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Project Terminal Evaluation Report:

Application of green chemistry in Viet Nam to support green growth and reduction in the use and release of POP/Harmful Chemicals

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ii. ACKNOWLEDGMENTS

I would like to thank the members of the UNDP CO Viet Nam office, the Project Coordination Team, and the TE National consultant for the logistical support in the realization of the online interviews so that this evaluation could be completed in shutdown conditions in the country. I would also like to acknowledge the commitment of the different institutions and partners that contributed with their time to participate in the interviews. This has been a successful project and all parties involved deserve congratulations.

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iv. ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AITVN	Asian Institute of Technology in Viet Nam
ASTDR	Agency for Toxic Substances and Disease Registry
BAT/BEP	Best Available Technique / Best Environmental Procedure
CBA	Cost Benefit Analysis
COD	Chemical Oxygen Demand
CSR	Corporate Social Responsibility
CW	Chemicals and Waste
deca-BDE	Deca-Bromo Diphenyl Ether
DONRE	Department of Natural Resources and Environment
GC	Green Chemistry
GCC	Green Chemical Cell
GEF	Global Environmental Facility
GGAP	Green Growth Action Plan
GHG	Greenhouse Gas
HBB	Hexa Bromo Biphenyl
HPPMG	Harmonized Program and Project Management Guidelines
IRIS	Integrated Risk Information System (U.S. Environmental Protection Agency)
LCA	Life Cycle Assessment
LCM	Life Cycle Management
LEP	Law on Environmental Protection
LPAC	Local Project Appraisal Committee
M&E	Monitoring and Evaluation
MEA	Multi Environmental Agreement
MIA	Mercury Initial Assessment
MOF	Ministry of Finance
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resources and Environment
MOST	Ministry of Science and Technology
MPI	Ministry of Planning and Investment
MSDS	Material Safety Data Sheet
N/A	Not Available or Not Applicable
NAP	National Action Plan
NGO	Non-Governmental Organization
NIP	National Implementation Plan of the Stockholm Convention on POPs
NSEP	National Strategy on Environment Protection
ODS	Ozone Depleting Substances
PBB	Poly Brominated Biphenyls
PBDE	Poly Brominated Diphenyl Ether

PCDD/F	Polychloro Dibenzo Dioxin/Furan
PD	Project Director
PFAS	Perfluorinated Alkylated Substances
PFC	Perfluorinated Compounds
PFOS	Perfluoro Octane Sulfonate
PIC	Prior Informed Consent
PIR	Project Implementation Review
PMU	Project Management Unit
POPs	Persistent Organic Pollutants
POPP	Programme and Operation Policies and Procedures
POPTT	Persistent Organic Pollutant Tracking Tool
PPG	Project Preparation Grant
PSC	Project Steering Committee
PVC	Poly-vinyl chloride
R&D	Research and Development
REACH	Regulation on Evaluation, Authorisation and Restriction of Chemicals (EU regulation 1907/2006)
RF	Result Framework
RIVM	Dutch National Institute for Public Health and the Environment
ROHS	Restriction of Hazardous Substances
SCCP	Short Chain Chlorinated Paraffin
SDS	Safety Data Sheet
SESP	Social and Environmental Screening Procedure
SMC	Sound Management of Chemicals
SME	Small and Medium Enterprise
TA	Technical Assistance
TOC	Theory of Change
TRAC	Target for Resource Assignment from the Core
UNDP	United Nations Development Programme
UNDP CO	UNDP Country Office
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
U-POPs	Unintentional Persistent Organic Pollutants
USAID	United States Agency for International Development
USEPA	United States Environmental Protection Agency
VASEP	Viet Nam Association of Seafood Exporters and Producers
VGGS	Viet Nam Green Growth Strategy

1. EXECUTIVE SUMMARY

Table 1. Project information table

Project Details		**Project Milestones**	
Project Title :	**Application of Green Chemistry in Viet Nam to support Green Growth and reduction in the use and release of POPs/harmful chemicals**	PIF Approval date	January 21, 2016
UNDP Project ID (PIMS)	5723	CEO Endorsement Date (FSP) / Approval date (MSP):	July 14, 2017
GEF Project ID	9379	ProDoc Signature Date:	January 4, 2018
UNDP Atlas Award ID, Project ID	00088146, 00094924	Date Project Manager hired:	February 18, 2018
Country	Viet Nam	Inception Workshop Date:	April 6, 2018
Region	Asia	Mid Term Review Completion date	N/A
Focal Area	Chemicals and Wastes	Terminal Evaluation Completion date	September 2021
GEF Operational Programme	CW1, CW2	Planned Operational Closure date	October 31, 2021
Trust fund	GEF TF		
Implementing partner (GEF Executing Entity)	Ministry of Industry and Trade (MOIT)		
NGOs/CBOs involvement	Chemical Society of Viet Nam- CSV Responsible Care (Viet Nam Responsible Care Council) Industrial associations and other institutions & academies		
Private sector involvement	6 industrial sectors and 2 private enterprises for piloting (Nishu and Plato)		
Geospatial coordinates of project sites	Viet Nam nationwide Pilot enterprises in Ha Nam and Thai Nguyen (02) provinces		
Financial Information			
PDF/PPG		At approval (USD$)	At PDF/PPG completion (USD$)
GEF PDF/PPG grants for project Preparation		50,000	
Co-financing for project Preparation			
Project		at CEO Endorsement (USD$)	at TE (USD$)
(1) UNDP Contribution		200,000	252,000
(2) Government		700,000	4,635,000
(3) Other multi-/bilaterals		1,500,000	0
(4) Private sector		4,000,000	4,976,990
(5) Others		2,000,000	0
(6) Total co-financing		8,400,000	9, 863,990
(7) Total GEF Funding		1,999,800	1,990,800
(8) Total Project Funding		**10,399,800**	11,854,790

PROJECT DESCRIPTION

The project request Project Information Form (PIF) was submitted to GEF on 21 January 2016 and was endorsed by CEO on 14 July 2017. The Prodoc was signed both by the representatives of UNDP and Government of Viet Nam on 4 January 2018 and this is the official start date. The initial project duration was 3 years with the official starting date of 4 January 2018 and the expected closure date of the project is 31 December 2020. However, due to Covid-19 pandemic that caused delay and slowdown the implementation of the project activities, therefore, the project has been extended to 10 more months and planned to be closed by 31 October 2021.

The GEF project grant approved at CEO endorsement of US$ 1,999,800 with total co-financing of US$8,400,000 for total project resources of US$10,399,800.

The project is in line with related national policies (strategies and plans on environment protection, sustainable development, green growth, socio-economic development, clean industrial production, imports and exports, and sustainable production and consumption) and international commitments that Viet Nam has participated in as such the National Implementation Plan (NIP) for the implementation of the Stockholm Convention. The results and outcomes of the project will contribute to various levels of outcomes, outputs, indicators and goals of the UNDP CPD, strategy, and SDGs in Viet Nam.

Table 2 Summary evaluation table.

1. Monitoring & Evaluation (M&E)	**Rating**
M&E design at entry	**S**
M&E Plan implementation	**S**
Overall Quality of M&E	**S**
2. Implementing Agency (AI) Implementation & Executing Agency	
Quality of UNDP Implementation/Oversight	**S**
Quality of Implementing Partner Execution	**S**
Overall quality of Implementation/Execution	**S**
3. Assessment of Outcomes	
Relevance	**S**
Effectiveness	**S**
Efficiency	**S**
Overall Project Outcome Rating	**S**
4. Sustainability	
Financial sustainability	**L**
Socio-political sustainability	**L**
Institutional framework and governance sustainability	**L**
Environmental sustainability	**L**
Overall Likelihood of sustainability	**L**

Summary of Evaluation Ratings Table	
Ratings for Outcomes, Effectiveness, Efficiency, M&E, Implementation/Oversight, Execution, Relevance	Sustainability ratings :
6 = Highly Satisfactory (HS): exceeds expectations and/or no shortcomings 5 = Satisfactory (S): meets expectations and/or no or minor shortcomings 4 = Moderately Satisfactory (MS): more or less meets expectations and/or some shortcomings 3 = Moderately Unsatisfactory (MU): somewhat below expectations and/or significant shortcomings 2 = Unsatisfactory (U): substantially below expectations and/or major shortcomings 1 = Highly Unsatisfactory (HU): severe shortcomings Unable to Assess (U/A): available information does not allow an assessment	4 = Likely (L): negligible risks to sustainability 3 = Moderately Likely (ML): moderate risks to sustainability 2 = Moderately Unlikely (MU): significant risks to sustainability 1 = Unlikely (U): severe risks to sustainability Unable to Assess (U/A): Unable to assess the expected incidence and magnitude of risks to sustainability

SUMMARY OF CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

Main Findings

1. The Project objective and its implementation results are in line with national priorities and UNDP and GEF strategic priorities.

2. The project design and the level of consistency in its implementation was well achieved.

3. The stakeholder involvement, particularly the Ministry of Industry and Trade (MOIT) and MONRE was slow initially however, efforts were made, and the Government along with the Project team, coordinated well and implementation improved subsequently. This has resulted in an important country ownership of the project in the chemical production sector that also provided useful synergies.

4. The Project was impacted by the COVID-19 pandemic in 2020 and because of travel restrictions, national lockdowns etc, many of the activities were slowed almost to a stop. To this date there are still COVID-19 lockdown measures, but the project has been able to reach, of the 16 committed targets, the project has achieved 5 targets with 100% completion and the remaining 11 targets are between 80% and 95% of the expected goal.

5. The two demonstration sites were selected after a delay of 7-8 months. Since the implementation of Green Chemistry principles implied possible changes in technologies, product formulation and in some cases equipment that was difficult to find partners, who were willing to commit to these possible investments. The two demonstration sites, the Plato Viet Nam J.S.C demonstration pilot (Electroplating sector) and Nishu Paint J.S.C., (Paint sector) were able to achieve a total reduction of 2.742-ton POPs, 1.3-ton Cr6+, 3.6-ton Cu, Ni, and their salts. The POPs reduction target was 2.5 times above the expected result.

Conclusions

1. Despite of all the restrictions from the COVID-19 pandemic, the project has been able to continue its work and produce important results toward the fulfilment of its objective; the reduction of the use and release of chemicals controlled under MEAs, other hazardous chemicals, improve energy and natural resource efficiency and reduce (GHG) emissions through the application of Green Chemistry principles in Viet Nam. The Government of Vietnam and project team should be commended for their efforts to keep the project initiative alive during these difficult working times.

2. There is a true country ownership of this project, and it is demonstrated through the high level of co-financing that was obtained, a total of 17.4 % above of the originally committed amount. The largest investments came from government agencies such as VEPF and the Viet Nam Chemicals Agency. The private sector through the investments made by the two demonstration companies also was above the expected amount.

3. One of the most positive results of this project and that is not identified with an indicator, but it is the combination of all the results, is the enabling environment that has been created for GC principal application in Vietnam. There are 6 industrial sectors that are aware of the social and environmental benefits and the economic savings that GC represents. There is a Green Chemical Cell (GCC) that will provide different industries the necessary technical support needed. The university curricula will contain the GC principles and the demonstrative projects will be used to have on hand case experience in its application.

4. The gender action plan was effective and facilitated gender mainstreaming objectives. Women's participation was apparent in the awareness raising and training activities done with 26% participation. It would have been better to have a more balance participation of men and women, but for this first GC enabling environment effort the percentage is acceptable.

