



REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: Full-sized Project

TYPE OF TRUST FUND: GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title: Implementation of eco-industrial park initiative for sustainable industrial zones in Vietnam			
Country(ies):	Vietnam	GEF Project ID: ¹	4766
GEF Agency(ies):	UNIDO (select) (select)	GEF Agency Project ID:	100052
Other Executing Partner(s):	National executing agency: Ministry of planning and investment (MPI)	Submission Date:	11/27/2013
GEF Focal Area (s):	Multifocal Area	Project Duration(Months)	36
Name of Parent Program (if applicable):		Project Agency Fee (\$):	352,400
	<ul style="list-style-type: none"> ➤ For SFM/REDD+ <input type="checkbox"/> ➤ For SGP <input type="checkbox"/> ➤ For PPP <input type="checkbox"/> 		

A. FOCAL AREA STRATEGY FRAMEWORK²

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount (\$)	Cofinancing (\$)
CCM-1 (select)	Technology successfully demonstrated, deployed and transferred.	- Innovative low-carbon technologies demonstrated and deployed on the ground. - GHG emissions avoided.	GEF TF	808,000	24,115,420
CCM-1 (select)	Enabling policy environment and mechanisms created for technology transfer.	National strategies for the deployment and commercialization of innovative low-carbon technologies adopted.	GEF TF	178,000	347,000
IW-1 (select)	Innovative solutions implemented for reduced pollution and improved water use efficiency.	Types of technologies and measures implemented in local demonstrations and investments.	GEF TF	488,000	8,509,845
IW-2 (select)	Innovative solutions implemented for reduced pollution of coasts.	Types of technologies and measures implemented in local demonstrations and investments.	GEF TF	288,000	9,589,000
(select) CHEM-1	POPs releases to the environment reduced.	Action plan addressing unintentionally produced POPs under development and implementation.	GEF TF	987,000	3,919,000
(select) CHEM-3	Contribute to the overall objective of the SAICM of achieving the sound management of chemicals throughout their life-cycle	Implementation of SAICM relevant activities incl. addressing PTS and other chemicals of global concern on a pilot basis.	GEF TF	775,000	3,117,000

¹ Project ID number will be assigned by GEFSEC.

² Refer to the [Focal Area Results Framework and LDCF/SCCF Framework](#) when completing Table A.

	in ways that lead to the minimization of significant adverse effects on human health and the environment.				
(select)	(select)		(select)		
Total project costs				3,524,000	49,597,265

B. PROJECT FRAMEWORK

Project Objective: Increased transfer, deployment and diffusion of clean and low-carbon technologies and practices for the minimization of GHG emissions, POPs releases and water pollutants as well as improved water-efficiency and the sound management of chemicals in industrial zones (IZ) of Vietnam.

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Cofinancing (\$)
1. Improvement of policy and guidelines to facilitate the transformation of industrial zones (IZ) into eco-industrial parks (EIP)	TA	<u>Outcome 1:</u> Legislation and policies on IZ planning and management, IZ environmental and industrial pollution management, responsibilities and investment facilitation for clean&low-carbon technology adopted to meet EIP criteria.	1.1: IZ policy and regulatory framework reviewed and formulated. 1.2: Centralized services for IZ evaluated, prioritized and proposed for implementation.	GEF TF	150,000	133,000
2. Capacity building on eco-industrial park (EIP) strategy and measures	TA	<u>Outcome 2:</u> Strengthened institutional capacities on eco-industrial park planning and management at central and provincial government level and IZ authorities in selected provinces. <u>Outcome 3:</u> Strengthened capacities on technology transfer, clean&low-carbon technologies and resource efficient and safe practices at company level in the selected IZ and government level.	2.1: Capacity on eco-industrial park planning and management built/strengthened among government staff and IZ authorities in the central and provincial level. 2.2: Technical capacity of IZ authorities in 3 project provinces strengthened to properly perform tasks and functions on the supervision of environmental protection in IZ. 3.1: Capacity built/strengthened to implement clean&low-carbon technologies and chemicals management. 3.2: Capacity on resource efficient and	GEF TF	370,000	930,000

			cleaner production (RECP) built/strengthened among company staff.				
3. Identification of eco-industrial parks (EIP) pilot projects	TA	<u>Outcome 4:</u> Potential for clean&low carbon technologies and resource efficient technical solutions identified and community enhancement projects clarified.	4.1: Companies for RECP and technology gap evaluation selected and assessed. 4.2: Strategic plans for IZ transformation developed. 4.3: Community enhancement projects identified and feasibility evaluated.	GEF TF	1,336,000	3,120,000	
4. Implementation of pilot projects in industrial zones and community and information dissemination	Inv	<u>Outcome 5:</u> EIP projects to reduce GHG, water consumption, water contaminants and unintentionally produced POPs demonstrated and community enhancement initiated. <u>Outcome 6:</u> Increased public awareness on issues concerning EIP development.	5.1: Companies for clean&low-carbon technology investment projects selected and investment projects developed. 5.2: Pilot clean&low-carbon technologies and practices established on identified production sites. 5.3: Pilot community enhancement projects established 6.1: Stakeholder engagement including NGOs, community representative and government established. 6.2: Development and implementation of training and awareness programs.	GEF TF	1,300,000	45,026,265	
5. Monitoring and evaluation	TA	<u>Outcome 7:</u> Effective project management, monitoring and evaluation implemented.	7.1: M&E mechanism developed and implemented.	GEF TF	200,000	125,000	
	(select)			(select)			
Subtotal						3,356,000	49,334,265
Project management Cost (PMC) ³				GEF TF	168,000	263,000	
Total project costs						3,524,000	49,597,265

³ PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME (\$)

Please include letters confirming cofinancing for the project with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount (\$)
National Government	Ministry of planning and investment (MPI)	In-kind	1,500,000
National Government	Ministry of industry and trade (MOIT)	In-kind	50,000
National Government	Ministry of science and technology (MOST)	In-kind	50,000
Local Government	Ninh Binh People's Committee	Investment	10,572,359
Local Government	Danang People's Committee	Investment	19,500,000
Local Government	Can Tho People's Committee	Investment	6,924,906
Bilateral Aid Agency (ies)	Green Credit trust Fund (GCTF) of seco	Cash	3,000,000
Others	Vietnam Environment Protection Fund (VEPF)	Soft Loan	5,000,000
Others	Vietnam development bank (VDB)	Soft Loan	1,770,000
GEF Agency	UNIDO (bilateral aid of seco)	Cash	1,000,000
GEF Agency	UNIDO	In-kind	200,000
GEF Agency	UNIDO	Cash	30,000
Total Co-financing			49,597,265

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY¹

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in \$)		
				Grant Amount (a)	Agency Fee (b) ²	Total c=a+b
UNIDO	GEF TF	Climate Change	Vietnam	986,000	98,600	1,084,600
UNIDO	GEF TF	International Waters	Vietnam	776,000	77,600	853,600
UNIDO	GEF TF	Persistent Organic Pollutants	Vietnam	1,762,000	176,200	1,938,200
(select)	(select)	(select)				
(select)	(select)	(select)				
Total Grant Resources				3,524,000	325,400	3,876,400

¹ In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

² Indicate fees related to this project.

1. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount (\$)	Cofinancing (\$)	Project Total (\$)
International Consultants	1,069,900	364,000	1,433,900
National/Local Consultants	875,200	35,000	910,200

2. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? (Select)

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF⁴

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.

The following information presented in this document builds on those provided in the PIF.

Based on the requests from the STAP review and on additional findings gained during project preparation amendments have been made to further clarify and strengthen project components, their outcomes and outputs. In order to allow for efficient and effective implementation of the project, component 2 was supplemented with a new output on technical capacity building in waste water monitoring and industrial pollution management and component 4 was supplemented to also define information dissemination. Monitoring and evaluation was added to component 5 to fully reflect the importance of these elements in the implementation of the project.

With regard to national strategies and plans further elaboration of the PIF elements is provided in the following. The proposed project is in line with the relevant national programs and policies stated in the “Proposed National GEF Portfolio in Vietnam 2010-2014” that represents Vietnam’s National Portfolio Formulation Exercise Document (NPFE). Particularly, the project is consistent with and addresses the selection criteria, as well as the guiding policies and national priorities for the use of GEF 5 funds, identified by Vietnam.

1. The Technology Needs Assessment for Climate Change Mitigation in Vietnam (TNA 2012) states that energy use technologies are outdated, with old equipment and energy consumption 1.2 – 1.5 times higher than the regional standards. Replacing low-efficiency technologies with new, low-carbon ones is inevitable. Transfer and application of advanced technologies are demanded to meet the target of social and economic development needs in the future. In energy use the TNA identified following situation present in numerous Vietnamese enterprises:

- Small-capacity, low-pressure steam generator technology, fuelled primarily by coal or petrol
- Small-scale, low-efficiency furnaces or kilns still dominant in various industries including construction
- Outdated electrical machines and appliances
- Industrial air conditioning, cooling or freezing technologies mostly old and obsolete

Among other low-carbon technologies TNA mentions exemplarily the implementation of integrated energy use strategy to increase electricity generation efficiency, in which combined heat and power (CHP) technology is prioritized for industrial zones that consume both heat and electricity. The TNA identified common barriers and inefficiencies for technologies, among these are 1) Economic barriers like lack of investment incentive mechanisms and subsidization schemes, difficulties in accessing financial resources from commercial banks due to low rate of return, low electricity prices compared to the international standard, therefore lack of attractive electricity generation or energy-saving projects, high capital cost and 2) support barriers like insufficient technology information and technical assistance, lack of a network of equipment suppliers, limited technical and operation and maintenance (O&M) capacity. To overcome the barriers recommended solutions for energy efficiency are 1) developing incentives for importing production technologies and concessional loans for national businesses to invest on, innovate or deploy new production technologies, 2) increase information on new technologies, equipment suppliers, and raise awareness on the benefits of energy-saving technologies and 3) support businesses to expand their cooperation with international partners in terms of sharing experience of how to enhance product quality. The eco-industrial park initiative will considerably contribute to at least two solutions to overcome the aforementioned barriers.

2. The Vietnamese government approved in 2008 the National Target Program to Respond to Climate Change (NTP). The goal of the program is to develop feasible action plans to effectively respond to climate change,

⁴ For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter “NA” after the respective question.

in the short and long term, in order to ensure the country's sustainable development and make use of low-carbon economic growth opportunities. The program sets out nine tasks, including development and implementation of a national technology program, and research of technologies that adapt to climate change and mitigate GHG emissions.

3. In 2012 the Vietnamese government approved the national Green Growth Strategy (1393/QD-TTg) for the period 2011-2020 with vision to 2050. Green growth, as a mean to achieve the low carbon economy and to enrich natural capital, shall become a dominant trend in sustainable economic development which requires that mitigation of green house gas emissions and increased capability to capture green house gas are gradually becoming essential indicators in social-economic development. Strategic targets are to reduce GHG emissions until 2020 by at least 8% and energy consumption per unit of GDP by 1% per year. Sectoral master plans will be adjusted to ensure the economically efficient use of natural resources including water and materials based on environmentally friendly technologies and equipments and controlling and treating pollution. The rate of manufacturing businesses that meet environmental standards shall reach 80% by the year 2020. The Green Growth Strategy also summarizes solutions for target achievement. Among other essential measures are 1) communication and awareness improvement as well as knowledge and management skills enhancement for public government staff and enterprises, 2) improving energy performance and efficiency as well as consumption in production, 3) revision of master plans for production sectors that generate huge waste, environmental pollution, degradation and creating favorable conditions for developing new green production sectors, 4) economic and efficient utilization of natural resources through forming of effective administrative organizations and promoting as well as disseminating technologies and practices that efficiently use natural resources, 5) technology innovation and wide application of cleaner production according to the national strategy on cleaner production in industry, 6) standardization in urban planning and architecture and 7) strengthen the international cooperation for creating favorable conditions for private and state-owned enterprises for technology transfer and human resource development.
4. In 2010 the Vietnamese PM approved the list of high technologies prioritized for development investment and the list of high-tech products eligible for development promotion (49/2010/QD-TTg). Governmental organization shall promote and facilitate the implementation especially of technologies for converting and storing renewable energy sources and power generators powered by solar energy.
5. In 2012 the Vietnamese government approved the National target program on energy efficiency and conservation phase 2012-2015 (1427/QD-TTg). One important goal of the program is to improve the energy end-use efficiency in industrial manufacturing and to promote high performance equipment and facilities. Objectives encompass 1) strengthening of dissemination and awareness raising for energy efficiency, conservation and environmental protection among involved decision makers, 2) arrangement of training and issuing certification on energy management to more than 2000 people in industrial production, 3) replacement of low-performance equipment and application of technical standards to improve energy efficiency in production and business activities, achievement of 4) at least 10% of reduction in energy intensity in steel, cement, textile and apparel industry and 5) implementation of mandatory management in compliance with construction standard "energy efficiency in construction of buildings" and application of high-performance lighting.
6. The objective of the National program on sustainable consumption and production (NPSCP) 2010-2020 is to reduce the material and energy intensity within the systems of production and consumption by increasing their efficiency and optimizing in particular through substitution of materials, processes, products and services. Priorities are the development of mechanisms and policy instruments related to the efficiency of energy, water and raw material use in the industry and promoting the 3R economy for effective use of resources and waste minimization.
7. To promote the implementation of environmental protection and sustainable production the Vietnamese PM has signed in 2009 a decision to approve the National Strategy on cleaner production in industry until 2020 (1419/2009/QD-TTg), which aims to improve efficiency of natural resources, fuel and raw material use, to reduce waste and mitigate pollution, to protect and improve the environment and human health.
8. In 2006 the Vietnamese ministry of industry and trade (MOIT) issued a report on the "Real state of technological qualification of industrial branches" (TDCN-BCN). The report revealed inadequacies of

technologies and insufficient investments in several industry sectors. In mechanical processing equipment is widely outdated with a life of installation of more than 25 years. In steel industry the technology qualification is at average and low level. Numerous steel enterprises have not recognized the significance of satisfactory investment. Vietnam's paper industry has a low level of technology and invested on a small scale. Except for a few big companies, the installed equipment is of low quality and production efficiency is low. In textile industry the installed technology is often outdated compared to the region. According to the report 45% of the equipment need to be upgraded and 30-40% need to be replaced. Different technology levels exist in this sector though. For the dyeing and finishing industry the technological level is assessed at average level. In the brewing sector companies with large production capacity have had intensive investment projects, innovation and modernization of technology. However small and medium sized companies still operate traditional and often inefficient technology in most of the stages of the production process.

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

9. The reason for using a multi-focal area project for implementing cleaner production and technology transfer lies in the multi-faceted nature of environmental problems in companies of industrial zones (IZ). Most measures are not for single focal areas, but several are affected simultaneously. In addition, different focal areas can be complementary. The promotion of innovative energy-efficient technologies, for example, may lead to efficient water usage and/or UP-POPs reduction. When implementing cleaner production and clean&low carbon technologies, the measures and their effects should thus be assigned to different focal areas and a multi-focal area project approach adopted. The project is in line with the GEF5 multi-focal strategies and fits into following objectives:

10. Climate change:

GEF 5 CCM-Objective No. 1: “Promote the demonstration, deployment, and transfer of innovative low-carbon technologies”

Under the selected CCM-Objective No. 1 the project aims at the deployment and **diffusion of innovative low-carbon technologies** not yet present in Vietnam for energy cascading, inter-plant energy flows and production process re-design in pilot companies of the selected industrial zones through investment and local capacity building. By waste heat recovery and low-carbon heat generators fossil fuel for power generation will be reduced and GHG emissions substantially avoided.

The GEF support will also involve the demonstration, deployment, and transfer of **priority technologies** identified by Vietnam that are commercially available but have not been adopted in their particular industries.

Beside the technical component the project will contribute to the adaptation and enforcement of regulations on industrial zone planning and management **enabling the future transfer of innovative low-carbon technologies** to industrial zones.

11. The proposed project is in alignment with:

- The Technology Needs Assessment for Climate Change Mitigation in Vietnam (TNA 2012), see part II, A1.
- The priority areas identified in Vietnam’s National Communication (NC) to the UNFCCC submitted in 2010

According to the NC the Vietnamese economy has a low efficiency in the use of raw materials, fuel and energy. This is due to the use of old and outdated equipment and technology and the inadequate management of energy utilization. Outdated and/or incompatible technologies are used in the cement, steel and construction materials industries but also in pulp and paper production, food processing such as brewing industry, soft drink production and fish processing that lead to high GHG emissions. Moreover there is strong need of capacity building in technology development and transfer. The proposed eco-industrial park initiative corresponds to the concerns of the NC.

- Vietnam’s GEF National Portfolio Formulation Document (NPF)

12. International waters:

1) *GEF 5 IW-Objective No. 1: “Catalyze multi-state cooperation to balance conflicting water uses in trans-boundary surface and groundwater basins while considering climatic variability and change”*

2) *GEF 5 IW-Objective No. 2: “Catalyze multi-state cooperation to rebuild marine fisheries, and reduce pollution of coasts and Large Marine Ecosystems (LMEs) while considering climatic variability and change”*

The project concentrates on two **transboundary surface water basins**, the Mekong and Red river deltas as well as on the **Large Marine Ecosystem** in Danang region and the Gulf of Tonkin in the South China Sea. Through the application of new technologies for closed water loops and water cascading in industrial zone industries **water use efficiency** will be improved and **groundwater sources preserved**. Moreover through the substitution of raw materials minimization of transboundary toxic water pollutants will be achieved contributing to **reduced land-based pollution** of large marine ecosystems (LME) and surface water as well as reduced intoxication of transboundary vital fish-species.

13. The proposed project will lead to significant **stress reduction** on international eco-systems in the transboundary river basins (Mekong and Red river, surface and groundwater) and the South China Sea (marine living resources incl. fish stocks). Consequently both GEF 5 international waters objectives, IW-1 and IW-2, are applied for the proposed initiative. Therefore, the project is in alignment with the priorities identified in Sustainable Development Strategy for the Seas of East Asia (2003), Strategic Action Programme for the South China Sea (2008), and Mekong Water Resources Assistance Strategy (2006).

14. Chemicals:

1) *GEF 5 CHEM-Objective No. 1: Phase out POPs and reduce POPs releases*

2) *GEF 5 CHEM-Objective No. 3: Pilot sound chemicals management and mercury reduction*

The project seeks to reduce the release of **un-intentionally produced POPs** (dioxins and furans) from industrial activities in the selected three pilot industrial zones through the application of BAT and capacity building on BEP for existing and new sources and the wide dissemination of results to other industrial zones. Among the relevant sources for dioxins in the industrial zones will be waste incineration, pulp production, aluminum/copper/zinc recycling, steel recycling, cement production and industrial coal/oil fired boiler systems. Moreover PCB compounds used in industry as heat exchange fluids and in electric transformers will be addressed as they appear.

15. With regard to un-intentionally produced POPs the project links the activities with the GEF 5 climate change objective No. 1 on the transfer of innovative low-carbon technologies.
16. Selected companies in industrial zones will be supported in achieving sound management of chemicals of global concern as stipulated in the SAICM policy framework. Special emphasis is put on technology transfer and pollution prevention through materials substitution as well as on waste minimization and disposal. Furthermore dangerous existing contaminated sites of industrial activity will be identified and means for monitoring or remediation will be developed.

A.3 The GEF Agency’s comparative advantage:

17. UNIDO has comparative advantages in the development and implementation of Industrial Resource efficient and Cleaner Production projects. With its mandate to promote sustainable industrial development, UNIDO has positioned itself as one of the most relevant player to assist industries of both developing countries and economies in transition. UNIDO has long-standing sector-wide experience with technical, policy and financing aspects of efficiency improvement in manufacturing and process industries. UNIDO is internationally recognized as leading advocate and technical assistance provider for resource efficient and cleaner production policies, industrial energy system optimization and energy management systems. UNIDO has supported resource efficient and cleaner production programmes for many years and actively supported the set-up of a Vietnamese cleaner production network. In particular UNIDO started cleaner production activities already in 1996 in Vietnam and launched the Vietnam Cleaner Production Centre (VNCPC) by the end of the 90’s. In the meantime the VNCPC has grown to a national centre of excellence recognized by the national stakeholders and successfully operating in its field of activities.

18. In addition UNIDO together with UNEP promotes the transition towards sustainable industrial systems in developing and transition countries specifically with the new joint programme on resource efficient and cleaner production (RECP) launched in 2009. This programme aims to improve the overall resource efficiency and environmental performance of businesses. RECP builds upon cleaner production in accelerating the application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment. During project development UNIDO will support the project team in consulting with relevant projects under the RECP and international energy conservation projects with regard to the transformation of IZ.

