

UNEP Global Mercury Partnership Partnership Area on Mercury releases from the cement industry Revised Mercury Business Plan (V3) 2023

Through its eight areas of work, the UNEP Global Mercury Partnership (GMP) focuses on supporting the implementation of the [Minamata Convention on Mercury](#), providing state of the art knowledge and science and raising awareness towards global action on mercury.

This business plan for the Mercury releases from the Cement Industry Partnership Area of the Partnership provides a framework for developing and implementing actions in the cement industry that address the overall objective of the Partnership. It serves as a common, cohesive structure within which partners can plan, implement, and communicate work with the cement industry, with the goal of reducing mercury releases.

The Partnership Area is open to government and non-government partners and UNEP welcomes the broadest possible collaboration. In the UNEP Governing Council Decision 24/3-part IV paragraph 27, UNEP is tasked with working in consultation with Governments and stakeholders to strengthen the UNEP Global Mercury Partnerships. New activities and partners are encouraged within the UNEP Global Mercury Partnership.

I. Summary of the issue

- The cement manufacturing process typically involves heating a mixture of limestone (CaCO_3) and additive materials-containing silica, alumina, and iron to produce an intermediate product called “clinker”. Clinker is then grounded with gypsum, fly ash, calcined clays, ground granulated blast furnace slag, and ground limestone to produce cement. In many countries the primary use of cement is the production of concrete, formed by mixing it with Supplementary Cementitious Materials (SCM’s) and other aggregates such as sand and water.

The major pathway for mercury releases from the cement industry is via exhaust gases into the atmosphere, in which mercury that is present in the raw materials (e.g., limestone) and/or in the fuel (e.g., coal) is released in the combustion process. It has been estimated that the cement industry contributes an estimated 11% of global anthropogenic mercury emissions (approximately 2220 metric tons per year).¹

- The worldwide average emission factor for mercury from cement kilns is around 35 mg/t² cement but the quantity of mercury emitted by different cement plants can vary significantly, depending on the amount of mercury in the raw materials and fuels, and the kiln process³. The range of mercury emissions from the European cement industry is reported to vary between 0 to 69 mg/t clinker.³ Raw materials typically have lower mercury concentrations than fuels. However, as the raw material to fuel ratio is approximately 10 to 1, the raw material often accounts for most of the mercury input.
- According to the United Nations, 68% of the world population are projected to live in urban areas by 2050¹. As the world continues to grow and urbanize, many countries will face challenges in meeting the needs of their growing urban populations, including for housing, transportation, energy systems and other infrastructure, as well as for employment and basic services such as education and health care. . Rapid development and strong growth in demand for cement in many emerging markets of the world has led to an unprecedented rate of construction of new cement plants. Cement, a key ingredient in concrete, is the second most consumed product in the world after potable water (Czigler et al. 2020). The production of cement involves chemical and thermal combustion processes that are also a key source of CO₂ emissions (Keena, N., Duwyn J., & Dyson, A. (2020), Biomaterials Supporting the Transition to a Circular Built Environment in the Global South). It is abundant, affordable, locally available and can be used in innumerable ways. With such an anticipated growing demand it is therefore even more important to lower emission factors and overall emissions and releases from the sector.
- The Minamata Convention establishes controls over emissions

¹ United Nations, Department of Economic and Social Affairs, Population Division (2019). World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420). New York: United Nations.

from Cement clinker production facilities. According to the provisions of the Convention, BAT/BEP shall be applied to new constructed or substantially modified facilities to control and, where feasible, reduce mercury emissions. Moreover, parties may use BAT/BEP as one of a range of measures for existing cement clinker production facilities to achieve reasonable progress in reducing emissions over time².

- A widespread regulatory approach to control the mercury entering the cement kiln system from the raw materials or fuel. Some of the proven techniques are listed below:
 - Input controls: Control of mercury emissions through the careful selection of raw materials and fuels inputs which includes raw material substitution, alternative raw materials, conventional and alternative fuels.
 - Dust shuttling: A proven technology to limit the buildup of the mercury cycle. It is the selective purging or “bleeding” of the kiln dust. A method when applied to all the kilns has the potential to reduce the mercury emissions by 10 to 40%.
 - Mercury control by using sorbents: Sorbents are injected into the exhaust gases ahead of the filter. Sorbents enhances the absorption of the mercury in the exhaust gases. There are various sorbents available such as such as activated carbon from coals (bituminous and lignite) and other biomass, zeolites, and reactive mineral mixtures.
 - Selective Catalytic Reduction (SCR): Selective catalytic reduction (SCR) technology is used primarily for NOx control but also shows some benefits in reducing mercury emissions. SCR catalysts can oxidize elemental mercury in the gas stream. Hence, the use of SCR technology enhances the efficiency of dust shuttling systems.