Recommendations Table

No.	TE Recommendation	Entity Responsible	Time frame
1.	The COVID-19 restrictions may not be removed soon. When planning another project these should be taken into consideration within the timeframe and the possible activities to be undertaken. Unfortunately, this is a reality we must learn to live with in all aspects.	UNDP	N/A
2.	The Green Chemical Cell should continue working with the universities that have participated in the project. This will enhance the knowledge exchange that these experts can provide with respect to other GC applications.	CSV/GCC	2021-2022
3.	Since the Law on Chemicals is under review, the MOIT and the MONRE should request to include monitoring and control responsibilities in the fulfillment of the application of GC principles in large and small companies so that they can exercise this function.	MOIT/MONRE	N/A
4.	Gender equality and women's empowerment should be enhanced with more of this type of projects that venture into areas that traditionally have not had female participation as a norm.	UNDP	N/A

Lessons learned

1. Early in the project implementation it took some time for Nishu and Plato to step forward and accept to participate in the demonstration pilots. This might have been avoided had there been information about financial support and in the form of loans or grants, presented early on in the project beginning.

2. Although women's participation in industrial activities has been limited but with the inclusion of gender equality in professional training, such as university curricula, this can be changed as this project as proven.

3. COVID-19 pandemic has hit all countries very hard in 2020 and still in 2021, but what is important is how all the institutions, UNDP, PMU, MOIT, MONRE, were able to work together to achieve the expected results. The lesson learned here is that with proper communications and commitment from all parties adversities can be overcome.

2. INTRODUCTION

PURPOSE OF THE EVALUATION

This Terminal Evaluation has the main purpose of determining whether the project has achieved the initially planned results. It also aims to identify the best practices and lessons learned that not only strengthen project outcomes and contribute to both national ownership and the sustainability of these results but support the overall programming framework of the United Nations Development Program – Vietnam. Identifying design implementations and issues that need to be strengthened, changed, or replicated.

According to the UNDP Evaluation Guide for GEF-funded projects, project evaluations have the following complementary purposes:

- Promote accountability, transparency, evaluate and disseminate the scope of project achievements.
- Synthesize lessons that can help improve the selection, design, and implementation of future GEF-funded UNDP activities.
- Provide feedback on issues that are recurrent throughout the UNDP portfolio that need attention, and on improvements on previously identified issues.
- Contribute to the overall evaluation of results in the achievement of GEF's strategic objectives for global environmental benefit.
- Assess the extent of the project convergence with other priorities within UNDP's country agenda, including poverty and risk reduction, disaster vulnerability, as well as cross-cutting imperatives on women's empowerment and human rights support.

Evaluations are a form of making evident the achievement of results and institutional performance and contributes to knowledge and organizational learning. They can serve as a driver of change and plays a critical role in supporting accountability. The results of the evaluation are directed to participating institutions, donor agencies, and civil society. The evaluation will provide information to improve management and decision-making processes develop into policies and strategies along with programming, implementation and reporting of activities in future projects. The results of the TE aim to improve the institutional relevance and achievement of results and optimize the use of resources to maximize future project impacts.

SCOPE AND METHODOLOGY

The scope of this exercise is the objective evaluation of the design, implementation and project results achieved, structured around the criteria of Relevance, Effectiveness, Efficiency, Results and Sustainability.

To develop this evaluation, the approach undertaken is consistent with the methodology developed for final evaluations of projects implemented by UNDP and funded by GEF. Its objective is to fully evaluate the project objectively, determining the scope of the results obtained and providing evidence-based information based on information to support all reported findings.

The tools used to collect the relevant data are:

- Document review.
- Interviews with stakeholders.

Due to the limitations of travel and a full lockdown condition in the country during the TE evaluation time because of the COVID19 pandemic, it was not possible to conduct the mission to and within Viet Nam for interviews with stakeholders in person. All the interviews were conducted by the TE team through the Zoom video conferencing platform.

The review of documents referred to all documents listed in the Terms of Reference and other additional documents requested to supplement the missing information in the aforementioned documents. The full list of reviewed documents is contained in Annex C.

The semi-structured interview allowed the TE team the opportunity to speak candidly with key stakeholders, from private consultants who facilitated key processes to focal points of the institutions involved. This method also ensured a participatory approach, giving the same voice to all stakeholders and ensuring that different multi-party perspectives were evaluated to reach conclusions on the different processes undertaken by the project.

These interviews were structured according to the matrix of evaluation questions (Annex D), so that the five criteria were addressed in the interviews without necessarily asking a question by criteria or mentioning these criteria in the interviews.

The two methods mentioned, together with the review of documents, provided important evidence-based information that was analyzed to carefully draw conclusions, lessons, and findings on all stages of the project. In addition, they allowed cross-references of all evaluations from different perspectives: each issue raised was addressed from the point of view of the project/document, from the perspective of the government and from stakeholders in the private sector and civil society. This come up with on how the processes were carried out, which stakeholders were key, how government and civil society participated, the potential impact and sustainability that the project's main results can produce in the coming years.

LIMITATIONS TO THE EVALUATION

Due to limitations to travel to Viet Nam and most recently a total shutdown of activities it was difficult to obtain information and interviews. This was solved by the National Consultant for this TE who worked hard to arrange and facilitate for all online interviews. There was another important limitation and it had to do with the language barrier as the International Evaluator does not speak Vietnamese only English. The National Consultant played an important role in translating the interviews and documents when necessary.

STRUCTURE OF THE EVALUATION REPORT

This report follows the structure outlined in the Terms of Reference of this final evaluation, which corresponds to the specifications detailed in the UNDP Evaluation Guide for GEF-funded projects:

- Executive summary, including the project summary table, a brief project description, the evaluation score table, and a summary of the conclusions, recommendations, and lessons learned.
- Introduction, detailing the purpose of the evaluation, the scope, methodology, and structure of the report.
- Description of the project and development context, explaining the start and duration of the project, the problems that were sought to be addressed, the immediate and development objectives of the project, the established benchmarks, the main stakeholders, and the expected results.
- Findings of the evaluation process, detailing a descriptive evaluation of the design, formulation, implementation, and results of the project, as well as the qualification of the criteria indicated in the Terms of Reference.
- Conclusions, recommendations, and lessons learned, all evidence based, credible, reliable, and relevant, is inferred from both the review of documents and from semi-structured interviews with key stakeholders.
- Annexes, including the Report used to evaluate, the timetable for the evaluation, the evaluation consultant agreement form, the lists of documents examined, the interviews, the evaluation question matrix and the questionnaire used.

Ethics

This evaluation was conducted in accordance with the principles outlined in the United Nations Evaluation Group (UNEG) 'Ethical Guidelines for Evaluations'. It was clarified to all of the stakeholders interviewed that the information they supplied would be kept in the highest confidentiality.

3. PROJECT DESCRIPTION AND DEVELOPMENT CONTEXT

The project request Project Information Form (PIF) was submitted to GEF on 21 January 2016 and was endorsed by CEO on 14 July 2017. The Prodoc was signed both by the representatives of UNDP and Government of Viet Nam on 4 January 2018 and this is the official start date. The initial project duration was 3 years with the official starting date of 4 January 2018 and the expected closure date of the project is 31 December 2020. However, due to Covid-19 pandemic that caused delay and slowdown the implementation of the project activities, therefore, the project has been extended to 10 more months and planned to be closed by 31 October 2021.

The GEF project grant approved for the project amounts to US$ 1,999,800 with total co-financing of US$8,400,000. The co-financing is composed of contributions from UNDP as the Implementing Agency and various national stakeholders and make the total resources committed for the project US$10,399,800.

The project is in line with related national policies (strategies and plans on environment protection, sustainable development, green growth, socio-economic development, clean industrial production, imports and exports, and sustainable production and consumption) and international commitments that Viet Nam has participated in as such the National

Implementation Plan (NIP) for the implementation of the Stockholm Convention. The results and outcomes of the project will contribute to various levels of outcomes, outputs, indicators and goals of the UNDP CPD, strategy, and SDGs in Viet Nam.

DEVELOPMENT CONTEXT

The expected outcomes are in line with the projects Global Environmental Benefits identified for this project. These are:

- Reduction in 15 g-TEQ/a releases of dioxins, furans (UPOPs), and other hazardous substances that result from the improved management of priority sectors identified.
- Elimination of 1 ton of POPs including the newly listed POPs pesticides and flame retardants.
- Reduction up to 0.002 tons/yr. of Mercury releases.
- Reduction of CO^2 /year emissions as GHG.

An important social and environmental benefit of this project is the creation of the environment for the adoption and commitment to the application of Green Chemistry in Viet Nam. For gender equality and women's empowerment the project doc establishes three criteria that should be met during its implementation. This evaluation will review the gender action plan and the results regarding the actions to be completed. The three criteria are as follow:

- Equal opportunity to jobs.
- Equal rights to access of information and training.
- Development of awareness raising materials specifically developed for female and male workers.

PROBLEMS THAT THE PROJECT SOUGHT TO ADDRESS

Viet Nam as part of its development of the national economy is undergoing an important industrialization and modernization process. The result of this process is that there is usage of certain chemicals that are potentially hazardous/toxic. The production processes that generate these chemicals and the products that have them, are of concern because of their impact on the environment and human health.

Viet Nam has made efforts to improve policy and regulatory issues accompanied by important technical assistance, but the country needs to introduce tools like Green Chemistry principles to obtain the necessary changes. The introduction of Green Chemistry also produces synergies that reduce the use and release of hazardous and toxic substances of chemical-related MEAs, and GHG.

The project aims to address two global environmental problems, the release of POPs and the release of Mercury. Both persistent substances can travel long distances and they can bio-accumulate in the food chain and humans. The Stockholm Convention and the Minamata Convention cover both substances.

The main objective for this project is reduction and elimination of POPs emissions. The reduction and elimination of Mercury in products from industrial processes and its contaminated waste are also important in this project.

The barriers that the project addressed were as follows:

1. Absence of regulatory framework, which encouraged the application of Green Chemistry in Vietnam.
2. Limited capacity and expertise in the application of Green Chemistry principles to reduce the use and release of POPs, PTS, and other hazardous chemicals.
3. Economic barriers and the absence of incentives for the application of Green Chemistry.
4. Low awareness on Green Chemistry and its principles.
5. No experience or success stories to demonstrate the potential of the Green Chemistry adoption.

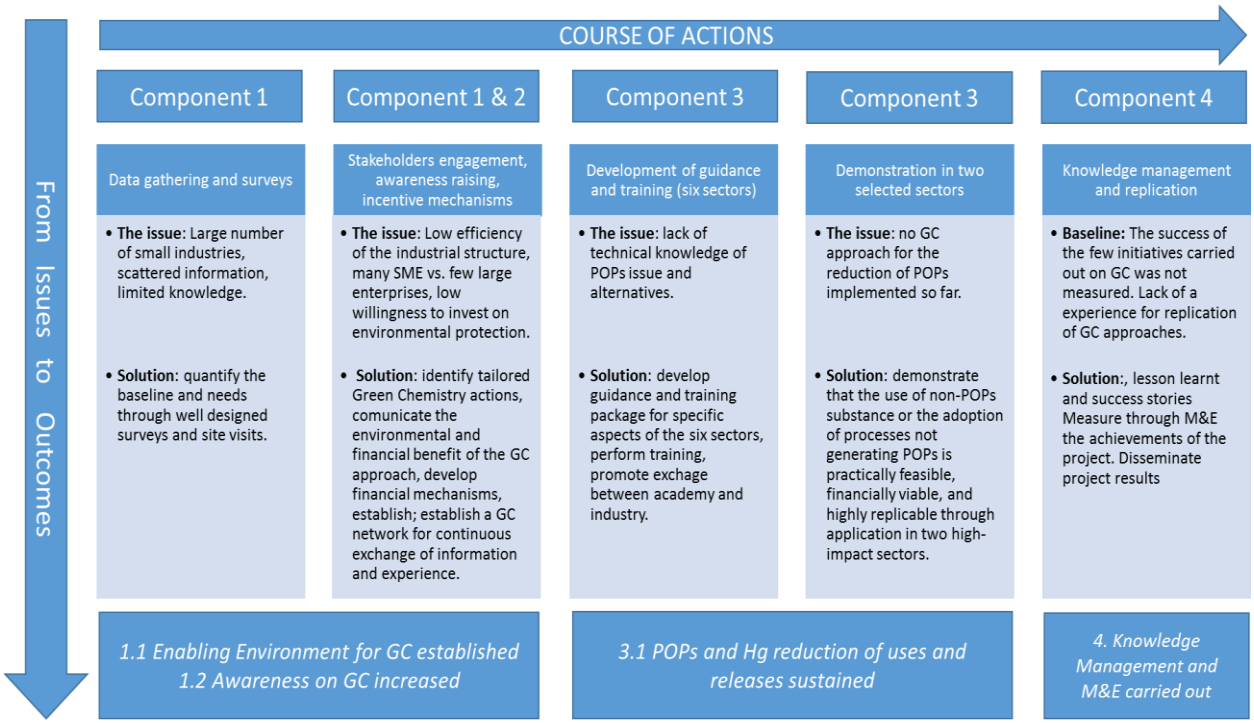
IMMEDIATE AND DEVELOPMENT OBJECTIVES

The project's main objective is to create an enabling environment for the introduction of Green Chemistry in Viet Nam and introduce Green Chemistry applications in productive sectors with the purpose of reducing the use and release POPs (the original ones and the new ones: PFOS and PBDEs) and Mercury which are controlled under the Stockholm Convention on POPs and the Minamata Convention. More specifically, the project aims to address two global environmental problems, the release of POPs as its main priority and the release of mercury as a second priority.

