# The Global Greenchem Innovation and Network Programme

## Part I: Project Information

**GEF ID**
**10353**

**Project Type**
FSP

**Type of Trust Fund**
GET

**CBIT/NGI**
☐CBIT
☐NGI

**Project Title**
The Global Greenchem Innovation and Network Programme

**Countries**
Global

**Agency(ies)**
UNIDO

| Other Executing Partner(s) | Executing Partner Type |
|---|---|

| Other Executing Partner(s) | Executing Partner Type |
|---|---|
| Yale University (main executing entity),RECP Network, Green Chemistry Network Members, Ministry of Industry of Indonesia, Agency for the Assessment and Application of Technology of Indonesia, Ministry of Planning and International Cooperation of Jordan, Ministry of Environment of Peru, Ministry of Environmental Protection of Serbia, National Environmental Authority of Uganda, Ministry of Energy and Environmental Protection of Ukraine. | Others |

**GEF Focal Area**

Chemicals and Waste

**Taxonomy**

Focal Areas, Chemicals and Waste, Sound Management of chemicals and waste, Persistent Organic Pollutants, Mercury, Stakeholders, Civil Society, Non-Governmental Organization, Communications, Awareness Raising, Private Sector, SMEs, Individuals/Entrepreneurs, Gender Equality, Gender results areas, Knowledge Generation and Exchange, Capacity Development, Gender Mainstreaming, Gender-sensitive indicators, Sex-disaggregated indicators, Capacity, Knowledge and Research, Enabling Activities, Learning, Theory of change

**Rio Markers**

**Climate Change Mitigation**

Climate Change Mitigation 0

**Climate Change Adaptation**

Climate Change Adaptation 0

**Duration**

72 In Months

**Agency Fee($)**

1,134,000

**Submission Date**

2/20/2020

**A. Indicative Focal/Non-Focal Area Elements**

| Programming Directions | Trust Fund | GEF Amount($) | Co-Fin Amount($) |
|---|---|---|---|
| CW-1-1 | GET | 12,600,000 | 89,697,521 |
| | **Total Project Cost ($)** | **12,600,000** | **89,697,521** |

**B. Indicative Project description summary**

**Project Objective**

To scale up green chemistry for POPs, mercury and microplastics replacement through capacity building and innovation, and creation of a global unifying green chemistry network for implementation and uptake.

| Project Component | Financing Type | Project Outcomes | Project Outputs | Trust Fund | GEF Amount($) | Co-Fin Amount($) |
|---|---|---|---|---|---|---|
| Component 1: Green Chemistry Inclusion Network for Capacity Building | Technical Assistance | Outcome 1.1 Functional Green Chemistry inclusion network | Output 1.1.1 Developed and provided training and awareness events<br>Output 1.1.2 Networking mechanism in place through established programmatic content schedule<br>Output 1.1.3 Mobilized Network to support Accelerator Programme | GET | 1,400,000 | 7,697,521 |

| Project Component | Financing Type | Project Outcomes | Project Outputs | Trust Fund | GEF Amount($) | Co-Fin Amount($) |
|---|---|---|---|---|---|---|
| Component 2: Green Chemistry Accelerator Programme | Technical Assistance | Outcome 2.1. Regional Accelerator Programmes developed and implemented | Output 2.1.1 Accelerators established with completed curriculum training for Judges, Mentors and Administrators<br><br>Output 2.1.2 Business competitions held ("Innovation Challenges")<br><br>Output 2.1.3 Global winners connected to further technical resources, investors, and commercial partners | GET | 5,200,000 | 40,000,000 |
| Component 3: Green Chemistry alternatives for POPs, mercury and micro-plastics for up-scale and replication | Technical Assistance | Outcome 3.1. Green Chemistry alternatives for POPs, mercury and microplastics implementation and upscaling of successful demonstrations | Output 3.1. 1. Green Chemistry alternatives for POPs, mercury and microplastics implemented<br><br>Output 3.1.2. Replication mechanisms of green chemistry alternatives for national, regional and global level up-take developed and implemented | GET | 5,000,000 | 38,000,000 |

| Project Component | Financing Type | Project Outcomes | Project Outputs | Trust Fund | GEF Amount($) | Co-Fin Amount($) |
|---|---|---|---|---|---|---|
| Component 4: Monitoring and evaluation | Technical Assistance | Outcome 4.1. Project monitoring and evaluation in line with GEF and UNIDO requirements | Output 4.1.1. Project monitoring and evaluation plan designed and implemented<br>Output 4.1.2 Mid-term evaluation completed<br>Output 4.1.3. Terminal project evaluation completed | GET | 400,000 | 2,000,000 |
| | | | | **Sub Total ($)** | **12,000,000** | **87,697,521** |

**Project Management Cost (PMC)**

| | | | |
|---|---|---|---|
| | GET | 600,000 | 2,000,000 |
| | **Sub Total($)** | **600,000** | **2,000,000** |
| | **Total Project Cost($)** | **12,600,000** | **89,697,521** |

**C. Indicative sources of Co-financing for the Project by name and by type**

| Sources of Co-financing | Name of Co-financier | Type of Co-financing | Investment Mobilized | Amount($) |
|---|---|---|---|---|
| Others | RECP Network Members | In-kind | Recurrent expenditures | 1,500,000 |
| Private Sector | Private sector companies with demonstration projects | Unknown at this stage | Recurrent expenditures | 38,000,000 |
| Others | Innovation/entrepreneurship programmes* | Grant | Investment mobilized | 40,000,000 |
| Others | Green Chemistry Commerce Council (GC3) | In-kind | Recurrent expenditures | 100,000 |
| Others | International Union of Pure and Applied Chemistry (IUPAC) | In-kind | Recurrent expenditures | 125,000 |
| Others | Green Chemistry Network Members | In-kind | Recurrent expenditures | 1,500,000 |
| Others | Yale University | In-kind | Recurrent expenditures | 6,900,000 |
| GEF Agency | UNIDO | Grant | Investment mobilized | 165,000 |
| GEF Agency | UNIDO | In-kind | Recurrent expenditures | 1,282,521 |
| Others | International Symposium on Green Chemistry (ISGC) | In-kind | Recurrent expenditures | 125,000 |
| | | | **Total Project Cost($)** | **89,697,521** |

**Describe how any "Investment Mobilized" was identified**

Investment mobilized was identified in institutional support from existing programmes that encourage entrepreneurship and innovation by national and regional governments or institutions as presented in Annex E. * The innovation/entrepreneurship programmes refer to different national and regional programmes identified that will be linked to the Accelerator programme during the PPG phase; furthermore the specific countries and regions for the accelerator programmes are defined. The list can be found in Annex E.

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

| Agency | Trust Fund | Country | Focal Area | Programming of Funds | Amount($) | Fee($) | Total($) |
|---|---|---|---|---|---|---|---|
| UNIDO | GET | Global | Chemicals and Waste | POPs | 9,600,000 | 864,000 | 10,464,000 |
| UNIDO | GET | Global | Chemicals and Waste | Mercury | 2,000,000 | 180,000 | 2,180,000 |
| UNIDO | GET | Global | Chemicals and Waste | SAICM | 1,000,000 | 90,000 | 1,090,000 |
| | | | | **Total GEF Resources($)** | **12,600,000** | **1,134,000** | **13,734,000** |

**E. Project Preparation Grant (PPG)**

PPG Required

☐

**PPG Amount ($)**

287,616

**PPG Agency Fee ($)**

25,885

| Agency | Trust Fund | Country | Focal Area | Programming of Funds | Amount($) | Fee($) | Total($) |
|---|---|---|---|---|---|---|---|
| UNIDO | GET | Global | Chemicals and Waste | POPs | 287,616 | 25,885 | **313,501** |
| | | | | **Total Project Costs($)** | **287,616** | **25,885** | **313,501** |

