GEF-8 PROJECT IDENTIFICATION FORM (PIF)

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General Project Information

Project Title	
Environmentally sound management and disposal of excess mercury and mercury waste from removing mercury electrolytic cells in Brazil's chlor-alkali sector (Chlor-alkali Brazil)	
Region	GEF Project ID
Brazil	11697
Country(ies)	Type of Project
Brazil	FSP
GEF Agency(ies):	GEF Agency ID
UNEP	
Executing Partner	Executing Partner Type
Fundação Educacional Ciência e Desenvolvimento (FECD)	Others
GEF Focal Area (s)	Submission Date
Chemicals and Waste	9/18/2024
Project Sector (CCM Only)	
Mixed & Others	
Taxonomy	
Focal Areas, Chemicals and Waste, Waste Management, Hazardous Waste Management, Emissions, Disposal, Mercury, Sound Management of chemicals and waste, Industrial Emissions, Best Available Technology / Best Environmental Practices, Influencing models, Convene multi-stakeholder alliances, Strengthen institutional capacity and decision-making, Transform policy and regulatory environments, Demonstrate innovative approache, Stakeholders, Private Sector, Capital providers, SMEs, Beneficiaries, Civil Society, Community Based Organization, Non-Governmental Organization, Academia, Trade Unions and Workers Unions, Type of Engagement, Participation, Partnership, Consultation, Information Dissemination, Gender Equality, Gender results areas, Participation and leadership, Capacity Development, Knowledge Generation and Exchange, Awareness Raising, Gender Mainstreaming, Sex-disaggregated indicators, Gender-sensitive indicators, Capacity, Knowledge and Research, Knowledge Exchange, Knowledge Generation, Learning, Adaptive management, Indicators to measure change, Theory of change	
Type of Trust Fund	Project Duration (Months)
GET	60
GEF Project Grant: (a)	GEF Project Non-Grant: (b)
12,000,000.00	0.00
Agency Fee(s) Grant: (c)	Agency Fee(s) Non-Grant (d)
1,080,000.00	0.00
Total GEF Financing: (a+b+c+d)	Total Co-financing
13,080,000.00	344,250,000.00

PPG Amount: (e)	PPG Agency Fee(s): (f)
200,000.00	18,000.00
PPG total amount: (e+f)	Total GEF Resources: (a+b+c+d+e+f)
218,000.00	13,298,000.00
Project Tags	
CBIT: No NGI: No SGP: No Innovation: No	

Project Summary

Provide a brief summary description of the project, including: (i) what is the problem and issues to be addressed? (ii) what are the project objectives, and if the project is intended to be transformative, how will this be achieved? iii), how will this be achieved (approach to deliver on objectives), and (iv) what are the GEBs and/or adaptation benefits, and other key expected results. The purpose of the summary is to provide a short, coherent summary for readers. The explanation and justification of the project should be in section B "project description".(max. 250 words, approximately 1/2 page)

The Chlor-alkali Brazil project aims to reduce negative environmental and social impacts from mercury and mercury wastes originating from the phase out mercury electrolytic cells from three chlor-alkali facilities located in Cubatão, Rio de Janeiro and Igarassu, Brazil. The companies operating these plants which release significant amounts of mercury each year have initiated the conversion and decommissioning of mercury technologies which will be completed by 2030. However, several challenges persist in adopting global Best Available Technologies/Best Environmental Practices (BAT/BEP) and minimizing potential health and environmental impacts due to regulatory, capacity and information and knowledge gaps.

The project will offer technical support for the sound disposal of excess mercury/mercury waste resulting from the phase-out of mercury cells in these plants through four main components: 1) national capacity building to manage hazardous chemicals and mercury contamination; 2) introduction and implementation of BAT/BEP[1] during decomissioning of mercury cells and following plant conversion; 3) stabilization, treatment and disposal of mercury and contaminated materials; and 4) knowledge management communications. It will also introduce appropriate technologies and approaches to monitor the decontamination of equipment and facilities, oversee temporary mercury storage and remediate affected areas around each facility. The phase-out of mercury is expected to result in an annual reduction of 53,670 MtonCO_2eq in emissions, energy savings of approximately 189,600 MWh/ and over the five years of the project, the safe disposal of 240 tons of mercury. The intervention will benefit 6.4 million people (3.4 million women and 3 million men) and eliminate the risk of mercury contamination from the chlor-alkali industry in Brazil, supporting international compliance with the obligations in the Minamata Convention.

[1] World Chlorine Council (2012) Euro Chlor. Guideline for decommissioning of mercury chlor-alkali plants. Available at: https://worldchlorine.org/unep-chlor-alkali-mercury-partnership/decommissioning-of-phased-out-mercury-units/

Indicative Project Overview

Project Objective

To reduce negative environmental and social impacts caused by mercury and mercury wastes from the chlor-alkali sector in Brazil.

Project Components

1. Strengthening national capacity for managing hazardous chemical facilities and mercury-contaminated sites

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
2,228,600.00	20,450,000.00

Outcome:

1 Brazil's relevant entities approve and adopt a good practice guide and implement plans for the decontamination, monitoring and remediation of the contaminated sites in Cubatão, Rio de Janeiro and Igarassu.

Output:

1.1 A good practice guide including policy recommendations for monitoring and managing decommissioning of chlor-alkali mercury cells and related contaminated sites developed and available.

1.2 Monitoring and remediation programmes for each site developed and agreed with federal and local authorities.

2. Introducing BAT/BEP during decommissioning of mercury cells and following technology conversion of the three plants

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
1,000,000.00	19,500,000.00

Outcome:

2.Decommissioning of mercury cells from chlor-alkali facilities and successful technological conversion is adopted in Brazil.

Output:

2.1. Excess mercury and mercury-contaminated materials collected in the decommission process from the Cubatão, Rio de Janeiro and Igarassu sites.

3. Stabilization, treatment and final disposal of excess mercury and contaminated materials from the three decommissioned and converted plants

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
7,800,000.00	282,000,000.00

Outcome:

3.240 metric tons of mercury are safely stored and disposed of.

Output:

3.1. Mercury and contaminated materials from plants are safely stored, stabilized, treated and/or disposed.

4. Knowledge Management and Communication

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
200,000.00	2,300,000.00

Outcome:

4.Improved and disseminated knowledge on the phasing-out mercury chlor-alkali technology

Output:

4.1 Knowledge products with gender-specific information developed and disseminated in collaboration with the Minamata Secretariat and Global Mercury Partnership.

4.2 Enhanced knowledge and lessons learned from the intervention in Brazil, including gender-related insights are disseminated to mercury cell chlor-alkali countries in the region and global operators.

M&E

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
200,000.00	1,000,000.00

Outcome:

5.Project is responsive to ongoing monitoring and evaluation.

Output:

5.1 Project is monitored and evaluated

Component Balances

Project Components	GEF Project Financing ($)	Co-financing ($)

1. Strengthening national capacity for managing hazardous chemical facilities and mercury-contaminated sites	2,228,600.00	20,450,000.00
2. Introducing BAT/BEP during decommissioning of mercury cells and following technology conversion of the three plants	1,000,000.00	19,500,000.00
3. Stabilization, treatment and final disposal of excess mercury and contaminated materials from the three decommissioned and converted plants	7,800,000.00	282,000,000.00
4. Knowledge Management and Communication	200,000.00	2,300,000.00
M&E	200,000.00	1,000,000.00
Subtotal	**11,428,600.00**	**325,250,000.00**
Project Management Cost	571,400.00	19,000,000.00
Total Project Cost ($)	**12,000,000.00**	**344,250,000.00**

Please provide justification

PROJECT OUTLINE

A. PROJECT RATIONALE

Briefly describe the current situation: the global environmental problems and/or climate vulnerabilities that the project will address, the key elements of the system, and underlying drivers of environmental change in the project context, such as population growth, economic development, climate change, sociocultural and political factors, including conflicts, or technological changes. Describe the objective of the project, and the justification for it. (Approximately 3-5 pages) see guidance here

1. Global environmental problems: Why urgent action is needed to phase-out mercury in the chlor-alkali industry and ensure that excess mercury is disposed of safely

The chlor-alkali industry is a chemical sector that produces chlorine and sodium hydroxide (caustic soda) through the electrolysis of sodium chloride. These chemicals are essential for various industrial processes, but traditional production methods often involve the use of mercury. Despite not being the largest emitter, the chlor-alkali industry is a major user of mercury, emitting an average of 1.4 tons annually since 2020[1][1], with significant impacts on workers' health, community well-being and environmental integrity. These impacts relate to the disposal of excess mercury, environmental management and the costs of decommissioning production units and remediating contaminated sites.

Therefore, Article 5 of the Minamata Convention mandates the phase-out of specific industrial processes using mercury, including the production of chlor-alkali from mercury electrolytic cells, by 2025.

1. The importance of the chlor-alkali industry and the viability of mercury-free alternatives

The chlor-alkali industry is integral to numerous facets of human life, providing essential chemicals that support various sectors. In water treatment, chlorine produced by the industry is vital for disinfecting drinking water, ensuring it is safe for consumption and protecting public health. In pharmaceuticals, chlorine and sodium hydroxide are key ingredients in the synthesis of a wide range of medications, contributing to the advancement of healthcare. The agricultural sector relies on these chemicals for producing pesticides and fertilizers that enhance crop yields and food security. In food processing, chlorine is used to sanitize equipment and maintain hygiene standards, preventing foodborne illnesses. Additionally, in manufacturing, chlor-alkali products are fundamental in producing plastics, paper, textiles and other materials, underscoring the industry's broad impact on everyday life and industrial processes. Historically, chlorine production relied on methods involving mercury and asbestos[2]. Both are now recognized as harmful pollutants.