The project also expects to improve energy and natural resource efficiency and generate a reduction in GHG releases co-benefits in the sectors and industries included in the project.

DESCRIPTION OF THE PROJECT'S THEORY OF CHANGE

Figure 1 Theory of Change (ToC) for the project



The Theory of Change for this project was developed based on a strategy that incorporated issues identified, possible solutions, and the inclusion of these within each component's main outputs.

In each component there is an action identified to respond to the issues and the expected solution. In this Theory of Change the following actions answer to the issues identified and the solutions that will provide input to the project outcomes.

- **Component 1.** Developing the Enabling Environment for Green Chemistry in Viet Nam.
  Outcome 1.1: Enabling environment for GC established.
  Proposed action: Data gathering and surveys.
  Expected solution: Quantification of the baselines needs.

- **Component 1 & 2**. Promote Awareness on GC and the benefits of the application of GC and its guiding principles.
  Outcome 2.1: Awareness on GC increased.
  Proposed action: Stakeholder engagement, awareness raising and incentive mechanism.
  Expected solution: necessary GC actions identified, communication of environmental and financial benefits, development of financial mechanism, establishment of a GC network for information and experience exchange.

- **Component 3**: Introduce GC approaches into priority sectors and at least 2 entities.
  Outcome 3.1: POPs and Mercury reduction of uses and releases sustained.

Proposed actions: Development of guidance and training in six industrial sectors. Demonstration in two selected sectors.
Expected solutions: Guidance and training activities for six sectors, promotion of experience exchange between academy and industry. Demonstration that uses of non-POPs substances or processes that do not generate POPs is feasible, financially viable and highly replicable from the experience of 2 pilot sectors.

- **Component 4**: Project monitoring and evaluation and dissemination of Project Results, Lessons Learned and Experiences.
  Output 4.1/4.2 Project results monitored, adaptive management applied, lessons learned, and best practices extracted and disseminated at national, regional, and global level.
  Proposed action: Knowledge management and replication.
  Expected solutions: Lessons learned and success stories through M&E, project achievements disseminated.

The theory of change for this project was developed correctly and responds to the actions implemented and that resulted in positive results for this project.

EXPECTED RESULTS

At the end of the project, Viet Nam will have a Green Chemical Cell established and functional and training workshops completed. An impact fund will be established with GC incentives incorporated in the projects to be funded.

Two pilot projects will be implemented with companies from two sectors. These achievements will be complemented by raising awareness among manufacturing and industrial companies that use chemicals in their processes and the general population of the health risks and the environment that POPs chemicals and their emission produces.

Table 3 lists the expected results, the corresponding indicators, the baseline at the time of project design and the expected targets at the conclusion of the project.

Table 3. Expected results, indicators and expected targets.			
	Objective and Outcome Indicators	**Baseline**	**End of Project Target**
Project Objective: Reduce the use and release of chemicals controlled under MEAs, other hazardous chemicals, improve energy and natural resource efficiency and reduce (GHG) emissions through the application of Green Chemistry principles in Viet Nam.	**Mandatory Indicator 1** **UN SP Indicator 1.3.1:** Number of new partnership mechanisms with funding for sustainable management solutions of natural resources, ecosystem services, chemicals, and waste at national and/or subnational level. **Mandatory Indicator 2** **UN SP Indicator 2.5.1:** Extent to which legal or policy or institutional frameworks are in place for conservation, sustainable use, and access and benefit sharing of natural resources, biodiversity, and ecosystems. **Indicator 3:** Amount of POPs, U-POPs and mercury uses and release	1) No partnership or financial mechanism in place for the implementation of Green Chemistry in Viet Nam 2) GoV adopted a few Strategies and Policy on Green Growth and Sustainable Development, NAP for sustainable production and consumption, no regulation and incentive policies exists which mentions or promotes Green Chemistry Only basic Green Chemistry principles applied in few industrial sectors in Viet Nam 3) Vietnamese standards and regulations for chemical release in industrial sectors (paper, textile, …) currently don't include POPs/dioxin/mercury parameter. Therefore, the release into the environment of these pollutants from industrial sources is currently not controlled. Gender issues currently not fully understood in industrial organizations	1) Green Chemistry network in place participated by private and institutional experts. An impact fund established to provide soft loan for implementation of Green Chemistry 2) Legal documents and technical standards developed and endorsed by the government to regulate GC implementation 3) Reduction of the use or releases of one ton of POPs (PFOS, C-PBDE, SCCP, pesticides), 15 gTeq/yr U-POPs and of 2 kg of mercury Equal opportunity for male and female in manufacturing and chemical industry through the implementation of safer workplace environment

	avoided at project implementation and predicted at replication.		
Component/Outcome 1 **Component 1. Developing the Enabling Environment for Green Chemistry in Viet Nam** **Outcome 1.1:** Enabling Environment for Adoption of Green Chemistry Practices Established	**Indicator 1:** Availability of an assessment report and feasibility study and of a Green Chemistry incentives scheme introduced following Cost-Benefit Analyses (CBAs). **Indicator 2:** Number of trainings successfully performed and, number of people (male and female) attending the training **Indicator 3:** Existence of a network of GC experts with equal opportunities among genders and institutional expertise created under the project	1) Similar study/ report not yet available. Incentives for GC currently not available 2) GC mentioned in several training initiatives by MOIT but not yet recognized as a key strategy for POPs reduction and sustainable production 3) A network of GC experts and institutional expertise does not exist yet	1) Assessment and feasibility reports and CBA of incentive scheme published and disseminated A GC incentive scheme adopted 2) all TOT training completed before MTR 3) A network of GC expert established, encouraging participation of women, and operating as a help desk through a blog platform or a dedicated line.
Component/ Outcome 2 **Component 2. Promote Awareness on Green Chemistry and the benefits of the application of Green Chemistry and its guiding principles** **Outcome 2.1** Awareness on GC and its guiding principles increased to a level necessary to support a shift to GC application.	**Indicator 1:** Level of Awareness on Green Chemistry among decision makers and stakeholders disaggregated by gender. (1-very low; 2-low; 3-average; 4-good; 5-very good) **Indicator 2:** Availability of reports from initiatives on Corporate Social Responsibility on Green Chemistry. **Indicator 3:** Availability of reports and material generated by Green Chemistry extra-curricular lectures, and from the exhibition and technology workshop on GC	1) Awareness on green chemistry is very low among enterprises and manufacturers Public media dedicating very little broadcasting time, If any to Green Chemistry in Viet Nam. 2) No CSR initiative on Green Chemistry exists 3) Training on Green Chemistry is not systematic and not integrated in MOIT universities. Exhibition and workshop on GC technologies never carried out before	1)At least one additional awareness raising workshop with the participation of at least 30 representatives from the 2 remaining industrial sectors carried out taking into account specific needs for women TV broadcasting continued in coordination with Viet Nam Television. 2) CSR initiative implemented by at least one industrial sector. 3) Training on Green Chemistry carried out including onsite training in selected industries from the six sectors,

	technologies promoted by Embassies in Hanoi		encouraging female participation as both teachers and trainees. One exhibition including workshop on GC technologies with bilateral support completed.
Component/ Outcome 3 **Component 3. Introduce Green Chemistry approaches into priority sectors and at least 2 entities** **Outcome 3.1:** 15 g-TEQ/Y of UPOPs releases, 1 tonne of POPs, 0.002 tonnes of Mercury reduced through the introduction of GC in priority sectors**.**	**Indicator 1:** Number of priority sectors and entities selected for demonstration **Indicator 2:** Availability of criteria for POPs/ mercury baseline assessment and calculation of POPs/mercury reduction **Indicator 3:** Amount of the reduction of the use / release of POPs, U-POPs, and mercury (both at project implementation and predicted at replication stage)	1)In the shortlisted selected sectors there are no significant actions aimed at reducing the use or release of POPs Limited opportunities for women to access jobs in the selected industrial sectors. 2) Criteria for baseline assessment in the priority sectors not yet developed 3) Zero Reduction of POPs or mercury in the selected sectors	1) Selection of priority sectors completed at Mid Term Equal opportunity given to male and female experts in the GC and POPs area. 2) Baseline assessment completed at Mid Term 3) At least 1 ton of POPs (C-PBDE, PFOS, SCCP, pesticides) and 2 kg of Mercury reduced from selected industries 15 g TEq/y of U-POPs reduced from selected industries.

Component/ Outcome 4: Project M&E, Dissemination of project result, lesson learned and experience	**Indicator 1:** number of monitoring activities have been carried out	N/A	Financial auditing and other monitoring activities carried out.
	Indicator 2: number of Evaluation activities that have been carried out.	No evaluation of project implementation till terminal evaluation	Project reporting and planning continued until project end -Terminal Evaluation carried out and submitted to GoM, UNDP and GEF.
	Indicator 3: availability and sustainability of knowledge management in place (including project materials and experience sharing)	Project result, lessons learned, and experience have not been available for disseminating	Project result, lesson learned, and experience widely disseminated

TOTAL RESOURCES

The project document indicates that co-financing has been committed from the following sources: UNDP, government, JICA, private sector and loans from VEPF.

The following table 4 illustrates the total resources identified in the project document. The final co-financing data will confirm this commitment has been completed or even increased in some cases.

Table 4. Total project implementation resources

Resource	GEF contribution	Co-financing	Amount (US$)
GEF	1 999 800		1 999 800
UNDP		Grant	200 000
Government		In-kind/grant	700 000
Multi bilaterals		Grant	1 500 000
Private sector		In-kind/grant	4 000 000
Others (VEPF)		Loans	2 000 000
Total project resources			**10 399 800**

Source: Project document

MAIN STAKEHOLDERS

The project document listed a large number of stakeholders and their roles. The complete list is illustrated in Table 5.