## Core Indicators

**Indicator 9 Reduction, disposal/destruction, phase out, elimination and avoidance of chemicals of global concern and their waste in the environment and in processes, materials and products (metric tons of toxic chemicals reduced)**

| Metric Tons (Expected at PIF) | Metric Tons (Expected at CEO Endorsement) | Metric Tons (Achieved at MTR) | Metric Tons (Achieved at TE) |
|---|---|---|---|
| **748.94** | **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) |
|---|---|---|---|---|
| **Select**Short-chain chlorinated paraffins (SCCPs) | 702.45 | | | |
| **Select**Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride | 19.91 | | | |
| **Select**Hexabromocyclododecane (HBCDD) | 26.58 | | | |

**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) |
|---|---|---|---|
| | | | |

**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) |
|---|---|---|---|

| 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 Quantity of 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) |
|---|---|---|---|
| 2,316,937.00 | | | |

**Indicator 11 Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment**

| | Number (Expected at PIF) | Number (Expected at CEO Endorsement) | Number (Achieved at MTR) | Number (Achieved at TE) |
|---|---|---|---|---|
| **Female** | 550 | | | |
| **Male** | 750 | | | |
| **Total** | 1300 | 0 | 0 | 0 |

Provide additional explanation on targets, other methodologies used, and other focal area specifics (i.e., Aichi targets in BD) including justification where core indicator targets are not provided

**Use of industrial POPs and the potential for replacement by Green Chemistry Alternatives were identified in Indonesia, Jordan, Peru, Serbia, Uganda, and Ukraine Annex I. Through in-depth analysis of POPs inventories, where significant data gaps were found that strongly tend towards quantity underestimation. Therefore, we expect the actual reductions from this project to be significantly higher as more sources are identified through Network, Accelerator, and demonstration components. The direct investment component consists primarily for commercially available and implementable solutions for HBCD, SCCPs and PFOS. During the time frame of this project, mechanisms established by this funding will allow for continued reductions towards near complete elimination. The complexity of the case and novelty of the approach, a detailed global environmental benefit for Chemicals and Waste strategy, can only be calculated in the PPG phase. Green Chemistry Alternatives for mercury and microplastics will be evaluated to have potential demonstration project deployments and upscaling, the reductions will be tabulated and reported. It is not possible to estimate the potential reduction at this stage but will be done during PPG phase. The number of foreseen trained facilitators**

**for Green Chemistry is estimated to be 300 (150 women and 150 men) and the expected number of people with increased awareness will be: 1000 (600 men and 400 women). Other benefits of the Accelerator programme will be 200+ jobs and beneficiaries due to safer products.**

## Part II. Project Justification

### 1a. Project Description

**1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed (systems description);**

1. Manufacturing of inherently hazardous materials occurs around the world, especially in developing countries. An overview is provided on the global treaty frameworks for Persistent Organic Pollutants (POPs) and mercury, the globally-recognized threat of microplastics, and the barriers to deploying green chemistry alternatives at scale. Workers and communities across the world, especially in emerging economies, are being exposed to chemicals with known hazard and exposure risk. These chemicals are produced because of technological lock-in and the initial deployment cost to adopt green chemistry alternatives available in developed economies.

2. Persistent Organic Pollutants (POPs) and the Stockholm Convention

3. The objective of the Stockholm Convention is to reduce the use and release of POPs while striving for their elimination. As of 2019, there are 182 signatories to the Stockholm Convention. As part of the treaty implementation countries transmit National Implementation Plans (NIPs), which estimate POP emissions and inventories, as well as provide information on programmes and policies towards meeting their commitments. Every four years, NIPs are supplemented with National Reports which provide updated emissions inventories, outcomes of programmes and policies, and the addressing of any additional compounds added to the Convention. As of 2018, four cycles of reporting have been requested by the Secretary from signatories. Of the 179 countries identified for reporting, 48 countries have not submitted any reports, and only 27 countries have submitted a report in each cycle. Reporting is challenged by scarce national resources for inventories, weak technological capacity for measurement, thresholds for reporting POPs in products in MSDS, and awareness of alternatives by companies that import and produce POPs and POPs-containing products. The next National Report is due to the Stockholm Secretariat in 2022.

4. Selected examples that have been identified as highly relevant for the demonstration projects, due to their high potential for replication by Green Chemistry (GC) alternatives and their considerable up-scaling potential, include: PFOS in the textile and carpet sectors, SCCPs in metal working and HBCDD in building insulation sectors. As Stockholm Convention National Implementation plans are being up-dated, inventories on recently added POPs, such as SCCPs, will be targeted for further potential for applying GC alternatives.

5. Mercury Exposure and the Minamata Convention

6. The objective of the Minamata Convention is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury-containing compounds. As of 2017, there are 128 signatories to the Minamata Convention. The Convention contains provisions that relate to the entire life cycle of mercury, including controls and reductions across a range of products, processes and industries where mercury is used, released or emitted. The treaty also addresses the direct mining of mercury, its

export and import, its safe storage and its disposal as waste. With mercury batteries still used worldwide in a variety of products, there exist substantial opportunities for scalable replacements to meet the goals of the Minamata convention.

7. Microplastics

8. Microplastics consist of plastics or plastic fragments less than 5 millimeters long. A variety of studies demonstrates evidence of harm to aquatic species across several types of hazard endpoints. These endpoints range from adverse impacts on proteins responsible for enzymatic reactions to transfer from the gut to other systems (i.e., circulatory, gills, glands). Other endpoints reported to be adversely affected by microplastic ingestion, include behavioral in terms of reduced feeding performance and impacts on the food chain as well as altered physical, neurological, reproductive and metabolic functions.

9. Green Chemistry Barriers

10. There are financial, regulatory, organizational, and cultural barriers to widespread adoption of Green Chemistry. In industry, suppliers are under pressure to deliver chemicals faster. There is an inherent regulatory risk of switching to a new process, an upfront investment vetting additional processes, the cost of redesigning existing processes, and an upfront investment barrier of new solvents and instrumentation. Moreover, additional identified barriers include; lack of information on the availability of Green Chemistry solutions, demonstration of commercialized scale-up of Green Chemistry from academia, connecting Green Chemistry solution providers to the industry, lack of awareness of the Green Chemistry principles, and the perception of high cost for small to medium enterprises. For academics, there are barriers for potential Green Chemistry entrepreneurs including the challenge of supporting themselves during the early years of scaling a startup, difficulties securing instrumentation and laboratory space, as well as regulatory approval for innovative chemical processes.

**2) the baseline scenario and any associated baseline projects**

11. Background information

12. Green Chemistry focuses on the inherent properties of chemicals to ensure they are benign and beneficial throughout their life cycles. Its purpose is not simply to reduce pollution at the source by eliminating the hazards of chemical feedstock, reagents, solvents, and products, but also to ensure that the broad spectrum of sustainability concerns are built into the design framework through innovation and invention. Green Chemistry touches virtually every business sector —food, energy, plastics, drugs, cosmetics, cleaning products, etc. Due to the nature of this approach, it has been, and will continue to be essential in the development of circular economy. Through this framework, many commercial sectors have adopted Green Chemistry solutions in the industrialized world which can serve as a valuable opportunity for pollution reduction through capacity building in the developing countries. Accordingly, UNIDO launched a global initiative to deploy Green Chemistry approaches and technologies. The initiative is supported by in-country partners, the Center for Green Chemistry and Green Engineering at Yale University, Braskem, and National Cleaner Production Centres (NCPCs) from Latin America, Africa, Asia, and Eastern Europe.

13. There are identified gaps in the accessibility of Green Chemistry alternatives in emerging economies, support of academics to transform their research into companies, and connection between the existing practitioners around a central effort. The Global Greenchem Innovation Programme will build on the activities of existing Green Chemistry networks and will provide connection through common challenges and outcomes identified in the programme components.