A.4. The baseline project and the problem that it seeks to address:

Baseline situation:

19. Vietnam has experienced sustained rapid economic growth over the last ten years mainly driven by widespread growth in the processing and manufacturing sectors. Government entities have created industrial development zones to facilitate the establishment of new industries with the provision of infrastructure like utility, water and effluent treatment. At the beginning of 2011 an estimated 260 industrial zones (IZ) exist in Vietnam located in 56 provinces from which 173 were put into operation. The Vietnamese government approved a master plan for the period 2006-2015 that targets on the establishment of 115 new industrial zones and the expansion of 27 existing ones resulting in an overall area of more than 700 km². In total 458 km² are industrial land for rent (January 2011). Most IZ are located in the important economic areas of the country (Southern Vietnam 124, Central Vietnam 23, Northern Vietnam 52). Industrial zones contribute significantly to the development of the national economy that has showed an average annual GDP growth rate of 7% during the last years. Industrial zones make up 26% of the total export value of the country and 38% of the country's GDP. Industrial zones therefore significantly contribute to drawing investments into the country, especially foreign investments. The socio-economic importance is also reflected in the number of jobs created. Industrial zones employed 1.17 million staff by the beginning of 2009.
20. The industrial growth in Vietnam has brought about adverse change in environmental quality. Basic environmental legislation is in place nevertheless, instruments and practices have not been sufficiently made available to lower the environmental impact so far. Approximately 70% of waste water from industrial zones is directly discharged in the water receivers without any treatment causing severe pollution of surface water as well as large marine ecosystems and negative impact on agriculture, aquaculture and on the supply of drinking water. Because of the competition between provinces to attract investors to IZ there is pressure on provincial authorities to relax environmental standards and for IZ authorities to minimize fees and charges made to IZ tenant companies for infrastructure services. The total solid waste from industrial zones has steadily increased in the recent years. The proportion of hazardous solid waste amounts 20% of the total, the amount of recyclable waste is very high. At present the collection, transportation, recycling and reuse of the solid waste from industrial zones is insufficient. Air pollution is concentrated on industrial zones with enterprises using obsolete technologies or not equipped with air emission treatment systems. Moreover outdated technologies for energy intensive processes in industrial zones excessively emit greenhouse gases and contribute to climate change.
21. Total primary energy consumption is increasing. Primary energy consumption, which totaled 32,235 kTOE in 2000, increased to 58,370 kTOE in 2009. In terms of energy share, total final energy consumption rose from 26.28 million TOE in 2000 to 46.77 million TOE in 2009, with coal consumption rising from 12.3% to 19.2%, oil and petroleum from 26.3% to 33.9%, gas from 0.1% to 1.4 % and electricity from 7.3% to 14.1%. The fast-paced economic development and GDP growth lead to high demand for natural gas, electricity and especially coal for the manufacturing industries and residential activities.
22. Environmental pollution has greatly influenced human health of the communities living near IZ resulting in economic losses in terms of health care service fees and lower income. The annual economic loss to people living in the areas influenced by contaminating plants is usually 3.5 times as high as that in areas without such influences. Employees directly exposed to contaminated environment in IZs often show occupational hazards such as pneumoconiosis, bronchitis and hazards caused by chemicals [2]. The environmental management of industrial zones is rather weak and their development often shows limited awareness of environmental issues. In order to reach the country's objective of continued sustainable economic growth actions beyond classic environmental protection measures are required.

23. The large number of industrial zones in Vietnam makes the development of these into eco-industrial parks (EIP) very desirable. Improving the environmental, social and economic performance of companies at this scale would make a significant contribution to the companies and park management, to neighbouring communities and to sustainable development. By working together, the EIP community of manufacturing and service businesses located together on a common property seeks a collective benefit that is greater than the sum of individual benefits each company would realize by only optimizing its individual performance. The goal of an EIP is to improve the economic performance of the participating companies while minimizing their environmental impacts. Components of this approach include green design of park infrastructure and plants (new or re-engineered), cleaner production, energy efficiency and inter-company partnering. An EIP also seeks benefits for neighbouring communities to assure that the impact of its development is positive. The EIP is a point of leadership and leverage for change in its region's and national industrial community. A park seeking to become an eco-industrial park can act as a hub of a national eco-industrial network through its own improvement projects and through the connections of its factories with suppliers and customers outside the estate's border. (ADB, EIP, E.A. Lowe 2005).
24. It was identified that scaling-up and extending resource efficient and cleaner production through industrial parks is a necessity in Vietnam [2]. The consideration of unique opportunities to combine enterprise level initiatives to reduce waste and emissions with collective opportunities to recover and reuse wasted by-products lags behind the development of new industrial zones. Thus, the present project aims at transforming existing industrial zones into EIP through Cleaner Production, Resource efficiency and Exchange of by-products and energy.
25. National finances and knowledge of appropriate environmental protection measures, particularly in the areas of climate change, waste water management and chemicals management are also limited in Vietnam. Reducing greenhouse gases, effluent treatment and safe chemicals use represent a major challenge particularly for SME. The reasons for this, amongst other things, lie in a lack of awareness of new, environmentally-friendly technologies and practices as well as in insufficient framework conditions (finance, legislation). Although a national environmental policy as well as the relevant legislation has been developed in recent years, these are highly fragmented and need to be improved in order to be effective.

Baseline project:

26. Previously, the Vietnamese government reacted to the situation by implementing various action programmes related to the need for optimising industrial processes, which were broad-based and not restricted merely to industrial zones. These action programmes were and will be implemented without regard to the GEF project proposed here and represent the baseline project, in order to reduce the afore-mentioned environmental problems. Numerous action programmes have ended in the meantime, with the broad implementation of environmental protection measures in industry not yet being achieved. The completed, nationally-significant industrial cleaner production activities included the "Development cooperation in environment (DCE)" programme with a cleaner production component (2005-2010), which was implemented by the Ministry of Industry and Trade (MOIT), the "Promoting Resource Efficiency in Small and Medium-sized Enterprises" project, supported by UNEP (2009 - 2010) as well as, in the product optimisation sector, the "Cleaner production for better products" project, which was supported by the European Union (2007-2009).
27. Current significant programmes include the five-year project "Vietnam Provincial Environmental Governance Project (VPEG)" (2009-2013), which focuses on the application of industrial pollution prevention strategies and the implementation of industrial pollution management (IPM) provisions in companies at provincial level. An important element of this is training authorities' representatives, allowing VPEG to support the Ministry of Natural Resources and Environment (MONRE) in improving IPM policy and the legal framework conditions. The project's specific focus is the planning, budgeting and management of public resources destined for environmental protection, supporting industrial pollution prevention measures (such as cleaner production) and enforcement of legislation in the industrial pollution sector. Most activities are designed to improve the skills and responsibilities of law enforcement agencies, such as MONRE and DONRE.
28. At present the Ministry of Planning and Investment (MPI) is implementing a project on industrial pollution management in Nhue-Day and Dong Nai rivers watershed [4]. This initiative is targeted on capacity building for provincial government on strengthening environmental compliance of industries. The MPI is also implementing the industrial pollution management project launched in 2012 to improve compliance with industrial waste water treatment regulations in four of the most industrialized provinces in Vietnam.

29. To implement the Prime Minister's Decision approving the National Target Programme to Respond to Climate Change [1], the Ministry of Industry and Trade (MOIT) has taken initiative in coordinating bodies in and outside the ministry, national and international consultants to develop an Action Plan on responding to climate change for the Ministry of Industry and Trade [3]. With the function of management relating to the industrial and trade sector, MOIT has also been assigned by the government the task of taking the lead in implementing the National Target Programme on the "Economical and Efficient Use of Energy" and the "Biofuel Development until 2015, with vision towards 2025" scheme. The outcomes of the action plan between now and 2015 will contribute to increasing the capacity to adapt to climate change and minimise greenhouse gas emissions, thus practically implementing National Target Programmes in industrial and trade operations. Specifically, the action plan encompasses, besides the identification of climate change risks to some key industrial and trade sectors, the control of greenhouse gas emissions in industrial production processes and trade activities. Furthermore, the action plan requires the transfer of green, climate-friendly technologies to energy-intensive sectors like steel, chemicals, metallurgy etc. on the basis of calling for international assistance in terms of financial resources and technologies and the deployment of the technologies in selected demonstration projects. The action plan specifically calls for increasing and diversification of funding sources for the implementation especially from international supporting programmes, as funds from the state budget are not sufficient to support relevant technology investments and capacity building.
30. Vietnam's government launched the Vietnam National Energy Efficiency Program (VNEEP) for the period 2006–2015, which was prepared by the Ministry of Industry and Trade (MOIT). The VNEEP is a national target program, and the first comprehensive plan for improving energy efficiency and conservation (EE&C) in all sectors of the economy in Vietnam. Despite initiatives for energy efficiency from both the government and donor side, significant barriers remain such that many energy-saving opportunities remain unexploited. The government's support under the VNEEP for key industries to improve, upgrade and optimize technologies aimed at energy saving and efficiency remains challenging. Many industrial enterprises do not consider energy efficiency a priority due to lack of awareness of the potential savings as well as the available technologies. They tend to carry out minimal or low cost energy efficiency measures while focusing on capacity expansion to modernize their operations and improve competitiveness and profitability. To the extent that they are aware of opportunities for larger energy savings, they tend to shy away from risks associated with these due to insufficient in-depth knowledge and expertise [6].
31. By becoming a party to the Stockholm Convention from its beginning, Vietnam has demonstrated that the reduction or elimination of POPs releases is a respective national priority and that it is committed to take appropriate actions. Since 1993, Vietnam has paid close attention to the management of POPs and other toxic chemicals. The Government has adopted a series of legal documents on prohibition of the production and use of all POPs pesticides in Vietnam. DDT and Lindane have been officially prohibited since 1993. All nine of the POPs pesticides covered by the Stockholm Convention have now been prohibited from use. PCBs are only imported and used under strict conditions pursuant to the regulations of the Ministry of Industry (MOI). Vietnam has, with the financial assistance from GEF, studied the POPs situation in the country and elaborated a National Implementation Plan (NIP) detailing the legislative, management as well as technical needs for reducing and eliminating POPs. In 2004, under the UNDP/GEF NIP preparation project, an inventory and assessment of unintentional production sources of POPs in Vietnam was conducted. This task relied on cooperation among various relevant authorities, localities, consultants and domestic and international experts. Data were analyzed by cities/provinces and then integrated by regions. There are 2,130 likely Dioxins/Furans release sources in Vietnam. By sector, the proportions are production of minerals (29%), ferrous and non-ferrous metal production (25%), production and use of chemicals and consumer goods (5.5%), heat and power generation (17%) and waste incineration (9.5%). The action plan section of the NIP details priority areas to be tackled by 2020. According to the action Plan, Vietnam is to apply BAT and promote BEP in new sources in priority (Part II of Annex C of the Stockholm Convention) source categories. UNIDO has supported these efforts by initiating the project "Introduction of BAT and BEP methodology to demonstrate reduction or elimination of unintentionally produced persistent organic pollutants (UP-POPs) releases from the industry" which was finalized in 2010. According to the NIP the sector-wide introduction of BAT/BEP is planned to be completed by 2020. The priority for the application of BAT/BEP to reduce and finally eliminate the unintentional production of POPs from production activity stated in the NIP is high. Equally high priority has the sound management, disposal and phase-out of PCBs and PCB-containing electrical equipment and industrial products until 2020 according to the NIP [7].

32. Further supporting strategies of UNIDO in the region are as follows: UNIDO launched the programme on “Green Industry for a Low-Carbon Future”, a strategy to support green industrial growth in the developing world. Based on European experience the programme encompasses the development of policy instruments aimed at raising resource efficiency on the level of companies and products that foster economic growth and international competitiveness. Further UNIDO/GEF projects in the region are "Reducing GHG and ODS Emissions through the Technology Transfer in Industrial Refrigeration" and "Promotion of Energy Efficient Industrial Boiler Adoption and Operating Practices in Vietnam".
 33. In addition UNIDO’s programme on resource efficient and cleaner production (RECP) worldwide and particularly in Vietnam forms a strong baseline for the proposed GEF project. RECP builds upon cleaner production in accelerating the application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment. During project implementation UNIDO will support the project team in consulting with relevant projects under the RECP and international energy conservation projects with regard to the transformation of IZ.
 34. UNIDO started cleaner production activities already in 1996 in Vietnam and launched the Vietnam Cleaner Production Centre (VNCPC) by the end of the 90’s. In the meantime the VNCPC has grown to a national centre of excellence recognized by the national and international stakeholders and successfully operating in its field of activities that can provide relevant local support to this GEF project in terms of awareness raising, finance, training and technical assistance.
 35. The proposed GEF project is therefore fully in line with UNIDO’s strategies and the related declarations adopted by Asian countries including Vietnam.
 36. The selected IZ for the project are located in the Red River Basin and at the Mekong River, which has a globally unique transboundary lake-river system and globally significant wetlands and flooded forests, is supporting one of the most productive and diverse freshwater ecosystems in the world. The Red River Basin, one of the largest watersheds in Southeast Asia, originates in Yunnan province, China, and flows through the most densely populated area in Vietnam to the South China Sea where it forms an extensive delta. The South China Sea is the catchment area of the associated upstream river basins. Therefore the health of the South China Sea is significantly impacted by these transboundary river basins and related industrial activities.
 37. At province level existing or planned initiatives that benefit the three selected industrial zones and are supportive for the conversion into eco-industrial parks include in particular following projects:
 38. a) Danang, Hoa Khanh industrial zone: as stated in official letter No.8411/UBND-QLDTu dated 12th October 2012 by Danang People Committee to Danang Authority of Industrial Zone Management, the following projects will be implemented in 2013-2014 to improve the environmental performance of Hoa Khanh industrial zone: 1) Upgrading/improving Bau Tram lake: Dredging of the lake (48.6 ha), reinforcing the lake bank, 2) Construction of drainage canal and concrete sewer system to connect Hoa Khanh IZ to Cu De river to drain rain water off from Hoa Khanh industrial zone to Cu De river, 3) Construction of drainage canal and concrete sewer system to connect Bau Tram lake to Cu De river (to drain water off from Bau Tram lake to Cu De river).
 39. b) Ninh Binh, Khanh Phu industrial zone: as decided by the government following projects will be implemented to enhance the environmental and infrastructure performance of the IZ: 1) Investment project for the development of energy efficient lighting and transformer in Khanh Phu Industrial Zone – Phase 1: construction of a transformer and lighting system with total capacity of 66.8KW in 2014. 2) Investment project on the finalization of the infrastructure of Khanh Phu IZ: Finalization of internal road system, stormwater drainage system, wastewater drainage system, lighting system and development of green belt to be implemented from 2014-2016.
 40. c) Can Tho, Tra Noc industrial zone: as stated in the investment certificate No. 57221000130 issued by Can Tho industrial management authority the following project will be implemented in 2013-2014: Investment project in the development of wastewater drainage and treatment system – Phase 1.
- A.5. Incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

41. Currently, around 70% of the effluent from industrial zones in Vietnam (around 1 million m³/day) enters the discharge system directly and untreated. The consequence of this practice is increased pollution in surface and ground water as well as marine ecosystems due to toxic substances, with negative consequences for agriculture, pisciculture and the provision of drinking water. Especially the rapid industrialization in coastal areas has contributed to the deterioration of coastal water quality. More than 2000 fish species are found in the sea waters of Vietnam. Of these, approximately 130 species are economically important for neighboring countries. The dominating land based source of pollution to the coastal environment and its transboundary fish resources is the discharge from the river and sewage systems. Beside organic pollutants a significant flux of heavy metals can be observed [5]. The pollution sources have not been curbed, weakening the competitiveness of Vietnam as well as neighboring countries' sea products.
42. The average proportion of hazardous waste as part of the whole is very high (20%, approx. 470kt/a) and its disposal in municipal landfill sites presents a high risk of groundwater pollution. At present, there is very little recycling in industrial zones, with sorted collections and the reuse and recycling of waste being inadequate. Obsolete and defective waste air purification technology and inappropriate production processes mean that industrial zones emit significant quantities of hazardous substances, including unintentionally produced POPs. Management of the environment currently plays a subordinate role in the development of industrial zones, with businesses in industrial zones working in isolation with collaborative partnerships between companies being almost unknown [2].
43. Significant barriers that have resulted in environmental problems and poorly developed environmental awareness in the IZ particularly include 1) Lack of knowledge by company managers, local engineering personnel and local technology suppliers about available clean&low-carbon technology, appropriate practices within the operation and process optimisation strategies, such as cleaner production; 2) Lack of awareness about alternative financial sources for investments in environmentally-friendly technologies, for instance from the Swiss Green Credit Trust Fund or the Vietnam Environment Protection Fund; 3) Lack of public economic incentives and confidence in the recycling economy and company cooperation within the IZ; 4) Little enforcement of environmental legislation by personnel bottlenecks and unclear responsibility of the authorities and expertise from the IZ management boards as well as a lack of framework conditions and guidelines for the transformation of IZ into eco-industrial parks.
44. The project will assist the country to overcome aforementioned barriers and by taking over the incremental costs by GEF. These include (a) awareness of the availability and use of clean und low-carbon technologies, best environmental practices and process optimisation strategies in IZ and accessing cost-effective financing through alternative finance models (deployment & demonstration), (b) transfer of know-how about the technologies introduced and practices implemented in eco-industrial parks in numerous other IZ through promotion, awareness-raising and training for companies, authorities and investors (diffusion) and (c) the long-term transformation of existing IZ in EIP by improving the skills, processes and legal guidelines of the authorities (transfer & consolidation).
45. The reason for using a multi-focal area project for implementing cleaner production in the broadest sense lies in the multi-faceted nature of environmental problems in companies, which are identified using the cleaner production method and then dealt with using technical and operational measures. Therefore, most are not single focal areas, but several are affected simultaneously (e.g. improved chemical management can have an impact on the international waters and chemicals focal areas). In addition, different focal areas can be complementary. The promotion of innovative energy-efficient technologies, for example, often leads to efficient water usage and/or UP-POPs reduction. When implementing cleaner production, the measures and their effects must be assigned to different focal areas and a multi-focal area project approach adopted.
46. The proposed project activities are designed to be for the long-term and include sustainability considerations: promoting the implementation of industrial production practices in IZ through the specific promotion of company cooperation in the areas of improved energy systems, minimized materials flows and waste management, minimized water flows, effective EIP management, increased capacities of ministries for post-implementation, training of trainers and integration into the host community.
47. The GEF project has 5 major components and focuses on three pilot IZ in the north, centre and south of Vietnam and selected 45 companies. The project provides a holistic framework to introduce environmentally sustainable management of industrial zones.

Component 1: Improvement of policies and guidelines

48. The first project component focuses on the review, formulation and enforcement of policy and guidelines to facilitate the transformation of industrial zones into eco-industrial parks. This project component will help government agencies fit existing guidelines to the sustainable planning, development and management of IZ and may be used as a basis for promoting innovative resource- and energy-efficient technologies and production practices. The GEF project is envisaged to assist in the formulation and/or adaptation of the following: 1) regulations on management and planning of IZ, 2) policies on environmental protection and environmental management in IZ, 3) policies on institutional arrangement of industrial pollution management and responsibilities in IZ, 4) policies on investment facilitation (national and international), tax, subsidies and customs to encourage the application of environmentally sound technologies and practices in IZ.
49. As outputs of component 1 concrete improvements for 1) environmental planning and management of IZ will be proposed and documented with regard to the three subjects responsibilities, environmental impact assessment and economic incentives that will encourage the IZ companies to change technology and apply best practices. 2) An evaluation of centralized services (e.g. emergency response, medical, waste management, maintenance) to be provided to IZ companies by IZ authorities will be conducted and selected services proposed.
50. Existing regulations with regard to environmental management in IZ, IZ management service provisions and finance opportunities are assessed as part of this project component and proposals put forward as to how these regulations may be improved and expanded. The relevant authorities will be informed about the core elements of the eco-industrial park transformation and prepared. No national programme includes these planned activities. The authorities, however, require information regarding how to improve the environmental situation in IZ. This is the reason why a co-finance share was put in place. Other activities beyond information transfer not covered by the co-finance are classified as additional.

Component 2: Capacity building on eco-industrial park strategy and measures

51. Under component 2 capacity building will address the needs of government officials, IZ authorities and IZ company managers at central and provincial levels in three areas: 1) Intensive training will be provided by international experts to a core group of government employees (MONRE, MPI, MOIT) at central and provincial level and IZ authorities of the three selected IZ (training of trainers). Knowledge on specific issues like eco-industrial park planning (building construction, energy systems, minimization of water/material flows, waste/by-product management, remediation of contaminated sites), effective eco-industrial park management (selection of companies, standard park services, maintenance, environmental management of the IZ incl. air emissions, information system for inter-company communications incl. materials exchange, information platform for IZ environmental conditions and performance) and integration of IZ into the host community (community business development for better living conditions e.g. child care, planning of housing and recreational facilities). This core group is expected to train other relevant stakeholders on the subject and to disseminate the knowledge widely to other industrial zones subsequently. 2) Intensive training will also be provided by international experts to IZ company managers and selected government responsible (MOIT, MOST, MPI) on technology transfer, low-carbon and resource efficient technologies and practices. This training will concentrate on state-of-the-art technologies in refrigeration, compressed air, heating systems, water treatment&recovery, chemicals management according to SAICM requirements and selected production technologies relevant for the industry sectors with high environmental impact. 3) In close cooperation with MOIT resource efficient and cleaner production training will be offered to IZ company workers, including cleaner production basics and a modular train-the-trainers program for wider dissemination of resource efficient and cleaner production (RECP) know-how.
52. As outputs of component 2 one training program for 1) the core group of government employees and IZ authorities will be completed and 160 people trained on eco-industrial park planning and management. For 2) the selected three IZ authorities three pilot projects on waste water monitoring and pollution management will be implemented. For 3) IZ company managers and government responsible a training program will be developed on a) low-carbon technologies, b) water and materials treatment and recovery systems, c) chemicals management and Globally Harmonized System of Classification and Labelling of Chemicals (GHS) and d) contaminated sites. At least 200 company managers shall be trained in the three selected IZ in two years. For 4) IZ company workers and future RECP trainers a training program on resource efficient and cleaner production (RECP) will be developed and 200

workers trained on RECP basics as well as additional 20 people trained as RECP-trainers (training-of-trainers). The new RECP-trainers will be able to further train company workers after project implementation.

53. The GEF funding is expected to catalyze eco-industrial park planning and management as well as the application of low-carbon and resource efficient technologies and practices. Training sessions are, for the first time, being used to instruct representatives of MOIT, MONRE, MOST, MPI and IZ authorities, followed by IZ companies' representatives. In these, they will be informed of the measures that have to be taken in the eco-industrial park transformation, particularly in the areas of IZ management, technology development and the enforcement of environmental legislation. Previously, these comprehensive training sessions did not include Vietnamese IZ.