In the mid-20th century, efforts to improve chlorine production methods began, driven by concerns over the environmental and health impacts of existing technologies. The development of selective membrane-based electrolytic cells in the 1970s marked a significant advancement. This technology uses cells with a selective membrane, typically made from a fluorinated polymer, to separate the chlorine gas from the sodium hydroxide and hydrogen, offering several advantages over mercury and asbestos methods, eliminating the need for hazardous pollutants and achieving greater energy efficiency.
Today, selective membrane technology dominates global chlor-alkali production, accounting for 83% of output in 2018[3]. This shift underscores the technical economic and environmental benefits of transitioning from mercury-based to selective membrane technology in chlor-alkali production. Global partners and networks such as the Chlor-Alkali Sector Partnership Area of the Global Mercury Partnership or the World Chlorine Council have developed a series of technical resources (BAT/BEP) to support the conversion of mercury cell production facilities and the environmentally sound management of mercury surplus and waste. These resources[4] include topics such as decommissioning of phased out units, storage and disposal of mercury, phase out options and progress, among others.

2. Phase-out of mercury cells in the chlor-alkali industry in Brazil

As a signatory of the Minamata Convention, Brazil has mandated the replacement or cessation of chlor-alkali production using mercury cells by 2025, as per Decree No. 9,470[5] issued on August 4, 2018. Currently, three chlor-alkali plants in Brazil still utilize mercury cells, collectively holding[6] an estimated 240 tons of mercury[7]. These facilities are located near densely populated areas and sensitive environmental zones, posing risks to approximately 17.2 million people[8] (Figure 1).

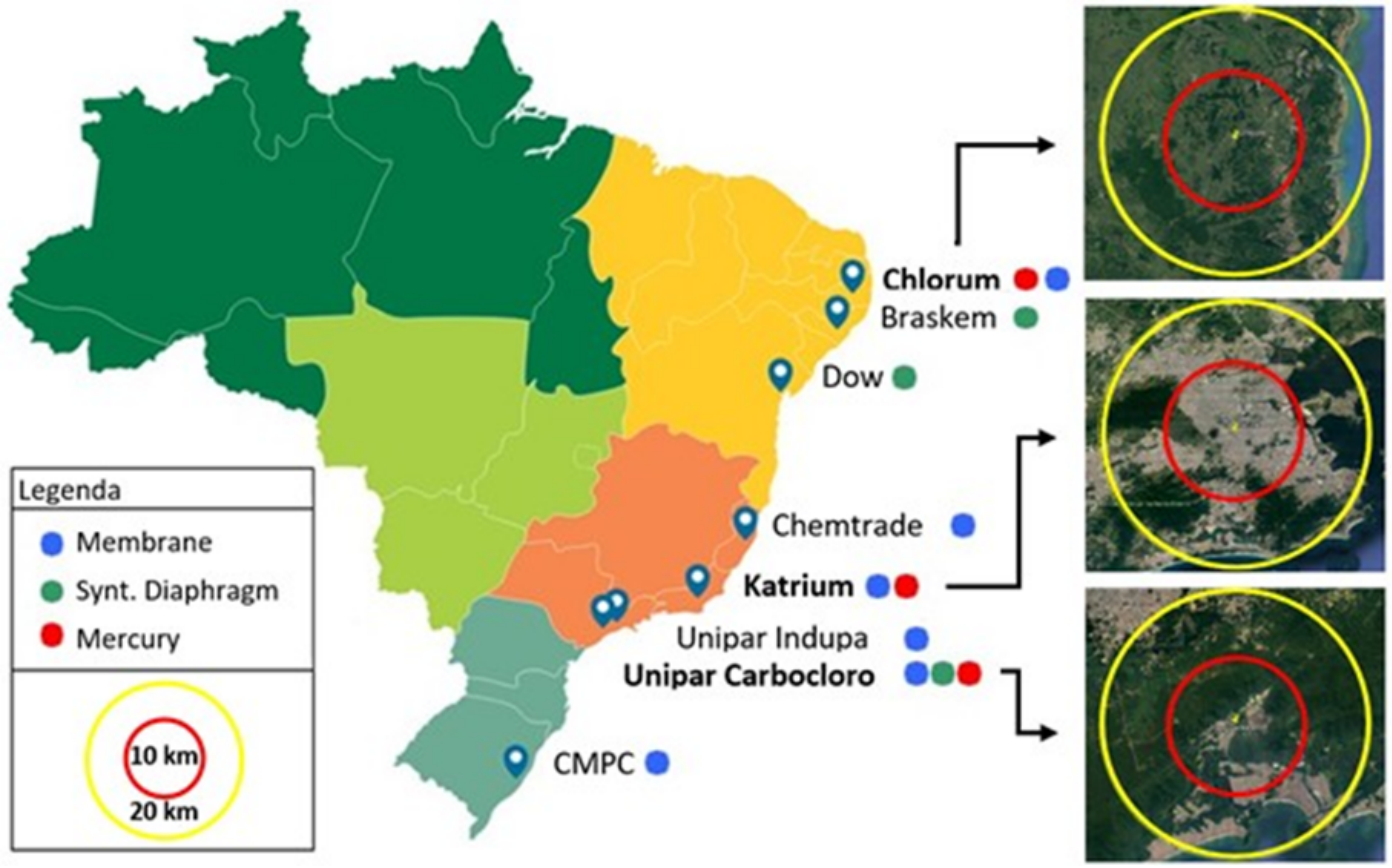


Figure 1 Location of mercury cells facilities (Chlorum, Katrium and Unipar Carbocloro).

The companies involved, Chlorum, Katrium and Unipar Carbocloro, began transitioning away from mercury in 2021, targeting a full phase-out by December 2025. Planned investments exceed USD 340 million (Table 1). The decommissioning of mercury installations is planned for 2026-2028 and Table 2 outlines the estimated costs associated with the disposal of excess mercury from chlor-alkali facilities in Brazil, detailing financial implications for the three companies. For each facility, total estimated costs reflect combined expenses related to recovery of mercury, decontamination of equipment, stabilization and disposal of mercury. Chlorum, with an installed capacity of 29,900 tons per year and 70 tons of excess mercury, faces total costs of USD 1.6 M. Katrium, with an installed capacity of 21,000 tons per year and 44 tons of excess mercury, has a total cost of USD 1.1 M. Unipar Carbocloro, with the largest capacity of 107,100 tons per year and 128 tons of excess mercury, will incur in the highest total costs of USD 7.4 M, highlighting the significant financial investments required for effective mercury management and disposal.

In collaboration with the Brazilian government, the private sector aims to ensure an efficient and safe transition away from mercury use to better protect both human populations and vulnerable ecosystems.

Table 1 - Estimated investment for technological conversion of chlor-alkali mercury cells in Brazil

Facility	Installed Capacity (ton/year)	Investment (million USD)				
		Technology Conversion	Decommissioning	Waste Treatment	Other	Total
Chlorum	29,900	60	1,8	4,7	3,5	70
Katrium	21,000	60	2,0	5,0	7,0	74
Unipar Carbocloro	107,100	183	2,3	5,8	8,9	200
Total	158,000	303	6,1	15,5	19,4	344

Table 2 - Estimated costs for disposal of excess mercury from chlor-alkali in Brazil

Facility	Installed Capacity (ton/year)	Mercury Amount Estimate (tons.)	Estimated Costs[9] (1,000 USD)				
			Recovery of Mercury 10 USD/ton. capacity	Decontamination of equipment 24 USD/ton. capacity	Stabilisations of Mercury 8,000 USD/ton. Hg	Disposal of mercury[10] 500 USD/ton. Hg	Total
Chlorum	29,900	70	299	718	560	35	1,612
Katrium	21,000	44	210	504	352	22	1,088
Unipar Carbocloro	107,100	128	1,071	2,570	1,024	64	4,729
Total	**158,000**	**242**	**1,580**	**3,792**	**1,936**	**121**	**7,429**

Company estimates reveal that the workforce in these facilities is predominantly male, with 82% men and only 18% women. However, female participation varies slightly by company: Chlorum has 27%, Katrium has 19%, and Unipar Carbocloro has the lowest at 13%. Mercury exposure presents significant health risks that vary between genders due to physiological, occupational and health factors. These differences need to be accounted for and necessitate targeted interventions and policies to mitigate the specific impacts of mercury on human health. Men, being the dominant group in these facilities, are likely more exposed to mercury, which is prevalent in certain industrial processes. However, if women are concentrated in specific roles or areas with higher or different types of mercury exposure, they may face unique health risks that are not as widely recognized or addressed. Gender-related aspects will be analyzed as part of the project preparatory phase and gender-differentiated impacts will be accounted for in the gender action plan to be developed during the PPG phase by a gender expert. Findings from the gender analysis and action plan will be incorporated into the project to strengthen the reflection of gender perspectives in the project components. A budget will be dedicated to the Gender Action Plan and related gender-specific activities/outcomes.

2.1. Drivers of inaction and barriers to be addressed

The chlor-alkali project needs to address several barriers to reduce mercury pollution. These include an unclear legal regulatory and policy framework that hinders compliance and enforcement, a lack of governmental administrative and coordination capacities that impede effective implementation of legislation, existing knowledge gaps in the sector limiting adequate and environmentally sound management of mercury, and a shortage of financial and economic support for final mercury disposal. These barriers will be assessed and expanded upon during the project preparatory phase.

2.1.1. Unclear legal, regulatory and policy framework

Brazil has an advanced legal framework for environmental protection, with shared responsibilities among federal entities (Union, States and Municipalities). However, there is a significant gap in policy regarding the management and disposal of mercury, especially excess mercury from chlor-alkali facilities, as there are no regulations on best practices and/or standardized terms of reference to tackle this issue.

Currently, relevant regulations include Law No. 9,976 issued on July 3, 2000, which bans new facilities using mercury or asbestos diaphragm electrolysis for chlorine production[11]11 and mandates some emission controls and the Minamata Convention (ratified via Decree No. 9,470 of August 4, 2018). However, these instruments do not include the Best Available Techniques/Best Environmental Practices (BAT/BEP) for safely storing, stabilizing, treating and disposing mercury and mercury waste, nor do they provide plans, guidelines or actions to support the phase-out of mercury cells. These regulatory and policy gaps results in technical and legal uncertainty for both the companies and the public officials responsible for environmental control as they lack the instruments and mechanisms to determine the most effective methods for environmental management and compliance. Furthermore, since each mercury-using chlor-alkali facility is located in different Federated States and environmental licensing of industrial plants is a state competence, there may be inconsistencies in the understanding and implementation of proper mercury management and disposal practices increasing risks of non-compliance and potential environmental and health hazards.