14. There are dozens of existing Green Chemistry Networks with no coordination or synchronization towards a common goal which are organized amongst non-profits, industrial, commercial, and academic levels, at the international, regional, and national scale. An extensive, but non-exhaustive, list of existing Green Chemistry networks that need this integration for global scalability and knowledge transfer are documented in Annex D. Some of these networks are international and funded, others are small efforts led by a few enthusiastic companies or a key faculty at an academic institution. Opportunities exist for capacity development and technology transfer by seeding new centers of economic momentum that connect those established green chemistry networks to those in developing countries.

15. Currently, identified networks are largely centered in the developed nations and their efforts lack integration to synchronize research and development, transfer findings, and present case studies for scalable adoption. GGINP proposes a “network of networks” aligned on unifying outputs: reducing release of POPs, mercury, and microplastic through commercially available technology. This is in addition to establishing a research commercialization pathway that accelerates the development of Green Chermistry entrepreneurship and the establishment of SMEs in developing countries.

16. The national level activities of the components 2 and 3 of GGINP will take place in Indonesia, Jordan, Peru, Serbia, Uganda, and Ukraine with the regional accelerator programmes covering Africa, Latin America, Eastern Europe, and South East Asia. Technical expert support for the national activities will be provide by Yale University.

17. Building on Serbia’s participation in UNIDO’s Global Green Chemistry Initiative the country will continue with their efforts and participate in the GGINP. Serbia has an extensive network of green chemistry well established in academia that have developed curricula on green chemistry, carried out awareness raising activities, and fosters research. These networks can benefit from being part of the global network to increase local capacity. Serbia also has programmes to support innovation and entrepreneurship that can be connected to these networks for the creation and support of new businesses. Finally, Serbia has an industry that still uses certain industrial POPs, such as HBCD, and has the necessary conditions for the implementation of GC alternatives.

18. UNIDO supports the government of Indonesia to scale up and mainstream RECP through a national programme. Additionally, UNIDO supports the country with the sound management and disposal of PCBs. Indonesia has financing and support programmes for entrepreneurs and researchers that can be connected to the accelerator programme. Some industrial sectors still use POPS and mercury, such as PFOs in the textile sector, and mercury in mining, where a demonstration project can be implemented.

19. In Jordan, UNIDO carries out activities for the elimination of HCFC and HFC in the refrigeration and polyurethane foam sectors. POPs such as HBCD are still used in the country's industry, with the opportunity to implement green chemistry alternatives to replace these substances. UNIDO also supports projects to create jobs for women and vulnerable groups. Jordan has support programmes for innovation and entrepreneurs that can be connected to the accelerator programme.

20. Peru is part of the UNIDO’s Programme for Country Partnership, which aims to foster a modern, competitive and inclusive industry in Peru. This programme seeks to facilitate the mobilization of partners, experience, and resources to help advance the Peruvian industry. Under this programme, Peru has the necessary conditions to implement

Green Chemistry alternatives for the replacement of industrial POPs that are still present in the country's industry such as PFOS, as well as for microplastics, which is in line with the country's roadmap for circular economy. In addition, Peru has a number of national programmes to support innovation and entrepreneurs that can be connected to the global network of Green Chemistry and that can contribute to increasing the transfer of capacity and knowledge as well as the creation of new businesses.

21. Uganda is an active country in UNIDO's Global Chemical Leasing Programme. The country has also a wide range of research activities in Green Chemistry that can take advantage of the Global Green Chemistry Network and, as part of the accelerator programme, can be connected with potential investors. In addition, Uganda still uses considerable amounts of POPs in industry, such as PFOS in textiles and carpets, and this represents an opportunity to implement a demonstration project on GC alternatives.

22. Finally, in Ukraine, UNIDO has ongoing projects on cleaner production and resource efficiency, including a Cleantech Innovation programme for SMEs and activities of the Global Eco Industrial Parks programme. In addition, UNIDO supported the country with the establishment of a system for the proper management and disposal of PCBs. POPs are still used in the Ukrainian industry, which offers an opportunity to implement a demonstration project to replace these POPs with Green Chemistry alternatives. The country also has programmes for the support of entrepreneurs and innovation that connected with the experience with the Cleantech programme can be connected with the accelerator programme.

23. Annex J contains more information on the baseline projects in Indonesia, Jordan, Peru, Serbia, Uganda, and Ukraine.

**3) the proposed alternative scenario with a brief description of expected outcomes and components of the project**

24. Theory of Change

25. T1. There is immense economic, social, and environmental potential to demonstrate the benefits of Green Chemistry at scale in developing countries. The UNIDO-led initiatives would engage Yale University, which would bring along an innovation ecosystem of entrepreneurship training, venture capital, and mentoring. GGINP will also tap into the extensive international network of NCPCs, national governments, and the Center for Green Chemistry and Green Engineering at Yale University, led by Drs. Anastas and Zimmerman.

26. The theory of change is to construct an ecosystem of open collaboration by establishing strong networks for capacity building, technology transfer, and a collective environment of entrepreneurial creativity (Figure 1).

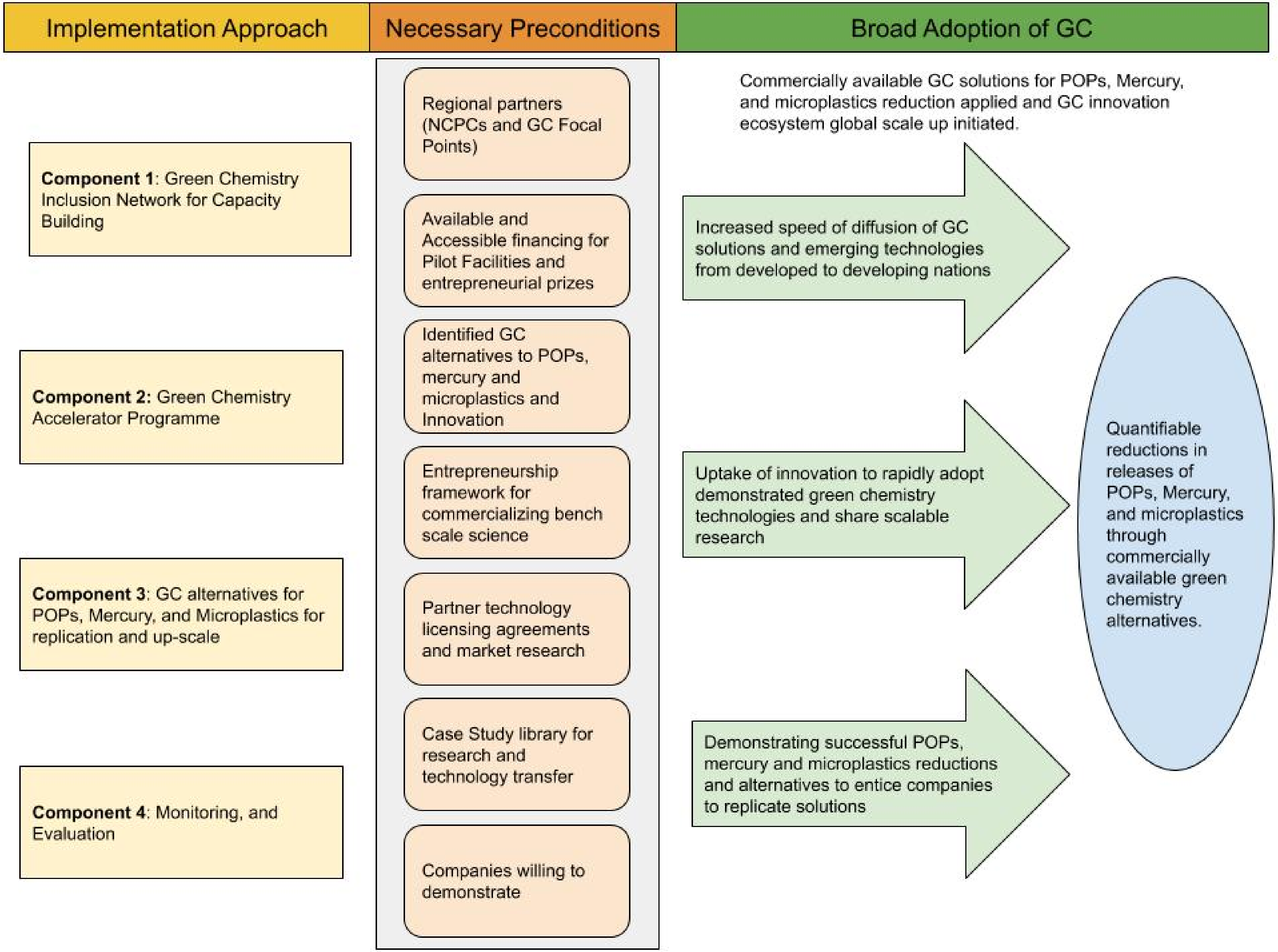
Implementation Approach
Necessary Preconditions
Broad Adoption of GC
Component 1: Green Chemistry Inclusion Network for Capacity Building
Component 2: Green Chemistry Accelerator Programme
Component 3: GC alternatives for POPs, Mercury, and Microplastics for replication and up-scale
Component 4: Monitoring, and Evaluation
Regional partners (NCPCs and GC Focal Points)
Available and Accessible financing for Pilot Facilities and entrepreneurial prizes
Identified GC alternatives to POPs, mercury and microplastics and Innovation
Entrepreneurship framework for commercializing bench scale science
Partner technology licensing agreements and market research
Case Study library for research and technology transfer
Companies willing to demonstrate
Commercially available GC solutions for POPs, Mercury, and microplastics reduction applied and GC innovation ecosystem global scale up initiated.
Increased speed of diffusion of GC solutions and emerging technologies from developed to developing nations
Uptake of innovation to rapidly adopt demonstrated green chemistry technologies and share scalable research
Demonstrating successful POPs, mercury and microplastics reductions and alternatives to entice companies to replicate solutions
Quantifiable reductions in releases of POPs, Mercury, and microplastics through commercially available green chemistry alternatives.