Table 5. Main Stakeholders enlisted in the Prodoc

Stakeholder	Role
Government Stakeholders	
Ministry of Industry and Trade (MOIT)	**Role and functions:** MOIT is a Ministry of the Government, performing the function of state management on industry and commerce. **Role in the project:** MOIT is the national implementing partner (NIP) and will chair the PSC meeting for guiding PMU on project execution and correct its course, if required. The PSC will also oversee the work done by the PMU in line with MOIT function and responsibility on a regular basis.
Ministry of Natural Resources and Environment (MONRE)	**Role and functions:** The Ministry of Natural Resources and Environment (MONRE) is a government ministry in Viet Nam, performing state management functions in the areas of land, water resources; mineral resources, geology; environment; hydrometeorology; climate change; surveying and mapping; management of the islands and the sea. MONRE is the focal point for the Stockholm Convention on POPs and in charge

	of issuing waste release and emission standards and regulations for industry sectors as well as monitoring the level of hazardous chemicals release to environment by industrial production and manufacturing. **Role in the project:** MONRE is a member of Project Steering Committee (PSC).
Ministry of Science and Technology (MOST)	**Role and functions:** The Ministry of Science and Technology (MOST) is a government ministry in Viet Nam responsible for state administration of science and technology activities, including technology transfer and import of new technology; development of science and technology potentials; intellectual property; quality control of national standards. **Role in the project:** MOST is a member of Project Steering Committee (PSC).
Ministry of Labor Invalids and Social Affairs (MOLISA)	**Role and functions:** The Ministry of Labor, Invalids and Social Affairs (MOLISA) is a government ministry in Viet Nam responsible for state administration on employment, occupational safety, social insurances, and vocational training; social protection and prevention of social evils; childcare and gender equality. **Role in the project:** MOLISA is a member of Project Steering Committee (PSC).
Viet Nam Environment Protection Fund (VEPF), managed by MONRE	**Role and functions:** VEPF is a state financial institution responsible for financial support through soft loans provision for the implementation of programmes, projects, activities in environmental protection, natural resources and biodiversity conservation, and reduction of pollution and reduction of environmental risks. VEPF also provides finance (grant) for the preparation and implementation of some selected projects under World Bank support. **Role in the project:** **VEPF** is a member of Project Steering Committee (PSC). VEPF will provide the soft-loan for the enterprises applying Green Chemistry solution and will be in charge of assessing enterprise application to the fund based on VEPF criteria established in the course of project implementation.
National Foundation for Science and Technology Development (NAFOSTED), managed by MOST	**Role and functions:** NAFOSTED is a state financial institution responsible for promoting researches in technology development in Viet Nam; building research capacity for young scientists; enhancing research quality; linking research activities to enterprises, investors; etc. **Role in the project:** **NAFOSTED** and its scientific network will be involved and play supporting role in the establishment of the Green Chemistry network.
Viet Nam Institute of Industrial Chemistry (VIIC)	**Role and functions:** VIIC is a national research institute under Ministry of Industry and Trade (MOIT), established in 1956. **Role in the project:** **VICI** and its units will have knowledge and expertise, specifically on bio-pesticides and bio-solvent sub-sectors, can provide data of national paint production sector and support feasibility studies of bio-

	solvent and bio-pesticides (*where relevant*). **VICI** will also be a member and involved in the initiative of the Green Chemistry network.
Local Government Agencies at provinces (DOIT, DONRE and DOLISA)	**Role and functions:** These are the respective provincial level departments of MOIT, MONRE and MOLISA. **Role in the project:** Local ministry departments will be involved in the activities conducted at provincial level (*when relevant*).
Associations and NGOs	
Chemical Society of Viet Nam (CSV) (so call Viet Nam Chemical Association)	**Role and functions:** **CSV** is a NGO and a professional association in the field of chemistry. The association has the function to promote knowledge exchange among its member and to support the implementation of research into practical applications; to promote the development of chemical sector; and to deliver training to their members. **Role in the project:** **CSV** is a supporting organization in identifying national experts for studies and assessments on chemical use and release in project–selected industrial sectors and project activities; one of potential agencies to collaborate in awareness raising activities and an institution to be involved and collaborate in the establishment of Green Chemistry Network.
Sector Associations (i.e., Viet Nam Textile Association, Plastic Industry Association, etc. Vietnamese Pulp and Paper association, etc.)	**Role and functions:** All the industrial associations aim at protecting rights and legal benefits of their members in compliance with the relevant Vietnamese legislation. The associations also examine and propose to the Government regarding issuances of policies and strategies for the development of their industrial sector. Some associations – like for example the Viet Nam Pulp and Paper association and the Viet Nam Textile Association – also performs research on the manufacturing technologies and provides trainings to their members. **Role in the project:** The Associations will be key partners in facilitating the activities to be conducted in the respective industrial sector such as collating sectorial information, disseminating information related to the project, providing support to the assessment and implementing awareness raising activities, specially to trainings to enterprises in each sector, CSR initiatives by enterprises, Infor Tech exhibition, etc.
Asian Institute of Technology in Viet Nam (AIT VN)/ Learning Centre (LC)	**Role and functions:** AITVN is one of the first international education centers in Viet Nam support technology transfer for the national development through providing high-quality postgraduate and short-term training, information services, research and consultancy. **Role in the project:** The AITVN Learning Center is a potential partner in providing trainings. The specific training content and collaboration modality will be further identified during inception phase.

Viet Nam Cleaner Production Centre (VN CPC)	**Role and functions:** VNCPC is a Public Service Ltd Co. established in 1998 with the mission to bring added values to clients through advanced scientific and technological services to contribute to the promotion of sustainable production and consumption **Role in the project** The VNCPC is a potential partner for training and establishment of the Green Chemistry Network.
Private Sector	
Korean Research Institute of Chemical Technology (KRICT)	**Role and Functions** KRICT is a South Korean Research Institute having functions of developing green chemical technologies and materials for sustainable society and chemical industries by providing comprehensive solutions. **Role in the project** KRICT is a potential partner for trainings, awareness raising workshops, identification of international experts for feasibility studies and establishment of the Green Chemistry Network, with reference to specific sectors like pesticide and plastic.
Plant & Food Research (PFR)	**Role and Functions** PFR is a New Zealand government-owned Crown Research Institute, providing research and development that adds value to fruit, vegetable, crop and food products. **Role in the project** PFR is a potential technical pool resource for implementing project activities on bio-pesticides through open bidding.
Bai Bang Pulp and Paper Company / Viet Nam Paper Corporation (Bai Bang company)	**Bai Bang Company** is a state enterprise. The corporation is home to the largest paper mill in Viet Nam funded by Sweden since 1970s. **Bai Bang Company** is potential partner in project implementation (*to be confirmed during inception and project implementation*)
PLATO company	Plato is a company providing surface treatment processes for many kinds of material, decorative Nickel-Chrome, Zinc, Hard chromium, etc. Plato serves several national and international customers. **PLATO Company** is potential partner in project implementation
Hoa Phat Group (HPG)	**HPG** is a Joint Stock Company and has 16 member companies with the major businesses on steel production, mining, coke production, real estate, furniture manufacturing, construction accessories and equipment with many factories across the country. Plating factories of Hoa Phat Group will be reviewed and HPG might be a potential demonstration partner (*to be confirmed during inception and project implementation*)
Viet Nam Textile Corporation (VINATEX)	VINATEX – the stock textile and apparel production corporation – working in the area of spinning, knitting, weaving, dying, garment making with purpose of modernizing production technology, changing production methods towards generation of highly value-added textile products. VINATEX is a potential demonstration partner (*to be confirmed during inception and project implementation*)

Source: Prodoc

4. FINDINGS

PROJECT DESIGN/FORMULATION

The project's objectives and outcomes were well incorporated into the Theory of Change that was proposed for the project document. For each component, there is a direct relationship between the issues that faced and a proposed solution to obtain the necessary output indicated in the diagram.

It is this evaluator's opinion that the Theory of Change and the project design are in accordance. The result of the proper development is what has been productive in the project obtaining the outputs and outcomes expected.

The Results Framework as defined in the prodoc were not changed and it was developed in the proper project management form. The indicators are well defined using the SMART principal. At the time of this evaluation, the analysis of the Results Framework has not been a challenge precisely because of its adequate formulation.

ASSUMPTIONS AND RISKS

The risks identified in the project document are illustrated in Table 6.

Table 6 Project Risks Identified

Description	Type	Impact (I) & Probability (P)
Lack of Coordination among bodies with different mandates may hinder project result	Management	I 3 P 3
Lack of participation of key players in workshops and training.	Management	I3 P3
Lack of effectiveness of training	Management	I3 P3
Financial resources will be not available to demonstrate and sustain Green Chemistry in the selected sectors as planned.	Financial	I3 P3
Gender issues not effectively mainstreamed in the project.	Policy	I3 P3
Moderate or low Global Environmental Benefit achieved	Technical / Financial	I3 P2
Lack of capacity on adequate project financial management and	Management/	I3

procurement by Government implementing partner to utilize the project fund effectively	Financial	P3
An adequate partner to manage the Green Chemistry Cell and Green Chemistry network is not found	Management/ Communication	I3 P3

There is one risk that was identified in the PIF that wasn't mentioned in the prodoc and it was important during the project implementation. The risk identified was:

- Limited private sector commitment because of the absence of incentives for the application of Green Chemistry resulting in the non-adoption of Green Chemistry principles within Vietnam's manufacturing and production sector.
- The obtaining of pilot companies to participate was a challenge and it was mainly because of type insecurity that the implementing changes with GC principles represented to small companies. Fortunately, the two companies that did participate in the pilot project were willing to take the risk because they were aware of the productive and financial benefits that the change would produce in their favor.
- Of the risks identified in table 6 above in general they are all in line with challenges that did arise during project implementation, but the mitigation measures taken were able to solve them.

LESSONS FROM OTHER RELEVANT PROJECTS

The TE did not find any information regarding lessons learned from other projects.

PLANNED STAKEHOLDER PARTICIPATION

In the Stakeholder Engagement Plan the prodoc identifies as main beneficiaries: workers in industries, consumers, and communities and secondly, the chemical and manufacturing industry. The first will benefit from the reduction of exposure to chemicals such as POPs emissions, mercury among others. The chemical and manufacturing industry will benefit through possible incentives, technical assistance and training and possible input in the regulations and guidance involved in GC implementation.

To promote the stakeholder's awareness raising, activities were held in which Green Chemistry principles were explained with all the GC and POPs relationships presented and the benefits. The PMU and the key stakeholders worked together identifying incentive mechanisms that would effectively sustain the development of Green Chemistry in the country.

LINKAGES BETWEEN PROJECT AND OTHER INTERVENTIONS WITHIN THE SECTOR

There were some projects from which linkages were established that contributed to the project. These would be:

- The “Master Plan for Development of Chemical Industry by 2020. Vision towards 2030 (MOIT 2014)” was important because it incorporates key environmental considerations that assist the project implementation. These considerations would be priority to chemical investment projects that apply new technologies to reduce and control wastes, minimize environmental pollution, elimination or phase out of outdated technologies that contribute to pollution reduction.

- JICA/MOIT project, “Strengthening Chemical Management in Viet Nam (2015-2018”. MOIT/JICA.

- The National Action Plan (NAP) on Sustainable Production and Consumption up to 2020 with a vision toward 2030. This project prioritizes promotion of sustainable consumption, which is in line with the GC principles.

- The National Strategy on Development of Chemical Industry which incorporates sustainable production and consumption principles.

- There is an important linkage of this project within the One Strategic Plan 2017-2021 which is the programmatic and operational framework for delivering United Nations (UN) support to the Government. The UN has supported the Government in the development of national priorities. The Plan is aligned with the Socio-Economic Development Strategy 2011-2020, the Socio-Economic Development Plan 2016-2020, the Sustainable Development Goals (SDGs) and Viet Nam’s international human rights commitments.
- The UNDP CPD outlines a strategic programme of support that is aligned with the Government of Viet Nam’s socio-economic development programme (SEDP) 2016-2020 and that contributes to the One UN Strategic Plan 2017-2021. In its Outcome2: Low-carbon, resilience and environmentally sustainable development there is a specific mandate to Design an environmental performance monitoring index for sustainable management of ecosystems and natural resources. This mandate is in line with the project’s objective to protect human and environmental health by reducing release of POPs and other hazardous substances.