The effectiveness of mercury reductions can be enhanced by careful monitoring of facility outputs. There are various techniques that can be used to analyze the mercury stack emissions for controlling the mercury emissions:

- Isokinetic sampling: The isokinetic method is applied when

² Best Available Techniques and Best Environmental Practices for reducing mercury emissions under the Minamata Convention, UNEP 2018

collecting stack samples for analysis. In isokinetic sampling, the particle bound mercury is captured with the dust.

- Continuous Mercury Emissions Monitors (CEM): A CEM will allow instantaneous mercury emission readings for the reporting of hourly or daily mercury emission limits.
- Sorbent Traps: Sorbent traps pull a small, measured quantity of representative gas through a sorbent filter system (or trap) over a specified time.

Objective of the Partnership Area

The objective of this Partnership Area is to minimize mercury releases to the environment from cement manufacture.

The partnership area aims to supplement existing programs in key, strategically selected ways to ensure that reductions are globally significant. Overall objectives for the Partnership Area include:

- Establishing sectoral mercury inventories and baseline scenarios for the industry.
- Encouraging use of most appropriate technique to reduce or minimize mercury releases into the environment.
- Increasing the awareness of the cement industry to mercury as a pollutant through increased outreach efforts.

The focus of the current business plan is establishing mercury emissions inventories and support such efforts while providing additional information on cost-effective approaches for enhancing reductions of mercury emissions.

Setting numerical targets of achievement for the Partnership Area has not yet been discussed and may not yet be feasible until reliable mercury emissions inventories are developed worldwide. Obtaining an updated and reliable mercury inventory should enable the Partnership Area to make a more advanced assessment of a baseline scenario and project a goal for reduction within the cement industry.

Priority Actions

- I. Establish sectoral mercury inventories and baseline scenarios for the industry by:

- A. Disseminating information on mercury monitoring techniques and systems applicable to the sector
 - B. Supporting the development and/or improvement of sectoral mercury emissions inventories to evaluate both mercury emissions and the effectiveness of emission reduction approaches.
 - C. Developing mercury emissions factors dependent on input raw material and fuel and process - specific factors
 - a. For the development of the mercury emissions factors mercury in the input raw materials, fuels need to be monitored. Challenges are as follows:
 - i. Limited database of mercury emissions;
 - ii. Analyzing the below detectable limits (BDL) of the mercury in the input raw materials;
 - iii. Analyzing mercury emissions from the dust shuttling system;
 - iv. Gathering site specific database.
 - D. Establishing accurate database focusing on developing countries and countries with economies in transition.
 - E. Encouraging the inclusion of cement manufacturing in country mercury inventories.
- II. Encourage the use of most appropriate techniques to reduce or minimize mercury releases into the environment by:
- A. Identifying and establishing primary and secondary mercury abatement techniques;
 - B. Providing information and technical assistance on methods to optimize pollution control systems to improve mercury control;
 - C. Demonstrating most appropriate techniques through pilot projects and installations, especially in developing countries.
- III. Increase the awareness of the cement industry, as well as government and regulatory bodies on mercury as a pollutant through increased outreach efforts by:
- A. Developing outreach materials and collaborating with complementary programs to disseminate information about mercury releases from the sector, opportunities to reduce these releases and the experience gained by the industry, including through pilot projects.
 - B. Capacity building, to promote an understanding of

techniques that should be used for management and control of mercury emissions as required under the Minamata Convention and as per the BAT/BEP guidance document adopted under it.

- C. Facilitating exchange of information on emerging technologies for existing and new facilities.
 - D. Capacity building for mercury measurement competence both at stack emissions and input materials.
- IV. Support the development of policies and regulatory frameworks supporting the objective of the Partnership Area, in line with the requirements under the Minamata Convention:
- A. Discussing the relevant policies needed to aid the mercury pollution abatement measures;
 - B. Identifying opportunities for improvement for existing regulatory frameworks.

II. Partners Efforts and Timelines

The Partnership Area has participation from governments, intergovernmental organizations, academia or scientific community, non-governmental organizations, and private sector.

The Best Available Technology (BAT)/ Best Environmental Practices (BEP) guidance document sets out guidance on controlling emissions of mercury and mercury compounds to air from cement clinker production facilities as adopted by the Conference of the Parties to the Minamata Convention at its first meeting in September 2017.

The Global Cement and Concrete Association (GCCA) has also developed a guidance document in which there are various methods that have been identified and proven to be effective in reduction of mercury emissions.