*Figure 1. Theory of Change for Global Greenchem Innovation and Network Programme*

27. For POPs, this Project Identification Form (PIF) presents an opportunity to build awareness for templatized Green Chemistry solutions. These templatized solutions will be created by providing opportunities through financing and in-kind support for companies to adopt them. This will help these companies to meet their POPs reporting and reduction requirements. This PIF presents an opportunity to perform technology transfer of replacement alternatives for mercury and microplastics in industry, for example batteries and microplastics in micro fibers, by combining existing networks with the creation of a global coalition of Green Chemistry networks. Opportunities exist to prove a viable pathway for academic practitioners and entrepreneurs to commercialize scale research through financial and mentor support during initial stages of exploring their startup venture. Additionally, opportunities exist to reduce regulatory hesitancy of the industry by proving the success of commercially available GC alternatives and emerging Green Chemistry research, which can increase confidence in manufacturers leading to a more rapid adoption and uptake.

28. Expected outcomes and components of the project

29. The following components outline a framework and a plan to realize POPs, mercury, and microplastics reduction through network development, a variety of strategic partnerships guided and supported by innovation, demonstration of commercial Green Chemistry technology, and knowledge sharing and technology transfer. The GGINP components foresee global and national level activities. The national level activities of the GGINP will take place in Indonesia, Jordan, Peru, Serbia, Uganda, and Ukraine. The regional accelerators administrators will be located in Indonesia, Jordan, Peru, Serbia, Uganda, and Ukraine and will be coordinated with other countries from the Latin American, East Asia, South and Eastern European, and African regions.

30. Component 1 - Green Chemistry Inclusion Network for Capacity Building

31. This global component will establish a Green Chemistry Inclusion Network for Capacity Building ("Network") that goes beyond awareness raising and training within developing countries. For the past several years, UNIDO has engaged in the Global Green Chemistry Initiative that has brought awareness raising, technical training, guidance, and educational curriculum to six nations: Brazil, Colombia, Egypt, Serbia, South Africa, and Sri Lanka. Two themes have arisen from the growing success of these programmes: 1) many developing countries, not included in this first group, are eagerly requesting Green Chemistry capacity building after observing its traction; and 2) there is a pronounced need to build a network between worldwide well-established and successful Green Chemistry centres and institutes and developing countries who seek to be engaged. While there are many networks listed in Annex D, they are small, dispersed, are topic-focused and in need of centralizing these nodes into one interconnected network. There is extensive Green Chemistry capacity in developed countries matched by equally extensive enthusiasm in developing countries for building connections and establishing green chemistry networks. This PIF creates the unifying goal of attracting these centers around entrepreneurship and Green Chemistry scalability POPs, mercury, and microplastic reductions.

32. Building on the experience and the tools developed within the Global Green Chemistry Initiative, capacity building will be extended to additional countries in a regional approach. Furthermore, the programme will build additional capacity in ‘innovation thinking’ using the so called Fab Lab and Maker Space facilities (such as those in Yale and MIT) to bring entrepreneurial creativity to the Green Chemistry endeavour. Fab Lab and Maker Space facilities are crucial parts of innovation and entrepreuership programmes. The training locations will be selected in the preparation phase by exploring the existing facilities in the countries where the programme will take place..

33. Component 1 Outputs

34. Output 1.1.1 - Developed and provided training and awareness events

35. A thorough review of other Green Chemistry networks will be conducted to identify potential participants and analyze existing sharing portals to assess the opportunities for improvement. The first output identifies and incentivizes existing Green Chemistry networks to unite under the UNIDO-led GGINP programme. This phase will also include contacting operational representatives from identified networks in order to do a gap analysis of what their network is lacking. These networks will be incentivized to join through co-funding, involvement in demonstration projects, and opportunities to commercialize their research and technologies. Building on successful programing with the Yale Center for Green Chemistry and Green Engineering amongst global Green Chemistry practitioners, outreach and training sessions will be replicated amongst the stakeholders in the networks established. The newly formed network will be used to publicize and attract collaborators to the accelerator programme in Component 2 and technical compendium for POPs, mercury, and microplastics reduction established in Component 3.

36. Output 1.1.2 - Networking mechanism in place through established programmatic content schedule

37. A regular schedule will be established to create a mechanism for consistent networking within the GGINP programme. This networking mechanism will primarily take place in a virtual community and will provide massive open online courses (MOOCs) for the members. Some of these MOOCs will be part of webinar series introducing emerging research, existing commercial solutions, and mentor training. This programmatic content schedule will be established to map out content for the following years consisting of webinars, whitepapers, a “conference of conferences”, and opportunities to interact between the various stakeholder levels: from students to executives in local to global organizations (industry, government, academia, non-profit, and finance).

38. Output 1.1.3 - Mobilized Network to support Accelerator Programme

39. The first test of the network will be to advertise for mentors to the Accelerator programme. The network can secondarily be used to identify a pipeline of research initiatives and business requests that could be transformed into commercial Green Chemistry solutions. Right now, this process consists of scanning all the U.S. Green Chemistry Presidential Awards and their counterparts in the United Kingdom and Japan, along with scanning journals such as the Royal Society of Chemistry’s Green Chemistry and the American Chemical Society’s Green Chemistry.

40. Component 2 - Green Chemistry Accelerator Programme

41. This component establishes an accelerator programme to nurture Green Chemistry entrepreneurs in the developing world and in countries with economies in transition. Building on and linking to UNIDO's Global Cleantech Innovation Programme, GGINP will support the development of demand-driven solutions by supporting bench-scale Green Chemistry and green engineering solutions that show promise to be scaled-up as commercialized technology. Initial targets for innovation would include green chemistry alternatives to POPs, mercury, and microplastics as well as new plastics and materials to fight ocean pollution, bio-based chemicals and materials, chemistry for carbon-reduction necessary for addressing climate change, solvents, and catalysts. These solutions are designed to engage issues across the full life cycle including energy, resource depletion, water, and hazard reduction. GGINP will identify the most promising green chemistry innovators and entrepreneurs, develop national capacity for innovation through replicable accelerators, and support national policy makers to strengthen market frameworks for small to medium enterprises.