Component 3: Identification of eco-industrial park pilot projects

54. The third project component of the project framework addresses the identification of eco-industrial park pilot projects and helps clarify the potential for eco-industrial park transformation in the three selected IZ in the north, centre and south of Vietnam. The aim of this component is to select examples of how innovative low-carbon and resource efficient technical solutions, such as creating symbiotic collaboration between IZ companies, may be implemented. The role of the IZ companies in this component is to actively contribute to the clean technology needs assessment and the identification of BAT and BEP for further implementation in component 4 and capacity building in component 2. Furthermore in this component community enhancement projects of global environmental concern shall be identified.
55. During project preparation three IZ were evaluated together with IZ authorities and selected for the GEF project in the north (IZ Khanh Phu, Ninh Binh city), centre (IZ Hoa Khanh, Danang city) and south of Vietnam (IZ Tra Noc1&2, Can Tho city). These IZ represent important industrial sectors, show considerable environmental impact in all three focal areas, are vitally important for socio-economic development of the area and are located close to densely populated areas and/or vulnerable water bodies (river basins, coastal waters). Following table shows some characteristics of these zones (see also Annex F).

Name/City	IZ Khanh Phu / Ninh Binh	IZ Hoa Khanh / Danang	IZ Tra Noc1&2 / Can Tho
Year of operation	2004	1998	1968 (renovated 1995)
Total surface area (ha)	366	396 (298 leased)	320
Number of companies	27	139	187
Number of employees	6800	28070	17267 (Tra Noc 1)
Industrial sectors	Iron&steel processing, chemical industry, communication devices, construction material, glass, garment, plating	Iron&steel processing, chemical industry, energy generation, construction material, food&beverage, textile, garment, electronics, pharmaceutical, plastics, paint manufacture, pulp&paper, packaging, plating	Iron&steel processing, chemical industry, energy generation, food&beverage, garment, electronics, leather, pharmaceutical, plastics, ceramics, construction material, packaging
Environmental features nearby	Day River (distributary of red river)	Bau Tram lake (water supply for agriculture and aquaculture), sea coast	Adjacent to Mekong river (Song Hau)
Settlement areas	Residential areas of Khanh Phu commune nearby	Residential area adjacent	10 km from Can Tho city
Industrial waste water (m ³ /d)	5000 (treated)	2000-3000 (treated)	12,000 (no central treatment)
Hazardous waste (kg/d)	N/A	>1000	100
Environmental issues	Gaseous emissions (dust, SO ₂ , NO _x , GHG, UP-POP)	Waste water quality (COD), groundwater contamination, gaseous emissions (GHG, UP-POP)	Waste water quality (SS, COD, BOD), gaseous emissions (dust, GHG, UP-POP)

Table 1: Characteristics of selected IZ

56. To obtain a picture of the potential for optimizing enterprises in the GEF focal areas CCM, IW and CHEM (company baseline) located in the selected IZ, a total of 15 enterprises were evaluated during the project

preparation phase. For this purpose, important company details on energy demand (process heat, compressed air, refrigeration, drives), water (conservation, water treatment), chemicals management, environmental problems and financing were first obtained with the aid of questionnaires. Then, an audit was carried out in each of the 15 enterprises to determine its energy consumption, energy efficiency, water consumption, use of chemicals, pre-treatment of waste water, the status of manufacturing processes and cross-cutting technologies, and environmental pollution. On this data basis, the possibility of economizing on energy, water and other materials and possible technical solutions were determined per company. The 15 enterprises were selected according to the following criteria: a) they represent common industrial sectors that are also present in other IZ, b) they are of a size (SME) that permits a forecast of potential savings within a larger group of enterprises, and c) they are capable of achieving global environmental benefits. The chosen industrial sectors were 1) brewing, 2) glass manufacture, 3) fertilizers, 4) garments, 5) steel rolling, 6) plastics processing, 7) pharmaceuticals, 8) ceramics, 9) metal processing, 10) dairy produce, 11) food processing and 12) seafood. Annex F shows a summary of the company baseline.

57. During the project preparation phase and within the framework of the company baseline evaluation, apart from the 15 audited enterprises, a further 12 energy and materials-intensive enterprises were surveyed by means of questionnaires and invited to take part in the GEF project. These enterprises will be considered second-priority candidates for implementing project components 3 and 4. These enterprises represent the following industrial sectors: Mechanics & metallurgy, plastic & aluminium manufacture, garments, wood processing, steel rolling, agricultural product processing, manufacture of construction materials, pesticides, seafood processing and brewing. Enterprises which have been additionally registered but not yet evaluated and which belong to the same industrial sectors, possess the size of an SME and show a potential to attain global environmental benefits, will be considered as a third priority for the project implementation. Totally 45 companies will be assessed during project implementation from which 30 will then be considered for pilot projects in component 4. The roll-out is summarized in following table:

Number/Priority:	Criteria:
15 first priority companies	Baseline questionnaire and plant audit already completed
12 second priority companies	Completed questionnaire
18 third priority companies	Registered but not yet evaluated

Table 2: Company criteria for roll-out

58. The establishment of the company baseline has shown that, in particular, cross-cutting technologies which can be applied across several sectors and which lead to reduced energy and materials consumption are either outdated or absent altogether. But in many cases, such technologies can be upgraded. Moreover, in a few enterprises the individual process technologies can be improved. Areas of innovative and robust solutions which seem applicable in Vietnamese firms and which will be evaluated in detail on an enterprise level within the GEF project framework are, in the energy sector: heat networks, steam and hot water production, furnaces, compressed air production, refrigeration technology and building standards and, in the water sector, water recycling and waste water pre-treatment. Innovative technologies which have been identified for the GEF project and are commercially available, but which have not yet been adequately introduced to the relevant market and can also be applied to other IZ, are as follows.

GHG mitigation technologies and standards:

59. **Steam-/Hot water production:** Replacement of existing fixed-grate coal-fired steam boilers by innovative *fluidized-bed biomass co-fired boilers*. A mixture of dust coal and sawdust/rice husk is supplied as fuel to the combustion chamber, into which air is blown in order to make fuel a fluidized bed. The combustion mechanism creates favorable conditions for the fuel mixture to be burnt up to 97-98%. The stack gases are treated with cyclones and scrubber to remove pollutants; *Waste heat boilers* use the heat from waste (flue) gases from combustion processes or from hot waste air streams to produce hot water or steam. Hot waste gas is here passed through a tube bundle where it transfers its heat to the water located in the boiler body; *Economizers* (heat exchanger) are capable of utilizing boiler waste gas to heat boiler feed, heating of plant water and can increase boiler efficiency by up to 11%; *oxygen control* measurement of the actual oxygen content in the flue gas ensures that the fuel/air ratio is always constant. Efficiency improvements of up to 2% are possible; *Efficiency monitoring*

systems at boilers observe the plant and visualizes a precise operating profile, thereby exposing possibilities for saving energy up to 10%. Burner capacity, fuel flow rate, flue gas temperature and oxygen content may be input data; *Combined heat and power* generation (CHP) generates power while making simultaneous use of heat for e.g. hot water. Up to 90% of the energy content of fuels can be utilised in this way. The pre-requisite for economically viable operation of CHP is a year-round heating demand, CHP is a priority technology listed in the TNA Vietnam (2012); *thermal solar systems* may be used to provide process heat at a temperature of up to an approximate maximum of 120°C. Coupling solar-thermal energy directly to the process is suitable for cleaning, drying, evaporation, bleaching, pasteurisation or boiling.

60. **Heat networks** allow residue heat in industrial plants to be utilized in other plants nearby. Water, as a store of heat and as a means of transporting heat, is pumped into a heat circulation system via a network of pipes. Via heat exchangers, the water is heated by the heat from one or more heat generators, and the heat is supplied to the user via the water inflow, where it is introduced to the user's heat circulation system also via heat exchangers. The cooled water flows back via the outflow. Furnaces, CHP and other boiler systems can all serve as heat generators because, as the enterprise audits during the project preparation have shown, they are sometimes operated at an excessively high level.
61. **Compressed air** facilities are operated in the majority of the industrial plants in the IZ. The *compressed air systems* are generally poorly laid out and up to 60% of the air pressure can escape through leaks. Thus, compressors that are replaced are too large, resulting in unnecessarily high spending on compressors and air compression systems and very high costs of electricity, which in Vietnam is produced mainly from coal. A correct system layout, improvement to the connectors (e.g. air pressure reduction valves and controlled condensed water outflows) and system maintenance are therefore an integral part of the optimization of compressed air production. Moreover, in the case of screw compressors, through *heat recovery* the recycled water can be heated to about 55°C to serve as water for practical use and up to 70°C to be used as water for internal heating purposes.
62. **Refrigeration systems** are present in numerous plants in the IZ and are used mainly for cooling, freezing, cold storage and air conditioning. Refrigeration systems consist of various components, each of which use electrical energy and represent an area of possible improvement. Apart from the optimization of power, pressure and temperature levels and steering and control systems, *absorption cooling systems* could be another contribution to reducing the energy-intensiveness of refrigeration. A prerequisite for economical operation of this technology is a cost-effective source of heat which, for air conditioning purposes, should possess a temperature of 80-130°C. At a temperature level of 50-100°C cold adsorption systems come into question. Such heat sources can be found in many enterprises in the IZ, but in individual cases they must be assessed regarding capacity and cost-effectiveness, especially in view of energy prices. *Natural refrigerants* such as ammonia and carbon dioxide are an interesting alternative to the climate and ozone-damaging chlorofluorocarbons (CFC's) and hydrofluorocarbons (HFC's). Ammonia is widely used in industrial refrigeration technology inside large plants, whilst CO₂ is used for example in shock freezing. The GEF project will reveal the possibilities of replacing existing refrigeration systems containing harmful synthetic greenhouse gases with ones containing natural refrigerants. The UNIDO/GEF project, "Reducing GHG and ODS Emissions through the Technology Transfer in Industrial Refrigeration" which is in the approval stage will be considered.
63. **Vapour recompression:** significantly reduced energy consumption, reduced water consumption and minimized odour emissions can be achieved by the application of vapour recompression especially in breweries. Wort boiling is the largest single heat consuming process in a brewery. The vapour formed in this process and emitted to the air is wasting energy and water (normally 6-10% evaporates). Thus, vapour heated with VR may be used to boil the wort and the condensate can be recovered.
64. **Manufacture of insulation foam:** Generally speaking, the use of HFC's as propellants, with their high global warming potential, is not needed for the manufacture of closed-cell PU hard foams. From a technical angle, pentane and industrial CO₂ offer suitable alternatives as propellants, and their use gives the same results in most cases. The use of HFC's as propellants in closed-cell XPS hard foams for construction purposes is not necessary, either. The entire range of products can be manufactured using CO₂ as a propellant, or a combination of CO₂ and 2 to 3% ethanol. Consequently, one should strive to put a complete stop to the use of HFC's on the manufacture of XPS hard foam. The GEF project will reveal alternatives.

65. The **building standard** LEED stands for “Leadership in Energy and Environmental Design“ and is a world-recognized standard for sustainable construction and a comprehensive sustainability principle that is also coming into use in Vietnam. LEED covers all major environmental aspects of construction, from planning, via construction, all the way to handover of a building. Through LEED certification, energy consumption in particular can be reduced and environmental impact lessened. LEED is a scoring system with several categories. Some of the categories are binding, whilst in other categories points are awarded for solutions that are particularly environmentally-friendly. A minimum number of points must be obtained for basic certification. Certification can be silver, gold and platinum (the highest grade). The possibilities of upgrading existing or new buildings and giving them a LEED certification will be examined under the GEF project.

Water efficiency and treatment technologies:

66. **Water efficiency technologies** can cause considerable savings in drinking water and other treated ground or surface waters in numerous plants in the IZ. They include in particular optimized rinsing technologies such as *countercurrent cascade rinse*, *air-knife* to reduce drag-out, *on-demand rinsing*, and *agitation technologies* to improve rinse efficiency for the galvanic industry or for seafood factories. Furthermore, the recycling of unpolluted *cooling water* in industrial refrigeration is particularly helpful in reducing water consumption. Regarding industrial cleaning, *cleaning-in-place (CIP)* facilities represent significant water-saving technologies in the manufacture of foods and paints. The viability and profitability of recycling water by means of *membrane filtration technology* (MF, UF, NF, RO) should also be considered on a case-by-cases basis.
67. **Industrial waste water pre-treatment** should be an important contribution to reducing the strain on centralized waste water treatment plants (CWWTP) of the IZ, which frequently operate at the limits of their capacity. The CWWTP often produce a fluctuating quality of effluent regarding the waste water parameters COD, BOD, TSS and heavy metals. What is more, numerous Vietnamese IZ are not yet connected to a CWWTP. Thus, industrial waste water pre-treatment results in a direct improvement to the quality of surface and coastal waters. As technologies, *aerobic biological treatment* techniques, *physico-chemical treatment* techniques (e.g. electrolytic removal of metals from plating effluents), *physical treatment* (e.g. recovery and reuse of brewer’s yeast), *chemical wet oxidation* technique and *anaerobic biological treatment* techniques are being assessed in particular. Deserving particular mention as an example of anaerobic biological treatment is the *UASB (Upflow Anaerobic Sludge Blanket)* technology, used above all to treat wastewater strongly contaminated with organic substances (e.g. in dairy production). Anaerobic treatment is a proven and energy efficient method to treat industrial wastewater. Low energy use, a small reactor surface area, lower chemical usage and reduced sludge handling costs are advantageous features of this technology over aerobic alternatives. In addition, biogas is produced during anaerobic treatment, which can be used to produce energy. It is possible for an anaerobic plant to be energy neutral or even an energy producer

Technologies and practices to reduce POPs:

68. In **fossil fuel combustion systems** which are not properly operated (e.g. temperature, residence time, oxygen & mixing not adequate) PCDD/F can be produced or survive the combustion process. Furthermore coal combustion which is widely applied in Vietnam may be a source of HCB emissions. The potential of unintentionally produced POP emission at greater concentrations exists from small and less well controlled fossil-fuel fired boilers. PCDD/F emission factor (I-TEQ) for industrial boilers were estimated for coal at 10µg TEQ/TJ of fossil fuel burnt (UNEP Guidelines on BAT and Guidance on BEP, 2005). Fuel quality and combustion control are the most important aspects in minimizing emissions of POPs in this application area. The application of Best Available Techniques and Best Environmental Practices (BAT/BEP) allow to achieve emission levels of PCDD/F from an effective (BAT) boiler system using only coal, oil or gas as fuel, significantly lower than 0.1 ng/Nm³ (I-TEQ).
69. Parameters that can be controlled to reduce PCDD/F emissions in fossil fuel combustion systems are combustion quality (indicated by carbon monoxide (CO), total hydrocarbons, soot formation, particle entrainment & burnout), air pollution control temperatures, fuel parameters (sulphur, metals, chlorine) and operating parameters for air pollution control devices if installed. The GEF project will focus on the improvement of existing industrial boiler systems and facilitate the replacement with new installations if necessary. Specific *BAT primary measures* that will be considered and improved are 1) *good combustion conditions* (to achieve complete combustion of POPs in the fuel) with maintenance of efficient combustion with high destruction efficiency (uniform high combustor temperature, sufficient residence time, good mixing with sufficient air), feed rate uniformity and active monitoring

and control of CO & total hydrocarbons as well as 2) *appropriate combustion technique* (e.g. pulverized coal-fired combustion & fluidized bed combustion). *Secondary measures* for the reduction of POPs from industrial boilers like air pollution control devices will be considered as appropriate (e.g. in glass and ceramic production). The activity will seek to maximize linkages with Climate Change Objective 1 (transfer of innovative low-carbon technologies) and will be implemented in project component 4 in parallel to activities for the improvement of energy efficiency at boiler systems.

70. **Contaminated sites:** *Soil contamination* appears particularly vital in view of the industrial operations in the IZ. Owing to a lack of sensitivity to this problem, no uniform investigation has been made yet. Contamination can be caused by POPs and by other persistent toxic substances. To determine the extent of the contamination of sites in the IZ and formulate management plans, solutions will be produced in collaboration with the IZ authority as part of the GEF project. This will include training in the application of testing methods, support in establishing old contamination, technical inspections of contaminated sites, analyses of the ground/surface water, air and soil at selected sites, and risk assessment and listing of priority measures, including prevention. The findings can then be transferred to other IZ.
71. **Chemical leasing** is a service-oriented business model in which the supplier sells the impact of chemicals and where impact units are used as a means of payment. Such a business model increases the responsibility of the chemical or service provider and can encompass management over the entire life cycle of the chemicals. Chemical leasing leads to a win-win situation between the suppliers and consumers, and is aimed at an efficient use of chemicals, minimization of risks, and health protection. This business model raises the profitability and environmental performance of participating enterprises and improves their access to new markets. Processes which involve no major capital spending when converting to chemicals leasing are ideal for this business model. Moreover, high and stable costs of chemicals, high overheads such as storage, waste disposal and administrative costs, and large consumption figures are good guarantees of the profitability of chemical leasing. So that a chemicals supplier can assume responsibility for a process, there must be a side process that is not part of the consumer's core business, and the chemicals consumer must only have limited know-how. International demonstration projects of chemical leasing in various sectors of industry show that it is possible to reduce the consumption of chemicals by an average of about 20%. The GEF project facilitates the new business model be implemented in enterprises in the IZ that manufacture toxic substances of global significance.
72. Chemicals represent dangers to human health and the environment throughout their entire life, from production, via handling and transport, all the way to their consumption. The **Globally Harmonized System of Classification and Labelling of Chemicals (GHS)** is a global initiative to harmonize their classification and labelling and packaging, based on their toxicity, environmental danger and objective risk. GHS includes the labelling of chemicals, safety data sheets for workers, and other information about the chemicals, with reference to their classification. GHS thus facilitates international trade in chemicals thanks to increased safety, has already been implemented in the European Union, and is indispensable for international trade in chemicals. GHS has introduced changes and additions to the range of signs (pictograms), additional information on hazards, and details of precautions to be taken.
73. In Vietnam GHS will be mandatory for substances as of March 30, 2014, and for mixtures as of March 30, 2016. The policy framework SAICM (Strategic Approach to International Chemicals Management) will be supported by the GEF project with measures to strengthen knowledge and information that would include GHS training and awareness-raising activities aimed at company personnel in IZ who is exposed to toxic substances at any stage in the life cycle of chemicals and the generation and dissemination of data on the hazards of chemicals. Special emphasis will be put on chemicals of global concern, chemicals produced or used in high volumes and chemicals subject to wide dispersive uses. Identification of IZ companies will be done under component 3, training will be provided under component 2.

Community enhancement:

74. Besides of social facilities there are social issues that affect communities neighboring IZ and will be addressed by the GEF project as they are of supra-regional concern and not considered by law. Among these social issues are minimum wages for male and female workers considering the family situation, supplier companies that are mostly not located in the surroundings of IZ and the companies/tennants selection for IZ without consideration of environmental community needs. The GEF project will analyse these aspects and solutions will be identified in

cooperation with NGOs like Vietnam Association for Conservation of Nature&Environment (VACNE). Moreover in order to resolve local as well as global environmental pollution problems of IZ, communities will be integrated in a public discussion. In the past numerous cases of violent public demonstrations were recorded due to environmental pollution of IZ companies. The GEF project will assist in the identification of solutions for environmental dispute particularly with regard to mediation and avoidance of juridical cases and will facilitate the work performed by IPONRE on this subject.

75. As part of the outputs of component 3 at least 15 companies at each IZ (totally 45) will be assessed in resource efficient and cleaner production and technology gap determined under consideration of global environmental benefits. These will result in 1) 45 detailed company status reports. Moreover the needs of IZ management boards to adapt to the new EIP structure/requirements will be assessed particularly on environmental management, waste exchange data management, logistics, legal compliance monitoring and documented together with the company status reports in 2) three strategic plans for the selected IZ for inter-company collaboration on re-use and recycling of by-products and waste, efficient use of energy and water and chemicals management. The strategic plans will also show candidate companies for the implementation of pilot projects in component 4 and an inventory of clean technology and best available technologies (BAT) and best environmental practices (BEP) needs in IZ. 3) Furthermore the needs of neighboring communities that will be served by a community enhancement program will be identified with regard to environmental, economic and social benefits and documented for further implementation or further processing under project component 4.
76. The activities under project components 3 and 4 supplement the existing or planned initiatives on infrastructure upgrade that benefit the three IZ (see baseline project). The GEF project in particular builds on these activities with regard to community enhancement (supplementation of planned construction of recreational areas at Hoa Khan IZ, Bau Tram lake, improved road access to Khan Phu IZ) and the waste water monitoring and pre-treatment (planned waste water sewage and treatment systems in Khan Phu IZ, Hoa Khan IZ and Can Tho IZ) through optimal use of and/or relief of the planned infrastructure.
77. Incremental/additional activities: All activities relating to assessing technology needs in businesses and developing strategic plans for energy and resource management in IZ are seen as additional, since no Vietnamese projects are planned. Independently of the GEF project existing planned investments in infrastructure are taken into consideration in co-financing. Needs assessment in neighboring communities and the community enhancement program in association with the development of eco-industrial parks in Vietnam are not part of the baseline project in Vietnam and are, therefore, classified as being completely new and additional with impact on global environmental benefits.