2.1.2. Lack of governmental administrative capability

Insufficient personnel allocation and a developing institutional knowledge poses a challenge to ensure effective monitoring and compliance with environmental regulations and the 2025 deadline mandated by the Minamata Convention. Deficiencies in streamlining actions, exchanging information and knowledge and communication across Federal States and governmental institutions have been identified. This underscores the need for continuous coordination with local and national environmental agencies and capacity strengthening at the local and national levels.

In light of current conditions, the Brazilian Federal Government cannot ensure that the disposal of surplus mercury from the chlor-alkali industry, as well as the cleanup and restoration of affected areas, is performed comprehensively.

2.1.3. Existing technical knowledge gaps

There is a lack of information to develop an action plan to phase out mercury cells and ensure the proper disposal of excess mercury/mercury waste. Brazil has the technical capacity and access to equipment but there are no established service providers that offer remediation, stabilization, transport and storage services for mercury contaminated sites due to irregular demand. The project will identify national service providers for mercury stabilization, transport and storage and evaluate financial costs and environmental risks to choose between local or international solutions. This decision will be taken jointly by the project steering committee members and the relevant national authorities as part of the project sustainability strategy.

3. Key Stakeholders

The project will develop a comprehensive stakeholder engagement plan during the preparatory phase to ensure engagement, participation and commitment of all key partners in achieving project results, integrating public sector entities, private sector partners and other key stakeholders such as academia, research institutions and non-government organizations at the international, regional and local levels. A steering committee will be established, composed of representatives from each stakeholder group. Regular multi-stakeholder meetings will be organized to facilitate open dialogues and exchanges. A clear communication strategy will also be developed at project inception to ensure all parties are informed and aligned with project objectives. A brief list of key stakeholders to be engaged is detailed below and further detailed in Appendix 3.

Ministry of Environment and Climate Change (MMA). MMA is a key governmental entity responsible for formulating and implementing national policies related to environmental protection, sustainable development and climate change. The Ministry oversees initiatives aimed at preserving Brazil's rich biodiversity, managing natural resources responsibly and reducing the country's carbon footprint and it is the main focal point for Multilateral Environmental Agreements such as the Minamata Convention on Mercury. MMA will play a crucial role in enforcing environmental regulations and ensuring compliance with the Minamata Convention on Mercury.

Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA). Regulatory agencies such as IBAMA oversee environmental activities directly, while the Ministry of Environment holds primary responsibility for meeting Convention obligations and monitoring mercury emissions as a national task. IBAMA also has authority over the import and export of hazardous waste, compliance with international agreements (like the Basel Convention) and oversight of hazardous waste transportation that crosses state or national borders.

State Environmental agencies are primarily responsible for licensing industrial activities within their respective states, including the management and control of pollution, waste and hazardous materials. They oversee the management and disposal of waste, including hazardous waste, within state boundaries and regulate the transportation and final destination of waste within the state.

Minamata Convention Secretariat. Collaboration with the Minamata Secretariat will be essential to ensure adherence to obligations, streamline the development of tools and knowledge exchange and learning.

Global Mercury Partnership (GMP). UNEP's Global Mercury Partnership hosted in UNEP's Knowledge and Risks Unit provides targeted technical assistance in the majority of UNEP's GEF funded projects under the mercury focal area as it acts as the main knowledge management mechanism for projects under the Minamata Convention. In that sense, it has a broad reach of stakeholders working in the sector and will strengthen the dissemination of project results regionally and globally. The project will work in close coordination with the chlor-alkali area of the GMP to enhance project execution, receive specialized technical support for components 1, 3 and 4, and facilitate the dissemination of lessons learned.

Brazilian Association of the Alkali, Chlorine and Derivatives Industry (ABICLOR) brings together all chlor-alkali companies in Brazil. The participation of this association as part of the project will be essential to ensure equal participation and information sharing amongst companies.

Chlorum, Katrium and Unipar Carbocloro. Each company will undertake the evaluation of mercury-contaminated sites at chlor-alkali facilities located in Cubatão (State of São Paulo), Rio de Janeiro (State of Rio de Janeiro) and Igarassu (State of Pernambuco). They will facilitate the transfer of technology to ensure mercury-free chlor-alkali production at their respective plants, aligning with Federal regulations and adhering to national and international environmental management criteria and standards. In addition, they will also play a role in disseminating regional communications highlighting the significance and advantages of adopting mercury-free chlor-alkali technologies.

World Chlorine Council (WCC). WCC is an international network of national and regional trade associations representing the chlor-alkali industry. They advocate for the responsible production, use and management of chlorine and its related products, promoting safety, environmental protection and sustainable practices. WCC will provide technical knowledge and disseminate lessons learnt.

Technical companies and experts in mercury waste. Technical agencies such as Econ Industries and TAUW (European consultancy firm with a strong position in environmental advice) having experience in remediation of contaminated soils with mercury will share experience and knowledge during the implementation of project.

Research institutes and laboratories. These entities could participate in the development and implementation of environmental monitoring and remediation plans for each plant to verify that threshold levels have been achieved after remediation takes place.

Non-Governmental Organizations (NGOs) and Civil Society Organizations (CSOs). These can include environmental NGOs, health-related organizations, labour unions and worker associations.

Beneficiaries. This group includes both the individuals directly employed by the chlor alkali industry who will benefit from improvements in health, safety and environmental standards as well as local communities living near production facilities who are exposed to environmental impacts.

During the preparatory phase, through the stakeholder engagement plan all of the actors mentioned above will be engaged and invited to participate as part of the project. Approaches to consultation with the above groups can include workshops, surveys and interviews, focus groups, public consultations, among others.

During the preparatory phase, through the stakeholder engagement plan all of the actors mentioned above will be engaged and invited to participate as part of the project.

4. Associated Baseline Projects

By building on existing efforts, the project will identify synergies with the below projects, ensuring resources are used efficiently and effectively. This approach will also enhance policy alignment with the Minamata Convention on Mercury. Additional projects will be identified during the preparatory phase and meetings will be conducted to exchange information and identify potential collaboration points.

Development of Minamata Convention on Mercury Initial Assessment in Brazil (GEF ID 5861): the project identified the production of chlor-alkali as a main mercury source, responsible in 2016 for the emission of 1.3 tons of mercury into the air, corresponding up to 15.2% of the total for the country in that year[12]12. The chlor-alkali project will generate detailed and accurate information that can contribute to Brazil's mercury inventory sources in the future.

Eliminate mercury use and adequately manage mercury and mercury wastes in the chlor-alkali sector in Mexico (GEF ID 10526: the project will reduce negative impacts of mercury and mercury wastes from the chlor-alkali sector on human health and the environment in Mexico. It will also seek to stabilize and dispose of at least 100 tons of mercury from two mercury-cell plants located in Monterrey and Coatzacoalcos. The implementation timeline of both projects will overlap, creating opportunities for parallel progress and mutual reinforcement. This alignment will facilitate experience and knowledge exchange between the two countries, allowing both projects to benefit from shared lessons, best practices and solutions. Knowledge generation and exchange will be enhanced through the Global Mercury Partnership.

Potential synergies with the UNEP MSP Project "Environmentally sound management of seized mercury in Brazil" which is under development (expected submission: Q4 2024) will be evaluated and implemented. The MSP project implementation is anticipated with a start date in early 2025 that will coincide with the PPG phase of the chlor-alkali proposal. Therefore, baseline information and proposed environmentally sound management solutions will be evaluated at the country level. During the PPG phase, options for stabilization, transport, treatment, storage and final disposal of the mercury from the chlor-alkali sector will be assessed as well. Activities of both projects will be planned and synchronized to obtain maximum efficiency of resources and optimize results.

[1] World Chlorine Council. (consulted June 2024) WCC Report to UNEP on chlor-alkali partnership, mercury reporting 2002-2023 data. Available at: https://worldchlorine.org/unep-chlor-alkali-mercury-partnership/reporting-on-mercury-use/

[2] O'Brien, Thomas F.; Bommaraju, Tilak V.; & Hine, Fumio (2005) History of the chlor-alkali industry. In: Handbook of Chlor-alkali Technology. Springer, Boston. Pp.17-36. Available at: https://link.springer.com/chapter/10.1007/0-306-48624-5_2

[3] ABICLOR, Associação Brasileira da Indústria de Álcalis, Cloro e Derivados. (2020) Balanço Socioeconômico da Indústria de Cloro-Álcalis no Brasil 2020. São Paulo, ABICLOR: nov. 2020. Available at: http://www.abiclor.com.br/wp-content/uploads/2021/04/Abiclor_Balanco_socioeconomico_2020.pdf
[4] World Chlorine. Available at: https://worldchlorine.org/unep-chlor-alkali-mercury-partnership/
[5] Presidency of the Republic General Secretariat, Sub-Headquarters for Legal Affairs (2018) (consulted July 2024). Available at: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/decreto/d9470.htm
[6] For comparison, it is estimated that the mercury contamination in Grassy Narrows, Ontario, Canada, referred to above, released between 9 and 11 tons of mercury into the environment.
[7] The amount of mercury will be reviewed and confirmed during the PPG phase.
[8] Brazilian Institute of Geography and Statistics (consulted July 2024). Available at: https://cidades.ibge.gov.br/brasil/panorama
[9] Based on estimates provided by companies
[10] Based on the cost for most common option used in EU (final disposal in a salt mine facility in Germany (including transport)
[11] Brazil's Law No. 9,976, issued on July 3, 2000, regulates the production of chlorine through the electrolysis process. This law sets specific standards and restrictions for chlorine production, including a prohibition on the installation of new plants using mercury and asbestos diaphragm technology
[12] de Assunção, João Vicente et al. (2019) Inventário nacional de emissões e liberações de mercúrio – Brasil. Basília: MMA, 27 may 2019.