42. The regional and national level activities of this component will be launched in six countries and regions with sufficient Green Chemistry capacity, demand for the uptake of innovative Green Chemistry solutions and facilitate global exchange through the overarching Global Cleantech Innovation Programme (GCIP). The regional administrators of the accelerator programme will be established in Indonesia, Jordan, Peru, Serbia, Uganda, and Ukraine. GGINP will connect academics with innovative laboratory processes as well as seed-stage entrepreneurs with a support ecosystem consisting of practitioners, SMEs, and national innovation and entrepreneurship programmes capable of helping them to develop and commercialize business models that can simultaneously reduce pollution and generate economic growth.

43. Component 2 Outputs

44. Output 2.1.1 - Accelerators established with completed curriculum training for Judges, Mentors, and Administrators

45. Yale University will collect curricula material from existing accelerators in the PPG-phase and evaluate the possibility of making materials available in multiple languages. Judges, mentors, and regional programme administrators will be trained by Yale University to manage each accelerator programme. The programme blends three in-person events with a core delivered in a massive online open course (MOOC) format, which allows use of the material simultaneously by mentors and participants across different accelerators. Three in-person events punctuate each accelerator: a kickoff, a mid-programme summit, and a final reflection leading to the demo-day pitch competition. All applicants, regardless of their acceptance into the Accelerator, will be funneled into the Network, and paired with a mentor if possible. Each Accelerator will seek out researchers and entrepreneurs on two primary considerations. The first is the pure scientific aspects such as the potential of promising reaction, laboratory demands of moving it from bench scale to pilot scale, process feedback and monitoring, and production systems integration. The second aspect is the pure business aspect such as the market potential, corporate support, and financial projections. The network will serve as a pipeline of experienced and enthusiastic individuals for the accelerator. Selected applicants will receive mentoring from science and business professionals in the Network and a cash award.

46. Output 2.1.2 - Business Competitions held ("Innovation Challenges")

47. Three "Innovation Challenges" will be submitted by the programme, one every two years, as an open call for green chemistry entrepreneurs (academia or industry) to propose technology innovations that can address a particular pollutant problem with high-impact potential. Securing corporate support is crucial for the success of the accelerator programme. This support could provide mentors, co-funders, opportunities to pilot different technologies, as well as partners to scale-up, if the technology is successful. To

encourage and institutionalize this corporate support, accelerators will invite companies to co-develop “Innovation Challenges” about problems in their respective industry. The Innovation Challenges will spark new research and pull green chemistry solution creators to the accelerator. This will create market-driven creation of green chemistry alternatives, will help ensure industrial uptake, and will also create effective impact through demand-driven solution generation. GGINP will connect, at regional level, academics with innovative laboratory processes as well as seed-stage entrepreneurs with a support ecosystem consisting of practitioners, SMEs, and national innovation and entrepreneurship programmes capable of helping them develop and commercialize business models that can simultaneously reduce pollution and generate economic growth.

48. Output 2.1.3 - Global winners connected to technical resources, investors, and commercial partners

49. Three “Innovation Challenges” will be submitted by the programme, one every two years, as an open call for green chemistry entrepreneurs (academia or industry) to propose technology innovations that can address a particular pollutant problem with high-impact potential. Securing corporate support is crucial for the success of the accelerator programme. This support could provide mentors, co-funders, opportunities to pilot different technologies, as well as partners to scale-up, if the technology is successful. To encourage and institutionalize this corporate support, accelerators will invite companies to co-develop “Innovation Challenges” about problems in their respective industry. The Innovation Challenges will spark new research and pull green chemistry solution creators to the accelerator. This will create market-driven creation of green chemistry alternatives, will help ensure industrial uptake, and will also create effective impact through demand-driven solution generation. GGINP will connect, at regional level, academics with innovative laboratory processes as well as seed-stage entrepreneurs with a support ecosystem consisting of practitioners, SMEs, and national innovation and entrepreneurship programmes capable of helping them develop and commercialize business models that can simultaneously reduce pollution and generate economic growth

50. Component 3 - Green chemistry alternatives for POPs, mercury and micro-plastics for up-scale and replication

51. This component will demonstrate scaled-up green chemistry alternatives to POPs at six demonstration project locations in Indonesia, Jordan, Peru, Serbia, Uganda, and Ukraine. Potential deployment of GC alternatives to mercury and microplastics will be evaluated during the preparation phase. Globally, the use of POPs, mercury, and microplastics continues in a large number of sectors (e.g. metal plating, building insulation, plastics, and textiles). Specific and quantifiable reductions of POPs in industry through the implementation of commercially available Green Chemistry and Green Engineering Alternatives (Annex H) will be accomplished through large demonstration projects in the target regions. Further research will be undertaken to capture generation and uses of POPs and uPOPs within additional companies to continue refining inventories to provide quantifiable POPs reduction through GC alternatives.

52. Examples that have been identified as highly relevant for the demonstration projects (due to their high potential for replication by GC alternatives and their considerable up-scaling potential) include PFOS in the textile, SCCPs in metal working and HBCD in building insulation sectors. As Stockholm Convention National Implementation plans are being updated, inventories on recently added POPs, such as SCCPs, will be targeted for further potential for applying GC alternatives.

53. As the optimal matching of a Green Chemistry and Engineering technology to the replacement of POPs, mercury and microplastics will depend on the particular application and the conditions of use in a specific partner company, the next step will be to cooperate with partner companies within the identified sectors and countries for technology replacement. This would include an assessment of the technical and environmental feasibility of the alternatives including the quantification of POPs, mercury and microplastics

reduction. In addition to the implementation and scale up of the technologies, giving partner companies the ability to serve as transferable models to other sectors and countries for POPs, mercury and microplastics reduction.

54. Component 3 Outputs

55. Output 3.1. 1. Green Chemistry Alternatives for POPs, mercury and micro-plastics implemented.

56. Terms of Reference will be developed to allocate funding and network support for a scaled-up Green Chemistry solution in Indonesia, Jordan, Peru, Serbia, Uganda and Ukraine. A minimum of 6 companies will be selected for the demonstration projects and will be incentivized by in-kind support from the network as well as financial support in process adaptation. Building on the list of Green Chemistry Alternatives for POPs in Annex H, additional commercialized Green Chemistry technologies and processes will be identified for the reduction of mercury and microplastics. Each company identified will be contacted by Yale University and the national partner for detailed information on their processes to develop template case studies that can be advertised to companies in developing economies.

57. These companies will be invited to apply in order to receive technology transfer and capacity development from Yale University, as well as from other academic partners and participants in the network. These Terms of Reference will determine the project selection criteria and will consist of at least, but not limited to, the following criteria: a fixed number of active years in business, written commitment from upper level management, ability to provide co-funding to supplement UNIDO's financial contribution, provide the amount of POPs and/or mercury and/or microplastics used by the company, inform whether they have an existing Green Chemistry programme and the ability to templatize and replicate the solution.

58. During the preparation phase companies that use POPs, mercury, and produce microplastics will be identified. After previously identified companies that use or produce POPs, mercury, and microplatics are reached out to and have reviewed the Terms of Reference, funding for a solution will be established and integrations support will begin for the identified industry partner. All applicants, regardless of whether they were selected for a demonstration (Annex F: Company selection criteria), will be retained in the larger network and will be invited to become mentors and partners in the Network for the accelerator portion of the project. Through national request for Green Chemistry demonstration co-funding, national partners will have the added benefit of receiving additional granularity for POP inventories. The selected companies from the Terms of Reference will begin a direct relationship with the GGINP, including allocation of funding, connection to the green chemistry alternative provider, and specialist advice for integration and deployment of the technology in their facility.

59. Output 3.1.2. Replication mechanisms of green chemistry alternatives for national, regional and global level up-take developed and implemented.

