Science, Technology and Social Value: Aquatic Ecosystem and Human Health Impacts of the Mercury Cell Chlor-Alkali Industry

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Social Value (n): the overall worth or importance of something to society as a whole, encompassing the collective benefits and contributions to public good, extending beyond economic or individual gain.

To be compensated, you must be valued. Developed in the 1890s and jointly patented in the United States and Austria, the Castner-Kellner chlor-alkali cell utilized elemental mercury in the electrochemical conversion of brine into chlorine gas and caustic soda. Over the span of the 20th century, ~300 mercury cell chlor-alkali facilities were built globally, generating Cl_2 for the production of bleach (for drinking water treatment and/or pulp and papermaking), PVC, and organochlorine pesticides, as well as NaOH for the catalytic cracking of petroleum and production of synthetic fibers. Across the Americas, mercury cell facilities were built in Canada (n = 15); the United States (n = 31); and in ten countries across Latin American (n = 24).

This paper summarizes the geographical distribution and eras of reliance on this technology across the Americas, including identification of national and international regulations that have closed or are in the process of eliminating the use of mercury in the chlor-alkali process. With specific focus on facilities that operated in Canada (Dryden, ON), the United States (McIntosh, AL) Nicaragua (Managua), and Venezuela (Maracaibo), this study also examines the ecological and human health impacts of facility operations as well as the aftermath of facility closures across a range of freshwater, estuarine and marine aquatic environments.