Component 4: Implementation of pilot projects in industrial zones and community and information dissemination

78. Component 4 of the project framework addresses the financing scheme for clean&low-carbon technology and practices application in industrial zones and community enhancement as well as information dissemination. This section of the project concentrates on the implementation of clean&low-carbon technologies, after these are identified in Component 3. It therefore deals with mobilising financial resources as well as developing eligible investment projects. The finance model is designed, with investment aid, to make it possible to implement timely technology demonstration projects. To this end, both Vietnamese and foreign funds are taken into consideration, including the Green Credit Trust Fund (GCTF) of the Swiss State Secretariat for Economic Affairs (SECO). The objective of the GCTF is to promote long-term investments in cleaner production technology. On the one hand, the GCTF facilitates the access to finance for Vietnamese Small and Medium Enterprises (SME) with insufficient collateral by guaranteeing 50% of the credit granted to the SME by local Joint Stock Banks (JSB) in the form of a Stand By Letter of Credit. On the other hand, the GCTF reimburses the SME up to 25% of the investment costs, if the SME has achieved certain environmental improvements. A total of 3 million USD was confirmed by seco for reimbursements. In addition, the Vietnam Environment Protection Fund (VEPF) will be considered. The conditions for companies applying for VEPF soft loan support for technology investments are as follows: interest rate 5.4%, loan <70% of project amount, refund period 5-7 years. The Vietnam Development Bank (VDB) will be another source of funding for technical investments (refund period max. 12 years, 85% of commercial bank interest rate, max 80% of investment capital). Besides the Ministry of Planning and investment (MPI), the Ministry of industry and trade (MOIT) and the Ministry of science and technology (MOST) will be considered for funding. With regard

to technological innovations, the National Technology Innovation Fund (NATIF) is available, which is administered by the Ministry of science and technology (MOST). Local bank financing should then follow from institutes with experience in investment banking. These include Techcombank, Vietnam International Bank (VIB) and Asia Commercial Bank (ACB), which are skilled in the proposed projects relating to the transformation of IZ into EIP and are aware of the benefits of financial contributions as well as strategic partnerships with IZ.

79. The role of the IZ companies in this component is to actively demonstrate and deploy process optimization measures and the adoption of clean&low-carbon technologies. IZ companies are, therefore, helped to develop concrete bankable investment projects and access suitable finance.
80. In order to accelerate the implementation of clean&low-carbon technology in companies up to 10% of investment costs can be covered by direct subsidies from the GEF funds. Criteria will be defined during the project inception phase.
81. Component 4 is also designed to promote the sustainable replication of projects in other IZ and multiplying the reduction of the environmental impacts. It is, therefore, mainly about overcoming the above barriers and creating trust and confidence on the side of investors and users. In addition the monitoring of the results is another important part of this component. In particular, it should demonstrate that cooperation between IZ companies and the application of innovative technologies will reduce environmental impact and cost and enhance the competitiveness of participating companies. The dissemination of the benefits of eco-industrial parks outwards to other IZ will attract new investors as well as qualified personnel. In addition, the adaptation of the IZ management boards' service provision portfolio will be highlighted and the new design of the IZ environmental management will be defined and disseminated.
82. The IZ companies participating in the project will actively demonstrate the results of the process optimizations and implementation of clean&low-carbon technologies. Hence IZ companies are key organizations and will act as opinion leaders towards the wide dissemination of the EIP initiative.
83. For knowledge sharing and knowledge management with other similar projects 1% of the international waters budget will be allocated to the "IW Learn" mechanism.
84. The main outcomes of this component are: 1) Demonstration of EIP projects to reduce GHG, water consumption, water contaminants and unintentionally produced POPs, as well as initiation of community enhancement through improved legislation and demonstration of social projects, 2) Increased public awareness on issues concerning EIP development through integration of public authority, associations and community in EIP projects.
85. As outputs of component 4 30 bankable clean&low-carbon technology investment projects will be 1) developed by experts and company representative and BAT/BEP considered. This task will be realized in close cooperation with technology suppliers. The details of the expected technical upgrade and commissioning, as well as the investment cost estimate, will be summarized in technical investment reports. When a suitable source of funding has been chosen, funding applications with finance plans will be prepared for the relevant banks, according to their guidelines. 2) When the applications have been checked and approved, the clean & low-carbon technology will be implemented and the facilities will be technically taken over. 3) Together with experts, the community enhancement projects selected in component 3 will be subjected to a detailed investment examination, investment applications shall be submitted to the relevant financial sources, and policy and guidelines regarding environmental disputes and compensation from companies will be drafted. 4) An awareness raising program for dissemination of the demonstration results in the three pilot IZ will be finalized, stakeholders incl. other IZ authorities engaged and 5) implemented together with community based campaigns to supervise environmental performance of IZ companies.
86. Incremental/additional activities: This project component includes activities that will lead to confirmed investment programmes in IZ companies. Concerted investment plans are developed together with selected companies and finance institutions, including alternative financing bodies. These activities are to be seen as incremental within the context of a rapid implementation of IZ demonstration projects. Since, within investment projects, there are clean & low-carbon technologies, which tend to be more expensive to procure and, therefore, are often not taken into consideration by companies, these additional investment costs are considered as incremental. For this reason, a GEF contribution is seen as part of these investments, alongside co-financing. The activities relating to the implementation of community enhancement are classified as being completely new and additional. Currently,

within Vietnam, there are no national efforts being made to encourage eco-industrial zones on a broad canvas. For this reason, no initiatives are planned to disseminate knowledge gained from transformed IZ companies. Initiatives are established for promoting and disseminating individual industrial pilot projects (e.g. through MOIT action plan), which are mostly assigned to international finance. Measures for communicating successful environmental projects are partly financed using environmental funds, which are taken into consideration in the co-financing. The other activities of this project component are classified as additional.

Component 5: Monitoring and evaluation

87. Component 5 of the project addresses effective monitoring and project evaluation and will ensure the successful achievement of the desired project outputs.
88. The expected output of this project component encompasses in particular the development of a monitoring and evaluation mechanism which is implemented to track project progress and the establishment of an appropriate project management provided by a project management unit (PMU). Details on the project implementation arrangement and M&E plan are listed in chapter B1 and C.

Global environmental benefits (GEB):

89. The GEF project scenario will support the baseline project by providing comprehensive actions for GHG mitigation, water-efficiency, reduced water pollution and reduced POPs releases to the environment in Vietnam. In the absence of GEF funding, the capacity for GHG, water and POPs management as well as legal frameworks related to industrial zones would improve slowly. The current conditions of industrial fossil energy and water use as well as emissions of unintentional produced POPs will continue and the awareness of improvement potential at company, government and IZ authority level would continue to be low. Without assistance the replacement of existing inefficient equipment and inappropriate manufacturing practices would continue at the current rate. The existing waste water discharge practices and emission of air pollutants would remain environmentally unsafe and there would be continued contamination and impacts on individuals, air, water and soil with risks for the respective ecosystems. The project will support the achievement of global environmental benefits (GEB) in the selected GEF-5 focal area strategies and is justified as follows.

Climate change focal area strategy:

90. The GEF project objectives, outcomes and outputs meet the goals of Climate Change FA objective 1: Promote the demonstration, deployment and transfer of innovative low-carbon technologies:
91. a) Significant avoidance of CO₂ emissions will be achieved by demonstration and deployment of technical energy efficiency measures in thermal power generation, compressed air generation and refrigeration, use of waste heat through company partnering, renewable energies and fuel substitution at company level. In addition the substitution of synthetic greenhouse gases (HFC propellant and refrigerant) in production processes (foam) and refrigeration will be considered and building standard for energy efficiency demonstrated; b) Technical assistance will be provided through training for creating an enabling environment for technology transfer, low-carbon and resource efficient technologies and practices.
92. The demonstration of low-carbon technologies in IZ and enabling policy environment has potential to be multiplied in 260 industrial zones in Vietnam and more in third countries resulting in significant GHG reduction of global concern.
93. During project preparation an average direct GHG avoidance potential of 15 evaluated companies was calculated at 91,000t/a CO₂eq. For the calculation consumption data of coal, FO, LPG and electricity were gathered and the potential energy savings in the areas steam/hot water production, district heating, compressed air, refrigeration and process heat determined. Following potential savings in GHG were identified (GHG emission factors: Vietnamese coal 1.84t/t, FO 2.67t/m³, LPG 1.60t/m³, electricity mix Vietnam 0.5764t/MWh).
94. Boiler efficiency: 72,294t/a CO₂ (23%); New boiler system: 3,300t/a CO₂ (50% per system), District heating: 11,103t/a CO₂ (use of waste heat); CHP: 250t/a CO₂ (15% per system); Compressed air: 2690t/a CO₂ (50%); Refrigeration 233t/a CO₂ (20%); Process heat (vapour recompression): 668t/a CO₂.
95. Taking into account the envisaged 30 companies in the three selected IZ of the project an estimated overall direct GHG reduction of 182,000t per year will result. With an average lifetime of 7 years of industrial appliances 1,273kt

CO₂ lifetime direct GHG emissions can be avoided. Lifetime indirect GHG emissions of 3,819kt CO₂ can be avoided considering a replication factor of 3 (conservative estimation based on GHG tracking tool). However, it is probable that the project findings will be replicated in numerous companies more after dissemination of findings to many further industrial zones as mentioned above and additional savings can be tapped. The main contributions to GHG avoidance will be provided by the implementation of energy efficiency measures in thermal power generation as they can widely be applied. The resulting amount of avoided GHG depends on the characteristics of the 30 enterprises finally selected for the project and will be calculated as part of the project implementation.

International waters focal area strategy:

96. The GEF project objectives, outcomes and outputs meet the goals of International Waters FA objective 1: catalyze multi-state cooperation to balance conflicting water uses in transboundary surface/groundwater basins while considering climatic variability and change, Outcome 1.3 Innovative solutions implemented for reduced pollution and improved water use efficiency. a) The project concentrates on IZ located in two transboundary surface water basins, the Mekong and Red river deltas; b) Through the application of innovative new technologies for closed water loops and water cascading in industrial zone industries water use efficiency will be improved and groundwater sources preserved that will be proved by measurable results.
97. The GEF project objectives, outcomes and outputs meet the goals of International Waters FA objective 2: catalyze multi-state cooperation to rebuild marine fisheries and reduce pollution of coasts and Large Marine Ecosystems (LMEs) while considering climatic variability and change, Outcome 2.3 Innovative solutions implemented for reduced pollution. a) The project concentrates on IZ located in proximity of the Large Marine Ecosystem in Danang region and the South China Sea/Gulf of Tonkin; b) Through the substitution of raw materials, production process optimization and waste water pre-treatment in IZ minimization of measurable transboundary water pollutants will be achieved contributing to reduced land-based pollution of large marine ecosystems (LME) and surface water as well as reduced harm of transboundary fish-species ensuring rebuild of marine fish stocks.
98. During project preparation potential water saving measures at the 15 evaluated enterprises in the three selected IZ were identified and an average direct water savings potential of 20% calculated. Totally approx. 3million m³/a water can be saved. Considering the envisaged 30 companies in the three selected IZ of the project estimated overall direct water reductions of approx. 6million m³ per year will result. Further significant reduction potential of water consumption of global concern exist after dissemination of findings to further industrial zones as mentioned above. The resulting amount depends on the characteristics of the enterprises finally selected in the IZ and will be calculated as part of the project implementation. Process data on the 15 evaluated enterprises determined is available however, not listed in this document due to confidentiality. A summary is provided in Annex F.
99. The pre-treatment of industrial waste water will have a considerable effect on the quality of the receiving water (see project baseline). During the project preparation phase, the parameters COD, BOD, TSS and heavy metals were identified as particular problems in the 15 audited enterprises. In the selected enterprises the GEF project will reduce contamination to levels that correspond to international discharge conditions. For the envisaged 30 companies pollution reduction of 76.9t/a COD (-50mg/l), 38.4t/a BOD (-25mg/l), 76.9t/a TSS (-50mg/l) were determined (based on IW tracking tool). Because numerous enterprises are not yet connected to treatment plants and the findings are to be transposed to other IZ, water contamination, a matter of international importance, will be reduced. Findings will be made available both for the existing and the new IZ in Vietnam and other countries in the region and expertise exchanged, thereby guaranteeing replicability of the project.
100. The application of the proposed eco-industrial park initiative resulting in reduced land-based pollution and increased water use efficiency and the dissemination of findings to numerous other IZ in Vietnam and other regional countries will lead to significant stress reduction on eco-systems of global concern in the transboundary river basins (Mekong and Red river, surface and groundwater) and the South China Sea (marine living resources incl. fish stocks).

Chemicals focal area strategy:

101. The GEF project objectives, outcomes and outputs meet the goals of Chemicals FA objective 1: reduce POPs releases. It also follows the NIP priority of BAT/BEP application in industrial source categories.

- a) The GEF project will focus on the improvement of existing industrial boiler systems and facilitate the replacement with new installations. Specific BAT primary measures for avoidance of unintentional POPs that will be considered are fuel reduction, good combustion conditions with high destruction efficiency, feed rate uniformity, active monitoring and control of CO & total hydrocarbons as well as appropriate combustion technique. Secondary measures for the reduction of POPs from industrial boilers like air pollution control devices will be considered as appropriate (e.g. in glass and ceramic production). The activity will seek to maximize linkages with Climate Change Objective 1 (transfer of innovative low-carbon technologies). Based on calculations done with the UNEP POPs tracking tool on fossil fuel power plants (coal, FO, LPG considered) and energy production of 15 audited companies the overall quantity of UP-POPs emitted from the 173 operational IZ in Vietnam amounts 46.7g/a TEQ. With a reduction rate of 90% and a replication factor of 3 the project may reduce 2.43 g/a TEQ. With a realistic higher replication factor significant more TEQ might be avoided. The resulting amount of avoided TEQ depends on the characteristics of the 30 enterprises finally selected for the project and will be calculated as part of the project implementation.
- b) The project will also provide solutions for the formulation of management plans for POPs and PTS contaminated sites through practical training of decision makers in the investigation methodology, conducting inspections, analyses and risk assessment.
102. The GEF project objectives, outcomes and outputs also meet the goals of Chemicals FA objective 3: pilot sound chemicals management. a) SAICM work areas that generate global environmental benefits will be supported by the GEF project with measures to strengthen knowledge and information that will include GHS training and awareness-raising activities aimed at company personnel in IZ who is exposed to toxic substances. Special emphasis will be put on chemicals of global concern, chemicals produced or used in high volumes and chemicals subject to wide dispersive uses and on measures for materials substitution, waste minimization and disposal. b) The GEF project demonstrates the chemical leasing business model be implemented in enterprises in the IZ that manufacture toxic substances of global significance. Chemical leasing is aimed at an efficient use of chemicals, a minimization of risks, and health protection and may reduce the consumption of chemicals by an average of about 20%.
103. GEF support for incremental costs and overcoming barriers allow the competitive benefits of EIP to be highlighted, optimum framework conditions created and broad implementation forced in Vietnam. The project will therefore meet the GEF multi-focal area objectives. Unlike current national practice and thinking internationally-relevant improvements are targeted: a reduction in significant amounts of greenhouse gases, increased efficiency in terms of water consumption and the relieving of sensitive large marine ecosystems as well as in (cross-border) rivers, minimised emission of unintentionally produced POPs and optimised management of the chemicals used.
104. Without GEF support, the transformation of existing or newly-planned industrial zones will be much slower. Therefore, the potential for environmental protection would not be exhausted in over 200 IZ with often more than 100 companies from various industrial sectors per zone. The current national planning strategy is primarily based on mid-term economic requirements. Most new investors are recruited by incentivising suitable personnel and lease conditions within IZ. Environmental concerns have been subordinate to these efforts, with the result that no extensive environmental management was introduced into the IZ.
105. Without the proposed project, cooperation between companies, such as for material and energy exchange, could not be actively supported and only occurred by chance. Existing and new companies in IZ would also manufacture in isolation, with, in terms of the State, predominantly local or national problems, such as the industrial waste water or energy supply. Unfortunately, solution approaches mainly do not consider the preventive improvement of production processes. In the sphere of the disposal of hazardous waste, in addition to planning new landfill sites, innovative approaches to the reduction of waste must be found in the production process. Otherwise there could again be problems with landfill availability and water contamination in the long term. The same also applies to avoiding unintentionally produced POPs. In addition, the planning and successful introduction of waste water treatment plants for IZ urgently requires manufacturers to take preventive measures to reduce the amount of waste water and the persistent toxic pollutants of waste water. Also, the critical discharge of greenhouse gases from industrial zones may only be reduced significantly in the mid-term, if appropriate low-carbon technologies are used.

106. The suggested project approach, which includes demonstration projects and the dissemination of information, will have a significant impact on the creation of new IZ and the expansion of existing ones. According to the Vietnamese development plan, 115 new IZ were set up for the period 2006-2015. In addition, 27 IZ were to expand. Project findings will be made available both for the existing and the new Vietnamese IZ. Other countries in the region, which, together can boast a significant number of IZ (Thailand, China and Cambodia), should also be linked in terms of exchanging expertise, thereby guaranteeing a further leveraging effect and broad, regional application. The project proposed will, therefore, result in the significant up-scaling of environmental improvements and a sustainability effect.

Co-Financing:

107. Already-planned activities, which are implemented under the existing baseline project are duly considered. Such initiatives are covered by the co-financing element. These specifically include training activities for the representatives of authorities in association with the implementation of the industrial pollution management (IPM) project (project component 1, co-finance: national government) as well as planned, selective measures for optimising environmental protection in industrial zones (project component 2, co-finance: national and local government, VEPF). The identification of pilot projects using cleaner production evaluations, which are planned using the MOIT action plan, receive further support from other sources (project component 3, co-finance: bilateral aid of SECO). In addition, substantial contributions to investments are expected for clean & low-carbon technology applications in industrial zones (project component 4, co-finance: businesses, banks, Green Credit Trust Fund, VEPF). Communications relating to successful industrial environmental projects are further financially supported by third parties (project component 5, co-finance: Seco, UNIDO).

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

Risks	Level	Mitigation Measures
<i>Outcome 1: Legislation and policies on IZ planning and management, IZ environmental and industrial pollution management responsibilities and investment facilitation for clean&low-carbon technology adopted to meet EIP criteria</i>		
Delays in the adoption of regulatory tools on IZ planning and management.	L	The elaboration and adoption of an official guideline prior to the development of a full regulation, will ensure a faster approval. The institutional capacity building component of the project will provide training to the government and other stakeholders and may reduce the risk.
Centralized services in IZ not requested by IZ companies.	M	The development of tailor made services and the adoption of an incentive mechanism will help convince companies to make use of emergency response, waste management or maintenance services and to reduce the overall environmental impact.
<i>Outcome 2: Strengthened institutional capacities on eco-industrial park planning and management at central government level and at provincial level and IZ authorities in selected provinces.</i>		
Governmental and IZ authority staff lack of willingness to participate in the trainings and to transfer the knowledge to other stakeholders.	L	Competences gained in the training will represent a competitive advantage for the career of people trained, and which will be especially useful as a variety of technologies, planning and environmental protection in IZ will be addressed. The endorsement from the respective offices and selection criteria for the participants and future instructors may reduce the risk.
<i>Outcome 3: Strengthened capacities on technology transfer, clean&low-carbon technologies and resource efficient and safe practices at company level in the selected IZ and government level.</i>		

Risks	Level	Mitigation Measures
Company staff lack of willingness to participate in the trainings.	L	Global trade and competitiveness forces company managers to comply with international regulations on safety and technology issues where legislation is not enforced yet. Subsidized training and promotion by MOIT will further catalyze participation in RECP trainings.
<i>Outcome 4: Potential for clean&low carbon technologies and resource efficient technical solutions identified and community enhancement projects clarified.</i>		
Lack of companies willing to be assessed and interested in technology investments.	L	Consideration and information of companies and business associations about the project by MPI already in the inception phase of the project will help finding commitment. Existing dissemination workshops for financing facilities (e.g. green credit trust fund) will recruit companies for the project. Early cooperation with commercial banks and their marketing departments will further facilitate the recruitment.
Delays in conducting the company RECP and technology gap assessments.	L	The project will rely on a sufficient number of existing national consultancies like VNCPC and experienced consultants. Standardized tools will be used for efficient and accurate assessments of processes and practices in companies.
Delay in identifying needs of communities to adapt to new EIP structure.	M	Key persons of communities at the selected IZ and relevant institutions and NGO like VACNE and IPONRE will assist in screening the potentials and will bring in their existing expertise and reduce this risk.
<i>Outcome 5: EIP projects to reduce GHG, water consumption, water contaminants and unintentionally produced POPs demonstrated and community enhancement initiated.</i>		
Sea level rise due to climate change affects IZ located at sea or estuaries.	L	Adaptation measures for the selected regions are under planning or realized by local authorities. Replication of results of EIP pilots will be promoted in IZ not endangered by sea level rise.
Changes in runoff of river flows affects IZ located at riverside (floods).	L	Capital investments will be concentrated on companies outside a possible flooding zone.
Lack of companies with potential for clean&low-carbon technology investments.	L	Already during project preparation industry sectors with significant environmental impact in the focal areas were selected and a number of companies audited. This data base will be refined (e.g. for energy exchange) for all three IZ at project beginning to identify effective investments.
Lack of sufficient financial resources for investments in clean&low-carbon technologies.	M	The project encompasses a variety of alternative financing sources for companies including soft loans and grants. Some funds like the GCTF offers guarantees in case of insufficient collateral and helps to improve creditworthiness. The existing lower interest rate will further reduce the risk of limited access to finance.
Limited interest to invest in new technologies that change core processes of the firm.	M	Suitable experts on clean&low-carbon technologies will elaborate detailed technology assessments and cost-benefit analysis together with the company's management.