60. The national partner or designated regional administrator, within the region where the demonstration facility is located will assign representatives that will support Yale University in the documentation of the demonstration project development. The information on the form will be the basis of an entry into a knowledge management platform, initially known as the "Green Chemistry Technology Compendium". This will serve as the centralized repository for case studies and templates which can be easily adopted and transferred to other regions.

61. Successful demonstration projects will be well documented and advertised through the network by presenting their success to commercial partners. In this context, the financial availability in the respective countries could be analyzed by identifying existing loan facilities that could be used for the uptake, matchmaking company needs with the supply of loans and potential investors interested in financing green chemistry deployment. Connections with government institutions that support innovation could benefit from an easier adoption of green chemistry alternatives.

62. For upscaling is important to provide replicable and templatized implementation procedures from the demonstration projects. This includes case studies for each demonstration project that consist of documented narratives and technical specifications for GC alternative adopters in the multiple phases of pilot implementation: scoping, integration, monitoring, and refining. In the scoping phase, the demonstration project adopter will record all the required specifications for the GC alternative provider to allow other potential adopters to collect this information in preparation for uptake. In the integration phase, all required upgrades and changes to existing processes, machinery, or workflows will be documented. In the monitoring phase, the adopter will record the deployment of any required equipment or communication infrastructure to measure the impacts (e.g. POPs consumption, energy use, water use, people hours, dollars spent). In the refining phase, reflections of the GC alternative integration will be collected from management as well as workers directly interacting with the technologies to record challenges so other adopters in similar industries can anticipate and prepare for adopting this alternative in their facility. The four steps will operate in a feedback loop, informing the demonstrations as well as future deployments, towards optimizing and streamlining the opereations of the GC alternative. These case studies will be shared in a targeted fashion with both a whitepaper and webinar through the network to SME and corporations who operate in similar industries and processes within the region of the demonstration project, as well as between regions

63. Component 4 – Monitoring and Evaluation

64. UNIDO is the implementing agency for administration of the GGINP, and is responsible for the monitoring and submission of required reports to GEF for all three components of the GGINP programme. The monitoring, evaluation, and reporting will be used to reflect potential adaptations to improve efficiency throughout the course of the GGINP's funding duration.

65. Component 4 Outputs

66. Outcome 4.1. Project monitoring and evaluation plan designed and implemented

67. An effective monitoring and evaluation process of project impact and sustainability will be designed and implemented, including a periodic review process to monitor the quality and the progress of the project. Gender issues as well as environmental and social safeguards will be fully integrated in the project's activities.

68. Output 4.2. Mid-term evaluation completed

69. At the mid-term of the programme, UNIDO and Yale will coordinate the collection of suitable information from accelerator administrators and demonstration projects to meet GEF reporting requirements and submit the requisite documents in a timely manner.

70. Output 4.3 Terminal project evaluation completed

71. At the termination of the programme, UNIDO and Yale will coordinate the collection of suitable information from accelerator administrators and demonstration projects to meet GEF reporting requirements per evaluation requirements and submit the requisite documents in a timely manner.

**4) alignment with GEF focal area and/or Impact Program strategies**

72. The project is well aligned with the GEF Focal Area Strategies for Chemicals and Waste in the GEF-7 cycle. The issues related to the use of HBCD in foams and insulating materials; the use of PFOS in carpets; the use of mercury; and microplastics in fibers as well as the requirement of these sectors to phase-out POPs and mercury are particularly aligned with GEF C&W program 1 on Industrial Chemicals.

73. The GEF Industrial Chemical program is approached to fund an enabling environment and strengthening of national legislation and regulatory capacity for meeting Stockholm Convention obligations, with regard to persistent organic pollutants. This will include the removal of market access barriers for alternatives for products containing GEF relevant chemicals, and which can reduce the production of harmful chemicals.

**5) incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing**

74. The only source of GEF funding that GGINP is applying to is the GEF Trust Fund (GEFTF). The programme is getting co-funding through UNIDO through the SCAIP programme and programmes that support Minamata programmes at UNIDO. GGINP is not applying to the Special Change Fund (SCCF), Least Developed Countries Fund (LDCF), Capacity Building Initiative for Transparency (CBIT). There are other sources of co-funding identified are through other public, industry partners, and non-profit organizations:

75. a) The RECP Network (Cleaner Production Centres Network) and other network partners will be the main source of regional knowledge. This will include information about companies with interest plus the potential of a Green Chemistry solution demonstration, interested faculty members who are aware of research with commercialization potential, and points of contact for key governmental regulatory and economic development programmes.

76. b) Private sector companies that are selected to participate in the demonstration projects will be requested to contribute direct co-funding. Co-funding will be required both by the company providing the Green Chemistry solution as well as the company receiving the solution.

77. c) Existing innovation initiatives and entrepreneurship programmes in the six regions will be requested to co-fund because of the shared goals between GGINP and regional priorities of environmental impact reduction and economic development. An extensive, but non-exhaustive, list of existing co-funding sources are documented in Annex E.

78. d) The Green Chemistry Commerce Council (GC3) is a network of over 100 companies that contribute to the development and deployment of Green Chemistry. This network represents a wealth of in-kind co-funding support through the creation of education materials and participation in the Network of Component 1, through the direct mentoring and judging of participants in the Accelerator of Component 2, and through the direct participation of Green Chemistry technology providers in the pilot deployment of Component 3.

79. e) The International Symposium on Green Chemistry (ISGC) is an international institution that awards prizes for innovation challenges and manages a startup network focused on green and bio-based chemistry. This network represents invaluable knowledge to exchange learnings that effectively scale-up Green Chemistry startups and transfer this knowledge into the curriculum for the Accelerator.

80. f) Green Chemistry Network Members, once assembled and aligned to the three proposed components of GGINP, will provide in-kind support through the creation of educational materials, the availability for mentoring and judging the accelerator programmes, and private sector companies interested in deploying and adopting Green Chemistry solutions.

**6) global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)**

81. GGINP's falls within the GEF Focal Area Strategies for Chemicals and Waste in the GEF-7 cycle. The issues of replacing existing POPs such as PFOS and HBCDs through scalable, commercially available solutions are aligned with GEF C&W programme 1 on Industrial Chemicals. The aim of this PIF is to prevent exposure of POPs, mercury, and microplastics in humans and the environment, through implementation of conscious design for inherently nonhazardous alternatives using green chemistry principles.

82. Use of industrial POPs and the potential for replacement by GC alternatives were identified in Indonesia, Jordan, Peru, Serbia, Uganda, and Ukraine in Annex I. Through in-depth analysis of POPs inventories, we find significant data gaps that strongly tend towards quantity underestimation. Therefore, we expect the actual reductions from this project to be significantly higher as more sources are identified through Network, Accelerator, and demonstration components. The direct investment component consists primarily for commercially available and implementable solutions for HBCD, SCCPs and PFOS. As an interim target, 20% - 40% reduction as a conservative for PFOS and HBCD, and 5% for SCCPs, achievable estimate was identified. This translates to 19,908 kg PFOS/year, 25,582 kg HBCD/year; or 66,359 ton/year contaminated fibers with PFOS 2,553 ton/year contaminated material with HBCD and 2.248 million ton/year metal products that had SCCPs used in their production. During the time frame of this project, mechanisms established by this funding will allow for continued reductions towards near complete elimination. Due to the complexity of the case and novelty of the approach, a detailed global environmental benefit for Chemicals and Waste strategy can only be calculated in the PPG phase.

83. Green Chemistry Alternatives for mercury and microplastics will be evaluated to have potential demonstration project deployments and upscaling, the reductions will be tabulated and reported. It is not possible to estimate the potential reduction at this stage but it will be done during PPG phase.

84. The Global Greenchem Innovation Programme is a globally-organized programme to meet international treaty goals while having local impact. It is designed to present holistic alternatives to harmful chemicals. Deploying these alternatives would reach down to communities and workers across the world as they would be prevented from the exposure to certain chemicals entering the water, air, and food chain.