B. PROJECT DESCRIPTION

Project description

This section asks for a theory of change as part of a joined-up description of the project as a whole. The project description is expected to cover the key elements of good project design in an integrated way. It is also expected to meet the GEF's policy requirements on gender, stakeholders, private sector, and knowledge management and learning (see section D). This section should be a narrative that reads like a joined-up story and not independent elements that answer the guiding questions contained in the PIF guidance document. (Approximately 3-5 pages) see guidance here

Theory of Change

The overall objective of the project is to reduce the negative environmental and social impacts caused by mercury and mercury wastes from the chlor-alkali sector in Brazil. The elimination of mercury will be achieved by phasing out the use and subsequent releases of mercury from the industrial process in the targeted facilities and supporting the transition to mercury-free technology alternatives. Mercury remains in wide usage and lacks environmentally sound management due to the following barriers identified in the baseline: limited administrative capability; unclear legal regulatory and policy framework; technical knowledge gaps.

The project will tackle each barrier through four interdependent components and their respective outcomes and outputs. More information is detailed in the Theory of Change (Fig.2) centered around the elimination of mercury from the chlor alkali sector in Brazil and aligns with the country's commitment to the Minamata Convention.

Outcome 1: Brazil approves and implements decommissioning and remediation plans for mercury-contaminated sites, which requires policy strengthening for the most appropriate technical solutions, which is provided through output 1.1 best practice guide for monitoring and policy recommendations. This outcome will also require the development under output 1.2, of agreements on site specific remediation programs. These remediation and monitoring programs are assumed to be adopted by the site owners, so both the engagement of national partners and the coordinated application of BAT/BEP will largely drive this process.

Outcome 2: Safe decommissioning of mercury cells from chlor-alkali facilities and successful technology conversion will be supported by output 2.1 the collection and disposal of excess mercury at the three sites, and following the adopted best practices & remediation plans. Predictability and adequacy of costs are assumed to be in place, which will support the speed and scale of this process.

Outcome 3: 240 metric tons of mercury are safely disposed of by output 3.1 safe disposal and monitoring of contaminated materials and output 3.2. the implementation of monitoring plans at the three sites. It is assumed that vendors present a consistent and reliable service to drive this process.

Outcome 4: Knowledge is disseminated on the phasing out of mercury through knowledge sharing on best practices at the national, regional and global levels. Interest of non-project countries and gathering of lessons learned will support knowledge generation and dissemination.

Commitment of key stakeholders including the Brazilian government and the private sector, the availability of financing and sufficient technical capacity are among the key assumptions underpinning the whole project design.

During the preparatory phase, elaborated information on the Theory of Change will be provided.

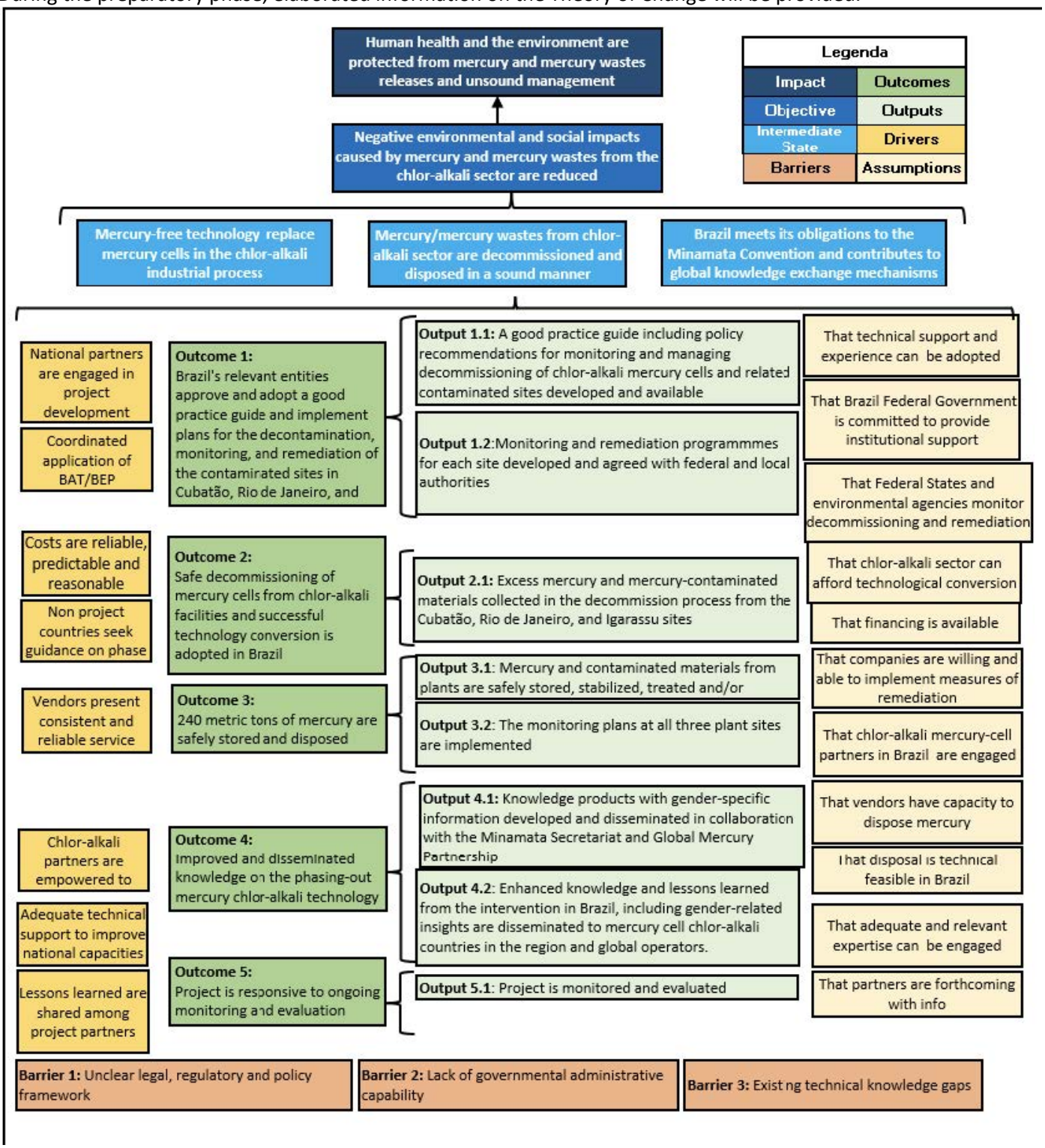


Figure 2. Theory of Change diagram

Alternative Scenario

This section offers a narrative overview of the individual components and their respective outputs. Each output is accompanied by a preliminary list of activities, which will be further detailed during the preparatory phase. The identification of barriers and project description stems from consultations with technical experts, private sector companies involved in the chlor-alkali sector and the Ministry of Environment. Insights drawn from a similar initiative in the region (the Mexico chlor-alkali project, GEFID 10526) have also guided the project approach. Additionally, a Stakeholder Engagement Plan, a Gender Analysis and Action Plan and other relevant documents will be prepared during the PPG phase and will feed into the final project design.

Component 1. Strengthening national capacity for managing hazardous chemical facilities and mercury-contaminated sites.

As the project supports the conversion of the three remaining mercury cell chlor-alkali plants in Brazil, the activities under Component 1 will enhance national capacity for decommissioning obsolete mercury cells in chlor-alkali plants and managing excess mercury and mercury wastes in a safe, environmentally sound and monitored manner. This includes thorough consideration of the treatment and disposal of contaminated materials.

Output 1.1 A good practice guide including policy recommendations for monitoring and managing decommissioning of chlor-alkali mercury cells and related contaminated sites is available for use by national stakeholders.

- Develop a good practice guide for decommissioning mercury cell chlor-alkali for Brazil, based on global BAT/BEP for collection and temporary storage of mercury, decontamination of equipment, infrastructure and wastes, and remediation of the sites. The good practice guide will include policy recommendations to improve mercury management at the national and local levels.
- Develop a good practice guide for transport, treatment, stabilization and disposing of excess mercury and mercury waste, considering the availability inside and outside the country of technologies and service providers.
- Enhance the existing legal and policy framework, as well as administrative tools, for the management of chemical and waste facilities in Brazil. This includes establishing clear guidelines for collection, temporary storage, treatment, and disposal, while ensuring the availability of adequate storage facilities. To achieve this, local government authorities will collaborate closely with the Brazilian federal government, working together to align regional practices with national standards (this coordination will also focus on improving the administrative capacity at all levels of government, ensuring effective implementation and enforcement of these regulations based on a PPG assessment that will outline specific proposals for necessary improvements).

Output 1.2 Monitoring and remediation programmes for each site developed and agreed with federal and local authorities.

- Technical experts will review and validate the characterization, decontamination, and remediation plans for the Cubatão, Rio de Janeiro, and Igarassu sites.
- A monitoring and remediation program for each site will be developed in close coordination with both federal and local authorities. This collaboration will not only ensure that the programs are effectively tailored to each site's specific needs but will also strengthen the administrative capabilities of government agencies at all levels. The results of these programs will be carefully gathered, discussed, and agreed upon with federal and local authorities to identify and integrate key lessons learned, further enhancing the effectiveness of future initiatives.

Environmental and social management plans, including gender-related aspects, will be developed during the preparatory phase. These plans will be integrated into the broader project activities, ensuring that all social and environmental dimensions are addressed comprehensively.

Component 2. Introducing BAT/BEP during the decommissioning of mercury cells and following technology conversion of the three plants

Building on the characterization, decontamination and remediation plans to be developed under Component 1, Component 2 will focus on supporting the decommissioning of the mercury cells and converting the plants and collecting all excess mercury and mercury-contaminated materials for processing, treatment, or disposal under Component 3. Chlorum, Katrium and Unipar have secured approximately USD 344 million in co-financing for new membrane technology facilities at Cubatão, Rio de Janeiro and Igarassu sites. The converted plants will aim to maintain the actual combined annual production capacity of 158,000 metric tons of chlorine.

Component 2 will include the decontamination of the mercury cell facilities in Cubatão, Rio de Janeiro and Igarassu and the identification of BAT/BEP for the remediation of legacy wastes at the sites. These actions will be based on the plans to be developed as part of Component 1. In addition, stabilization and sound disposal of mercury wastes from the sites will be conducted under Component 3.

Output 2.1. Excess mercury and mercury-contaminated materials collected in the decommission process from the Cubatão, Rio de Janeiro and Igarassu sites.