Risks	Level	Mitigation Measures
Inappropriate means to measure key indicators GHG, UP-POP, water efficiency and water pollutants.	L	For all key indicators existing tracking methodologies required by GEF will be applied. For the calculation of UP-POPs the UNEP Dioxin toolkit will be used. Moreover national capacity developed by previous GEF projects on POPs analyses will be used and existing laboratories of MONRE considered.
Skilled and/or properly trained labour to operate and maintain the clean&low-carbon technology is not available leading to equipment disrepair and malfunction.	M	The implementation of the new technologies will be accompanied by PMU and supervised by the technology suppliers. Emphasis will be put on workers' training to operate and maintain the technology properly.
Low integration of workers in sharing benefits of project results.	L	The project entails besides new technologies also training on appropriate practices in cleaner production and chemicals management for workers. The competences gained in the training will result in reduced exposure risk (fire, chemicals handling) and improved efficiency of manufacturing processes (e.g. less outages, energy&raw material). This holistic approach will help improve the work surroundings, the competitiveness of companies and to sustain jobs.
Low consideration of gender implications that accompany the project results.	L	The training on cleaner production and chemicals management as well as the technical improvements will result in improved workplace conditions of labor especially women and cost reductions and thereby enabling companies' contributions to social services. The project also focuses on sectors with high percentage of female staff, e.g. garment production. The project's community enhancement component addresses in particular gender relevant issues like child care, social responsibility of investors and inappropriate working conditions. The project will involve women at stakeholder level (participation PSC) and in awareness raising as well.
Outcome 6: Increased public awareness on issues concerning EIP development.		
Delay in the selection of the stakeholders to implement the awareness component may affect the dissemination of results.	L	Assistance of central government in the selection and the establishment of criteria for the selection of stakeholders will reduce the risk.
Outcome 7: Effective project monitoring and evaluation implemented.		
Delays in project implementation and low quality performance.	L	Following carefully the established M&E plan and in particular the selected success indicators and the adaptive monitoring practice will allow for timely implementation and high quality results

Table 3: Project risks and mitigation

A.7. Coordination with other relevant GEF financed initiatives

108. The GEF project will build on and supplement following previous national Vietnamese/regional GEF projects in the focal areas:

109. Chemicals (GEF 5 Objective CHEM-1: phase out POPs and reduce POPs releases; GEF 5 Objective CHEM-3: pilot sound chemicals management):

110. UNDP/GEF: Development of National Implementation Plan for Vietnam in the process of Accession, Implementation and Enforcement of the newly-signed Stockholm convention on POPs (2003)

The UNDP/GEF project aimed to help Vietnam fulfill its obligations under the Stockholm Convention by building the country's capacity to manage and monitor POPs and to help Vietnam address its public health and environment

issues related to POPs. The objectives of this project were to strengthen capacity of the authorities to manage and monitor POPs, to establish a POPs inventory, to conduct assessments of national infrastructure and capacity and to formulate a national implementation plan. The project was expected to lay the foundation for treatment infrastructure including disposal technologies for POPs waste and cleaner production to reduce the release of POPs into the environment. The proposed eco-industrial park initiative corresponds to the concerns of this project and builds on its preliminary work in particular in the areas cleaner production and technology transfer to minimise POPs release.

111. UNIDO/GEF: Introduction of BAT and BEP methodology to demonstrate reduction or elimination of unintentionally produced persistent organic pollutants (UP-POPs) releases from the industry in Vietnam (2008)

This project was designed within the overall context of supporting the country with human resources and infrastructure to implement the obligations under the Stockholm Convention on the reduction of UP-POPs in key sectors of the industry through introduction of BAT and BEP measures (Article 5, Annex C). The project comprised of four different components: capacity building for BAT and BEP introduction to reduce UP-POPs, harmonization of the BAT/BEP and clean production activities with Stockholm convention activities, capacity building of UP-POPs monitoring, incremental cost effectiveness and cost estimation for BAT/BEP application in industrial sectors to reduce UP-POPs. Capacity building in this project was targeted on four source categories companies: waste incineration, cement kiln, pulp and paper and iron and steel production. The proposed eco-industrial park project will consider and build on the findings of this project in particular in UP-POPs monitoring and cost estimation for BAT/BEP application. Moreover it will consider UP-POPs formation in fossil fuel burning in other industry sectors.

112. GEF/WB/SDC/SIDA: Sound management, disposal and phase-out of PCBs and PCBs-containing electrical equipment and industrial products (2006)

The project aimed at safe management, disposal and phase-out of PCBs and PCB-containing electrical equipment and industrial products. Activities encompassed the gradual treatment and disposal of PCB and PCB-containing equipment in the electricity sector, capacity building for rapid and exact analysis and assessment of PCB-containing oils and equipment and the finalization of regulations and technical guidelines for handling and disposal of PCBs and PCB-containing wastes. The proposed GEF project will consider the capacity built for the planned RECP-company assessments as PCB-containing transformers and condensers might be encountered.

113. UNIDO/GEF: Reducing GHG and ODS Emissions through the Technology Transfer in Industrial Refrigeration (2013)

The project will provide policy support and technical assistance for promotion of hydrocarbon refrigerant systems in fisheries sector (cold chain) in Viet Nam and is in the final stages of GEF approval. At the company level, synergies would be possible working with those selected pilot companies in the sector which would also benefit from policy-level interventions, including legislation on cleaner technologies (i.e. natural substitutes for HFCs). Both projects aim to support financial mechanisms including low-interest loans for companies to upgrade their capacities and guidance to banks on how to assess such loan applications and therein, cooperation would also be possible.

114. International waters (GEF 5 Objective IW-1: balance conflicting water uses in trans-boundary surface and groundwater basins while considering climatic variability and change; GEF 5 Objective IW-2: rebuild marine fisheries, and reduce pollution of coasts and Large Marine Ecosystems (LMEs) while considering climatic variability and change):

115. The proposed eco-industrial park initiative, which is part-financed through the international waters focal area, includes previous work carried out by GEF and other organisations in South-East Asia. This work includes strategic lines as well as action plans for protecting transboundary basins/aquifers and marine ecosystems and forms the present finance application. The work includes the following projects:

116. Sustainable Development Strategy for the Seas of East Asia (Putraya declaration of regional cooperation for the sustainable development of the Seas of East Asia), GEF/UNDP, PEMSEA (2003)

This development strategy has identified various pollution hotspots in Vietnam, where the existing eco-industrial park initiative will carry out pilot projects. The strategy is based on the significant increase of industrial production

in Vietnam and the resultant pollution of the South China Sea, which, together with the effluent and waste from households, represents the largest source of pollution. The development strategy requires the region's countries, including Vietnam, to take actual steps to avoid and reduce environmental effects, which will affect the South China Sea. Environmental action programmes should, therefore, be integrated into national and regional development plans. It is also pointed out that coordinated projects in the form of the proposed eco-industrial park initiative are also important and contribute to the improvement of the environmental situation in large marine ecosystems (LME). (GEF 5 Objective IW-2 relevant).

117. An Overview of Public and Private Sector Capacities for Environmental Infrastructure in Five East Asian Countries, GEF/UNDP, PEMSEA (2005)

This assessment has identified, in Vietnam, a significant deficit in drinking water provision and effluent systems. Industrial effluent has, according to the assessment, a significant negative effect on the environment. The content of the effluent and the lack of adequate effluent both in industrial and in residential areas are seen as the greatest problems. Due to the high degree of industrialisation, the surface and ground water was polluted in numerous industrial locations. The authorities, therefore, decided to move industrial operations out of residential areas and concentrate them in industrial zones. It is also noted that, in Vietnam, there is not sufficient capacity for developing environmental and infrastructure projects at local authority level. The proposed eco-industrial park initiative offers solutions to these problems in the areas of water efficiency, minimising toxic effluent content and pre-treating industrial effluent. (GEF 5 Objective IW-1 relevant).

118. Mekong Water Resources Assistance Strategy, World Bank (2006)

The study shows that, due to industrial activity in Vietnam and other countries, significant environmental hazards for the Mekong River basin occur that have a negative effect on fishing in the Mekong and resident's livelihood. These problems need to be dealt with through cross-border collaboration. The above strategy proposes establishing environmental protection initiatives within the context of a regional network, doing away with individual, isolated interventions. The proposed eco-industrial park initiative, with its aim of making expertise available to other IZ and regional countries to reduce effluent and its content using pilot project, corresponds to these concerns. (GEF 5 Objective IW-1 relevant).

119. Strategic Action Programme for the South China Sea, GEF/UNEP (2008)

The action programme relates to the considerable economic growth and industrialisation of the countries that adjoin the South China Sea, including Vietnam and highlights the consequent destruction of ecosystems in coastal areas. In particular, the wetland ecosystems and marine animals threatened by land-based industrial water pollution are included, some of this being caused by toxic heavy metals. The reduction in and treatment of effluent are in the forefront. This was also taken into consideration in the Vietnamese National Action Plan. One significant target to be found in the action programme is identifying land-based pollution problems and implementing environmental measures both in Vietnam and the region as a whole. The action programme identified two pollution hotspots in Vietnam, in which pilot projects were carried out for the existing eco-industrial park initiative. The aims of the eco-industrial park initiative clearly meet the requirements of this Strategic Action Programme for the South China Sea. (GEF 5 Objective IW-2 relevant).

120. Industrial Wastewater Management in Nhue-Day and Dong Nai river basins of Vietnam, World Bank (2010)

According to the study, the management of the IZ has few personnel capacities and limited knowledge on which to rely when continually implementing the environmental management required in the IZ. Cleaner production is explicitly promoted as a future method regarding water efficiency and effluent minimisation. The study also mentions that, legally, IZ must include centralised waste water treatment plants, the successful operation of which mostly depends on internal effluent pre-treatment measures, due to the wide variety of the toxic effluent content from the different companies. For financial reasons these measures cannot be implemented by numerous companies and, therefore, it is suggested that these businesses be supported through low-interest loans or grants. For such companies, the incentive is even more important, because, in Vietnam, the law is still not fully enforced. The proposed eco-industrial park initiative fully corresponds to the concerns of the study. (GEF 5 Objective IW-1 relevant).

121. Industrial pollution management project, World Bank (2012)

The development objective of this WB project is to improve the compliance with industrial waste water treatment regulations in four of the most industrialized provinces in Vietnam. It comprises of policy review and revision, environmental monitoring and enforcement, finance of the construction of new and expansion of existing central waste water treatment plants as well as capacity building for project implementation and technical assistance. The proposed GEF project will supplement this initiative by focusing on waste water pre-treatment at companies and help maintain the effluent and receiving waters quality to meet national standards.

122. Climate change (GEF 5 Objective CCM-1: demonstration, deployment, and transfer of innovative low-carbon technologies):

123. UNIDO/GEF: Promoting Industrial Energy Efficiency through System Optimization and Energy Management Standards (2008)

The proposed project is aimed at assisting industries to adopt energy efficiency at the system levels and new ISO 50,001 energy management standards. Through adoption of energy management standards, energy management practices will be integrated into the management cycle and realize energy efficiency improvements on continuous basis. The project primarily focuses on capacity building of stakeholders that include industrial enterprises, equipment suppliers, distributors, engineering/energy service companies and government planners. The GEF project will build on this initiative on the energy management system and will consider where possible expertise for its company assessments.

124. UNDP/GEF: Vietnam – Promoting Energy Conservation in Small and Medium Scale Enterprises (2006)

The project development goal was to reduce the annual growth rate of GHG emissions through the removal of key barriers to the adoption of more energy efficient technologies and energy efficient practices in the SME sector. To achieve this goal, the project was designed with a number of expected project outcomes, in particular with improved energy efficiency and energy conservation (EE&EC) awareness and improved capacity for EE&EC policy development, adoption of a communications strategy to enhance SME and public awareness of EE&EC, enhanced EE&EC capacity that has been developed through a comprehensive training plan that improves technical and financial skills. The final evaluation of the project recommended to promote certain EC technologies that would be popular EC investments for SMEs with potential to be fabricated or manufactured in Vietnam. A survey should be conducted to determine the specific technologies that would be in high demand in future for SMEs and to determine the feasibility of manufacturing or assembling such EC technologies in Vietnam. The proposed GEF project will build on this initiative and will further reveal potential for EE&EC technologies in SME.

125. UNIDO/GEF: Promotion of Energy Efficient Industrial Boiler Adoption and Operating Practices in Vietnam (2013)

126. At the time of this request for CEO approval, the PIF for this GEF project has recently been approved. This project aims to reduce energy consumption and reduce GHG emissions by promoting the adoption of energy efficient boilers and at the same time, best operation practices in industry. There is great potential for synergies in the capacity building activities targeted at industrial boiler operation for end-users, government officials, energy managers and consultants etc. Policymakers, IZ authorities and those companies based at IZs would benefit from policy and regulatory framework being established to support standardization of boiler systems.

127. WB/GEF: Demand-side Management and Energy Efficiency Program (2003)

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation.

128. Various stakeholders such as ministries, enterprises, NGOs, IZ authorities and banks were identified during the formulation of the PIF and project preparation phase, and informed of the purpose of the project. Inputs from the stakeholders have been taken into account in the project document in hand. The ministries involved have pledged their support.

129. During the project preparation phase, MPI earned broad recognition from the private sector for its engagement in transforming the IZ into eco-industrial parks and for its demand for clean & low-carbon technologies in enterprises, and has set off appropriate co-financing contributions for the successful implementation of the technology transfer

in this sector.

Project implementation arrangement (based on decree No. 29-2008-ND-CP):

130. UNIDO will be the GEF Implementing Agency (IA) for the project and bear full project responsibility against GEF. All project partners will report to UNIDO. UNIDO will further administer the GEF grant. The government of Vietnam will designate a focal point government agency to sign an agreement with UNIDO on the receiving of this grant. To execute the project and support project partners, competent organizations, firms or individuals (hereafter named service providers) will be selected to do assigned activities. Selected service providers will sign contracts with UNIDO. The selection of sub-contractors will be in accordance with UNIDO rules and regulations of the Vietnamese government. The guidelines on the selection of service providers will be detailed in the PIOM. A project manager will be appointed within UNIDO Headquarters (Vienna) to supervise the project implementation. He or she will be supported by administrative staff. The supervision of the project manager will be provided by the UNIDO Environmental Management Branch. The UNIDO country office in Vietnam will ensure the coordination with the Project Management Unit (PMU) in MPI.
131. The national executing and lead agency is the Ministry of Planning and Investment (MPI). Overall, MPI is responsible for co-ordination with the relevant ministries and agencies in executing all activities of the project. Particularly MPI is responsible for the co-ordination with the IZ management boards, for drafting and adaptation of policies and legal frameworks with regard to IZ planning and management, for providing management boards with relevant guidance and training as well as for dissemination of project results to other IZ.
132. The Ministry of Natural Resources and Environment (MONRE) is a partner in the execution of the project and will assist the project in all issues related to regulations on administration and protection of the environment in particular for policies targeting environmental management of IZ and sustainable production and works closely with the partners in the project management team.
133. The Ministry of Industry and Trade (MOIT) is a partner in the execution of the project and will assist the project in all issues related to the development of industries in IZ, in guiding trainings of stakeholders on eco-industrial park strategy and measures, RECP, chemicals management and will supervise the adaptation of existing and selection of new clean and low-carbon technologies in companies. MOIT will participate in institutional capacity building on IZ development and strengthening regulatory and policy framework.
134. The Ministry of Science and Technology (MOST) is a partner in the execution of the project and will assist the project in all issues related to the technology innovation and application program according to decision 677/2011. MOST will facilitate R+D activities necessary to adopt new technology at company level.
135. To ensure the proper and effective coordination and collaboration among various line ministries, local authorities and stakeholders, a Project Steering Committee (PSC), comprising major stakeholders will be established. Its chairperson will be a Vice Minister of MPI. The PSC will comprise representatives of MONRE, MOIT, MOST and the Ministry of Finance (MOF) and the three selected IZ authorities. The National Project Director (NPD) and the UNIDO Project Manager will also sit on the PSC. The PSC's function will include:
 - (a) Provide overall guidance for project execution to the PMUs, especially on cross-cutting issues which require consensus from the various stakeholders involved in the project;
 - (b) Ensure that recommended policy and institutional renovation undertaken under the project are consistent with the country's overall agenda;
 - (c) Ensure full cooperation of various stakeholders under their jurisdictions to provide access and support to the PMU in carrying out their tasks;
 - (d) Review and monitor the project execution progress.
136. A Project Management Unit (PMU) will be established within MPI to undertake the roles and responsibilities of the execution of the overall project execution on behalf of the PSC and in coordination with UNIDO. The PMU will be headed by the National Project Director (NPD) employed and appointed by MPI. A National Project Coordinator (NPC) will also be appointed by MPI to assist the NDP in the regularly monitoring of project execution. Besides, other staff from MPI will be allocated to provide necessary support to facilitate the project execution on demand. The PMU will be operated with the professional support for day-to-day business provided by a working team

consisting of a National Project Manager (NPM), a project officer and an accountant as administrative staff (Admin staff). Those will be recruited by the PMU and in close consultation with UNIDO. A Chief Technical Advisor (CTA) will be hired by UNIDO to liaise with experts, trainers and technology providers. Short-term international and national consultants will also be recruited based on actual needs to undertake the project activities. The PMU will be responsible for the preparation of regular project plans and progress reports under the guidance given by the NPD and the CTA to submit to UNIDO and the PSC for their endorsement and approval. The CTA will provide the specific technical and operational expertise to prepare and develop capacity building of the PMU to facilitate the project execution process.

137. Sub-contracting and purchase carried out by the project will be in accordance with UNIDO rules and regulations of the Vietnamese government. The project will obey the auditing and financial management guidelines of UNIDO and Vietnamese government. In addition, all project activities must comply with regulations of Vietnamese government on management and use of ODA, reporting regimes, including but not limited to such legal documents as: Decree No.38/2013/ND-CP dated April 23, 2013 by the government promulgating regulations on management and use of official development assistance; Circular No. 03/2007/TT-BKH dated March 12, 2007 of the Ministry of Planning and Investment (MPI) guiding functions, tasks and organizational structure of ODA program and project management units; Decision No. 803/2007/QD-BKH dated July 30, 2007 of MPI promulgating the regime of reporting on implementation of ODA programs and projects; Circular No. 82/2007/TT-BTC dated July 12, 2007 of the Ministry of Finance (MOF) providing guidance on regime of state financial management towards foreign non-refundable aids under state budget revenue and the Vietnamese Bidding Law and other relevant legal documents.
138. The authorities of the three industrial zones in Danang, Can Tho and Ninh Binh are responsible for the provision of administrative services relevant to the investment and business operations of investors in industrial zones and therefore an important link between the project management and the IZ companies.
139. The companies in selected industrial zones will be mobilized to actively participate in the project activities, especially in the pilot projects under component 4.
140. The local communities in the three project provinces (i.e. Ninh Binh, Da Nang and Can Tho), NGOs and unions will actively participate in the development and deployment of community based activities under the framework of the project. The community participation will be in line with the GEF policy for public involvement.
141. The project will seek the sub-contracted support of universities, research institutions, scientist communities and service providers in performing any tests and adaptations of innovative technologies (e.g. the recovery of reusable materials from waste waters) prior to their introduction to enterprises, in community enhancement and in RECP training and technology gap assessments.
142. Further organizations to be involved in the technology transfer and information dissemination activities on demand are following: Vietnam Chamber of Commerce and Industry (VCCI); Vietnam Urban environment and industrial zone association (VUREIA); Urban Environment Company (URENCO); Vietnam National Textile Garment Group (Vinatex); Vietnam Steel Association; Vietnam Food Association (Vietfood); Vietnam Pulp and Paper Association (VPPA); Vietnam Beer, Alcohol and Beverage Association (VBA); Vietnam Association of Seafood exporters and Producers (VASEP); Vietnam Cleaner Production Centre (VNCPC); Selected companies in industrial zones for pilot projects; Other business associations of relevant industry sectors; International and national suppliers of clean and low-carbon technologies.
143. Following institutions and organizations will be involved in project finance:
 - Green Credit Trust Fund (GCTF), Swiss State Secretariat for Economic Affairs (Seco)
 - Techcombank, Vietnam International Bank (VIB), Asia Commercial Bank (ACB)
 - National Technology Innovation Fund (NATIF)
 - Vietnam Environment Protection Fund (VEPF)
 - Vietnam Development Bank (VDB)
 - Other commercial banks on demand

144. The structure of the project implementation arrangement is shown in the following chart:

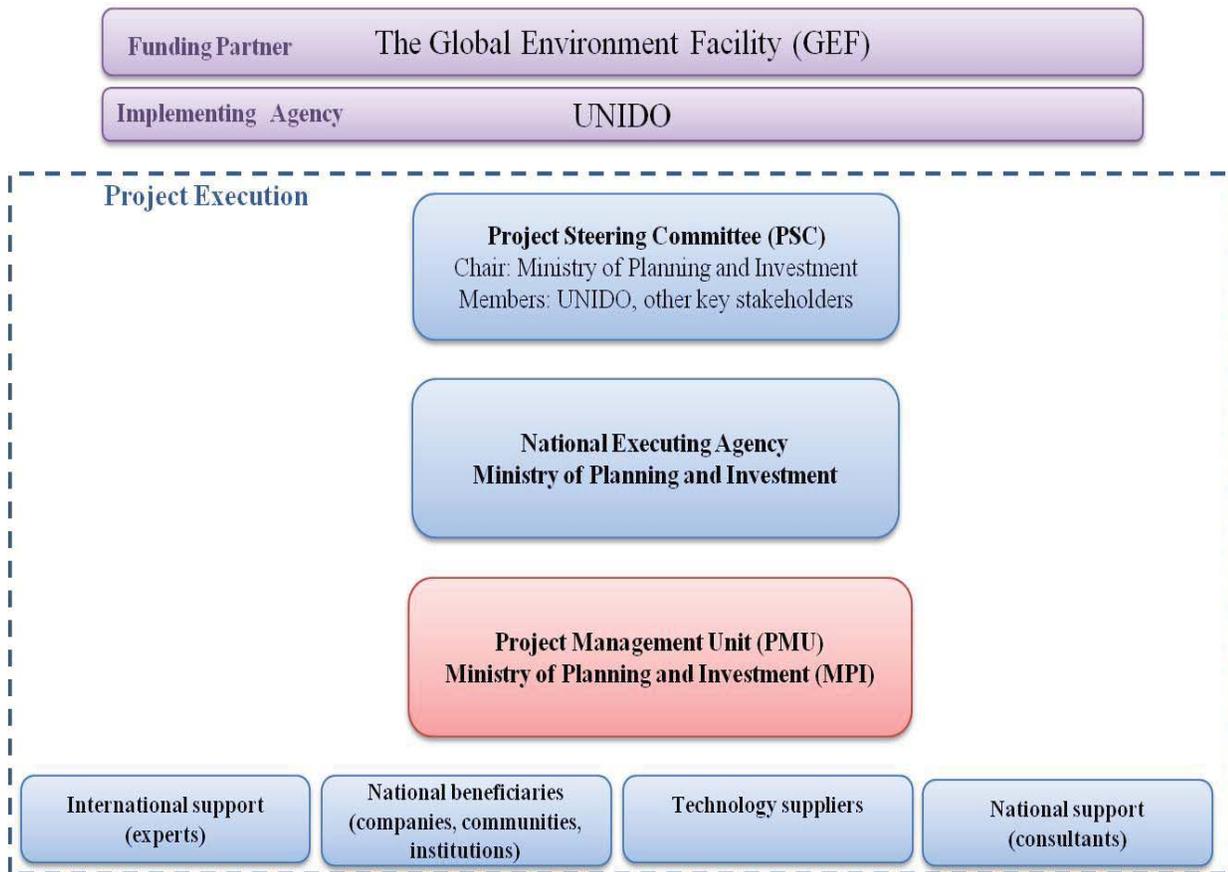


Figure 1: Project implementation arrangement

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF):

145. The project focuses on three pilot industrial zones in the north, centre and south of Vietnam and selected 45 companies in all three zones and communities for interventions. The project will generate the following socio-economic benefits:
146. The use of low-carbon technologies and the implementation of preventive energy efficiency measures in production processes in IZ companies significantly reduce energy requirements. Since the production of thermal and electrical energy is mainly based on fossil energy sources, CO₂, SO₂, NO_x and dust are reduced, which leads to international and local environmental damage.
147. The substitution of toxic chemicals and optimised processing through training and improved business models on chemicals management will have a positive effect on the health of the workforce and the environment and help ensure long-term and stable working conditions.
148. The avoidance of unintentionally produced POPs through low-carbon technologies and the implementation of BAT/BEP in selected production processes will help both the local population and the international community.
149. The reduction of volumes of hazardous and other industrial waste minimises the need for new landfill areas and opens new market opportunities for the recycling industry. Resource efficiency analysis will be subject to the RECP assessments to be undertaken under the project.
150. Improving IZ operations through resource-efficient and cleaner production, companies cooperating in materials and energy and the use of clean and low-carbon technologies will result in a significant improvement in the competitiveness of companies. This means that these companies will appear more successful in both national and

international markets, with supplier companies also benefiting. Optimised IZ companies will also be more attractive, a consequence of this being attracting a better-qualified workforce and, in particular, international investors.