GENDER RESPONSIVENESS OF PROJECT DESIGN

In the project document a mainstream gender action plan was developed. It included the outcome to which there was a gender objective to be completed, the proposed action and the corresponding indicator.

The outcomes that have gender objectives are the following:

Outcome 1.1: Enabling Environment for Adoption of Green Chemistry Practices Established

Outcome 2.1 Awareness on GC and its guiding principles increased to a level necessary to support a shift to GC application.

Outcome 3.1 15 g-TEQ/Y of UPOPs releases, 1 ton of POPs, 0.002 tons of mercury reduced through the introduction of GC in priority sectors.

The Theory of Change and the project strategy properly integrate the outcomes that also have gender objectives included as indicated above. The actions to undertake respond to the gaps exist in gender equality and women's empowerment in Vietnam.

The Gender Marker Rating was **GEN1**: some contribution to gender equality in the 2020 PIR. At the time of this rating there were still gaps which had not been taken into consideration but were considered in the project implementation.

SOCIAL AND ENVIRONMENTAL SAFEGUARDS

The overall risk rating under the Social and Environmental Screening Procedure (SESP) is "Low" for this project at the time of its design. In the social and environmental safeguards identified in the SESP there was no way of knowing of the upcoming COVID-19 pandemic that effected and continues to do so in almost all of the project activities.

At the project design it was expected that GC demonstration activities in industrial processes, capacity building and awareness raising, and incentives would provide for a safer and more competitive manufacturing sector that in turn is a benefit for environment and society. For this reason, is that the SESP rating was **low.**

4.1 PROJECT IMPLEMENTATION

ADAPTIVE MANAGEMENT

The most significant management issue that this project has experienced is regarding the COVID-19 pandemic. There were delays in the procurement of international consultants due to travel restrictions to enter Viet Nam. The two pilot companies were experiencing closure because of the COVID restrictions and shutdowns that caused reduction in the production outputs.

The adaptive management to solve this situation was discussed in the Project Steering Committee. The measures taken to have national and international consultants work from home with virtual interventions was a positive measure that help resolve some of the setback in project implementation.

The PSC and UNDP decided to request a 10-month extension of the project deadline to October 2021. The extension was approved, and this alleviated the pressure on the non-completion of project activities for reasons beyond the PMU control.

At the time of this evaluation COVID-19 is still impacting Viet Nam very hard and there have been national shutdowns in the recent months. The project is generating significant results in these challenging times. The demonstration activities in the painting and electroplating sectors are being completed, providing inputs to incorporate GC in the Chemical Management Law and capacity building and awareness raising activities are being held virtually. The project, even with these difficulties, has been able to reduce the POPs target by 2.5 times. In this closing year despite the difficulties, the project has also been able to

develop communication products. UNDP held regular meeting to follow up on the progress and provide guidance to the PMU and its government counterparts.

ACTUAL STAKEHOLDER PARTICIPATION AND PARTNERSHIP ARRANGEMENTS

The project document includes a stakeholder analysis that is included in the section on project description of this evaluation document. This table was updated and revised during the project inception period. For the most part, the proposed roles and responsibilities of stakeholders were fulfilled during project implementation as detailed in the Table 7 below.

The project has successful collaboration and coordination between PMU and other stakeholders including the relevant ministries (MOIT, MONRE, MOST), Viet Nam Environmental Protection Fund, Local Government Agencies (Thai Nguyen, Ha Nam and Phu Tho, Quang Ngai and Quang Tri DONREs and DOITs), association and NGOs (Viet Nam Chemical Association, Viet Nam Responsible Care Council, etc.), institution and education sector (Hanoi University of Science and Technology, Hanoi University of Industry, Phenikaa University, Viet Nam Institute of Industrial Chemistry, etc.), private sector manufacturers (Plato JSC. VN, Nishu paint JSC, Northern Paint and Printing Ink Club, The Viet Nam Corrosion and Metal Protection Association, etc.), and UNDP.

A Green Chemistry Cell has been created and hosted by the CSV and includes 61 experts from different stakeholders. The objective of the cell is to create a network of industrial chemical experts, representatives of universities and chemical orientated NGOs to come together to offer advice and share their experience for future developments in the Vietnamese industry to any interested party.

Due to Covid-19 situation in the country, all the stakeholders' interviews under this TE were through online with mostly zoom meetings. In general, the stakeholders interviewed highly appreciated and expressed their satisfaction with the Project's supports and the interventions by the Project Management Unit and UNDP. A list of detailed stakeholders interviewed can be found in Annex 1

Table 7. Key stakeholders and actual involvement in project

Organization	Actual involvement in project
Ministry of Industry and Trade (MOIT)	MOIT chairs the PSC and assigned VINACHEMIA as the national implementing partner (NIP) of the project. PSC provide guidance on project strategy and approve project annual work plans. With the leadership and guidance from MOIT, the project PMU has worked closely with UNDP and other stakeholders for implementation of the project as planned and ensuring the achievement of set objectives.
Ministry of Natural Resources and Environment (MONRE)	MONRE has assigned a senior official as a permanent PSC member, who participated in most of the PSC meetings and always have comments and contributions to the project planning and implementation

	with related to NRE sector either directly in the participated meetings or through emails in case the MONRE's representative could not presented.
Ministry of Science and Technology (MOST)	Like MONRE, MOST has assigned a senior official as a permanent PSC member, who participated in most of the PSC meetings and always have comments and contributions to the project planning and implementation with related to ST sector either directly in the participated meetings or through emails in case the MOST's representative could not presented.
Ministry of Labor Invalids and Social Affairs (MOLISA)	Except for being mentioned as a member of PSC in the Inception Report, MOLISA was not shown in any PSC meeting notes in all meetings from 2018, 2019, and 2020
Viet Nam Environment Protection Fund (VEPF), managed by MONRE	VEPF is an active member of the PSC with a permanent senior official was assigned to participate in all PSC's meetings with relevant comments and contributions. VEPF has fulfilled its commitment on green fund in collaboration with PMU and UNDP. Till the date of TE mission, VEPF has disbursed over USD 2.0 million of green loan to enterprises under the project
National Foundation for Science and Technology Development (NAFOSTED), managed by MOST	NAFOSTED is participating in the project as a member of Green Chemistry network
Viet Nam Institute of Industrial Chemistry (VIIC)	VIIC is an active member of the Green Chemistry network. The representatives of VIIC have participated in project trainings and workshops in both roles as knowledge receivers and providers to related enterprises.
Local Government Agencies at provinces (DOIT, DONRE and DOLISA)	DONREs and DOITs where pilot enterprises located, and some other local government agencies have participated in project events as meetings, trainings, and workshops
Chemical Society of Viet Nam (CSV) (so call Viet Nam Chemical Association)	CSV is an active member of Green Chemistry Network and has effectively supported the project MPU in identifying national experts for setting up the Green Chemistry Network and for other project activities such as capacity building and awareness raising. The CSV is the host of the GC Cell.
Sector Associations (i.e., Viet Nam Textile Association, Plastic Industry Association, etc. Vietnamese Pulp and Paper association, etc.)	These associations are participating in the project as a member of Green Chemistry network and in other training and workshop events under the project
Asian Institute of Technology in Viet Nam (AIT VN)/ Learning Centre (LC)	Instead of AITVN, many universities in the Vietnam, particularly in the Northern part of the country, have been invited to participate in the project activities and Green Chemistry Network. Up to date knowledge and information on green chemistry has been shared with participated universities and the project is planned to integrate the GC principles and knowledge into the university curriculums

Viet Nam Cleaner Production Centre (VN CPC)	VNCPC is participating in the project as a member of Green Chemistry network
PLATO company	Plato is participating in the project as one of the two demonstrative companies, who are piloting green chemistry principles in their production and have successfully achieved more than their expectation
Hoa Phat Group (HPG)	Nishu, a paint company, is participating in the project as one of the two demonstrative companies, instead of HPG. Like Plato, Nishu's leader also confirmed the successful achievement of the project support through piloting
Other manufacturing industries, universities and their students.	6 industries and 4 universities have been selected to be involved in different events of the project for capacity building and awareness raising on green chemistry principles and application

Source: TE evaluation team

PROJECT FINANCE AND CO-FINANCE

Financial management was carried out with the project management unit and with the approval of the project direction, always under UNDP budgetary protocols.

The planned budget vs the actual expenditure Table 8 below indicates that the % of execution during each year was relatively normal. The final year 2021 has a total of 82% which includes the execution from January to September 2021.

The reason behind the slower execution in 2020 and 2021 is that the project has had important delays due to COVID 19 pandemic measures along with social and economic restrictions because of shutdowns.

Table 8. Project budget vs actual expenditures

Budget	2018 exp	2019	2020	2021 (Jan-Sep)*	Commitment	Total
1,990,800	91,122	449,828	467,832	350.092	317.347	1,676,221
						Total 84 %

Source: PMU. * Includes budget Jan. To Sept. 2021

However, once the different actions undertaken as adaptive management to the COVID-19 Pandemic were applied, the project management increased in efficiency and effectiveness. Although at precisely this time of this evaluation Viet Nam is once again experiencing national shutdowns because of increase in COVID-19 cases.

The originally committed co-financing for the project, as indicated in Table 9 Co-financing table, was USD 8 400 000. The PMU has accounted as the amount invested by the stakeholders during implementation as USD 27 333 751. The difference in co-financing investments that were used as environmental improvements should be accounted for as co-financing. As indicated in Table 10 Confirmed Sources of Co-Financing at TE Stage there are large amounts that correspond to investment mobilized by some companies for

environmental protection (e.g., investment on wastewater treatment plant) and should not be considered co-financing for the GC project. The actual co-financing that was used for GC work amounts to USD 9 863 990, which represents 17.4% above of the original amount committed by the stakeholders. This is a very good percentage of co-financing.

The VEPF loans were catalyst for the improvement of small private companies in different initiatives towards GC application. The pilot companies did not need loans and used their own capital to make their investments because they were aware of the importance in the application of GC to their competitivity in world markets and the savings that would come from these changes.

The largest investments for co-financing came from the private sector and government agencies such as VEFP and Viet Nam Chemicals Agency.

Table 9. Co-financing table

Co financing (type/source)	UNDP Financing (US$)		Government (US$)		Private sector (US$)		Total (US$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants	200 000	252 000	40 000	1 595 000			240 000	1 847 000
Loans/Concessions			2 000 000	3 040 000			2 000 000	3 040 000
In-kind support			660 000				660 000	
Others					5 500 000	4 976 990	5 500 000	4 976 990
Total	**200 000**	**252,000**	**2 700 000**	**4 635 000**	**5 500 000**	**4 976 990**	**8 400 000**	**9 863 990**

Source: PMU

Table 10 Confirmed Sources of Co-Financing at TE Stage

Sources of Co-Financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount (US$) dedicated for Green Chemistry related work
UNDP	Donor Agency	Grant	Investment Mobilized	252 000
Recipient Country Government	Vietnam (MOIT)	Grant	Investment Mobilized	1 535 000
Recipient Country Government	Vietnam (MOIT)	Grant	Recurrent expenditures	60 000
Recipient Country Government	Viet Nam Environment Protection Fund	Loan	Investment mobilized	3 040 000

Private sector	PLATO company	Equity Investment	Investment mobilized	885 000
Private sector	PLATO company	Equity Investment	Recurrent expenditures	5 000
Private sector	Duc Giang Chemicals Group	Equity Investment	Investment mobilized	800 000
Private sector	Vietnam Paper Corporation	Equity Investment	Investment mobilized	1 500 000
Private sector	Special National Laboratory on petroleum	Equity Investment	Investment mobilized	969 000
Private sector	NISHU company	Equity Investment	Investment mobilized	760 990
Private sector	NISHU company	Equity Investment	Recurrent expenditures	57 000
Total Co-Financing				9 863 990

MONITORING & EVALUATION: DESIGN AT ENTRY, IMPLEMENTATION, OVERALL ASSESSMENT OF M&E

At the project design stage, the Monitoring and Evaluation Plan indicated in the project document details several mandatory instruments. These instruments are:

- Inception Workshop Report
- AWP
- APR/PIR GEF
- Quarterly progress reports
- GEF Tracking tools
- Audit Report
- Lessons learned and knowledge generation
- Oversight missions
- Environmental and social grievances report

The coordination of this project has presented most of the instruments indicated efficiently and meeting the deadlines established.