- Engage specialized contractors with the technical expertise required to manage mercury and mercury-contaminated wastes safely. This will ensure that all materials are handled, stored, and disposed of in compliance with national and international regulations.
- Provide ongoing financial and technical support to Chlorum, Katrium and Unipar to address the mercury and mercury waste issues comprehensively. This support will cover the design and implementation of effective mercury management strategies, including decommissioning protocols, waste handling procedures, and environmental monitoring.
- Construct secure storage facilities at the Cubatão, Rio de Janeiro, and Igarassu sites to safely contain mercury and mercury-contaminated materials until they can be processed or disposed of. This infrastructure will be critical to preventing environmental contamination during the decommissioning process.

Component 3. Stabilization, treatment and final disposal of excess mercury and contaminated materials from the three decommissioned and converted plants

Component 3 will address excess mercury stabilization from the conversion and the safe handling, treatment and final disposal of mercury-contaminated materials and equipment from the three plants. The feasibility of technical measures will be site-specific. Actual remediation costs will be supported by co-financing from Brazil while GEF resources will assist in identifying appropriate procedures and technologies for the remediation process.

Currently, there are no stabilization facilities in the country. Feasibility tests and assessments of stabilization and disposal options will be coordinated with national partners under the GMP's supervision. It is expected that approximately 240 tons of mercury will be collected from Cubatão, Rio de Janeiro and Igarassu plants for stabilization, with the exact amount to be confirmed during the PPG phase.

Output 3.1. Mercury and contaminated materials from plants are safely stored, stabilized, treated and/or disposed.

- Conduct feasibility studies for the stabilization, storage, treatment and final disposal of mercury, based on decontamination and remediation plans from Component 1.
- Evaluate the potential of stabilization of metallic mercury from the cells in synergy with the MSP Project "Environmentally Sound Management of seized mercury in Brazil" on the basis of the above feasibility study, timeframe compatibility required resources.
- Create technical, infrastructural, financial and legal conditions to stabilize 240 tons of mercury.
- Implementation of selected options for mercury management, especially disposal of stabilized mercury.

Output 3.2 The monitoring plans at all three plant sites are implemented.

- Conduct environmental monitoring (following national regulations) for the three sites: Cubatão, Rio de Janeiro and Igarassu.

The governance and monitoring arrangements will be initiated during the PPG phase and further detailed during the development of the monitoring and remediation plans to be elaborated under Component 1. Clear roles and responsibilities will be assigned to ensure results are met and activities continue after project closure.

Component 4. Knowledge Management and Communication

Component 4 will ensure that the knowledge and experience gained in Brazil is shared through the Global Mercury Partnership and other mechanisms with countries that have active mercury cell chlor-alkali plants. This will facilitate south-south cooperation and peer-to-peer learning on how to deal with conversion and management of excess mercury and mercury contamination. Information will be disseminated through the UNEP GMP website, regional and country offices and international mercury and chemicals-related forums. This component will also organize regional and global forums for experience sharing to support the decommissioning and conversion of all remaining mercury cell chlor-alkali plants worldwide with gender specific information. Additionally, it will closely work with the GMP to update the chlor-alkali mercury cell conversion guidelines based on the project's findings. To ensure adequate processes to capture and distribute key information, a Knowledge Management expert will be engaged by the EA during project implementation including gender-related insights.

Output 4.1. Knowledge products with gender-specific information developed and disseminated in collaboration with the Minamata Secretariat and Global Mercury Partnership.

- Generate a communications and knowledge management plan entailing targeted outreach to stakeholders, incorporating gender-specific considerations;
- Gather findings from gender analysis and action plan developed during the preparatory phase to inform knowledge strategies and products to be produced;
- Compile insights and lessons learned from previous efforts to inform the current project including capturing best practices and expertise related to gender-responsive generated during implementation;
- Develop processes for capturing, assessing and documenting information, lessons learned and best practices throughout the project lifecycle with a focus on gender-specific aspects;
- Identify the needs of stakeholders regarding available guidance, ensuring that gender-specific requirements are considered and compile a list of required documents such as: BAT/BEP for non-mercury technologies; instructions for assessing mercury wastes and mercury in materials; GMP handbook on phase-outs; cost-benefit analysis, etc.;
- Record insights from the development and implementation of phase-out plans including gender-specific outcomes and impacts;
- Share guidance documents with stakeholders and adapt them based on feedback received ensuring that gender-specific considerations are included.

4.2 Enhanced knowledge and lessons learned from the intervention in Brazil, including gender-related insights are disseminated to mercury cell chlor-alkali countries in the region and global sector operators.

- Share lessons learned and guidance development through UNEP, GMP and Minamata Convention networks ensuring that gender-specific insights and gender-responsive practices are highlighted;
- Develop project webpage or similar on appropriate platforms such as GMP website to allow sharing of guidance documents and lessons learned ensuring content addresses gender specific needs;
- Hold technical workshop/webinars in years 3 and 5 for non-project countries incorporating gender-specific sessions and maintain regular knowledge exchange and South-South cooperation mechanisms with the related project in Mexico;
- Promote guidance documents and lessons learned emphasizing gender-responsive approaches at international industrial sector conferences.

Close coordination should be ensured with existing initiatives and partners of the Global Mercury Partnership on the topic of wider environmentally sound management of mercury.

Innovation and scaling towards wider transformation

The conversion of the three chlor-alkali plants in Brazil to mercury-free membrane cell technology represents a significant step towards transformation of this sector, as the project is addressing the three remaining plants still using mercury in Brazil. Nonetheless a significant environmental risk remains unless the conversion is done with a focus on avoiding releases or illegal disposal of mercury, and unless measures are taken to decontaminate legacy pollution hotspots. By prioritizing environmentally responsible technology, this initiative will not only eliminate mercury use but set a precedent for broader industry transformation with due attention being paid to environmental status in the process, both nationally and regionally.

Capacity building is integrated across all three project components, including gender mainstreaming and other cross-cutting aspects through specialized training, modules and materials. By project completion, stakeholders and government authorities involved in the chlor-alkali sector will have enhanced capacity and means to sustain project outcomes and contribute to the regional transformation of this potentially highly polluting industry sector. Training methods prioritize sharing project information, lessons learned and best practices through partner websites like the Global Mercury Partnership (GMP), ensuring knowledge transfer regionally and globally. Brazil is a large and influential country which serves as a role model and source of technical expertise and industrial services in the region. By reinforcing national capacities for mercury management, the project will contribute to global availability of hazardous waste management services.

Project results and practices will be disseminated and scaled up nationally, regionally and globally, leveraging insights from the chlor-alkali project in Mexico (GEFID 10526). A Gender Action Plan will be developed and budgeted during the preparatory phase. Regional scaling opportunities and broader dissemination of results will benefit from close collaboration with the Mexico project, potentially achieving greater efficiency and impact through networking and synergies.

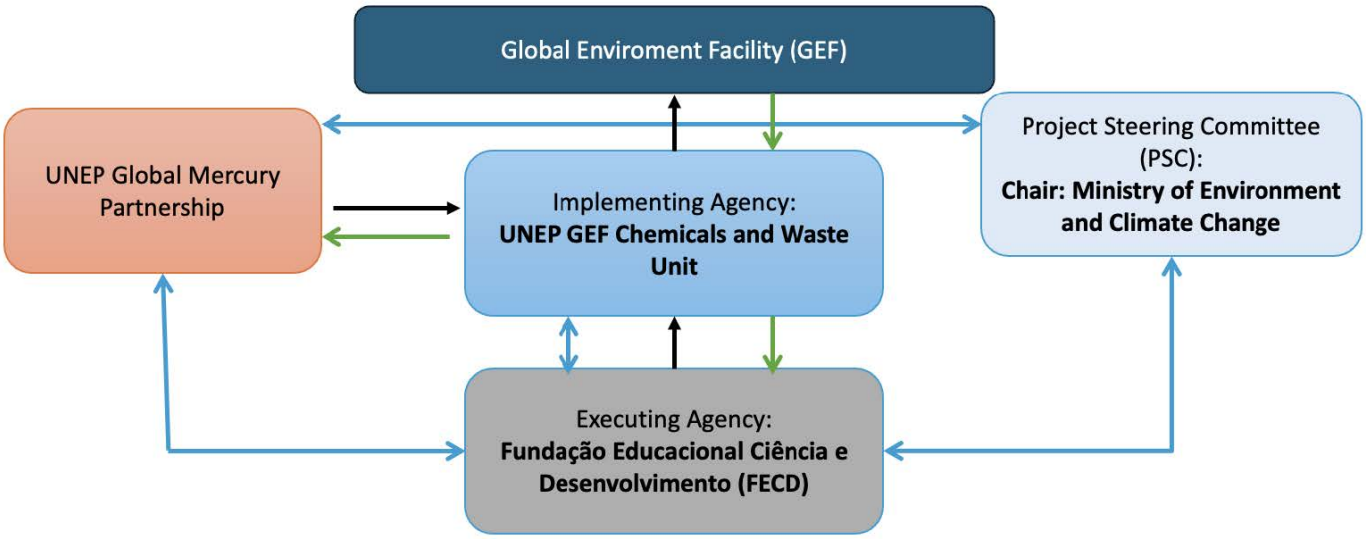
Implementation arrangements

UNEP will serve as the Implementing Agency (IA) for the project, while the Executing Agency (EA) will be the Fundação Educacional Ciência e Desenvolvimento (FECD). FECD, a Brazilian non-profit organization established in 1998 from the Federal University of Rio de Janeiro (UFRJ), serves as a mediator between the university and civil society, facilitating a range of initiatives that provide innovative solutions derived from the extensive knowledge and expertise of Brazil's academic and research institutions. Working closely with UFRJ's professors — who are among the leading experts in mercury contamination analysis in Brazil — FECD has the capacity to bring additional experts from other institutions when needed.

Although FECD does not have direct experience in the chlor-alkali sector, its extensive background in chemicals management provides a solid foundation for successfully executing the project. This expertise, coupled with their ability to manage large-scale initiatives, positions them well to handle the project's requirements. In areas where more specific sector knowledge is required, FECD will seek consultations and collaborate with specialized experts to ensure that all technical aspects, particularly those related to the chlor-alkali sector, are appropriately addressed. FECD previously worked on large projects in partnership with leading organizations such as WHO, UNEP, the National Service for Industrial Training (SENAI), Brazil's Biodiversity Fund (FUNBIO), and a number of prestigious universities, including Durham, Oxford Brookes, York, and Birmingham.