III. Opportunities

1. Opportunities for enhancement

A. For Emissions Inventories

- a. Aside from national registries existing in many parts

of the world, CEMBUREAU in Europe and the Portland Cement Association (PCA) in the USA have undertaken specific actions to collect more detailed information on the performance of kilns regarding mercury emissions. GCCA is also planning to strengthen our members mercury emissions inventories. These on-going efforts will help in developing a preliminary inventory assessment.

- b. In 2020, GCCA formulated its guidelines for reporting and monitoring mercury emissions. In addition, GCCA developed a specific guidance also known as "GCCA Mercury Guidance" from cement industry. The guidance is available for its full members.

B. Specialist assistance could be provided to allow the production of up- to-date emissions inventories in target regions. This would include, where necessary, help with mercury measurement at the stack. Guidance could also be given on how to include current and impending emissions legislation and control technology application in future emissions estimates.

- 2. One of the primary opportunities for the Mercury Releases from the Cement Industry Partnership Area is to add value by providing a forum of exchange between the cement industry, governments, the scientific community and NGOs regarding the establishment of guideline emission limits. Many of the techniques to limit the emissions are now known to the industry. The further aim is to spread these techniques to the lesser-known regions and make it feasible for them to install and operate. Development of a more common viewpoint may help in the speed of implantation and adoption of many of these techniques which can lead to real emission reductions.

V. Evaluation

The Partnership Area will report biannually to UNEP in accordance with the UNEP reporting format. Reporting will include monitoring performance (tracking partnership activities and partner contributions) as well as assessing effectiveness (measuring the impact of partnership activities on target beneficiaries).

Amongst other means, results will be characterized in terms of:

- Expanding the knowledge base of effective tools for managing and reducing mercury emissions from cement plants.
- Availability of guidance tools to assist countries in achieving emissions reductions.
- Emissions reductions achieved.

VI. Resource Mobilization

Partnerships and the associated business plans are a way of mobilizing funding in a systematic, focused, and harmonized way. The Partnership Area's objectives and business plans should provide clarity for potential donors and finance institutions. The business plans should encourage and facilitate donors to support activities and provide a tool to leverage funds.

While the Partnership itself does not have resources to independently fund Partner projects, individual partners, having decided to work to advance the Partnership's objectives and business plan, may fund specific activities. The Partnership also provides networking opportunities for stakeholders who would like to identify partners for collaboration on existing and future activities. Working with UNEP, the Partnership helps facilitate communication to ensure that individual activities or projects are connected to the larger, overall strategic goals of the Partnership, and to ensure that experience can be shared and lessons learned from Partners' activities.

Funding for Partnership Activities:

The success of the Partnership Area will be dependent on obtaining adequate funding to carry out its activities. Funding will be needed in primarily three areas:

- Project Management and Support – see next section;
- Technology development/demonstration and pilot testing;
- Capacity Building and government assistance including the development of related guidance documents.

VII. Business Planning process

The initial Business Plan for the Partnership Area was developed in 2013 by the WBCSD CSI acting as co-lead. The first draft of an updated plan was developed by the GCCA as co-leads of the Partnership Area, in

consultation with the co-lead, the chair of the Partnership Advisory Group and the Secretariat. It will be finalized following consultations with the members of the Partnership Area. It may be amended periodically in consultation with members of the Partnership Area.

Table 1: Administration and Management Support		Source of Support
Partnership Co-Lead (Project Management)	Facilitation and support of the Partnership Area.	Claude Lorea, GCCA
Partnership Co-Lead (Direction)	Chair meetings, coordinate Partnership Area	Zaigham Abbas, Ministry of Climate Change, Pakistan
UNEP Secretariat Support	Administrative and secretariat support. Disseminate information to the Partners on relevant issues. Assist the leads in following up activities by partners. Other tasks as requested.	In-kind support from UNEP
Partnership Area meetings	Estimated one per year. All attempts will be made to host face to face meetings of the Partnership Area in the most cost- effective way (e.g., back-to- back with other related meetings and can participate by teleconference).	Should funding be available, UNEP will support some limited travel of developing countries/NGOs in face-to-face meetings, rest is in-kind support from partners for their own travel
Online meetings / Webinars	Estimated 4 per year	To be determined

VIII. Linkages

Cross-cutting activities internal and external to the UNEP Global Mercury Partnership efforts to be identified.

IX. Partners

The list of partners can be found from the following link:

[Partners | Global Mercury Partnership \(unep.org\)](https://www.unep.org/global-mercury-partnership/partners)