lesser health effects still go unrecognized. *Id.*

[11] Normile, *supra* note 4, at 1446.

[12] *See* Normile, *supra* note 4, at 1446. *Compare Minamata Disease Related Sights*, Japan Guide, http://www.japan-guide.com/e/e4527.html (last visited Feb 18, 2013) *with Minamata Disease Archives Factsheet*, Japan Ministry of Env't (2014), *available at* http://www.nimd.go.jp/archives/english/outline/leaflet_jyoho.pdf.

[13] Joseph DiGangi, *Opinion: A Call for Action in Minamata*, Environmental Health News (Oct. 10, 2013), http://www.environmentalhealthnews.org/ehs/news/2013/a-call-for-action-in-minamata.

[14] Minamata Convention on Mercury, Nov. 6, 2013, UNEP(DTIE)/Hg/INC.5/7*, *available at* http://www.mercuryconvention.org/Portals/11/documents/conventionText/Minamata%20Convention%20on%20Mercury_e.pdf.

[15] Naomi Lubick & David Malakoff, *With Pact's Completion, The Real Work Begins*, 341 Science 1443, 1443 (2013).

[16] *Id.*

[17] *Id.* at 1443-44.

[18] Krabbenhoft & Sunderland, *supra* note 7, 1458.

[19] *See* Minamata Convention on Mercury, *supra* note 14, at art. 21 (outlining Parties' reporting requirements).

[20] Lubik & Malakoff, *supra* note 15, at 1443.

[21] Krabbenhoff & Sunderland, *supra* note 7, at 1458.

[22] *See* Lubick & Malakoff, *supra* note 15, at 1445 (explaining that Parties to the Mercury Convention could develop a coordinated database, similar to that developed under the 2001 Stockholm Convention on Persistent Organic Pollutants, to record biomonitoring and infrastructure data for mercury).

[23] Lubick & Malakoff, *supra* note 15, at 1445.

[24] Lubick & Malakoff, *supra* note 15, at 1443.

[25] *See* Lubick & Malakoff, *supra* note 15, at 1445.

[26] Lubick & Malakoff, *supra* note 15, at 1445.

[27] Lubick & Malakoff, *supra* note 15, at 1445.

[28] Lubick & Malakoff, *supra* note 15, at 1445; *see also* Minamata Convention on Mercury, *supra* note 14, at art. 13 (outlining the Convention's mechanism for sharing financial resources).

[29] Lubick & Malakoff, *supra* note 15, at 1445 ("Countries still need to work out what kinds of data to collect . . . .").

[30] Lubick & Malakoff, *supra* note 15, at 1445.

[31] *See supra* notes 19, 23 and accompanying text.

[32] Lubick & Malakoff, *supra* note 15, at 1445.

[33] Lubick & Malakoff, *supra* note 15, at 1445.

[34] For example, unlike measuring ozone depletion, utilizing a variety of different methods or sample sources used to measure mercury may skew results. Lubick & Malakoff, *supra* note 15, at 1445 ("An alternative [to blood samples] might be gathering hair or urine samples, but recent research has shown that each might accumulate a different record of mercury exposure, potentially skewing results.").

Endnotes: Rubber-Stamped Regulation: The Inadequate Oversight of Genetically Engineered Plants and Animals in the United States

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an important opening for covering innovations in biotechnology and genetic engineering); 35 U.S.C. § 101 (2011).

[18] Fernandez-Cornejo, *supra* note 16, at 19 (explaining the act established the International Union for the Protection of New Varieties of Plants to ensure that breeders of new varieties of plants were provided with the appropriate intellectual property rights).

[19] 7 U.S.C. § 2483 (2010); USDA, Plant Variety Protection Act and Regulations and Rules of Practice 14 (2006).

[20] 7 U.S.C. § 2543 (2011); USDA, *supra* note 19, at 19.

[21] Diamond v. Chakrabarty, 447 U.S. 303 (1980) (deciding to extend patent rights to genetically engineered microorganisms, which are important tools and products of biotechnology, and strengthen the rights of breeders).

[22] The USDA defines "transgenic organism" as an "organism resulting from the insertion of genetic material from another organism using recombinant DNA techniques." *Glossary of Agricultural Biotechnology Terms*, U.S. Dep't of Agric. http://www.usda.gov/wps/portal/usda/usdahome?navid=BIOTECH_GLOSS&navtype=RT&parentnav=BIOTECH (last updated Feb. 27, 2014).

[23] Franklin Costantini & Elizabeth Lacy, *Introduction of a Rabbit B-globin Gene into the Mouse Germ Line,* 294 Nature 92, 92-94 (1981).

[24] Fernandez-Cornejo, *supra* note 16, at 19 (noting that several rulings by the U.S. Patent Office extended intellectual property rights to a wide range of new biotechnology products such as seeds, plants, plant parts, genes, traits, and biotechnology processes).

[25] Robert Hammer, et al. *Production of Transgenic Rabbits, Sheep and Pigs by Microinjection,* 315 Nature 680, 680 (June 1985).

[26] 51 Fed. Reg. 23302. (June 26, 1986).

[27] Shoemaker, *supra* note 7, at 9.

[28] *History of Biotechnology and Regulatory Services*, USDA APHIS, http://www.aphis.usda.gov/wps/portal/banner/help?1dmy&urile=wcm%3apath%3a/