**7) innovation, sustainability and potential for scaling up.**

85. The goal is to support GEF goals by funding replicable case studies that demonstrate viable GC alternatives to the current chemical production processes that create hazardous exposure pathways. These replicable case studies are designed to be conveyed openly, through a complementary network established in the GGINP, so that they can be

rapidly up-taken and scaled in different regions with minimal modifications. The demonstration projects are intended as replicable templates, that can be easily adopted in similar industries in different regions. Successful demonstration projects will be presented as case studies to network members who will be invited to adopt the technology, connect with experts who can help to deploy the pilot, and potentially receive financing. Results of the financial availability analysis in the respective regions will connect identified loan facilities as well potential investors interested in financing Green Chemistry deployment. These identified financial resources and connections will be introduced through the network and serve as support for uptake throughout the region as well as transfer demonstrations to other regions in the programme.

### 1b. Project Map and Coordinates

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

The project is global. National and regional activities will take place in Indonesia, Jordan, Peru, Serbia, Uganda and Ukraine.

## 2. Stakeholders

**Select the stakeholders that have participated in consultations during the project identification phase:**

**Indigenous Peoples and Local Communities**

**Civil Society Organizations** Yes

**Private Sector Entities** Yes

**If none of the above,please explain why:**

**In addition, provide indicative information on how stakeholders, including civil society and indigenous peoples, will be engaged in the project preparation, and their respective roles and means of engagement.**

| Class of Organization | Involvement |
|---|---|
| Civil Society Organizations | Integration between global implementing agency UNIDO, Yale University and Ministry of Industry of Indonesia, Agency for the Assessment and Application of Technology of Indonesia , Ministry of Planning and International Cooperation of Jordan, Ministry of Environment of Peru, Ministry of Environmental Protection of Serbia, National Environmental Authority of Uganda, Ministry of Energy and Environmental Protection of Ukraine as well as the governments of the other countries to be included in the preparation phase for the success of the exaction of the project.<br><br>Secondary organization support will be crucial to the success of the programme. For instance, by contacting other government intitutions within the regions and selected who have programmes to support innovation and entrepreneurship as well as technology transfer. They are also crucial for the uptake of the adaption of the green chemistry alternatives for POPs, mercury, and microplastics at national and regional level. Additionally, the GCIP programme will be a crucial partner to transfer knowledge and coordinate the grand prize of the accelerator. |
| Private Sector Entities | A variety of Green Chemistry alternative providers based in the developing world will be connected to a variety of adopting SMEs and established industrial producers in developing economies.<br><br>Secondary support is needed from corporations who are not directly producing chemicals, but who have strong corporate social responsibility and can influence the purchase of materials derived from green chemistry through making demands of their supply chain. |
| Academic Institutions | The Center for Green Chemistry and Green Engineering at Yale University will be the lead academic partner, coordinating a network of academic researchers to encourage students to submit their research to the global accelerator programme. |

**3. Gender Equality and Women's Empowerment**

**Briefly include below any gender dimensions relevant to the project, and any plans to address gender in project design (e.g. gender analysis).**

86. Gender Equity and Women's Empowerment are woven into the fabric of each component of this PIF. Gender equity is embedded into the terms of reference to select participants for Accelerator and demonstration components. At the conclusion of each Accelerator, there will be a mandatory award in each programme given to women-led ventures. This component will record gender disaggregated data to monitor the programme's support of women entrepreneurs and track the economic development in developing countries for the fields of Green Chemistry and related engineering ventures. In

identifying industry partners as recipients of technical and financial assistance to implement commercially available Green Chemistry solutions, one term of reference is whether the venture is women led, as well as the fraction of women in their executive management and board of directors. A detailed explanation of additional gender equity programmes will be conducted in the PPG stage in consultation with the UNIDO gender expert.

**Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment?** Yes

**closing gender gaps in access to and control over natural resources;**

**improving women's participation and decision-making; and/or**

**generating socio-economic benefits or services for women.** Yes

**Will the project's results framework or logical framework include gender-sensitive indicators?**

Yes

**4. Private sector engagement**

**Will there be private sector engagement in the project?**

Yes

**Please briefly explain the rationale behind your answer.**

87. The private sector will be engaged in each component of the project. The Network (component 1) is designed to create connections to implementable and emerging edge GC alternatives that are commercially available or under development. The Network also includes programmatic content consisting of webinars, whitepapers, and a forum for industry to interact with academics, NGOs, and other SMEs to discuss, identify, and implement potential solutions. The Accelerator (component 2) is driven through private sector innovation challenges to encourage and institutionalize corporate support. Programme administrators and the accelerator administrators will work with companies to invite them to co-develop challenges to solicit solutions to Green Chemistry entrepreneurs on problems in their industry. The Innovation Challenges will spark new research that is needed in their field to help meet international targets and provide industry evolution where GC alternatives are not clearly articulated. This creates market-driven creation of green chemistry alternatives, helps ensure industrial uptake, and creates effective impact through demand-driven solution generation. The project demonstrations (Component 3) will be executed to connect private sector companies to GC alternatives. Demonstrations are designed to increase chances of success by providing advice on best practices and non-

harmful alternatives in the private industry processes. They will provide incentives to increase investment to phase out polluting processes through documentation in a replicable and templatized fashion for uptake in similar businesses throughout and between regions.

**5. Risks**

**Indicate risks, including climate change, potential social and environmental risks that might prevent the Project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the Project design (table format acceptable)**

| Risk | Likelihood | Mitigation |
|---|---|---|
| Climate Change | Low | Green Chemistry technologies are implemented in companies where the impacts of climate change can be low. Environmental Management Plans will be prepared and any risks will be mitigated. |
| Low number of companies to apply | Low | Alleviate fear of policy retribution and incentivize with co-funding for Green Chemistry process upgrades. |
| High cost per hazardous chemical (POPs, mercury) reduction | Medium | Challenge to balance mass reduction versus toxicity reduction. Green Chemistry alternatives with the largest mass and or potential toxicity reduction will be prioritized. |
| Research to commercialization financing barrier for bench-scale science | Medium | Identify a pipeline of investment partners and foundations interested in creating a patient blended capital structure that supports the development, and piloting of Green Chemistry research. High level of investment required for startups in chemical sector (e.g. lab infrastructure and demonstration facilities). |
| Underrepresented participants (low income, women, etc) | Low | Gender equity and women's empowerment are integrated in each project component. Gender equity is embedded into the terms of reference to select participants for the Accelerator, capacity building and demonstration components. At the conclusion of each Accelerator, there will be a mandatory award in each programme given to women-led ventures. |

**6. Coordination**

**Outline the institutional structure of the project including monitoring and evaluation coordination at the project level. Describe possible coordination with other relevant GEF-financed projects and other initiatives.**

88. UNIDO, as the GEF Implementing Agency, will lead the process of project preparation and development with the participation of key stakeholders from the government and the private sector. The project execution will be undertaken through a contractual arrangement between UNIDO and Yale University, National Governments, regional administrators and members of the Green Chemistry and RECP Networks.

89. The GGINP programme will be led by the Center for Green Chemistry and Green Engineering at Yale University, acting as the main executing entity, with the guidance of UNIDO. Complying with the requirements of a clear separation of roles and responsibilities between the Implementation and the Execution Agency, all operational tasks will be the responsibility of the Center for Green Chemistry and Green Engineering at Yale. The Project Management Unit will be established at the Center for Green Chemistry and Green Engineering at Yale and will support the management and coordination work. The responsibility at a regional level will be delegated to entities in each region. The final selection of the partners, the components, and their activities will take place during PPG phase and in line with specific predefined terms of reference. The selection of national and regional partners requires a support letter from the respective governments.

90. The Project Steering Committee (PSC) will meet once a year a will provide strategic guidance for the development of the project. Ministry of Industry of Indonesia, Agency for the Assessment and Application of Technology of Indonesia, Ministry of Planning and International Cooperation of Jordan, Ministry of Environment of Peru, Ministry of Environmental Protection of Serbia, National Environmental Authority of Uganda, and the Ministry of Energy and Environmental Protection of Ukraine a will be part of the PSC.