The M&E budget proposed was well prepared and correspond to an accurate estimation of the expenditure associated to these exercises. During implementation stage the M&E plan was sufficiently budgeted according to the budget presented in the project document. The APR/PIR reports for each year well prepared efficiently and risk management, social and environmental risks were analysed were identified using the UNDP SESP, gender analysis were covered accordingly in different yearly PIR reports.

There was a Theory of Change included in the project design that responds to the logic to implementation undertaken. It was not refined during the project implementation.

The Project Board Meeting Minutes were available at the time of this evaluation. These meetings were held yearly. In these minutes it is clear that the Project Board analysed the challenges that the project had and also suggested ways of solving them.

The GEF/LDCF/SCCF core indicators were only presented at the TE stage. These indicators were not indicated early on in the project.

The Annual Implementation Reports were completed for 2019 and 2020. The Quarterly Reports were completed for all of 2020 and 2019. The Quarterly Reports for 2018 were included but in Vietnamese.

The PIRs were an important tool to re evaluate possible adaptive management at certain moments in the project implementation. Such moments as the Covid 19 restrictions and national shut down requirements were discussed, and adaptive management implemented. The PIR self-evaluating ratings were consistent with the findings of this evaluator.

In conclusion, monitoring and evaluation management is valued as satisfactory and very useful in decision-making, when implementing adaptive management.

Table 11. Ratings

Monitoring and Evaluation (M&E)	Rating
M&E design at entry	S
M&E Plan Implementation	S
Overall Quality of M&E	S

Table 12. Monitoring & Evaluation Ratings Scale

Rating	Description
6= Highly Satisfactory (HS)	There were no short comings; quality of M&E design/implementation exceeded expectations.
5= Satisfactory (S)	There were minor shortcomings; quality of M&E design/implementation met expectations.
4= Moderately Satisfactory (MS)	There were moderate shortcomings; quality of M&E design/implementation more or less met expectations.
3= Moderately Unsatisfactory (MU)	There were significant shortcomings; quality of M&E design/implementation was somewhat lower than expected.
2= Unsatisfactory (U)	There were major shortcomings; quality of M&E design/implementation.
1= Highly Unsatisfactory (HU)	There were severe shortcomings in M&E design/implementation.
Unable to Assess (UA)	The available information does not allow an assessment of the quality of M&E design/implementation.

UNDP IMPLEMENTATION/OVERSIGHT IMPLEMENTING PARTNER EXECUTION AND OVERALL ASSESSMENT OF IMPLEMENTATION/OVERSIGHT AND EXECUTION.

UNDP involvement in the implementation was verified through the interviews. All the stakeholders, beyond the PMU, have expressed their positive evaluation regarding the UNDP CO intervention in the project and its activities.

The UNDP CO reporting in the yearly PIR is consistent with what in general was the project action and results. The possible risks associated to challenges such as the non-definition of the pilot companies was well defined and the actions taken and supported by UNDP were positive and effective.

The UNDP CO has been responsive to the different challenges that the PMU faced regarding different adaptive management changes that needed to be applied because of COVID-19 pandemic restrictions.

The MOIT as implementing partner was committed to the project objectives and played an important role in the obtaining of key results, like the regulations that apply to the Chemical Management Law. The funds were utilized in an efficient and effective manner in all cases of procurement of consultancies and services.

The implementing partner was direct and realistic in the PIR comments and reporting done regarding the project progress, challenges that it faced and the possible risks.

Having taken into consideration all of the above the following Table 11 indicates the ratings that this evaluator gives to this item.

Table 11. Ratings

UNDP Implementation/oversight & Implementing partner Execution	Rating
Quality of UNDP Implementation/Oversight	S
Quality of Implementing Partner/Execution	S
Overall quality of Implementation/Oversight and Execution	S

RISK MANAGEMENT

In the project document a total of eight risks were identified and the impact and probability indicated; Table 6 summarized them.

The risks identified and the mitigation measures proposed proved to be adequate in most of the cases. The suggested measures were the solutions with the corresponding adaptative management to respond to the COVID-19 restrictions that were successful.

In the 2019 PIR risk number 1 identified at design phase was once again brought to the attention. The low support from the PSC was hindering the implementation process. Subcommittees for operational purposes between PSC meetings was suggested. The TE was not able to verify if this suggestion was put into effect.

Another risk indicated in this PIR was difficulty to procure trained consultants. This risk was mitigated by using other international audiences for recruitment of consultants.

The most important mitigation effort made was the request for a 10-month extension of the project termination date to October 2021. This request was approved and has proven to be beneficial since the project has been able to move forward in the obtaining of the expected results during this 2021.

SOCIAL AND ENVIRONMENTAL STANDARDS

The SESP template was completed during the project design phase and the expected environmental or social risks were low for the project at that time.

Another important social risk during the project implementation was the outbreak of the COVID-19 Pandemic. Adaptive management was required to adjust in the project work plans taking into consideration limitations in travel and supply chain disruptions.

To bypass the limitations from Covid-19 the project implemented online training courses and awareness raising activities that were useful to reach a large audience of interested parties.

In the 2019, 2020 and 2021 PIR there were no social and environmental grievances indicated. The safeguard management measures identified in the SESP at design phase were well conceptualized and responded to the reality during implementation.

4.2 PROJECT RESULTS AND IMPACTS

PROGRESS TOWARDS OBJECTIVE AND EXPECTED OUTCOMES.

The project overall progress towards the fulfilment of the proposed objective and the expected outcomes is rated by the TE team as **satisfactory**. In the logical framework analysis below the different components were evaluated and given a rating individually.

Table 12 summarizes the ratings given for the overall objective and the components.

Table 12. Summary of logical framework evaluation

Objective/Component	Rating
Objective	**S**
Component 1	**HS**
Component 2	**S**
Component 3	**S**
Component 4	**S**

The TE team gives the total project progress towards objective and expected outcomes a **satisfactory** rating due to these individual scores. The logical framework analysis below

gives a justification indicating the results obtained in each one of components using the indicators and the PIR results as sources of verification.

Table 13. Logical framework objective and expected outcomes analysis and rating				
	Objective and Outcome Indicators	**End of Project Target**	**Rating**	**Justification**
Project Objective: Reduce the use and release of chemicals controlled under MEAs, other hazardous chemicals, improve energy and natural resource efficiency and reduce (GHG) emissions through the application of Green Chemistry principles in Viet Nam.	**Mandatory Indicator 1** **UN SP Indicator 1.3.1:** Number of new partnership mechanisms with funding for sustainable management solutions of natural resources, ecosystem services, chemicals and waste at national and/or subnational level. **Mandatory Indicator 2** UN SP Indicator 2.5.1: Extent to which legal or policy or institutional frameworks are in place for conservation, sustainable use, and access and benefit sharing of natural resources, biodiversity and ecosystems.	1) Green Chemistry network in place participated by private and institutional experts. An impact fund established to provide soft loan for implementation of Green Chemistry 2) Legal documents and technical standards developed and endorsed by the government to regulate GC implementation 3) Reduction of the use or releases of one ton of POPs (PFOS, C-PBDE, SCCP, pesticides), 15 gTeq/yr U-POPs and of 2 kg of mercury Equal opportunity for male and female in manufacturing and chemical	**S**	- Green Chemistry Cell (GCC) established in 2020 and functioning with 61 members. GCC has financial sustainability with service portfolio. - VEPF gives loans for GC for 7 projects totally USD3 040 000. - Guideline for access to financing developed for GC in process. - Six technical guidelines for six industrial sectors completed. - Technical regulation on limits of Lead content in paints approved. - Project provided technical input to the “National Strategy on Development of the Chemical Industry” adding GC concept. - Law on Chemicals under review. Project provided technical inputs to integrate GC principles. - 2 GC pilot demonstrations achieved and implemented in Plato Viet Nam J.S.C. (electroplating) and Nishu Paint J.S.C. (paint) - Reduction resulting from pilot demonstrations: 2.742-ton POPs,1.3-ton Cr6+ and usage reduced by 429 kg PFOS, 1300 kg Cr6+, 3600 kg Cu and Ni and their salts reduced.

	Indicator 3: Amount of POPs, U-POPs and mercury uses and release avoided at project implementation and predicted at replication.	industry through the implementation of safer workplace environment	**S**	- GC established in Nishu plant allowed for replacement of SCCP with MCCP. They also replaced solvent-based paint with less toxic water-based paint. - There was a reduction in coal-based power contributing to Mercury reduction. - POPs reduction has exceeded target by 3 times. - Gender mainstreaming plan developed at project design and monitored annually. - 40% of the recruiting of women consultants. - 26% of women participation in six project training/workshops.
Component/Outcome 1 **Component 1. Developing the Enabling Environment for Green Chemistry in Viet Nam** Outcome 1.1: Enabling Environment for Adoption of Green Chemistry Practices Established	**Indicator 1:** Availability of an assessment report and feasibility study and of a Green Chemistry incentives scheme introduced following Cost-Benefit Analyses (CBAs). **Indicator 2:** Number of trainings successfully performed and, number of people (male and female) attending the training	1) Assessment and feasibility reports and CBA of incentive scheme published and disseminated A GC incentive scheme adopted 2) all TOT training completed before MTR	**HS**	- CBA report and assessment completed and socialized. - Results have provided inputs to the Law on Chemicals review and the National Strategy on the Development of Chemical Industry. - Mechanism for financial and non-financial incentives included in Law on Chemicals review. - 5 TOT held during project. 27% women. - 4 training/workshop courses held on different chemical safety, agrochemicals and pesticides, GC and CSR,

	Indicator 3: Existence of a network of GC experts with equal opportunities among genders and institutional expertise created under the project	3) A network of GC expert established, encouraging participation of women, and operating as a help desk through a blog platform or a dedicated line.		awareness raising on GC in universities. Average participation of women 28%. - GCC established with 61 members under the Chemical Association of Viet Nam (CSV). - GCC sustainability ensured with inclusion in CSV. - Facebook page created. - MOU between KSIEC and CSV to promote cooperation between experts, enterprises, universities of Viet Nam and Korea on GC.
Component/ Outcome 2 **Component 2. Promote Awareness on Green Chemistry and the benefits of the application of Green Chemistry and its guiding principles** Outcome 2.1 Awareness on GC and its guiding principles increased to a level necessary to support a shift to GC application.	**Indicator 1:** Level of Awareness on Green Chemistry among decision makers and stakeholders disaggregated by gender. (1-very low; 2-low; 3-average; 4-good; 5-very good)	1)At least one additional awareness raising workshop with the participation of at least 30 representatives from the 2 remaining industrial sectors carried out taking into account specific needs for women TV broadcasting continued in coordination with Viet Nam Television. 2) CSR initiative implemented by at least one industrial sector.		- Project website with communications, TV reportages and talk shows developed. - TV reportage and talk-shows on Application of GC in industrial production. - Social media channels and website developed. - 31 news articles published. - Awareness raising workshop on GC with participants from industrial sectors, government agencies, academia, universities and mass media. 25% women participation. - MOU between Nishu Paint as CSR company and implemented campaign on CSR. - Nishu Paint capacity building and training to staff members and distributors of their paint. - Training/Workshop “Green Chemistry and CSR” organized. 23% women of 100 participants. - Trainings organized at Nishu and Plato.