151. Promoting clean&low-carbon technologies in Vietnam will furthermore facilitate the creation of a market for these products and multiply their economic and environmental benefits resulting in generation of livelihood, special expertise and health benefits.

152. The project will be implemented in a gender sensitive manner through the inclusion of the following steps:

Ensuring that the stakeholders in Vietnam are aware of and have knowledge about the importance of embedding gender implications throughout the project. All the project stakeholders will receive a Guideline with information regarding the nexus between the creation of eco-industrial parks and gender implications, background information on gender mainstreaming and gender equality, main gender definitions and terms, as well as information regarding gender at large - including UNIDO's endeavors to mainstream gender at all levels of its operating: policy sphere, organizational sphere and delivery sphere.

153. *Gender Analysis and Collection of Sex-Disaggregated Data.* Conducting a gender analysis will enable the project team to systematically examine the differences between men and women in the context of the project. The analysis will be conducted on a macro level, on the level of the sectors, and on the level of the stakeholders. Thus, as part of the analysis, gender-disaggregated data will be collected from the selected sectors. Based on this information, gender activities will be tailored in a way that addresses the specific needs of men and women. This is particularly important because the project aims at improving the situation in some sector where women are dominantly employed, like for instance in the garment sector.

154. *Creation of gender-sensitive actions.* Based on the collected information regarding the implications of both men and women in the project, and in line with the project outcomes, the activities related to raising public awareness, knowledge dissemination and conducting trainings will be tailored in a gender-sensitive manner.

155. Industrial areas often run alongside migration from rural to urban areas. The creation of industrial zones in the last 15 years has shown that 70% of workers in industrial zones are immigrants from other Vietnamese provinces and 60% of these are women, many of them working on the operational level. The project will assess their needs and provide examples of how they can be supported in optimizing their work place conditions and in a community enhancement initiative in social matters, including tangible support in the planning of recreational facilities, the organisation of childcare, environmental dispute (mediation), and local businesses connected to IZ. Moreover the project involves improvements in industry sectors that involve a high number of female workers as e.g. the garment sector.

156. The level of exposure to UP-POPs and other hazardous chemicals and the related impacts on human health are determined by social and biological factors. Women and men workers might therefore be exposed at different level and frequency. The project will address these gender issues by involving women at the industry level (work place conditions), at stakeholder level (participation in the project steering committee) and in the dissemination and awareness raising component.

157. VACNE, INOPRE and MOLISA will be also be engaged in community enhancement activities ensuring that environmental and gender issues are duly considered.

B.3. Explain how cost-effectiveness is reflected in the project design:

158. The GEF Project is aimed at the introduction of innovative and trusted clean & low-carbon technologies in the three Focal Areas of Climate Change, International Waters and Chemicals. Other IZ in Vietnam and other developing countries will benefit from the experience of this Project because they can also encourage the introduction of these technologies. The Project will demonstrate the advantages of more efficient and effective technologies which, given the future increases of the costs of energy and resources, will offer an important alternative to the present partly out-dated plants, particularly in the areas of energy conversion and supply and waste water pre-treatment. Basically, every energy and resource-efficient technology recommended by the project is more cost effective than alternative scenarios involving technologies which do not focus on a minimization of energy and raw materials.

159. Numerous GEF energy efficiency projects have already been implemented and their results taken into account, for example in Vietnam the UNDP/GEF Project: Vietnam – Promoting Energy Conservation in Small and Medium Scale Enterprises, 2011.
160. Although many approaches have been adopted in GEF projects to promote energy efficient products, the most cost-effective design will undertake activities on both the supply- and the demand side. The situation with water efficient products is comparable. On the supply side, the project will consider cooperation with technology suppliers for the drafting of technical investment proposals. The suppliers will get deeper insight in functional requirements of the technologies to be adopted by the Vietnamese clients to upgrade their product designs to the customers’ needs in developing countries.
161. On the demand side, the project will educate consumers and other stakeholders about the characteristics, costs, and benefits of energy- and water efficient technologies and products. Moreover the project aims at reducing retail prices of energy-efficient products through subsidies to accelerate the adoption. According to realized GEF projects a combination of both “supply push” and “demand pull” has proven to be most effective in harnessing market forces and transforming the market for energy- but also water efficient technologies and products.
162. Regarding technologies for the pre-treatment of waste water, their cost-effectiveness for the enterprises concerned lies in the fact that they reduce the water treatment costs of the centralized waste water treatment plants (CWWTP) already installed. For example, in the Danang IZ the following fees were charged for the treatment of waste water with COD: 0.2 USD/m³ (<200mg/l), 0.5 USD/m³ (400-1000mg/l), 0.6 USD/m³ (1000-1500mg/l). With additional parameters, the costs rise correspondingly. The planned CWWTP in Can Tho is geared to the national technical regulation on industrial waste water (QCVN 40:2011/BTNMT) and expects to pay fees in the region of 1 USD/m³ (grade A) or 3.2 USD/m³ (grade B). In the case of IZ not connected to a CWWTP, the costs relate to direct environmental impact and the required even stronger waste water pre-treatment according to legislation (grade A).
163. Added to this is the cost-effective reduction of fresh and waste water quantities and pollutants in waste water through the application of preventive measures such as those recommended in the RECP assessments under the project (water use reduction, substitution of chemicals etc.). This reduction will have an impact on the enterprises involved, as well as on the operating costs of the CWWTP.
164. The cost-effectiveness of reducing UP-POP’s can be increased thanks to the synergies connected with measures in the sphere of energy efficiency. Technologies to minimize the use of fossil fuels also lead to a reduction in UP-POP’s. For this reason, the GEF project pursues a multi-focal objective. In most cases, alternative mitigation technologies such as the secondary treatment of waste gases would be considerably more expensive.

C. DESCRIBE THE BUDGETED M & E PLAN:

165. Monitoring and Evaluation (M&E) is an important project component, used to monitor progress of the project and the attainment of its goals. M&E also encourages project managers to share their know-how and learn from the project results, in order to improve work performance. The envisaged M&E plan of the project will be presented and further explained below.

Type of M&E activity	Responsible Parties	Budget USD*	Time frame
Establish Project management structure	UNIDO PM, MPI	0**	Within the first two months of project start
Inception Workshop (IW) and inception report	UNIDO PM, PMU, MPI	0**	Within first three months of project start up
Regular monitoring and analysis of performance indicators	UNIDO PM, PMU, MPI and M&E consultants as required	0**	Regularly to feed into project management and Annual Project Review. Annual tracking tool measurement.

Type of M&E activity	Responsible Parties	Budget USD*	Time frame
Annual Progress Reports (APRs) and Project Implementation Reviews (PIRs)	PMU to prepare prior to the annual project review UNIDO PM to validate and finalize to submit to GEF	0**	Annually
Annual Project Review to assess project progress and performance	PMU, UNIDO PM and Project Steering Committee to review the project performance and make corrective decision	0**	Annually prior to the finalization of APR/PIR and to the definition of annual work plans
Steering Committee Meeting	PMU, UNIDO PM and Project Steering Committee	0**	Annually coincide with the Annual Project Review and whenever an urgent and important decision that need approval of the Steering Committee
Bi-annual progress reports	PMU	0**	Every six months
Mid-term Review	PMU, MPI, external consultant, UNIDO PM, Steering committee	40,000	Mid of project
Terminal Project Evaluation	PMU, MPI, UNIDO PM and Project Steering Committee, independent external evaluators	60,000	Evaluation in the last month of the project period; report at the end of project implementation
Financial audit	External consultant, PMU, MPI	40,000	Annually
Lessons learned	PMU, UNIDO PM	0**	By the end of project implementation; annual as part of PIR
Visits to field sites	UNIDO PM, PMU, MPI	0**	Annually
TOTAL indicative cost <i>* Excludes project team staff time, UNIDO staff and travel expenses and cost for workshops ** The costs are covered under Project Management Costs</i>		140,000	

Table 4: M&E plan

Project inception:

166. The Project inception phase will comprise the formation of the PMU, the appointment of the members of the Project Steering Committee (PSC), the preparation of a Project Implementation and Operation Manual (PIOM), the holding of the Inception Workshop (IW), and the first PSC Meeting. The IW will launch the project and gather the broad consultation comments from relevant stakeholders and project beneficiaries on the finalization of PIOM before getting official endorsement of UNIDO and the PSC. Therefore, apart from the PMU, important representatives of governments, co-finance partners and UNIDO will also participate. This will be an opportunity to communicate the project objectives, work plan and responsibilities.
167. PIOM will guide the PMU, project beneficiaries and all institutions and/or individual experts who will be mobilized in the project management and execution to maximize the effectiveness of the project activity deployment and both the socio-economic and environmental impacts of the project. The PIOM should collect main contents of all agreements between the GEF, UNIDO and Vietnamese Government, approved project documents, the rules and regulation of Vietnam and UNIDO on the project management and execution. The PIOM therefore will describe in details the project implementation and execution procedures, including administrative and financial management; execution arrangement; overall project implementation plan; reporting scheme (i.e. procedures, requirements and forms); M&E rules, criteria and practices. The PIOM will be delivered to the appropriate project partners after the IW and the first PSC meeting for final consultation before its submission to get official endorsement by UNIDO and the PSC.

Project implementation and execution:

168. Before each project year, the PMU will produce an Annual Work Plan (AWP), which will comply with the requirements laid down in the PIOM. The AWP will be checked by UNIDO and provides the basis on which to measure progress in implementing the project at the end of each project implementation year.
169. The daily monitoring of project progress will be performed for PMU by the National Project Manager (NPM), with the aid of the AWP and the established indicators. The NPM will coordinate the monitoring with the National Project Coordinator (NPC). The PMU will inform UNIDO of any variations from the schedule and work plan, so that corrective measures can be undertaken promptly. The PMU will examine the objectives and parameters each year as part of the internal evaluation and planning process.
170. From time to time, UNIDO will carry out missions to monitor progress of the project and will inform the project team of the results in writing.
171. The annual monitoring will be performed by PSC Meetings, held once a year. For this purpose, the NPM will produce the Annual Project Report (APR) and submit it to UNIDO for comment prior to the PSC Meeting.

Key impact indicators:

172. The priority objective of the GEF Project is to reduce GHG emissions, water use, waste water contamination and UP-POP's. For this reason, the four direct parameters which demonstrate the effect of the project are the quantities of the above substances reduced each year, calculated for the year as a whole and for the life-time of the clean & low-carbon technology. The remaining two parameters concern the adaptation of the regulatory instruments and the implementation of the community enhancement projects. These describe not only the project's direct impact, but also the sustainability of the project outcomes. In the following table 4 an estimation of target and baseline values is provided. These values might change during project implementation as all of the target companies have not been selected so far. In addition replication factors might be higher than proposed in the GHG, IW, UP-POPs tracking tools.

Key Impact Indicator	Baseline	Target	Means of Verification	Frequency of verification	Location
A set of regulatory instruments compliant with EIP criteria on IZ management adopted.	Regulation is limited to generic provisions in the planning and construction of IZ.	One set	Copies of officially adopted regulations	Annually	-
Pilot clean&low-carbon technologies and practices established in identified production sites.	10% of planned investments	30 investments	Site visits, installation acceptance reports, reports on implemented new business models	Annually	Companies in industrial zones
Amount of direct GHG emissions avoided by clean&low carbon technologies.	18,200t/a and 127kt lifetime direct CO ₂ eq (10%) of estimated	182,000t/a CO ₂ eq and 1,273kt lifetime direct CO ₂ eq ^{5 7}	Report on fossil fuel consumption, KPIs, Lifetime direct and indirect avoidance of CO ₂ eq	Annually	Technology owners sites in three IZ

⁵ Extrapolated from 15 audited companies to 30 companies. Value may change due to different company characteristics during project implementation.

Key Impact Indicator	Baseline	Target	Means of Verification	Frequency of verification	Location
	savings ⁵				
Amount of water reduced by clean technologies.	300,000m ³ (5% of water use efficiency target) ⁵⁶	6million m ³ /a ⁵	Report on water consumption, KPIs	Annually	Technology owners sites in three IZ
Amount of water contaminants reduced by clean technologies.	7.7t/a COD, TSS each, 3.8t/a BOD (10% of target value) ⁵	76.9t/a reduction of COD, TSS each, 38.4t/a BOD ⁵	Measurement reports, CWWTP confirmation	Annually	Technology owners sites in three IZ
Amount of UP-POPs reduced by clean&low carbon technologies.	0.08 g/a TEQ (10% of target value) ⁵	0.81g/a TEQ reduction, 2.43g/a through replication ⁵⁷	Report on fossil fuel consumption, KPIs	Annually	Technology owners sites in three IZ
Pilot community enhancement projects established.	Regulation is limited to IZ construction and generic environmental issues.	Policy for mediation and avoidance of juridical cases. Guideline on community compensation. One community enhancement project supported.	Meeting reports, copy of the adopted policy and guideline	Annually	Neighboring community of IZ

Table 5: Key impact indicators

a) Tracking of UP-POPs reduction:

173. With a baseline release estimate the first inventory of sources and releases of unintentionally produced POPs will be elaborated during the resource efficient and cleaner production assessments in the selected companies.
174. This first inventory serves as a baseline against which subsequent updated release estimates are assessed in order to establish trends in releases over time and evaluate the efficacy of the adopted strategies for minimizing and/or eliminating PCDD/PCDF and other unintentional POPs releases. For this purpose the UNEP/Stockholm convention Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs (2013) will be used. Emission factors derived from the toolkit will allow the calculation of POPs releases before and after the changes in technologies in particular through phasing in BAT and BEP or substitution of fuels. As source categories with relevance to article 5, Annex C of the Stockholm Convention fossil fuel power plants (coal, oil, gas), biomass power plants (wood, straw, other biomass), lead production (batteries) but also ceramics production and glass production are selected. The main release vectors of UP-POPs in these categories are air and residue.
175. As generation of heat or power is the aim of power plants, in the case of the combustion of biomass or fossil fuels, the amount of PCDD/PCDF cannot easily be equated to mass (in tons). The preferred basis to report emissions of

⁶ Uptake of water efficiency measures low due to limited cost of water supply and WWT.

⁷ Calculated with replication factor 3 (conservative judgment).

PCDD/PCDF would be the energy input of the fuel. As the heat or power output is the “product” of the processes in this group, the default emission factors derived from the available data are linked to the heating value of the fuel. Thus, instead of reporting default emission factors in µg TEQ/t of fuel, these factors are given in µg TEQ/TJ of heat input. The reason for this approach is the high variety of fuels used for power generation. As tracking indicator for the annual release of UP-POPs g TEQ/a will be applied. The GEF POPs tracking tool, section “reduction of unintentionally produced POPs” will be applied for reporting. At GEF project start the targeted lifetime UP-POPs emissions avoided will be calculated and its progress verified mid-term and after finalization of the project.

b) Tracking of GHG reduction:

176. For calculating GHG benefits of the GEF project in energy efficiency and renewable energy the GEF tracking tool for climate change mitigation projects will be applied. The project will have direct CO₂eq emission reductions achieved by investments that are directly part of the results of the projects and a range of indirect impacts through dissemination and development.

177. Direct emission reductions are calculated by assessing the fuel savings attributable to the investments made during the project’s supervised implementation period. These are then projected for, and totaled over the respective lifetime of the investments both during and post implementation. All CO₂eq savings resulting from investments made within the boundaries of the project either using GEF resources or the resources contributed by co-financiers and tracked through monitoring and evaluation (M&E) systems will be counted toward a project’s direct effects. At project start the targeted lifetime CO₂eq emissions avoided will be calculated and its progress verified mid-term and after finalization of the project. The tracking indicator will be lifetime direct and indirect avoidance of CO₂eq.

c) Tracking of IW benefits:

178. For tracking and reporting of water benefits the GEF international waters tracking tool will be applied. The tracking tool’s indicators represent the three types of IW indicators used by the focal area: process, stress reduction, and environmental/water resources & socioeconomic status indicators. The stress reduction indicators are divided into two larger groups, national/local reforms and local investments. For the GEF project stress reduction measurement is relevant and water use efficiency measures will be tracked by applying the indicator m³/year water saved. In addition industrial waste water pollution reduction will be tracked by the indicator kg/year reduction of COD, BOD and heavy metals. At project start the targeted lifetime water savings and pollution reduction will be calculated and its progress verified mid-term and after finalization of the project.

Project conclusion:

179. In the final month of the project, a concluding workshop will be held. At this event, the overall implementation of the project will be evaluated and assessed to see if the project has attained the established objectives and contributed to the attainment of environmental targets. The workshop will reveal if any further measures regarding individual outcomes are required, taking into account the sustainability of the project results. This workshop should also bring together the lessons learned, so that they can be taken into account when formulating new projects

Reporting:

180. A first Project Inception Report will be produced after the inception phase. It will contain the first year’s work plan, covering all the activities and parameters that are important for measuring progress of the project. The report will present project activities, as well as missions and meetings of the Project Steering Committee. The report will also include a budget for the first project year, based on the Annual Work Plan. Moreover, the report will give an insight into the requirements for effective monitoring and evaluation in the first year.

181. The Annual Project Report (APR) is demanded by UNIDO and is one of the means of project supervision, monitoring and project management by UNIDO. The APR will be produced annually by the PMU and submitted to UNIDO and the PSC in order to prepare the PSC meetings and to reveal the extent to which the activities in the Annual Work Plan have been realized. The APR serves as the basis for judging progress of the project and the attainment of planned outcomes and outputs.

182. The Project Implementation Report (PIR) is part of the monitoring process and is demanded by GEF once a year. It serves as an instrument of management and monitoring for the project management and formulates the lessons learned from the ongoing project.

183. All reports will be sent to UNIDO after finalization. UNIDO will be responsible for reporting to GEF and forwarding.

Independent Evaluation:

184. An independent Mid-Term Evaluation will be performed after 18 months to measure progress with the project and the attainment of outcomes, and will also include corrective measures if necessary. In particular, the evaluation will highlight those aspects that require rapid decisions and measures. Furthermore, the first lessons learned concerning design, implementation and management of the project will be formulated. They will be used to optimize the second half of the project. The Mid-Term Evaluation will be organized and planned in consultation with the project partners.

185. An independent and final project evaluation will be carried out at the end of the Project implementation, and will address in particular the project's impact and the sustainability of its results, as well as the project's contribution to capacity building and to global environmental benefits. Project output will be determined by balancing out relevance, effectiveness and the efficiency of measures. Recommendations for subsequent projects from the lessons learned and success stories are also part of this project evaluation. The Terms of Reference (TOR) for this project evaluation will be formulated by UNIDO in compliance with the requirements of the GEF Evaluation Office.