A Project Steering Committee (PSC), chaired by the Ministry of Environment, will act as the national coordination mechanism, involving relevant institutions and stakeholders such as ABICLOR, Chlorum, Katrium, Unipar Carbocloro, Ministry of Environment and Climate Change, UNEP and the GEF. Implementation and coordination arrangements will be further developed during the PPG phase. Strong inter-institutional coordination and communication will ensure consistent messaging and alignment of actions within the chlor-alkali sector.

The PSC and other project delivery structures will aim for gender balance and inclusivity. This approach will help promote diverse perspectives and ensure that gender considerations are integrated into decision-making processes. Gender and human rights will be integrated into deliberations beyond mere participation and representation data by embedding gender-sensitive criteria into project policies and procedures.



Notes:
Green indicates flow of funds dirbursed for the project
Black indicates financial and programmatic accountability of funds dirbursed
Blue indicates reporting, collaboration and coordination between entities

Coordination and Cooperation with Ongoing Initiatives and Project.

Does the GEF Agency expect to play an execution role on this project?

If so, please describe that role here. Also, please add a short explanation to describe cooperation with ongoing initiatives and projects, including potential for co-location and/or sharing of expertise/staffing

The chlor-alkali project in Brazil aims to collaborate closely with national partners, including federal and local governments, to plan joint activities at both national and local levels. The Ministry of Environment and Climate Change (MMA) and relevant private sector entities such as Chlorum, Katrium, Unipar Carbocloro will contribute in-kind and investment support during project implementation. Technical expertise from the project team will guide government bodies like the National Chemical Safety Commission (CONASQ), focusing on addressing mercury pollution issues.

UNEP brings significant comparative advantage to the project, having developed long-lasting relationships with key partners in Brazil and across the globe. UNEP's extensive knowledge base on mercury management, derived from its leadership in global efforts such as the Global Mercury Partnership (GMP), positions it well to provide technical and strategic guidance for this project. UNEP's involvement in previous projects, like the Minamata Initial Assessment (GEFID 5861) and a similar project Mexico, has built a robust information base, technical knowledge and strong global networks, enhancing coordination, knowledge sharing, and capacity building for mercury management. UNEP's deep expertise in guiding governments and private sector entities through complex environmental challenges ensures that this project will benefit from best practices and lessons learned globally.
The project will leverage findings from the Minamata Initial Assessment (GEFID 5861), highlighting chlor-alkali mercury cells as significant mercury sources, and from the National Action Plan for Artisanal and Small-Scale Gold Mining (GEFID 10860). The expertise in environmentally sound management of mercury could extend to the safe management and disposal of mercury from small miners. Collaboration with the Global Mercury Partnership (GMP),

led by UNEP, will facilitate knowledge exchange, coordination and outreach with other regional and global projects in the industrial sector.

The project will also integrate experiences from UNEP projects like 'Eliminate mercury use and manage mercury wastes in the chlor-alkali sector in Mexico' (GEFID 10526) and 'Accelerate Minamata Convention compliance through improved understanding and control of mercury trade in Latin America' (GEFID 11047). The Brazilian project aims to strengthen regional information exchange and knowledge generation to support countries facing similar challenges from the chlor alkali industry such as Argentina and Uruguay.

In addition, the project has close connections to a pipeline initiative ('Environmentally Sound Management of Mercury Seized in Brazil') being developed by the Ministry of Environment and Climate Change and UNEP, which aims to establish and support legal frameworks, management procedures, logistics and infrastructure necessary to safely seize, handle, transport, store and eliminate current and future elemental mercury obtained through law enforcement operations or voluntary surrender to authorities. A key outcome of this project will be the implementation of a pilot stabilization unit, whose feasibility relies on adequate stocks of metallic mercury, underscoring the importance of alignment and synergies with this project. The two projects are necessary because they address mercury from different sources, varying magnitudes and timelines: one from public institutions and the other from the private sector, each with unique challenges and stakeholders. The stabilization plant to be developed under the MSP proposal will act as a pilot, providing valuable lessons and best practices that can be applied to the chlor-alkali project, ensuring an aligned and effective mercury management approach from different sources.

Coordination is planned with established stakeholders in mercury waste assessment in the chlor-alkali sector, such as BATREC, Econ industries and TAUW. Consultations during the preparatory phase will engage with UNEP's Brazil Focal Point and Regional Office to identify additional collaboration opportunities for project implementation.

Core Indicators

Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	0	0	0	0
Expected metric tons of CO_2e (indirect)	53670	0	0	0

Indicator 6.1 Carbon Sequestered or Emissions Avoided in the AFOLU (Agriculture, Forestry and Other Land Use) sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)				
Expected metric tons of CO_2e (indirect)	53,670			
Anticipated start year of accounting	2026			
Duration of accounting	5			

Indicator 6.2 Emissions Avoided Outside AFOLU (Agriculture, Forestry and Other Land Use) Sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)				
Expected metric tons of CO_2e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

Indicator 6.3 Energy Saved (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)				

Indicator 6.4 Increase in Installed Renewable Energy Capacity per Technology (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Technology	Capacity (MW) (Expected at PIF)	Capacity (MW) (Expected at CEO Endorsement)	Capacity (MW) (Achieved at MTR)	Capacity (MW) (Achieved at TE)

Indicator 9 Chemicals of global concern and their waste reduced

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
340.00	0.00	0.00	0.00

Indicator 9.1 Solid and liquid Persistent Organic Pollutants (POPs) removed or disposed (POPs type)

POPs type	Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)

Indicator 9.2 Quantity of mercury reduced (metric tons)

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
340.00			

Indicator 9.3 Hydrochloroflurocarbons (HCFC) Reduced/Phased out (metric tons)

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)

Indicator 9.4 Number of countries with legislation and policy implemented to control chemicals and waste (Use this sub-indicator in addition to one of the sub-indicators 9.1, 9.2 and 9.3 if applicable)

Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)

Indicator 9.5 Number of low-chemical/non-chemical systems implemented, particularly in food production, manufacturing and cities (Use this sub-indicator in addition to one of the sub-indicators 9.1, 9.2 and 9.3 if applicable)

Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)

Indicator 9.6 POPs/Mercury containing materials and products directly avoided

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)

Indicator 9.7 Highly Hazardous Pesticides eliminated

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)

Indicator 9.8 Avoided residual plastic waste

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)

Indicator 11 People benefiting from GEF-financed investments

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	3,400,000			
Male	3,000,000			
Total	**6,400,000**	**0**	0	**0**

Explain the methodological approach and underlying logic to justify target levels for Core and Sub-Indicators (max. 250 words, approximately 1/2 page)

GEF Core Indicator 6: The calculation factor for CO2was estimated by the industry association on energy efficiency of membrane technology compared to mercury cells over 1 year for a 100,000-chlorine production unit plant (0.283 MtonCO2-Eq/MWh). All companies involved will convert their mercury electrolytic cells to membrane technology. The reduction in energy consumption was calculated considering the average energy efficiency of the installed capacity of the mercury cells (3,700 kWh/ton.) compared to the projected energy efficiency of the membrane technology (2,500 kWh per ton of chlorine produced), as reported by companies.

GEF Core Indicator 9: 240 tons of mercury used currently at the plants and considered excess mercury as informed by involved companies – all this mercury will be permanently disposed by the project. Additionally, together, the 3 companies currently purchase an average of 20 tons per year to replace lost mercury (in the air, in the soil and in the catalyst consumed), so the project estimates an additional 100 tons of mercury emissions avoided over a period 5 years, reaching an overall total of 340 tons of mercury.

GEF Core Indicator 11: The number of direct beneficiaries corresponds to the number of inhabitants of the municipalities in which the mercury using facilities are located, according to estimates for 2022 from Brazil's official statistical body (IBGE - Brazilian Institute of Geography and Statistics). Therefore, a total of 6,438,895 individuals (2,991,866 men and 3,447,029 women) was estimated based on the aggregation of the population of Cubatão, Igarassú, and Rio de Janeiro. Additionally, 425 workers are

included from the three facilities (54 women and 371 men) During PPG phase, the direct number of beneficiaries that will benefit through reduced exposure to mercury and improved health will be refined and validated with updated statistic data.

Key Risks

	Rating	Explanation of risk and mitigation measures
CONTEXT		
Climate	Low	Risks: The regions targeted by the project present low vulnerabilities to climate events and natural disasters. Theoretical risks identified in both Rio de Janeiro and Sao Paulo include urban floods, coastal floods; all sites could also face extreme heat. The likelihood and severity of these risks depend on specific sites and related infrastructure. Mitigation measures: Climate change risks will be identified and taken into account during the assessment of intervention areas and mitigation strategies will be proposed to ensure durability of project outcomes. Effective coordination and communication with federal and local authorities will be prioritized in relation to this risk.
Environmental and Social	Moderate	Risks: The likelihood of social factors preventing the adoption of mercury-free technologies and the sound disposition of mercury and mercury wastes from the chlor-alkali sector is low while the incorporation of gender mainstreaming objectives into the project design stands as moderate. Potential gender-associated risks related to the project could include but are not limited to exclusion of women from project planning, differential environmental impacts, community health risks and reinforcing traditional gender roles. Furthermore, the introduction of mercury-free technologies may lead to job losses for workers accustomed to mercury-cell technologies both men and women. Environmental risks of accidents during handling of mercury waste may be moderate as outlined in the SRIF (Annex D1). Mitigation Measures: To mitigate this risk, a detailed assessment and continuous communication with relevant stakeholders, along with a gender analysis and related action plan during the PPG phase, will be conducted. The project will address environmental and social issues related to the chlor-alkali sector and the sound management of remediation. Stakeholders, primarily from the private sector, will be involved in the selection of the best mercury-free technologies and the sound management for stabilization and remediation of mercury contaminated sites. To understand private sector interests and propose appropriate actions, the project will consider mercury-free technology providers and national authorities. Environmental risks will be managed via an Environmental Management Plan to be developed as part of the remediation plans under Component 1; and will be continuously monitored by the project and Brazilian authorities under Component 2.
Political and Governance	Moderate	Risks: Brazil has a long-standing tradition of democratic political stability. Currently, the government is in the second year of its four-year term. However, there is a risk that political support from the Brazilian Government may be insufficient to ensure strong engagement from relevant actors. Additionally, changes in government and personnel could negatively impact and delay