	Indicator 2: Availability of reports from initiatives on Corporate Social Responsibility on Green Chemistry. **Indicator 3:** Availability of reports and material generated by Green Chemistry extra-curricular lectures, and from the exhibition and technology workshop on GC technologies promoted by Embassies in Hanoi	3) Training on Green Chemistry carried out including onsite training in selected industries from the six sectors, encouraging female participation both as teachers and trainees. One exhibition including workshop on GC technologies with bilateral support completed.	**S**	- International consultants and local consulting firms provided on the job training on paint and electroplating sectors. - Three universities: Hanoi University of Science and Technology, Hanoi University of Industry and Phenikaa University integrated GC in curriculum and training activities organized. - Exhibition was not organized because of Covid-19 Pandemic measures. - Workshop on GC technology and best practice in GC principles organized with 80 participants.
Component/ Outcome 3 **Component 3. Introduce Green Chemistry approaches into priority sectors and at least 2 entities** Outcome 3.1: 15 g-TEQ/Y of UPOPs releases, 1 tonne of POPs, 0.002 tonnes of Mercury reduced through the introduction of GC in priority sectors**.**	**Indicator 1:** Number of priority sectors and entities selected for demonstration **Indicator 2:** Availability of criteria for POPs/ mercury baseline assessment and calculation of POPs/mercury reduction **Indicator 3:** Amount of the reduction of the use / release of POPs, U-POPs and mercury (both at project implementation and predicted at replication stage)	1) Selection of priority sectors completed at Mid Term Equal opportunity given to male and female experts in the GC and POPs area. 2) Baseline assessment completed at Mid Term 3) At least 1 ton of POPs (C-PBDE, PFOS, SCCP, pesticides) and 2 kg of Mercury	**S**	- 2 companies representing the two selected industrial sectors (electroplating and paint). - Demonstration results provided inputs into GC principles and to the revised Law on Chemicals. -Nothing to report. - Baseline assessment for U-POPs and POPs completed. - Procurement of equipment for both demonstration companies was completed. - Demonstration sites have total reduction of 2.742-ton POPs, 1.3 tons Cr6+, 3.6 ton Cu, Ni and their salt. These reductions are above the expected project levels. - Energy saving contributed to reduction of Mercury arising from the use of coal in the thermal power plants.

		reduced from selected industries 15 g TEq/y of U-POPs reduced from selected industries.		
Component/ Outcome 4: Project M&E, Dissemination of project result, lesson learned and experience	**Indicator 1:** number of monitoring activities have been carried out	Financial auditing and other monitoring activities carried out.	**S**	- Audit conducted in Dec. 2019 and in Dec. 2020. - PSC meetings held every year. - PMU regular missions to demonstration companies.
	Indicator 2: number of Evaluation activities have been carried out.	Project reporting and planning continued until project end -Terminal Evaluation carried out and submitted to GoM, UNDP and GEF.		- UNDP and PMU had monthly reviews of project activities. - AWP prepared every year. - Annual report prepared and submitted to UNDP and MOIT. - PIRs prepared every year. - Quarterly reports prepared and submitted to UNDP and MOIT. - TE evaluation completed in September 2021.
	Indicator 3: availability and sustainability of knowledge management in place (including project materials and experience sharing)	Project result, lesson learned and experience widely disseminated		- Project experiences and lessons learned during GC implementation in the 2 companies were shared with relevant stakeholders, but these were not presented to this evaluator. - Report of lessons learned is pending to be presented to this evaluator.

RELEVANCE ANALYSIS

The proposed project is entirely in line with the Viet Nam 2007 NIP and addresses 6 of the 15 priorities taken up in the NIP (Priorities No. 8; 11; 12; 13; 14; and 15). Therefore, it can be concluded that the proposed project is entirely consistent with Viet Nam's National Strategies pertaining to POPs. It is also in-line with national strategies and plans in particular to the National Strategy on Environment Protection (NESP) to 2020 with Visions to 2030 and Viet Nam Sustainable Development Strategy (2011-2020)

The project is consistent with GEF 6-Chemicals and Waste Focal Area Strategy in support of the Chemicals and Waste Strategic Objective 1 (CW1) and Strategic Component 2 (CW2).

The project has successful collaboration and coordination between PMU and other stakeholders including the relevant ministries (MOIT, MONRE, MOST), Viet Nam Environmental Protection Fund, Local Government Agencies, association and NGOs, institution and education sector, private sector manufacturers, and UNDP.

The TE team would rate the relevance of this project results as **satisfactory (S).**

EFFECTIVENESS ANALYSIS

The project contributed to the fulfillment of the national expectations with regard to the promotion and application of Green Chemistry principles in Viet Nam. A Green Chemistry Cell was established and will be directed by the Chemical Association of Viet Nam (CSV), technical guidelines for 6 industrial sectors and provided inputs into the Law on Chemicals review. The demonstration pilots were successful and contribute to the promoting among other enterprises the benefits and advantages of applying GC principles. Last but not less important reductions in POPs and U-POPs emissions were obtained.

Although there were some delays because of the COVID-19 pandemic measures most of the planned activities were completed using virtual resources.

A gender mainstreaming plan was developed at the beginning and to a certain extent, not the best in terms of actions taken, the actions were completed in assurance of women participating in consulting positions, equal participation in awareness raising and training activities among others.

The TE team's rating for the project effectiveness as **satisfactory.**

EFFICIENCY ANALYSIS

The budget invested in project activities and the resulting outcomes were well balanced and there was an efficient use of the funds. The total project expenditures till TE date only reached 77% of the original GEF grant of USD1 999 800. Although the total GEF grant was not disbursed, the positive results obtained were the product of an efficient use of the funds and the important stakeholder participation in fulfilling their committed co-financing in 17.4% above of the original amount. All project activities were completed in most cases above and beyond the expected results.

There was a project extension request and approval not because of implementation inadequacies but because of the COVID-19 pandemic restrictions that made it almost impossible to carry out activities during the year 2020.

The TE team would rate the efficiency for this project as **satisfactory.**

Table 14. Assessment of Outcomes

Assessment of Outcomes	Rating
Relevance	**S**
Effectiveness	**S**
Efficiency	**S**
Overall Project Outcome Rating	**S**

SUSTAINABILITY: FINANCIAL, SOCIO-ECONOMIC, INSTITUTIONAL FRAMEWORK AND GOVERNANCE, ENVIRONMENTAL, AND OVERALL LIKELIHOOD.

FINANCIAL SUSTAINABILITY

Probably the most important element of financial sustainability is concentrated in the government agency VEPF that gives loans for initiatives such as the application of GC principles in companies. This along with the revision of the Law on Chemicals that could provide incentives for GC applications is another factor that could assist in the financial sustainability.

The benefits that the application of GC in companies, such a marketing improvement, production cost reduction are all positive inputs to make the sustainability even more probable after the GEF funds have finished.

The above elements all contribute the likelihood of financial sustainability of the project results obtained to date; therefore, the TE team would rate the financial sustainability as **likely (L).**

SOCIAL-POLITICAL SUSTAINABILITY

The awareness raising activities have been important to strengthen information regarding the global environmental and health benefits that applying GC principles for the population in general to understand and accept the necessary changes.

The project is in line with Vietnam's NIP plan priorities with respect to chemical and hazardous waste management so there is no political risk identified in this sense.

The positive results of the pilot demonstrations is something that will strengthen the desire of other companies to follow suit in taking measures to approach the GC application. These experiences were shared with the industrial companies, but unfortunately the lessons learned were not documented by the PMU on a continual basis.

All these stakeholders understand it is in their best interest to give the positive results obtained continuity in the future as well as their enhanced improvement. The TE team would rate the social-political sustainability with a **likely (L)** rating**.**

INSTITUTIONAL FRAMEWORK AND GOVERANCE SUSTAINABILITY

Through the project the institutions that primarily are involved with GC such as MOIT/VINACHEM, MONRE and VEPF have worked to strengthen their entities to move forward with the application of GC principles. The revision of the Law on Chemicals should be an instrument to strengthen these institutions even more in their work.

Another important aspect is that GC principles are being included in the curriculum of several universities in Viet Nam such as Hanoi University of Science and Technology, Hanoi University of Industry, Phenikaa University, Viet Nam Institute of Industrial Chemistry to name a few. The inclusion of these important chemical management principles in the preparation of the new professionals will support even more the goverance sustainability.

The TE team gives this aspect a **likely (L)** rating.

ENVIRONMENTAL SUSTAINABILITY

The environmental and health benefits that are produced with the proper application of GC principles in industrial activities is a guarantee of the environmental sustainability.

The reductions obtained in POPs use and U-POPs emissions along with the reduction of the generation of mercury waste along is a positive element towards the environmental sustainability. There were environmental and health benefits that obtained.

The TE team based on the above gives the environmental sustainability a rating of **likely (L).** Table 15 summarizes the sustainability ratings

Table 15. Sustainability Ratings

Sustainability	Rating
Financial resources	**L**
Social-political	**L**
Institutional framework and governance	**L**
Environmental	**L**
Overall Likelihood of Sustainability	**L**

Table 16. Sustainability Ratings Scales

Ratings	Description
4= Likely (L)	There are little or no risks to sustainability

3= Moderately Likely (ML)	There are moderate risks to sustainability
2= Moderately Unlikely (MU)	There are significant risks to sustainability
1= Unlikely (U)	There are severe risks to sustainability
Unable to Assess (UA)	Unable to assess the expected incidence and magnitude of risks to sustainability

COUNTRY OWNERSHIP

This project is totally consistent with Vietnam's National Strategies pertaining to POPs. It is also in line with the priorities established in the Viet Nam 2007 NIP as well as several national strategies and plans indicated in the PIF. In the recent updated NIP for the Stockholm Convention new POPs such as PFOS and PBDEs were included.

The results obtained in this project have been included as inputs into the revision of the Law on Chemistry and in VINACHEMIA's work on Vietnam's "National Strategy on Development of the Chemical Industry".

The most important stakeholders MOIT/VINACHEMIA and MONRE were very much involved in the planning and implementation in both the operational aspects as well as in the PSC. There were also participantion in the PSC from other government institutions such as MOST and VEPF.

Through the government agency VEPF loans there is an important financial commitment for the project results sustainability. These are just a few reasons why the TE team considers that Viet Nam has shown ownership of their country responsibilities and committed multiple resources to the success of this project.

GENDER EQUALITY AND WOMEN'S EMPOWERMENT

After having reviewed several project documents: Gender Mainstreaming Action Plan, the Gender Mainstreaming reports (2018-2019, 2020) and the corresponding PIRs that have information regarding gender mainstreaming the following can be concluded:

At the design phase the gender mainstreaming was developed in the hope of ensuring several aspects:

- Equal opportunity to jobs.
- Assessment of the exposure to dangerous chemicals in the targeted industrial sectors to identify differences in the risks for men and women and identify measures to reduce these risks.
- Encourage conditions for women to be members of the GC Cell and in the promotion of CSR to improve safety conditions in the workplace for the workers.
- Equal rights to access of information and training.
- Development of awareness raising materials specifically developed for male and female workers.

This action plan identified gender-mainstreaming indicators to evaluate the project implementation process. These indicators are :

- Number of male and female employed in project implementation, for each category of work.
- Percentage/ratio to male and females attending workshops and training courses.
- Gender differential risk are considered in the chemical risk assessments and sector feasibility studies, which plan to conduct for project-targeted industries.