91. Figure 2 presents the operational structure of the projects and the integration with other stakeholders to ensure the uptake of the components of the project.

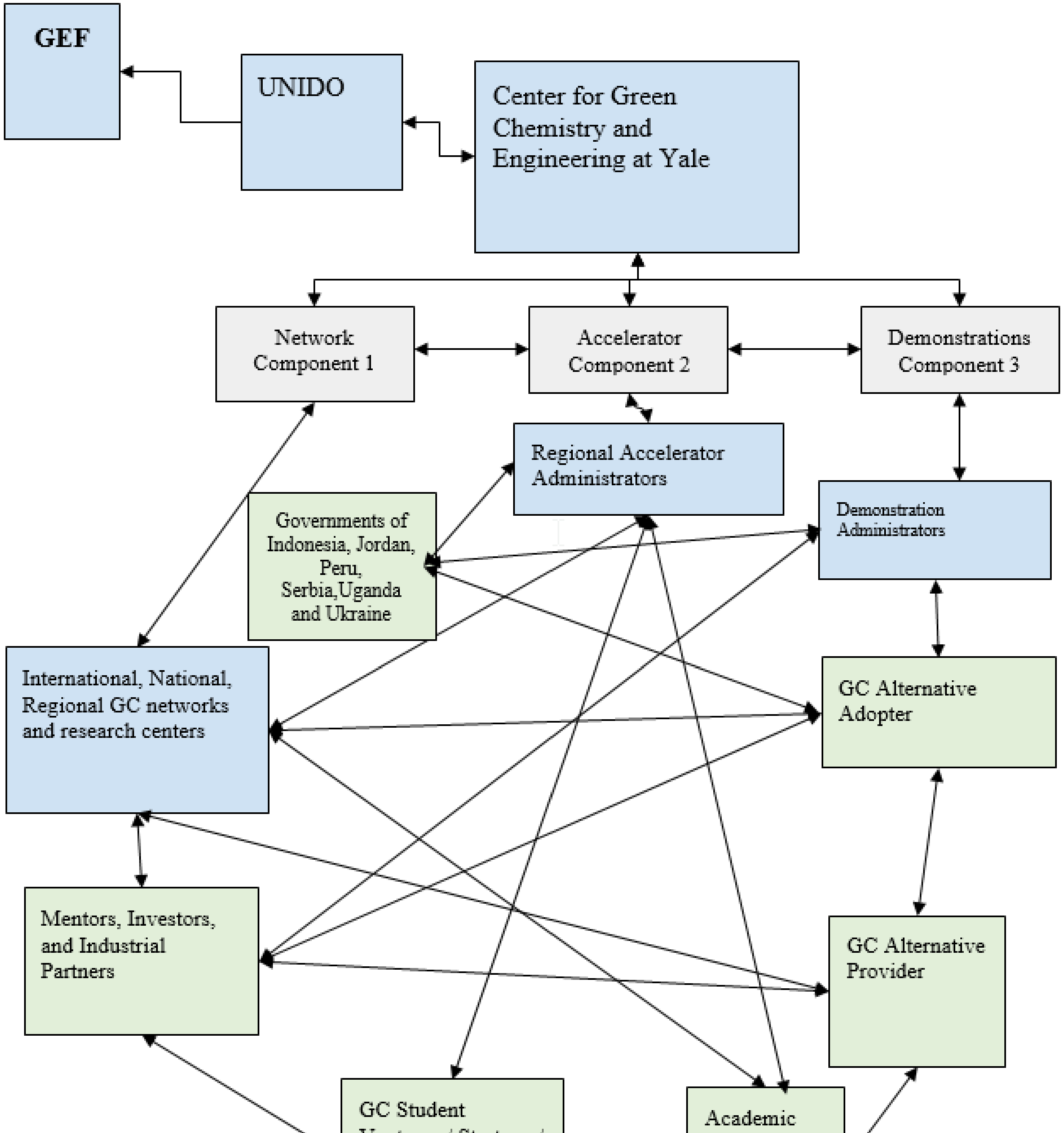
GEF
UNIDO
Center for Green Chemistry and Engineering at Yale
Network Component 1
Accelerator Component 2
Demonstrations Component 3
Regional Accelerator Administrators
Demonstration Administrators
Governments of Indonesia, Jordan, Peru, Serbia,Uganda and Ukraine
International, National, Regional GC networks and research centers
GC Alternative Adopter
Mentors, Investors, and Industrial Partners
GC Alternative Provider
GC Student
Academic

*Figure 2. Outline of distributed, decentralized GGINP organizational structure including coordination by Center for Green Chemistry and Engineering at Yale and UNIDO reporting to GEF.*

**7. Consistency with National Priorities**

**Is the Project consistent with the National Strategies and plans or reports and assesments under relevant conventions**

Yes

**If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc**

92. The GGINP is a global project and the thrust of work aligns with national priorities, indicated as signatories to the international treaties of the Stockholm Convention and Minamata Convention. Additionally, the project will align with multiple Sustainable Development Goals (SDGs): Good Health and Well Being (SDG 3), Gender Equality (5), Clean Water and Sanitation (6), Decent Work and Economic Growth (8), Industry, Innovation and Infrastructure (9), Reduced Inequalities (10), Responsible Consumption and Production (12), Climate Action (13), and Partnerships for the Goals (17).

**8. Knowledge Management**

**Outline the Knowledge management approach for the Project, including, if any, plans for the Project to learn from other relevant Projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.**

93. Currently, there is no readily accessible database of commercially available GC alternatives. The current process requires an industrial consumer to actively seek out alternative processes by searching through government awards such as the United States Environmental Protection Agency's Presidential Green Chemistry awards and other nation's equivalent prizes, in addition to industry publications through academic journals such as the Royal Society of Chemistry's Green Chemistry or the American Chemical Society's Sustainable Chemistry & Engineering. This bespoke approach is not suited to rapid scalability of GC alternative solutions.

94. The GGINP will establish an alternative to the current disjointed research process, whereby interested parties, such as chemical manufacturers or SMEs, can look for their process or products by identifying individual POPs, and obtain a list of commercially available solutions with demonstrated case studies. The same is true for mercury and microplastics. The primary tool for knowledge management will be a "Green Chemistry Technology Compendium", serving as an open source database of case studies and other technical information. All this data will be stored in a computer and mobile readable format to allow API integration, scraping, and contributions from the member network. The intent is to have a centralized clearinghouse of adoptable, commercially available solutions that is constantly updated. Detailed information such as the POPs, mercury and microplastics reductions, the process adaptation costs, and the economic outcomes will be stored by case study participants from the demonstration Component.

## Part III: Approval/Endorsement By GEF Operational Focal Point(S) And Gef Agency(ies)

**A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the Operational Focal Point endorsement letter with this template).**

| Name | Position | Ministry | Date |
|---|---|---|---|
| Martha Carolina Cuba Villafuerte de Cronkleton | Operational Focal Point Director of Cooperation and International Affairs Office | Ministry of Environment of Peru | 10/29/2019 |
| Goran Trivan | Minister of Environmental Protection and GEF Political Focal Point | Ministry of Environmental Protection | 10/25/2019 |
| Patrick Ocailap | Deputy Secretary to the Treasury and GEF Operational Focal Point | Ministry of Finance, Planning and Economic Development | 10/22/2019 |
| Zeina Toukan | Secretary General and GEF Operational Focal Point | Ministry of Planning and International Cooperation | 11/25/2019 |
| Oleksandra Kozlovska | Director of International Cooperation Department and GEF Operational Focal Point | Ministry of Energy and Environmental Protection of Ukraine | 12/10/2019 |
| Laksmi Dhewanthi | Senior Advisor to the Minister for Industry and International Trade and GEF Operational Focal Point | Ministry of Environment and Forestry | 2/14/2020 |

**ANNEX A: Project Map and Geographic Coordinates**

Please provide geo-referenced information and map where the project intervention takes place