		project implementation. Mitigation measures: The project will closely monitor the political landscape at both the national and local levels to identify potential sources of conflict early on that could affect implementation. Strategic and periodic communication with stakeholders at all levels will be maintained to ensure political aspects are addressed. During the PPG phase, the project's governance structure will establish an Independent Executive Team to minimize the impact of sudden changes in key government roles on project implementation.
INNOVATION		
Institutional and Policy	Moderate	Risks: There is a risk of low commitment and engagement in the project, inadequate political support, challenges in technological conversion, co-financing difficulties, remediation technology and shifts in priorities due to adverse economic conditions affecting national and international stakeholders, as well as federal and local government institutions. Changes in political agendas could potentially lead to delays in project implementation. Mitigation measures: The project has been strategically designed to align with the priorities of the private sector and chlor-alkali facilities involved in the interventions. It will leverage existing mechanisms to maintain strong participation throughout the implementation phase. Ongoing cooperation with private sector partners ensures alignment with national policies and plans. Furthermore, the project will incorporate lessons learned from previous experiences, particularly from the chlor-alkali project in Mexico, to enhance its effectiveness.
Technological	Moderate	Risks: The introduction of mercury-free technologies entails several technological risks, including feasibility, maintenance reliability, availability of technology and service providers for mercury waste and contaminated and remediation, mercury stabilization and disposal and cost implications for the chlor-alkali sector. Mitigation measures: A gender-sensitive assessment of existing technologies and remediation practices such as market studies will be conducted to ensure their compatibility with Brazil's chlor-alkali sector. The project will prioritize effective communication, stakeholder engagement and participatory approaches throughout all phases. Demonstrating the effectiveness of mercury-free alternatives and the sound management of mercury/mercury wastes will be crucial for gaining acceptance. Furthermore, sustainability considerations will be integrated into the design and implementation of technological interventions.
Financial and Business Model	Moderate	Risks: Various factors, including operational efficiency, mercury stabilization rates and remediation costs, could affect the financial feasibility of the intervention. Additionally, there is a risk that financial institutions may be reluctant to engage with the chlor-alkali sector for site remediation due to perceived high risks or insufficient knowledge of viable alternatives. Mitigation measures: Project partners will explore and evaluate multiple sources of financing to address this challenge. During the PPG phase, activities

		will be specifically designed to ensure that financial mechanisms are not only feasible but also sustainable, fostering engagement with financial institutions.
EXECUTION		
Capacity	Moderate	Risks: There is a risk that project partners and national counterparts may not sustain project activities, including co-financing commitments. Variations in management capacities, resources and availability among chlor-alkali sector partners could also impact project design and implementation. Mitigation measures: National stakeholders possess experience in implementing GEF-funded projects and have prior collaborations with UNEP. Moreover, the executing agency (EA) responsible for the project has extensive expertise in managing such initiatives. Monitoring, knowledge generation and dissemination efforts within the project will ensure sustainability and longevity of outcomes. Additionally, effective stakeholder engagement strategies will secure ownership and commitment from partners.
Fiduciary	Low	Risks: Inadequate management of project funds and a lack of available co-financing for planned activities. Mitigation measures: The project will strictly adhere to GEF and UNEP policies and procedures throughout its duration. Independent financial audits will be conducted to prevent any potential misuse of project funds. Stakeholders' co-financing expectations will be clearly communicated, with ongoing updates and coordination efforts in place.
Stakeholder	Low	Risks: Potential issues include insufficient participation, waning trust and loss of interest among project partners. Mitigation measures: To address these risks, a comprehensive Stakeholder Engagement Plan will be meticulously crafted during the PPG phase. This plan will prioritize understanding the needs, priorities and desired levels of involvement of stakeholders. Continuous communication with all involved parties will commence early during the PPG phase. Key stakeholders such as private sector partners, technical experts from national and international arenas, government authorities and other crucial partners will be identified and engaged proactively to secure ongoing support.
Other		
Overall Risk Rating	Moderate	The main risk to this project is considered moderate. Vigilant monitoring of these risks and robust implementation of mitigation strategies will safeguard against any potential negative impacts on the project's success and long-term sustainability.

C. ALIGNMENT WITH GEF-8 PROGRAMMING STRATEGIES AND COUNTRY/REGIONAL PRIORITIES

Describe how the proposed interventions are aligned with GEF- 8 programming strategies and country and regional priorities, including how these country strategies and plans relate to the multilateral environmental agreements.

Confirm if any country policies that might contradict with intended outcomes of the project have been identified, and how the project will address this.

For projects aiming to generate biodiversity benefits (regardless of what the source of the resources is - i.e., BD, CC or LD), please identify which of the 23 targets of the Kunming-Montreal Global Biodiversity Framework the project contributes to and explain how. (max. 500 words, approximately 1 page)

The project is in line with GEF-8 Chemicals and Waste Focal Area Programming Strategy, that directly supports implementation of the Minamata Convention, contributing to the achievement of GEF 8 Objective 1: Creation, strengthening and supporting the enabling environment and policy coherence to transform the manufacture, use and sound management of chemicals and to eliminate waste and chemical pollution; Objective 2: Prevention of future build-up of hazardous chemicals and waste in the environment; and Objective 3: Elimination of hazardous chemicals and waste.

The project supports UNEP's Medium-Term Strategy (MTS) 2022-2025 and its Programme of Work (PoW) 2022-2023), namely to Outcome 3A: Human health and environmental outcomes are optimized through enhanced capacity and leadership in the sound management of chemicals and waste; and Outcome 3C: Releases of pollutants to air, water, soil and the ocean are reduced. Concretely, the project will directly contribute to the following outputs:

3.1 Regional and national integrated policy has shifted towards the sound management of chemicals and waste.
3.5: Institutional capacity to adopt and act on national and international commitments is enhanced
3.9: Use of harmful chemicals in products and processes is reduced in key sectors.
3.10: Collective action of United Nations system entities addresses sound management of chemicals and waste

It also links to the "Pollution and Health" Programme Coordination Project (PCP).

In addition, the project has the potential to contribute to the United Nations Sustainable Development Cooperation Framework (UNSDCF) 2023-2027 in its Strategic Priority Area 3: Environmental sustainability, climate and disaster resilience; and its Priority Area 4: Governance, Federalism, Participation and Inclusion. During the preparatory phase, the project will engage with UN Country Team to ensure sound cooperation and coordination with other ongoing and future initiatives and identify concrete results to which the project can contribute to.

Brazil ratified the Minamata Convention in August 2017. As part of the obligations under the Convention, the project will support the decommissioning of chlor-alkali facilities, the disposal in accordance with the guidelines for environmentally sound management, the implementation of mercury-free technologies and the assurance that the mercury is not recovered or recycled. In this sense, the project is aligned with the priority actions outlined in the Minamata Initial Assessment (MIA) which identified the chlor alkali sector as a significant source of mercury in the country, making this project a critical step toward addressing this issue.

In addition, the project supports the Ministry of Environment' Strategic Planning (2024-2027), which prioritizes the need for responsible chemical management and hazardous waste disposal. By supporting these national priorities, the project not only addresses environmental concerns but also integrates sustainable industrial practices that can foster economic and social benefits.

At a broader level, the project will contribute to policy coherence by aligning with existing national, state, and municipal regulations, including Brazil's broader environmental laws and policies. This ensures that the project's interventions are aligned with both national and local legislative frameworks, which is critical for its smooth implementation. Additionally, it will support Brazil's industrial growth by promoting sustainable practices, contributing to the country's long-term development goals, and reinforcing Brazil's leadership in environmental governance on the international stage.

D. POLICY REQUIREMENTS

Gender Equality and Women's Empowerment:

We confirm that gender dimensions relevant to the project have been addressed as per GEF Policy and are clearly articulated in the Project Description (Section B).

Yes

Stakeholder Engagement

We confirm that key stakeholders were consulted during PIF development as required per GEF policy, their relevant roles to project outcomes and plan to develop a Stakeholder Engagement Plan before CEO endorsement has been clearly articulated in the Project Description (Section B).

Yes

Were the following stakeholders consulted during project identification phase:

Indigenous Peoples and Local Communities:

Civil Society Organizations:

Private Sector: Yes

Provide a brief summary and list of names and dates of consultations

Organization	Date of consultation
ABICLOR - Brazilian Association of the Alkali, Chlorine and Derivatives Industry	24/Oct/2023
Chlorum Solutions	26/May/2023-19/Oct/2023
Katrium Indústrias Químicas S.A.	26/May/2023-19/Oct/2023
Unipar Carbocloro	26/May/2023-19/Oct/2023
Ministry of the Environment of Brazil (MMA)	Regular exchanges
Fundação Educacional Ciência e Desenvolvimento (FECD)	13/May/2024
ABICLOR, Chlorum Solutions, Katrium Indústrias Químicas S. A., Unipar Carbocloro, MMA and UNEP	8/August/2024

(Please upload to the portal documents tab any stakeholder engagement plan or assessments that have been done during the PIF development phase.)

Private Sector

Will there be private sector engagement in the project?

Yes

And if so, has its role been described and justified in the section B project description?

Yes

Environmental and Social Safeguard (ESS) Risks

We confirm that we have provided indicative information regarding Environmental and Social risks associated with the proposed project or program and any measures to address such risks and impacts (this information should be presented in Annex D).