The PIRs and the Gender Mainstreaming Reports have information that answers to some of the indicators that are identified above. These results are as follows :

- Average percentage of women participating in workshops and training sessions is 26%, although this amount increased in 2020 with a total of 45% participating in certain workshops.
    - This has resulted in women's improvement in understanding the issues of chemical management and GC principles. This permitted women to provide technical inputs to the process of integrating GC in industrial sectors contributing to the project's sustainability.
- For the selection of consulting firms, a 40% female requirement among its consultants was put into effect. Of the total project related employees, a total of 31% were women. This includes consultants and PMU staff.
- Women played an important role in policy development and the formulation of legal documents and technical guidelines.

The inclusion of GC principles in university curriculum is not an indicator as such but it will promote gender equality with the technical expertise of more women understanding and implementing GC actions in future jobs.

The project monitored annually the fulfilment of the Gender Mainstreaming Plan. The GC Cell has a total of 61 members of which 19 are women, which represents 31% of the total.

The project contributed in a moderate amount to the closing of gender gaps within the chemical industrial production sector. This also enhanced women's participation in CSR and the implementation of GC principles in industrial sectors through their participation in legal and technical documents and several awareness activities.

After having analysed all this information the TE team would give the gender equality and women's empowerment a rating of **satisfactory**.

This does not mean that there is not more space for improvement and the gaps indicated in the Gender Mainstreaming Plan still need to improve with more actions. Applying the Gender Results Effectiveness Scale (GRES) the effectiveness and quality of the gender related results would be Gender Responsive.

CATALYTIC/REPLICATION EFFECT

In assessing the catalytic role of this project, it is important to bring to the attention that the GC principles in chemical industrial processes are being applied in other countries because of market competitive necessity. This was one of the deciding factors that contributed to the participation of the two pilot demonstration companies. The TE team believes that experiences shared through the pilot demonstrations and lessons learned in this project will contribute to the replicability in other neighboring countries. This would mean that the catalytic role can be defined as scaling because the GC principles are being implemented and are widely becoming accepted and the market is requiring the necessary productive changes.

To demonstrate the positive results of the implementation of GC the pilot experiences in the two companies is good enough proof of improvement on site. Public awareness has been made on the reduction and use of POPs chemicals and the reduction of U-POPS emission and how this can positively affect the environment and human health throughout the country.

There was not an official exit strategy but within the results produced during the project implementation the necessary actions were taken to provide for the sustainability of goals obtained. The legal framework is being enhanced with the review of the Law on Chemicals. The training activities and the public awareness activities done are important factors to guarantee that the results obtained up until now will form part of the daily life requirements for the Viet Nam industrial sector that interacts with chemicals.

To enhance the already effective scaling up of this project it is necessary to continue with efforts to find new sources of project funding to give continuity with other relevant projects in both areas of interest.

PROGRESS TO IMPACT

According to the Theory of Change the following are the long-term impacts outlined:

a) Enabling environment for GC established.
b) Awareness on GC integrated.
c) POPs and Hg reduction of uses and releases sustained.
d) Knowledge management and M&E carried out.

Of these impacts established the following results were obtained regarding each one of them. An enabling environment on GC was established through many actions and products resulting to the implementation. One of them was the 2 demonstration pilots in the companies Nishu and Plato. This hands-on experience can be shared with other industrial production process and small-scale companies that were fearful of the original need to make changes in technology and equipment.

The incorporating of GC principles in the Law on Chemicals and in the National Strategy on Development of the Chemical Industry were efforts made to enhance the regulatory sustainability of GC in Viet Nam.

There were a total of 6 large workshops with an average of 26% of women involved. A particular workshop with a total of 485 persons trained, with 25.4% women attending on different POPs/Mercury management and POPs/Mercury free alternatives. These workshops and other awareness raising activities with Nishu and Plato staff on the reduction of POPs exposure with a total of 36% women attending completed the awareness on GC expected impact.

POPs and Hg reduction of uses and releases sustained was achieved with the two demonstrations companies, that together achieved a total reduction of 2.742-ton POPs, 1.3-ton Cr6+, 3.6-ton Cu, Ni, and their salts. The POPs reduction target was exceeded by 2.5 times.

The knowledge management has been handled by the project through different forms of communication such as TV programs, You Tube, Facebook, Websites, newspapers, and magazines. The more formal form of knowledge management and passing on of this know how to future professionals is being obtained through the incorporation of GC principles in the chemical students' curricula at the University level. There important universities participated in this effort. These universities contributed also to women's empowerment through the incorporating of these concepts to have more informed female professionals who can participate in the chemical production industry.

5. MAIN FINDINGS, CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED.

MAIN FINDINGS

1. The Project objective and its implementation results are totally in line with national priorities and UNDP and GEF strategic priorities.

2. The project design and the level of consistency in its implementation was well achieved.

3. The stakeholder involvement, particularly the MOIT and MONRE was slow initially however, efforts were made, and the Government along with the Project team, coordinated well and implementation improved subsequently. This has resulted in an important country ownership of the project in the chemical production sector that also provided useful synergies.

4. The Project was impacted by the COVID-19 pandemic in 2020 and 2021 and because of travel restrictions, national lockdowns many of the activities were slowed almost to a stop. To this date there are still COVID-19 lockdown measures, but the project has been able to reach of the 16 committed targets, the project has achieved 5 targets with 100% completion and the remaining 11 targets are between 80% and 95% of the expected goal.

5. A no-cost extension of 10 months was granted in 2020 because of the COVID-19 pandemic restrictions that slow down the project implementation. The closure date is now October 31, 2021.

6. The two demonstration sites were selected after a delay of 7-8 months. Since the implementation of GC principles implied possible changes in technologies, product formulation and in some cases equipment it was difficult to find partners that were willing to commit to these possible investments. The Plato Viet Nam J.S.C demonstration pilot (Electroplating sector) and Nishu Paint J.S.C., (Paint sector) were able to achieve a total reduction of 2.742-ton POPs, 1.3-ton Cr6+, 3.6-ton Cu, Ni, and their salts. The POPs reduction target was 2.5 times above the expected result.

7. The VEPF created an impact fund for GC and provided loans for a total of USD 3 040 000 to 7 projects that were interested in GC and environmental protection, including plastic recycling, energy-saving unburnt materials investment and energy-saving multi-material fluidized bed boiler investment.

8. A Green Chemistry Cell (GCC) was established and hosted by the Chemical Society of Vietnam. The fact that the CSV is hosting this GCC make it self-sustainable. The GCC consists of 61 members from different government agencies, private sector companies, academia, institutional exports, and associations.

9. A total of 6 basic technical standard and technical guidance for implementing GC in the target industrial sectors were completed. These industrial sectors are electroplating, solvent and paint, plastic, textile, pesticides, pulp, and paper.

10. GC input was provided by the project because of the demonstration projects and the capacity building training for use in the revision of the Law on Chemicals and the National Strategy on Development of the Chemical Industry.

11. Women's empowerment was enhanced through the active participation in the awareness raising and training activities, involvement in the project management team and in the inclusion of GC principles in university chemical curricula. A total of 26% of all activities had women involved and consulting firms had to have at least 40% of their staff women for tender purposes.

12. The originally committed co-financing for the project, as indicated in Table 9 Co-financing table, was USD 8 400 000. The actual co-financing that was used for GC work amounts to USD 9 863 990, which represents 17.4% above the original amount committed by the stakeholders. This is the result of the stakeholder's ownership, particularly government agencies, of the project and the results obtained.

13. The total financial implementation as of June 2021 is 61.72% of the total budget approved, even though the Development Activities are close to completion. From the

2019 PIR which reported a 9.13%, for the 2020 PIR a 37.85% and now a 61.72% in PIR 2021 a marked improvement in the budget execution has been achieved in 2021.

CONCLUSIONS

1. Considering all the restrictions from the COVID-19 pandemic the project has been able to continue its work and produce important advances toward the fulfilment of its objective; the reduction of the use and release of chemicals controlled under MEAs, other hazardous chemicals, improve energy and natural resource efficiency and reduce (GHG) emissions through the application of Green Chemistry principles in Viet Nam. The Government of Vietnam and PMU should be commended for their efforts to keep the project initiative alive during these difficult working times.

2. The finding of demonstration companies for the two pilots was difficult but once it was able to be done the results were very good. Both companies made the necessary investments because they were convinced that the applying of GC principles would produce savings and make them more competitive on the international and national markets.

3. There is a true country ownership of this project, and it is demonstrated through the high level of co-financing that was obtained, a total of 17.4% above of the originally committed amount. The largest investments came from government agencies such as VEPF and the Viet Nam Chemicals Agency. The private sector through the investments made by the two demonstration companies also was above the expected amount.

4. One of the most positive results of this project and that is not identified with an indicator, but it is the combination of all the results, is the enabling environment that has been created for GC principal application in Viet Nam. There are 6 industrial sectors that are aware of the social and environmental benefits and the economic savings that GC represents. There is a GCC that will give the different industries the necessary technical support needed. The university curricula will contain the GC principles and the demonstrative projects will be used to have on hand case experience in its application.

5. The results obtained in this project will be an important contribution to Vietnam's efforts to comply with the Stockholm Convention and the new POPs. The project has been successful improving national capacities to fulfill the country's responsibility to reduce and eliminate POPs/harmful chemicals, consequently achieving the objective of protecting human health and the environment.

6. The gender action plan was effective and facilitated gender mainstreaming objectives. Women's participation was apparent in the awareness raising and training activities done with a favorable percentage of participation. It would have been better to have a more balance participation of men and women, but for this first GC enabling environment effort the percentage is acceptable.

7. Taking note of the implementation progress, the project has been managed and progressed well despite difficult and unavoidable situation. The delay and challenges are mainly due to the pandemic.

RECOMMENDATIONS

No.	TE Recommendation	Entity Responsible	Time frame
1.	The COVID-19 restrictions will not be removed soon. When planning another project these should be taken into consideration within the timeframe and the possible activities to be undertaken. Unfortunately, this is a reality we must learn to live with in all aspects.	UNDP	N/A
2.	The Green Chemical Cell should continue working with the universities that have participated in the project to enhance the knowledge which the exchange that these experts can provide about actual GC applications.	CSV/GCC	2021-2022
3.	Since the Law on Chemicals under review, the MOIT and the MONRE should request to include monitoring and control responsibilities in the fulfillment of the application of GC principles in large and small companies so that they can exercise this function.	MOIT/MONRE	N/A
4	One of the expectations of this project was to create an enabling environment for GC application. The two demonstration companies experience should be used as an example for other companies to participate. Another project to create capacity building in small companies could be a possible initiative to explore.	UNDP/MOIT	2022
5	Gender equality and women's empowerment should be enhanced with more of this type of projects that venture into areas that traditionally have not had female participation as a norm.	UNDP	N/A
6	The results of the Nishu and Plato demonstration pilots should be made public in industrial forums or chemical associations to take multiply this among other sectors.	MOIT/UNDP	2021-2022

LESSONS LEARNED

1. Early in the project implementation it took some time for Nishu and Plato to step forward and accept to participate in the demonstration pilots. This might have been avoided had there been more information regarding possible financial loan support, like what VEPF provides, long term economic and market gained benefits to enterprises.

2. Although women's participation in industrial activities has been limited but with the inclusion of gender equality in professional training, such as university curricula, this can start to be changed as this project as proven.

3. COVID-19 pandemic has hit all countries very hard in 2020 and still in 2021, but what is important is the resilience that UNDP, PMU, MOIT, MONRE and all other institutions involved in the project were able to achieve to continue and obtain the expected results.

ANNEXES

A. Terms of reference
B. List of persons interviewed
C. List of documents reviewed
D. Evaluation question matrix
E. Co-financing table

F. TE Rating scales
G. Signed evaluation consultant Code of Conduct and Agreement
H. Signed UNEG Code of Conduct form
I. Signed TE Report Clearance form

Separate Annex File : TE Audit Trail

Separate Annex File: GEF/LDCF/SCCF Core Indicators

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