List of references

- [1] Decision No: 158/2008/QD-TTg issued on 2 December 2008 - Approval of the National Target Program to respond to climate change
- [2] National State of Environment report 2009, Vietnam Industrial Zone Environment, MONRE, 2009
- [3] Decision No. 4103/QD-BCT issued on 3 August 2010 - Action plan on response to climate change of the ministry of industry and trade
- [4] Industrial pollution management in Nhue-Day and Dong Nai rivers watershed, MPI, 2011
- [5] Water Environment Partnership in Asia (WEPA) under the initiative of the Ministry of the Environment of Japan, 2011
- [6] Clean production and Energy Efficiency Project, GEF/WB, 2011
- [7] Vietnam National Implementation Plan for Stockholm Convention on Persistent Organic Pollutants, GEF/UNDP, MONRE, 2006

Following reports, decrees and laws require actions as outlined in the proposed project:

- Decision 183/2004/QD-TTg issued on 19 October 2004 – Financial support from the central state budget to technical infrastructure investment in IZs in localities with difficult socio-economic conditions
- Law No. 52/2005/QH11 approved by National Assembly on 29 November 2005 – Law on Environmental Protection
- Law No. 2008/QH 12 approved by the National Assembly on 21 November 2007 – Law on Chemicals
- Decree No. 59/2007 issued on 9 April 2007 – Management of solid wastes
- Decree No. 88/2007 issued on 28 May 2007 – The water drainage in IZs and urban areas
- Decree No. 29/2008/ND-CP issued on 14 March 2008 – Specification of the establishment, operations, policies and state management of IZs, PZs, economic zones and border gate economic zones
- Decision No. 1107/2006/QD-TTg issued on 21 August 2008 – Approval of industrial zone development planning in Vietnam up to 2015 and orientation to 2020
- Decision No 1440/QD-TTg issued on 6 October 2008 – Master plan for installation of solid waste treatment systems in major economic areas of North, Central and South Vietnam
- Decree No. 120/2008/ND-CP issued on 1 December 2008 – River Basin Management
- Decree No. 120/2008/ND-CP issued on 1 December 2008 – River Basin Management
- Circular No. 08/2009/TT-BTNMT issued on 15 July 2009 – Regulations on environment management and protection in economic areas, modern technology areas, industrial areas and industrial parks
- Decision No. 1419/QD-TTg issued on 7 September 2009 – Cleaner industrial production until 2020
- Decision No. 2149/QD-TTg issued on 27 December 2009 – National strategy for comprehensive management of solid wastes until 2025, with a vision to 2050
- Law No. 50/2010/QH12 approved by the National Assembly on 17 June 2010 – Law on Energy Efficiency and Conservation
- Draft report of Danang industrial and export processing zones authority issued in October 2010 - Construction of concentrated wastewater treatment and environmental protection works at industrial zones
- Decision No. O4I2008IQD-BXD of April 2008 – Promulgating the Vietnam Building Code on regional and urban planning and rural residential planning
- Decision No. 1427/QD-TTg of 2 October 2012 on approval of national targeted program on energy efficiency and conservation phase 2012-2015

Abbreviations

BAT/BEP	Best Available Technologies/Best Environmental Practices
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CWWTP	Centralized Waste Water Treatment Plant
EC	Energy Conservation
EE	Energy Efficiency
EIP	Eco-Industrial Park
GCTF	Green Credit Trust Fund
GHG	Greenhouse Gas
IA	Implementing Agency
IPONRE	Institute of Strategy and Policy on Natural Resources and Environment
IZ	Industrial zone
MDG	Millennium Development Goals
MOF	Ministry of Finance
MOIT	Ministry of Industry and Trade
MOLISA	Ministry of Labor, Invalids and Social Affairs
MONRE	Ministry of Natural Resources and Environment
MOST	Ministry of Science and Technology
MPI	Ministry of Planning and Investment
NIP	National Implementation Plan
NPC	National Project Coordinator
NPD	National Project Director
NPM	National Project Manager
PMU	Project Management Unit
POP	Persistent Organic Pollutants
PSC	Project Steering Committee
PTS	Persistent Toxic Substances
SAICM	Strategic Approach to International Chemicals Management
SC	Stockholm Convention
TEQ	Toxic Equivalents
TNA	Technical Needs Assessment
TOE	Ton of Oil Equivalent (42 GJ)
TSS	Total Suspended Solids
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UP-POPs	Unintentionally produced POPs
VACNE	Vietnam Association for Conservation of Nature and Environment
VNCPC	Vietnam Cleaner Production Centre
WB	World Bank

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

- A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S):** (Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this form. For SGP, use this [OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Philippe Scholtès Officer-in-Charge Programme Development and Technical Cooperation Division (PTC) UNIDO GEF Focal Point		12/06/2013	Heinz Leuenberger	+43 1 260265611	h.leuenerger@unido.org

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Hierarchy of Objectives	Indicators	Baseline	Target	Sources of Verification	Assumptions
<p>Project Objectives:</p> <p>(a) Introduce and implement an EIP-management system to reduce and/or eliminate GHG, water consumption, water pollution, POPs and other chemicals of global concern. (b) demonstrate innovative clean&low-carbon technologies and practices in industry</p>	<p>Tons of GHG, m³ of water, kg of water pollutants and g TEQ of UP-POPs reduced</p>	<p>Inefficient use of fossil energy and water, untreated release of water and air contaminants</p>	<p>Avoidance of around 182,000t/a CO₂eq direct emissions and related UP-POPs, 6million m³/a water and water effluent quality according to international standards</p>	<p>GHG, water and POPs tracking reports</p>	<p>The financial facilities and companies will commit funds to invest into new efficient clean&low-carbon technologies</p>
<p>Component 1</p> <p>Outcome 1: Legislation and policies on IZ planning and management, IZ environmental and industrial pollution management responsibilities and investment facilitation for clean&low-carbon technology adopted to meet EIP criteria</p>	<p>A set of regulatory instruments compliant with EIP criteria on IZ management adopted..</p>	<p>In Vietnam, regulation on sustainable planning, development and management of IZ is limited to generic provisions in the planning and construction legislation. No incentive mechanism for promoting innovative resource- and energy-efficient technologies and production practices in IZ exists.</p>	<p>A new set of guidance/guidelines particularly focusing on EIP planning and management drafted and implemented.</p>	<p>Copies of officially adopted regulations</p>	<p>The government of Vietnam is committed to timely adopt regulatory tools which will obligate stakeholders at managing IZ in an environmental sound manner.</p>
<p>Output 1.1: IZ policy and regulatory framework reviewed and formulated</p>	<p>A set of regulatory instruments compliant with EIP criteria on IZ management adopted..</p>	<p>Currently, to improve the environmental situation in IZ a decision on waste water treatment plants is being enforced. No legislation on holistic planning and</p>	<p>Regulatory instruments, like a framework regulation on EIP creation and transformation is drafted, submitted to the relevant legislative bodies, and officially</p>	<p>Meeting reports, copy of the officially adopted regulatory instrument.</p>	<p>Agreement among stakeholders on the content of the regulatory tool incl. responsibilities will be reached rapidly and effectively.</p>

Hierarchy of Objectives	Indicators	Baseline	Target	Sources of Verification	Assumptions
Output 1.2: Centralized services for IZ evaluated, prioritized and proposed for implementation	A set of centralized services like emergency response, waste management, maintenance developed and proposed	environmental management of IZ exist. Very few services provided by IZ authority to companies and concentrated to pollution control and marketing.	adopted. Various centralized services evaluated based on an economic and environmental analysis, documented and adopted in regulations to support EIP transformation.	Service analysis report with international best practice, meeting reports; copy of the regulatory instrument.	Centralized services in IZ are requested and funded by IZ companies willing to outsource non-core businesses and lower the overall impact of IZ.
Component 2					
Outcome 2: Strengthened institutional capacities on eco-industrial park planning and management at central and provincial government level and IZ authorities in selected provinces.	Number of staff from governmental institutions and IZ are provided with the necessary skills to carry out technical and administrative tasks related to the planning of new and transformation of existing IZ.	Currently, capacity of governmental institution and IZ authority on implementing the provisions of an EIP is scarce.	At least 40 core staff covering local and central governments and IZ authorities of the three project provinces and 120 staff of other provinces intensively trained to implement EIP management awareness.	Training curricula. Number of trainees.	The project will be fully supported by MPI, MONRE, MOIT, IZ authorities of 3 project provinces and other provinces nationwide.
Output 2.1: Capacity on eco-industrial park planning and management built/strengthened among government staff and IZ authorities in the central and provincial level.	Capacity building needs for governmental institutions and IZ authorities are assessed. Number of training addressing identified needs is designed and carried out successfully.	Representative of the three IZ and MPI, MOIT and MONRE were selected during project preparation and can serve as initial working group to be trained on eco-industrial park planning and management.	An EIP working group of at least 40 selected people will be trained on all the technical, managerial, financial, environmental and social aspects of eco-industrial park planning and management enabling them to conduct training to other relevant stakeholders.	Report on training effectiveness properly measured (feedback from the trainees) and documented. Training material translated in Vietnamese and made available for future training courses.	A sufficient number of people from governmental institutions and IZ authorities is willing to attend the training and to subsequently train other stakeholders on the topic. A skilled working group represents one of the key resource for ensuring the sustainability of EIP development.
Output 2.2: Technical capacity of IZ authorities in 3 project provinces strengthened to properly perform tasks and	Number of IZ authority staff trained on the monitoring of environmental pollution and supervision of	Currently, the technical capacity of IZ authorities in monitoring of environmental performance of the	An online system of industrial pollution monitoring will be developed to support IZ authorities in 3 project	An online waste water monitoring system will be developed and piloted in each of the 3 project IZ authorities.	The activities under this output will require the proactive participation of provincial IZ authorities in the 3 project provinces

Hierarchy of Objectives	Indicators	Baseline	Target	Sources of Verification	Assumptions
<p>functions on the supervision of environmental protection in IZ</p>	<p>environmental performance of companies in 3 IZ.</p> <p>Three pilot projects on waste water monitoring successfully implemented in 3 IZ.</p>	<p>companies in IZ is still poor.</p>	<p>provinces in undertaking tasks and functions in industrial pollution management and environmental protection.</p>		
<p>Outcome 3: Strengthened capacities on technology transfer, clean&low-carbon technologies and resource efficient and safe practices at company level in the selected IZ and government level.</p>	<p>Number of technical staff from companies and governmental institutions (MOIT, MOST) are provided the necessary information to initiate investment into clean&low-carbon technologies and to facilitate technology transfer as well as to implement resource efficient and safe practices.</p>	<p>Currently, governmental institutions (MOIT) work on regulations for facilitating clean&low-carbon technologies. Capacity of governmental institution on promoting innovative and efficient technology is modest.</p> <p>At company level capacity on clean&low-carbon technologies is scarce and resource efficient, cleaner and safe production is not widely adopted yet</p>	<p>Core staff covering companies and central government and IZ authorities of the three selected IZ trained on clean&low-carbon technologies.</p> <p>Another significant number of company workers trained on safe, resource efficient and cleaner production (RECP) and selected people trained as RECP-trainers.</p>	<p>Training curricula. Number of trainees.</p>	<p>The project will be fully supported by MONRE and MOIT</p>
<p>Output 3.1 Capacity built/strengthened to implement clean&low-carbon technologies and chemicals management.</p>	<p>Number of staff trained to identify and implement clean&low-carbon and resource efficient technologies as well as proper chemical management according to SAICM.</p>	<p>Information basis on clean&low-carbon technology and chemical management at company level is weak and capacity building at governmental level for new regulations necessary.</p>	<p>At least 200 selected technical managers from companies of the three selected IZ in Ninh Binh, Danang and Can Tho and government responsible trained in two years on application range, properties and environmental aspects of technologies and practices.</p>	<p>Training reports and feedback from trainees.</p>	<p>A sufficient number of technical decision makers of companies and staff from governmental institutions will attend the trainings.</p>

Hierarchy of Objectives	Indicators	Baseline	Target	Sources of Verification	Assumptions
Output 3.2 Capacity on resource efficient and cleaner production (RECP) built/strengthened among company staff.	Number of staff trained to conduct RECP audits and to optimize manufacturing processes	Limited number of staff are able to conduct internal RECP audits	At least 200 company staff of the three selected IZ in Ninh Binh, Danang and Can Tho trained on methodology and implementation of RECP Around 20 local consultants trained as future RECP trainers	Training reports and tests on learning progress. Finalized RECP assessments conducted by future RECP-trainers.	The project will be fully supported by MOIT and established and proven training programs will be applied.
Component 3 Outcome 4: Potential for clean&low carbon technologies and resource efficient technical solutions identified and community enhancement projects clarified.	Number of eligible clean&low-carbon as well as community enhancement projects identified. Strategic plans for the selected IZ on implementation of technical improvements.	No needs assessment on the status of clean&low-carbon technology implementation in IZ available. Basic initiatives on community enhancement with regard to social facilities (e.g. child care).	At least 45 companies in the three selected IZ assessed and potential for clean&low carbon technology incl. BAT/BEP implementation identified and reported. Strategic plans developed and used for future upgrade of IZ. Community enhancement projects identified and described for further processing.	Company assessment reports on technology gaps and inappropriate practices. Documented strategic plans for three IZ. Summary report on community enhancement baseline and possible improvements	The project will be fully supported by MOIT and IZ authorities.
Output 4.1: Companies for RECP and technology gap evaluation selected and assessed.	Criteria for the selection of companies fulfilling eligible criteria.	No comprehensive assessments of companies in the selected IZ available.	At least 45 companies in the three selected IZ assessed in RECP and potential for implementation of clean&low carbon technology incl. BAT/BEP and training needs identified and reported.	Eligibility criteria for the companies. Detailed company status reports.	A sufficient number of companies is willing to be assessed and interested in manufacturing process improvement and technology investments. The companies represent the key resource for the demonstration of innovative technical

Hierarchy of Objectives	Indicators	Baseline	Target	Sources of Verification	Assumptions
<u>Output 4.2</u> Strategic plans for IZ transformation developed.	The overall procedure for IZ transformation with regard to inter-company collaboration on re-use and recycling of by-products and waste, efficient use of energy and water, BAT/BEP and chemicals management established for three selected IZ and code of practices implemented.	No strategic plans with regard to clean&low-carbon technologies and practices for IZ available.	Needs of IZ authority to adapt to the new EIP structure/requirements assessed particularly on environmental management, waste exchange data management, logistics, legal compliance monitoring. Service and technology gap identified at IZ authority and in company assessments in three selected IZ summarized and documented. Code of practice elaborated and adopted.	Three strategic plans for the three selected IZ. Code of practices document.	The early identification of needs of the IZ authorities and companies and strengthening of the IZ authority is important for the implementation of the project and will ensure sustainability of project activities after project end.
<u>Output 4.3:</u> Community enhancement projects identified and feasibility evaluated.	Criteria for community enhancement projects at three IZ developed and number of projects identified fulfilling eligibility criteria.	No evaluation of community enhancement potential in the context of IZ development available.	Needs of communities at three IZ to adapt to the new EIP structure assessed particularly on supplier companies, environmental dispute and social facilities and under consideration of environmental, economic and social benefits.	Needs assessment and project feasibility report.	The project will be fully supported by VACNE and IPONRE. Activities under the project supplement ongoing governmental efforts to improve community status.
<u>Component 4</u>					
<u>Outcome 5</u> EIP projects to reduce GHG, water consumption, water contaminants and unintentionally produced	Number of submitted clean&low carbon technologies investment proposals.		Numerous bankable clean&low-carbon technology investment projects developed in three IZ by experts and	Technical specifications. Investment reports. Tracking tools for GHG,	Appropriate and sufficient sources of finance will be accessed and suitable, efficient and cost effective

Hierarchy of Objectives	Indicators	Baseline	Target	Sources of Verification	Assumptions
POPs demonstrated and community enhancement initiated.	Number of successfully implemented EIP investment projects. Amount of GHG, water, water pollutants, UP-POPs reduced.		company representative and implemented. Relevant policy and guideline covering environmental dispute and community compensation drafted and approved.	IW, UP-POPs	technologies identified and implemented by the companies within the project period.
Output 5.1 Companies for clean&low-carbon technology investment projects selected and investment projects developed.	Number of selected companies. Number of developed investment projects.	There is not enough knowledge at company level to satisfy the need for appropriate innovative clean&low-carbon technology and for the elaboration of bankable investment projects especially at SME.	At least 30 bankable clean&low-carbon technology investment projects developed in detail by experts and company representative. Appropriate financial facilities selected and loan requests elaborated.	Technical investment reports. Investment proposals for the respective financial facilities.	A sufficient number of companies is willing to invest into clean&low carbon technologies with the subsidizing conditions set forth by the GEF project. Suitable experts on clean&low-carbon technologies are to be identified who can properly interact with company representatives to develop transparent investment projects.
Output 5.2 Pilot clean&low-carbon technologies and practices established on identified production sites.	Number of implemented and successfully operating technologies and practices. Investment amount in clean&low-carbon technology and co-finance share.	Currently only scattered and insufficient financial assistance for clean technology without coordination exist.	At least 30 clean&low-carbon technology investment projects commissioned, implemented and functional.	Installation acceptance reports. Technical specifications of the installed technology. Reports on implemented new business models (e.g. chemical leasing)	Financial facilities approve the companies' requests for a loan.
Output 5.3 Pilot community enhancement projects	Number of supported and implemented community enhancement projects	Insufficient public investment generally for social facilities and	Policy for environmental dispute particularly with regard to mediation and	Meeting reports, copy of the adopted policy and guideline.	Community enhancement project at Bau Tram Lake, Danang ready for

Hierarchy of Objectives	Indicators	Baseline	Target	Sources of Verification	Assumptions
<p>established.</p>	<p>with supra-regional environmental significance.</p>	<p>environmental protection available. Numerous cases of public demonstrations due to environmental problems.</p>	<p>avoidance of juridical cases supported, drafted and adopted. Guideline for companies on community compensation drafted and adopted. One community enhancement project with supra-regional environmental and social benefits supported.</p>		<p>further support. The project will be fully supported by VACNE and IPONRE, IZ authority.</p>
<p>Outcome 6 Increased public awareness on issues concerning EIP development</p>	<p>Number of relevant public awareness workshops held. Number of stakeholders aware of the potentials associated with the transformation of IZ in EIP and of the benefits of managing them in an environmental sound manner.</p>	<p>The awareness of the eco-industrial park issue in particular with regard to adoption of innovative clean&low-carbon technology is limited even among the IZ authorities.</p>	<p>At least 3 Awareness Workshops held on EIP issues. Numerous IZ authorities, public institutions, associations, scientific institutions and NGOs with increased awareness on EIP transformation and management.</p>	<p>Awareness raising workshops reports.</p>	
<p>Output 6.1: Stakeholder engagement including NGOs, community representative and government established.</p>	<p>Number of stakeholders targeted and participating in awareness raising events.</p>	<p>Identification of target stakeholders for awareness raising on EIP issues never carried out.</p>	<p>At least 20-25 organizations (incl. scientific institutions (universities), NGO, public institutions, IZ authorities, associations) identified and participating in awareness raising events.</p>	<p>Awareness raising plan. List of targeted stakeholders contacted. Reports of awareness raising initiatives.</p>	<p>Identification of the relevant target group is essential for an effective awareness raising on EIP. Target stakeholders identified are willing to participate in awareness raising events. The level of awareness is measurable by means of properly conducted</p>

Hierarchy of Objectives	Indicators	Baseline	Target	Sources of Verification	Assumptions
Output 6.2: Development and implementation of training and awareness programs.	Awareness raising material. Number of awareness raising events held.	No awareness raising material on EIP is available in the country, neither for the general public nor for specific stakeholders.	Awareness raising material specifically developed for public institutions, IZ authorities and associations. Website established for the disclosure of environmental performance of companies in selected IZ and knowledge sharing on EIP and in particular on international waters issues under the "IW Learn" mechanism.	Dissemination materials specifically prepared for each target group.	Further awareness raising on EIP with IZ authorities and associations expected from governmental staff.
Component 5					
Outcome 7: Effective project management, monitoring and evaluation implemented.	Timely monitoring and reporting of project performance indicators. Corrective measures in place in case of variations.	M&E activities with other projects established at PMU.	M&E system for tracking implementation progress towards outcomes and outputs in place. Project management operational and PMU established within MPI.	Documentation on responsibilities, timelines and deliverables.	Project implementation arrangement established and responsibilities accepted by all project partners.
Output 7.1: M&E mechanism and PMU developed and implemented.	Number of reports on project progress and corrective measures taken.	No M&E and project management for EIP projects have been applied.	Regular monitoring and analysis of performance indicators. Annual project review. Mid-term project review. Terminal project evaluation.	Progress reports. Steering committee meetings. Visits to field sites.	The M&E plan is fully budgeted.

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

Scientific and Technical Advisory Panel

The Scientific and Technical Advisory Panel, administered by UNEP, advises the Global Environment Facility (Version 5)

STAP Scientific and Technical screening of the Project Identification Form (PIF)

Date of screening: May 10, 2012

Screener: Guadalupe Duron

Panel member validation by: Michael Anthony Stocking; Hindrik Bouwman

Consultant(s): Margarita Dyubanova

I. PIF Information (*Copied from the PIF*)

Full Size Project **GEF Trust Fund**

GEF Project ID: 4766

Project Duration : 3

Countries : Vietnam

Project Title: Implementation of Eco-industrial Park Initiative for Sustainable Industrial Zones in Vietnam

GEF Agencies: UNIDO

Other Executing Partners: National executing agencies:

Ministry of planning and investment (MPI)

GEF Focal Area: Multi Focal Area

II. STAP Advisory Response (*see table below for explanation*)

Based on this PIF screening, STAP's advisory response to the GEF Secretariat and GEF Agency(ies):

Minor revision required

III. Further guidance from STAP

UNIDO's proposal "Implementation of eco-industrial park initiative for sustainable industrial zones in Vietnam" has the objective to increase transfer, deployment and diffusion of clean technologies and practices for the minimization of hazardous waste, GHG emissions, POPs and other pollutants as well as sound management of chemicals in industrial zones of Vietnam.

While STAP welcomes this initiative, it suggests that the project framework needs to be revisited as it fails to adequately capture the environmental changes being sought by project investments. Expected Outputs and Outcomes are largely descriptors of activities, rather than changes brought about by the project. Some outcomes are almost identical to their respective outputs. Under Expected Outputs STAP would like to see the actual project deliverables and substantive and measurable indicators, rather than a list of project activities. Under Expected Outcomes, STAP would expect to see the major changes to which the project will contribute, including the delivery of GEBs. This is a key element of the project strategy which must be clarified.