Yes

Overall Project/Program Risk Classification

PIF	CEO Endorsement/Approval	MTR	TE

Medium/Moderate

E. OTHER REQUIREMENTS

Knowledge management

We confirm that an approach to Knowledge Management and Learning has been clearly described in the Project Description (Section B)

Yes

ANNEX A: FINANCING TABLES

GEF Financing Table

Indicative Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	Grant / Non-Grant	GEF Project Grant($)	Agency Fee($)	Total GEF Financing ($)
UNEP	GET	Brazil	Chemicals and Waste	Mercury	Grant	12,000,000.00	1,080,000.00	13,080,000.00
Total GEF Resources ($)						**12,000,000.00**	**1,080,000.00**	**13,080,000.00**

Project Preparation Grant (PPG)

Is Project Preparation Grant requested?

true

PPG Amount ($)

200000

PPG Agency Fee ($)

18000

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	Grant / Non-Grant	PPG($)	Agency Fee($)	Total PPG Funding($)
UNEP	GET	Brazil	Chemicals and Waste	Mercury	Grant	200,000.00	18,000.00	218,000.00
Total PPG Amount ($)						**200,000.00**	**18,000.00**	**218,000.00**

Please provide justification

Sources of Funds for Country Star Allocation

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Sources of Funds	Total($)
Total GEF Resources					**0.00**

Indicative Focal Area Elements

Programming Directions	Trust Fund	GEF Project Financing($)	Co-financing($)
CW-2	GET	12,000,000.00	344250000
Total Project Cost		**12,000,000.00**	**344,250,000.00**

Indicative Co-financing

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Recipient Country Government	Ministry of Environment and Climate Change	In-kind	Recurrent expenditures	200000
Private Sector	Unipar Carbocloro	Equity	Investment mobilized	200000000
Private Sector	Katrium Indústrias Químicas	Equity	Investment mobilized	74000000
Private Sector	Chlorum Solution	Equity	Investment mobilized	70000000
GEF Agency	UNEP – Global Mercury Partnership	In-kind	Recurrent expenditures	50000
Total Co-financing				**344,250,000.00**

Describe how any "Investment Mobilized" was identified

Investment mobilized refers to the substantial financial commitments made by the private sector, specifically by Unipar Carbocloro, Katrium Industrias Quimicas and Chlorum Solutions. These firms are investing in the conversion of their chlor-alkali plants to adopt new mercury-free membrane cell technology at three different sites in Brazil. These investments, which are critical for modernizing their production processes and ensuring environmental compliance, are being developed in parallel with the current project supported by UNEP. The mobilization of these investments reflects the private sector's commitment to

sustainability, innovation and regulatory adherence and underscores the collaborative effort between the private sector and international organizations to achieve broader environmental and industrial transformation.

ANNEX B: ENDORSEMENTS

GEF Agency(ies) Certification

GEF Agency Type	Name	Date	Project Contact Person	Phone	Email
GEF Agency Coordinator	Global Environment Facility (GEF) Interim GEF Executive Coordinator	9/12/2024	Mr. Ersin Esen	+ 41-22-917-81-9	ersin.esen@un.org
Project Coordinator	Portfolio Manager, GEF Chemicals and Waste Unit	9/12/2024	Mr. Kevin Helps	+(254 20) 762 50	kevin.helps@un.org

Record of Endorsement of GEF Operational Focal Point (s) on Behalf of the Government(s):

Name	Position	Ministry	Date (MM/DD/YYYY)
Ms. Livia Farias Ferreira de Oliveira	General Coordinator for Sustainable Finance	Ministry of Finance	9/2/2024

ANNEX C: PROJECT LOCATION

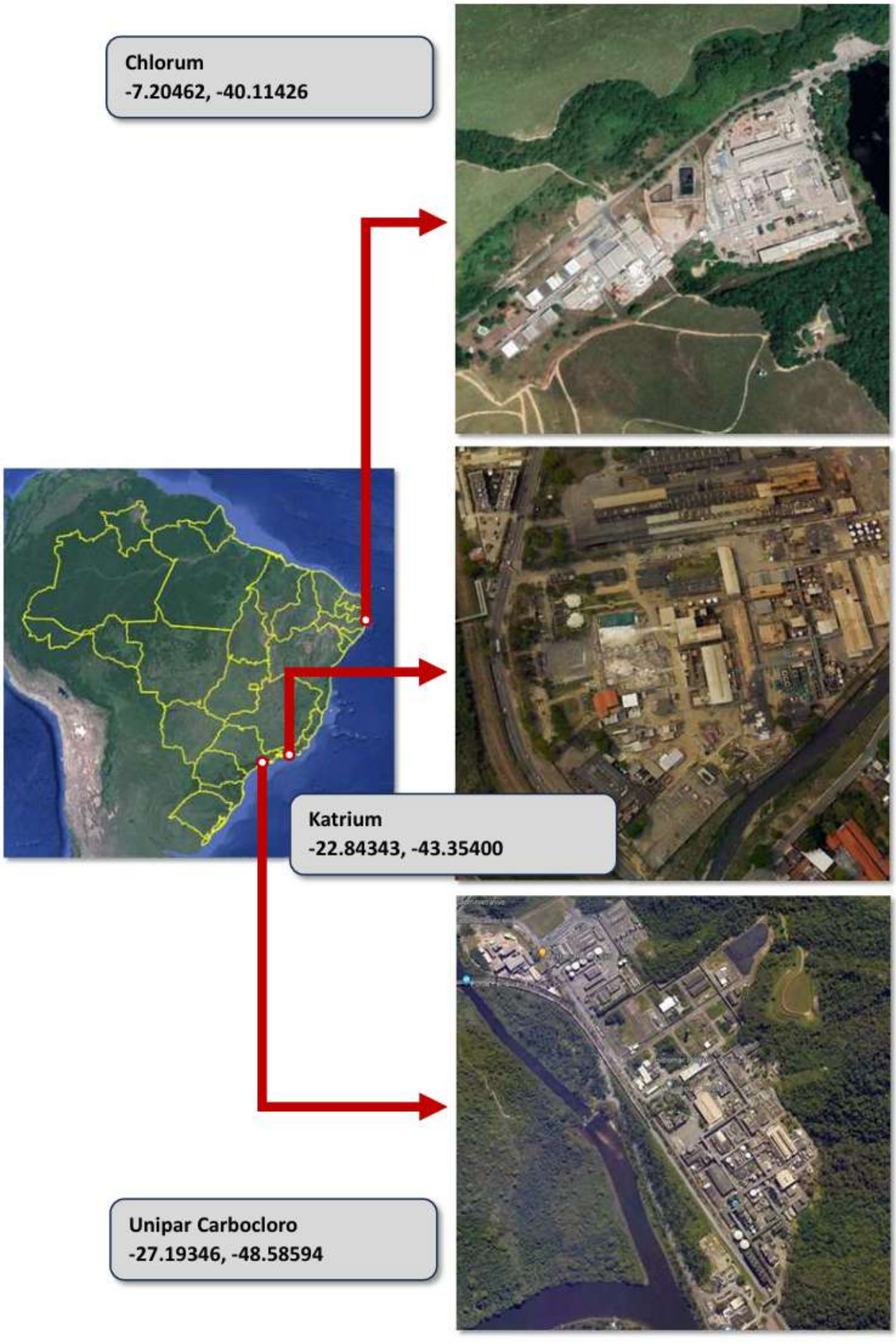
Please provide geo-referenced information and map where the project interventions will take place

The location of the three chlor-alkali facilities areas considered for this intervention is shown in the table and highlighted in the maps below:

Facility	Location				
	District/ Neighborhood	Municipality	Metropolitan Region	Federal State	Coordinates
Chlorum	Araripe	Igarassu	Recife	Pernambuco	-7.20462, -40.11426
Katrium	Honório Gurgel	Rio de Janeiro	Rio de Janeiro	Rio de Janeiro	-22.84343, -43.354
Unipar Carbocloro	Perequê	Cubatão	Baixada Santista	São Paulo	-27.19346, -48.58594

Additionally, some activities aimed at policymakers and other interested parties will be held in Brazil's capital, Brasília (-15.77972, -47.92972), Recife (-8.05389, -34.88111), Rio de Janeiro (-22.90642, -43.18223) and São Paulo (-23.5475, -46.63611), capitals of the States in which the chlor-alkali plants are located.


IBGE
Instituto Brasileiro de Geografia e Estatística
REPÚBLICA FEDERATIVA
DO BRASIL
MAPA POLÍTICO
2021
AMAZONAS
PARÁ
OCEANO
ATLÂNTICO
OCEANO
PACÍFICO
CONVENÇÕES
ESCALA 1:5.000.000


Chlorum
-7.20462, -40.11426
Katrium
-22.84343, -43.35400
Unipar Carbocloro
-27.19346, -48.58594

ANNEX D: ENVIRONMENTAL AND SOCIAL SAFEGUARDS SCREEN AND RATING

(PIF level) Attach agency safeguard screen form including rating of risk types and overall risk rating.

Title

Chlor-alkali Brazil - PIF - Annex D1 - Safeguard Risk Identification Form

ANNEX E: RIO MARKERS

Climate Change Mitigation	Climate Change Adaptation	Biodiversity	Land Degradation
No Contribution 0	No Contribution 0	No Contribution 0	No Contribution 0

ANNEX F: TAXONOMY WORKSHEET

Level 1	Level 2	Level 3	Level 4
Influencing Models	Transform policy and regulatory environments Strengthen institutional capacity and decision-making Convene multi-stakeholder alliances Demonstrate innovative approaches		
Stakeholders	Private sector Beneficiaries Civil Society Type of Engagement Communications	Capital providers SMEs Community Based Organization Non-Governmental Organization Academia Trade Unions and Workers Unions Information Dissemination Partnership Consultation Participation Awareness Raising Education Public Campaigns Behavior Change	
Capacity, Knowledge and Research	Capacity Development Knowledge Generation and Exchange Targeted Research Learning Innovation Knowledge and Learning	 Theory of Change Adaptive Management Indicators to Measure Change Knowledge Management Innovation Capacity Development Learning	

	Stakeholder Engagement Plan		
Gender Equality	Gender Mainstreaming Gender results areas	Beneficiaries Sex-disaggregated indicators Gender-sensitive indicators Participation and leadership Capacity development Awareness raising Knowledge generation	
Focal Area/Theme	Chemicals and Waste	Mercury Sound management of chemicals and waste Waste management Emissions Disposal Industrial Emissions Best Available Technology / Best Environmental Practices	 Hazardous waste management Industrial waste