UNIDO response: *Agreed. Changes and supplementations are made in the project results framework and para 48-88.*

The proposal makes it clear that GHG mitigation potential and chemicals reduction and elimination are important national priorities. However, for eligibility for GEF finance, the proposal needs to elaborate on several items that are currently missing from Section B2 to B5 and the Project Framework:

- global environmental benefits. As noted above, these need to be explicitly identified and related to the GEF-5 focal area strategies;

UNIDO response: *Agreed. Identification and relation is reflected in para 89-103.*

- impact and tracking indicators. These need to be part of the monitoring structure of the project, with identified criteria for choice of indicator and methods of measurement;

UNIDO-response: *Agreed. Detailed explanation is provided together with M&E plan in chapter C, para 173-178.*

- a realistic risk analysis. For example, STAP identifies the need for quantitative data on direct and indirect avoidance of GHG emission, amount of un-intentionally produced dioxins and furans reduced using the Dioxin Toolkit, and improvements in water use efficiency and quality. Previous GEF and UNEP efforts have supported capacity development for POPs analyses in Vietnam. This capacity could be used to track actual reductions in emissions.

UNIDO-response: *Duly noted. Reference to previous GEF projects to be considered including POPs-analyses made in chapter A7.*

- Furthermore, in Section B4 risks need to be rated and mitigation measures clearly identified.

UNIDO-response: *Agreed. A detailed risk analyses has been incorporated in chapter A6.*

In summary, STAP believes that while project activities are well-described and justifiable, given the fact that the PIF states that "a serious barrier for technology transfer is the lack of information on clean&low-carbon technologies", the STAP must also comment that it finds that the context of the project and its source of finance have not been clearly addressed. It might be wise to look at lessons learned from other Focal Areas where similar barriers arise (eg. Climate Change Mitigation), and see what can be replicated in this project. It is vital that the activities relate to the project objective and that systems are in place to identify, track and monitor the contribution of the project to global environmental benefits. The above weaknesses need to be addressed as the project develops to a full proposal.

UNIDO-response: *Agreed. The context of the project is clarified in more detail in chapter A2 para 9ff and findings of other projects considered in the project methodology and reflected in chapter B3.*

The risk analysis also needs to be broadened during project development. For example, noting that 70% of industrial workers in the industrial zone are immigrants, and that 60% of them are women, there is a sociocultural risk associated with how these workers will be integrated into project activities and share in benefits. What might the potential barriers be to this? Where in the infrastructural hierarchy do these workers exist? Would they be fully integrated and viewed as equal stakeholders in the project? Are there language barriers to consider? Will they easily take up new approaches and technologies? In addition, there are clear gender implications that accompany this. The STAP therefore urges a wider consideration of risk categories during the project development phase.

UNIDO-response: *Noted. A wider consideration of gender issues is provided in the risk analysis in chapter A6 and B2.*

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS⁸

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF:			
<i>Project Preparation Activities Implemented</i>	<i>GEF/LDCF/SCCF/NPIF Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
Total			

Project preparation activities were fully funded by UNIDO (no GEF PPG) and comprised following steps:

1. Preparation of public and private sector involvement
2. Determination of clean&low-carbon technology investments in private sector
3. Involvement of sector experts, preparation of investment plan and project document preparation

Total amount spent for project preparation: USD 117,000

⁸ If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (IF NON-GRANT INSTRUMENT IS USED)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

N/A

ANNEX E: PROJECT BUDGET

Activity	National Consultants		International Consultants		Sub-contract (USD)	Other inputs			Total Cost (USD)	GEF Grant (USD)	Co-Finance (USD)
	w/m	USD	w/m	USD		Travel	Equipment	Workshops			
Outcome 1: Legislation and policies on IZ planning and management, IZ environmental and industrial pollution management, responsibilities and investment facilitation for clean&low-carbon technology adopted to meet EIP criteria	25.00	100'000	3.00	78'000	1'000	32'500	0	71'500	283'000	150'000	133'000
Output 1.1: IZ policy and regulatory framework reviewed and formulated	18.00	72'000	1.50	39'000	0	22'000	0	60'000	193'000	64'000	129'000
Activity 1.1.1: Review and Assessment of existing legal and regulatory framework and drafting evaluation report	8.00	32'000	0.50	13'000		10'000		10'000	65'000	24'000	41'000
Activity 1.1.2: Development of official guideline on EIP planning	6.00	24'000	1.00	26'000		4'000		20'000	74'000	24'000	50'000
Activity 1.1.3: Dissemination and communication of official guideline on EIP planning	4.00	16'000		0		8'000		30'000	54'000	16'000	38'000
Output 1.2: Centralized services for IZ evaluated, prioritized, piloted and proposed for implementation	7.00	28'000	1.50	39'000	1'000	10'500	0	11'500	90'000	86'000	4'000
Activity 1.2.1: Review of existing centralized services and drafting of assessment report with recommendations	3.00	12'000	0.75	19'500	500	6'500		2'500	41'000	41'000	0
Activity 1.2.2: Development of technical guidelines on the application of centralized service provision in IZ to meet the standards of EIP	4.00	16'000	0.75	19'500	500	4'000		9'000	49'000	45'000	4'000
Subtotal of Component 1	25.00	100'000	3.00	78'000	1'000	32'500	0	71'500	283'000	150'000	133'000
Outcome 2: Strengthened institutional capacities on eco-industrial park planning and management at central and provincial government level and IZ authorities in selected provinces	6.75	27'000	3.50	91'000	160'000	25'000	125'000	42'000	470'000	40'000	430'000
Output 2.1: Capacity on eco-industrial park planning and management built/strengthened among government staff and IZ authorities in the central and provincial level	2.75	11'000	1.50	39'000	40'000	0	0	30'000	120'000	40'000	80'000

Activity	National Consultants		International Consultants		Sub-contract (USD)	Other inputs			Total Cost (USD)	GEF Grant (USD)	Co-Finance (USD)
	w/m	USD	w/m	USD		Travel	Equipment	Workshops			
Activity 2.1.1: Assessment of capacity building needs in EIP and curricula development	2.00	8'000	0.50	13'000					21'000		21'000
Activity 2.1.2: Conduct training at central and provincial level on EIP incl. preparation	0.75	3'000	1.00	26'000				30'000	59'000		59'000
Activity 2.1.3. Organization of study tour on EIP planning in industrialized country for leadership officials and officials at implementing level		0		0	40'000				40'000	40'000	0
Output 2.2 Technical capacity on environmental and industrial pollution management and centralized service management strengthened through pilot projects at 3 selected IZ authorities	4.00	16'000	2.00	52'000	120'000	25'000	125'000	12'000	350'000	0	350'000
Activity 2.2.1. Pilot project on the development of an online wastewater monitoring system in Can Tho IZ	1.50	6'000	0.75	19'500	45'000	10'000	50'000	5'000	135'500		135'500
Activity 2.2.2. Pilot project on the development of an online wastewater monitoring system in Da Nang IZ	1.50	6'000	0.75	19'500	45'000	10'000	50'000	5'000	135'500		135'500
Activity 2.2.3. Pilot project on the development of an online wastewater monitoring system in Ninh Binh IZ	1.00	4'000	0.50	13'000	30'000	5'000	25'000	2'000	79'000		79'000
Outcome 3: Strengthened capacities on technology transfer, clean&low-carbon technologies and resource efficient and safe practices at company and government level	10.50	42'000	6.15	159'900	0	45'100	0	83'000	330'000	330'000	0
Output 3.1: Capacity built/strengthened to implement clean&low-carbon technologies and chemicals management	3.50	14'000	6.00	156'000	0	36'000	0	43'000	249'000	249'000	0
Activity 3.1.1: Assessment of capacity building needs in technologies and chemicals management and curricula development	2.00	8'000	0.50	13'000		4'000		3'000	28'000	28'000	0
Activity 3.1.2: Conduct training at company/government level on technology and practices incl. preparation	1.50	6'000	5.50	143'000		32'000		40'000	221'000	221'000	0

Activity	National Consultants		International Consultants		Sub-contract (USD)	Other inputs			Total Cost (USD)	GEF Grant (USD)	Co-Finance (USD)
	w/m	USD	w/m	USD		Travel	Equipment	Workshops			
Output 3.2: Capacity on RECP built/strengthened among company staff	7.00	28'000	0.15	3'900	0	9'100	0	40'000	81'000	81'000	0
Activity 3.2.1: Adjust training program for basics&trainers	1.00	4'000	0.15	3'900		4'100			12'000	12'000	0
Activity 3.2.2: Conduct training on RECP for companies and consultants	6.00	24'000	0.00	0		5'000		40'000	69'000	69'000	0
Subtotal component 2	17.25	69'000	9.65	250'900	160'000	70'100	125'000	125'000	800'000	370'000	430'000
Outcome 4: Potential for clean&low-carbon technologies and resource efficient technical solutions identified and community enhancement projects clarified	80.25	327'000	20.50	552'500	50'000	92'000	400'000	34'500	1'456'000	1'336'000	120'000
Output 4.1: Companies for RECP and technology gap evaluation selected and assessed	75.00	300'000	15.75	409'500	0	64'000	0	6'500	780'000	780'000	0
Activity 4.1.1: Company selection, preparation and pre-assessment	7.50	30'000	0.75	19'500		4'000		6'500	60'000	60'000	0
Activity 4.1.2: Company RECP&technology gap assessments, reporting	67.50	270'000	15.00	390'000		60'000			720'000	720'000	0
Output 4.2: Strategic plans for IZ transformation developed	3.75	21'000	4.25	130'000	50'000	20'000	400'000	21'000	642'000	522'000	120'000
Activity 4.2.1: Needs assessment at three IZ authorities on centralized services and technology diffusion	0.75	3'000	0.75	19'500		4'000		6'000	32'500	32'500	0
Activity 4.2.2: Inventory of clean&low-carbon technology needs in IZ and BAT/BEP identified with survey and site visits	2.00	8'000	1.50	39'000		8'000			55'000	55'000	0
Activity 4.2.3: Development of three strategic plans for IZ transformation and code of practice	1.00	4'000	2.00	52'000		8'000			64'000	64'000	0
Activity 4.2.4: Pilot projects to apply the provision of centralized services (water supply, electricity, waste management) in 3 selected IZs based on the recommendations made by experts		0		0	50'000		400'000	15'000	465'000	345'000	120'000
Activity 4.2.5: Assessment of pilot projects and recommendations for the preparation of technical guidelines to replicate the model of centralized service provision in IZ nationwide	1.50	6'000	0.75	19'500					25'500	25'500	0

Activity	National Consultants		International Consultants		Sub-contract (USD)	Other inputs			Total Cost (USD)	GEF Grant (USD)	Co-Finance (USD)
	w/m	USD	w/m	USD		Travel	Equipment	Workshops			
Output 4.3: Community enhancement projects identified and feasibility evaluated	1.50	6'000	0.50	13'000	0	8'000	0	7'000	34'000	34'000	0
Activity 4.3.1: Needs assessment at communities and NGO on environmental and social issues, reporting	1.50	6'000	0.50	13'000		8'000		7'000	34'000	34'000	0
Subtotal component 3	80.25	327'000	20.50	552'500	50'000	92'000	400'000	34'500	1'456'000	1'336'000	120'000
Outcome 5: EIP projects to reduce GHG, water consumption, water contaminants and UN-POPs demonstrated and community enhancement initiated	41.25	165'000	11.25	292'500	0	70'500	10'600'000	5'000	11'133'000	933'000	10'200'000
Output 5.1: Companies for clean&low-carbon technology investment projects selected and investment projects developed	26.25	105'000	9.00	234'000	0	56'000	10'500'000	0	10'895'000	695'000	10'200'000
Activity 5.1.1: Selection of companies and documentation of financial feasibility	3.75	15'000	1.50	39'000		16'000			70'000	70'000	0
Activity 5.1.2: Elaboration of final investment projects reports and funding applications, submission to financing institutions	22.50	90'000	7.50	195'000		40'000	10'500'000		10'825'000	625'000	10'200'000
Output 5.2: Pilot clean&low-carbon technologies and practices established on identified production sites	7.50	30'000	0.00	0	0	2'500	0	0	32'500	32'500	0
Activity 5.2.1: Ex-post evaluation of installed technology, reporting	4.50	18'000	0.00	0		2'500			20'500	20'500	0
Activity 5.2.2: Financing scheme for clean&low-carbon technology investment projects promoted to banks and IZ companies	3.00	12'000	0.00	0					12'000	12'000	0
Output 5.3: Pilot community enhancement projects established	7.50	30'000	2.25	58'500	0	12'000	100'000	5'000	205'500	205'500	0
Activity 5.3.1: Drafting of policy on environmental dispute and guideline for companies on community compensation	3.00	12'000	0.75	19'500		4'000			35'500	35'500	0
Activity 5.3.2: Development of pilot community enhancement projects in 3 project provinces (Selection and support of community enhancement project with supra-regional environmental and social	4.50	18'000	1.50	39'000		8'000	100'000	5'000	170'000	170'000	0

Activity	National Consultants		International Consultants		Sub-contract (USD)	Other inputs			Total Cost (USD)	GEF Grant (USD)	Co-Finance (USD)
	w/m	USD	w/m	USD		Travel	Equipment	Workshops			
benefits)											
Outcome 6: Increased public awareness on issues concerning EIP development	38.00	152'000	1.00	26'000	100'000	14'000	0	75'000	367'000	367'000	0
Output 6.1: Stakeholder engagement including NGOs, community representative and government established	10.50	42'000	0.00	0	0	0	0	5'000	47'000	47'000	0
Activity 6.1.1: Drafting of awareness raising strategy, identification of target group (NGO, community, university, associations, IZ authorities)	3.00	12'000	0.00	0				3'000	15'000	15'000	0
Activity 6.1.2: Development of awareness raising materials for target groups	7.50	30'000	0.00	0				2'000	32'000	32'000	0
Output 6.2: Development and implementation of training and awareness programs	27.50	110'000	1.00	26'000	100'000	14'000	0	70'000	320'000	320'000	0
Activity 6.2.1: Holding awareness raising workshops on EIP development for identified target groups	7.50	30'000	1.00	26'000		8'000		30'000	94'000	94'000	0
Activity 6.2.2: Printing, dissemination, contribution to IW Website		0	0.00	0	100'000				100'000	100'000	0
Activity 6.2.3 Organizing community based campaigns/activities to supervise the environmental performance of the companies in the IZs in 3 project provinces	20.00	80'000		0		6'000		40'000	126'000	126'000	0
Subtotal component 4	79.25	317'000	12.25	318'500	100'000	84'500	10'600'000	80'000	11'500'000	1'300'000	10'200'000
Outcome 7: Effective project management, monitoring and evaluation established	216.00	97'200	9.00	234'000	190'000	49'800	125'000	60'000	756'000	368'000	388'000
Output 7.1: M&E mechanism and PMU developed and implemented	216.00	97'200	9.00	234'000	190'000	49'800	125'000	60'000	756'000	368'000	388'000
Activity 7.1.1 PMU operation	216.00	97'200	9.00	234'000	50'000	49'800	0	0	431'000	168'000	263'000
CTA			9.00	234'000		15'000			249'000		249'000
NPM	36.00	19'800		0					19'800	19'800	0
Admin staff	36.00	12'600		0					12'600	12'600	0
Project Officer	36.00	16'200		0					16'200	16'200	0
Project Officer at provincial level	108.00	48'600		0					48'600	48'600	0

Activity	National Consultants		International Consultants		Sub-contract (USD)	Other inputs			Total Cost (USD)	GEF Grant (USD)	Co-Finance (USD)
	w/m	USD	w/m	USD		Travel	Equipment	Workshops			
<i>(3 provinces x 1 person x 36 months)</i>											
<i>Project Travel</i>				0		34'800			34'800	34'800	0
<i>Interpreting and translation services (for the whole 3 years of implementation)</i>				0	50'000				50'000	36'000	14'000
Activity 7.1.2. E&M consultants		0		0	100'000				100'000	100'000	0
Activity 7.1.3. Financial audit		0		0	40'000				40'000	40'000	0
Activity 7.1.4. Inception workshop, midterm review workshops and final closing workshop and other meetings (including PSC meetings)				0			125'000	60'000	185'000	60'000	125'000
<i>Office equipment and supplies (car, photocopier, laptops/computers, printers, stationary, etc...) for M&E and PMU</i>				0			125'000		125'000		125'000
Subtotal component 5	216.00	97'200	9.00	234'000	190'000	49'800	125'000	60'000	756'000	368'000	388'000
Additional co-finance											38'326'265
Total	417.75	910'200	54.40	1'433'900	501'000	328'900	11'250'000	371'000	14'795'000	3'524'000	49'597'265

ANNEX F: BASELINE OF COMPANIES VISITED DURING PROJECT PREPARATION

No.	Sector	Founda tion	Staff	Export	Fuel	Electricity (kWh/a)	Water (m ³ /a)	Chemicals (t/a)	Process heat	Compressed air	Refrige- ration	Auxiliaries	Water	Waste water	Chemicals mgt.	
1	Metal proc./ Plating	2009	200	No	10m ³ /a LPG	110161	14,000	3.6 (Zn) 3.6 (NaOH sol.) 3.6 (HNO ₃) 6 (HCl)	Use of waste heat (tempering) for drying	Use of waste heat for drying.			Counter- current rinse improvement	Waste water reuse possible (plating, membrane).	Chem. management training, recovery of Zn (future Ct).	
2	Garment	2007	2740	Yes	64,256m ³ /a FO 5,626 t coal	7520	77,460	N.A.	Plant could be connected via district heating with glass factory.	Use of waste heat for washing.				Waste water reuse possible (washing, membrane).		
3	Glass	2006	294	Yes	15,000m ³ /a FO 20,000 t Petcoke	2.75*10 ⁶	50,000 (surface water)	N.A.	Up to 16,000m ³ /h steam 1.5 bar could be sold. District heating network required. No economizer. Co- generation to be evaluated.	High amount of waste heat. Use for air pre- heating possible.					Stack gases: SO ₂ (8.5*QCVN), NOx (2.83*QCVN), dust. High S- content of fuel. Scrubber needed.	
4	Urea	2011	1053	Yes	860,000 t/a anthracite, 724m ³ /a FO, 200m ³ /a LPG	2.304*10 ⁸	10,752, 000 (surface water)	N.A.					Recycling of ww possible.	Non- and contaminated ww collected together. Separate sewage system for non- contaminated ww and recycling needed.		New process line would allow for lead battery recycling.
5	Lead battery	2012	220	No	96 t/a LPG	42,000	n.a.	N.A.	Cooling water might be used for pre- heating boiler feed							
6	Ceramic tiles	1981	450	No	8000 t/a coal	6.2*10 ⁶	16,000 (mains) 53,000 (well)	3500 (glaze, pigments)	Heat recovery at two furnaces (1200°C) possible (economizer), heat to be used for drying process.				Change from wet to dry milling process is envisaged.	Water reuse in wet milling can be improved.		
7	Pharmace uticals	2010	40	Yes	300 m ³ /a DO	1.2*10 ⁶	25,000 (mains)	80m ³ /a (ethanol)	Reduction of steam losses at condensate recovery. Additional economizer for stack gases possible. Herb drying with solar heating possible.				Broken tiles rejects are collected but not reused.			Training in chemicals management.
8	Steel	2008	136	No	20,000 t/a coal	2.0*10 ⁷	12,000	N.A.	Installed stack gas heat exchange system to be improved due to blocking.	Considerable amount of waste heat could be used for pre-heating combustion gas.						36 t cinder crust might be recycled in cement.

No.	Sector	Founda tion	Staff	Export	Fuel	Electricity (kWh/a)	Water (m ³ /a)	Chemicals (t/a)	Process heat	Compressed air	Refrige- ration	Auxiliaries	Water	Waste water	Chemicals mgt.
9	Cooling systems	1988	300	No		97,000		7.65 (Polyether polyol blend) 8.77 (Diphenylm ethane Diisocyanat e)	Use of solar thermal energy for hot water production possible.	Use of waste heat for hot water/cleaning purposes.		LEED- certification of 3 buildings possible.			PU insulation foam with cyclopentane instead of R141b possible by replacement of process line. Chemicals management training.
10	Dairy	2001	237	No	113m ³ /a FO (steam from ESCO)	6.9*10 ⁶	288,000 (mains)	N.A.	Use of solar thermal energy for hot water production possible.	Use of waste heat for hot water/cleaning purposes.	Absorption cooling to be evaluated.	Purchase of energy monitoring system (software) required.	Membrane filtration and reuse of waste water possible.		
11	Brewery	1999/20 06	128	No	27m ³ /a FO (steam from ESCO)	3.2*10 ⁶	148,000 (mains)	HNO ₃ , HCl (for ion- exchange)	Heat recovery with mechanical vapour recompression from wort kettle saves energy and avoids odour problems.	Use of waste heat for hot water/cleaning purposes.	Absorption cooling to be evaluated.	Waste yeast is disposed as special waste. Could be used as valuable raw material for cosmetics, animal feed.			
12	Seafood	1997	973	Yes	1100m ³ /a FO	2.7*10 ⁶	66,500 (mains) 253,929 (well)	Transforme r oil NaOCl	Heat recovery from stack gases possible with economizer. Condensate recovery to be evaluated. Two different steam pressures/piping (185°C/121°C) system to be implemented.			Water saving measures in the process possible: UASB-treatment countercurre nt rinse, water reuse at equipment.	Waste water pre- treatment poor. Generated methane escapes. UASB-treatment under evaluation, CH ₄ might be used for heating.		
13	Food processin g	2002	54	Yes	160m ³ /a FO, 80m ³ /a LPG	100,000	9,000 (mains)	N.A.	Heat recovery from stack gases possible with economizer, limited capacity (1.8t steam/h)					Waste water is discharged without treatment. Pre- treatment necessary (filtration, oil separation).	
14	Steam producer	1999	n.a.	No	Rice husk		25 t/h (for steam)	N.A.	Existing boiler and district heating to be refurbished. Additional cogeneration needed for economic operation of plant. Stand-by boiler for steam production.			Storage for 10,000m ³ rice husk to be constructed.			