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Independent terminal evaluation

Demonstration of BAT/BEP in fossil fuel-fired utilities and industrial boilers in response to the Stockholm Convention on POPs

UNIDO Project number: GF/RAS/10/003

UNIDO SAP ID: 104066

GEF ID: 3732



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

INDEPENDENT EVALUATION DIVISION

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Glossary of evaluation related-terms

Term	Definition
Baseline	The situation, prior to an intervention, against which progress can be assessed.
Effect	Intended or unintended change due directly or indirectly to an intervention.
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
Impact	Positive and negative, intended and non-intended, directly and indirectly, long term effects produced by a development intervention.
Indicator	Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention.
Lessons learned	Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations.
Logframe (logical framework approach)	Management tool used to facilitate the planning, implementation and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results based management) principles.
Outcome	The likely or achieved (short-term and/or medium-term) effects of an intervention's outputs.
Outputs	The products, capital goods and services which result from an intervention; may also include changes resulting from the intervention which are relevant to the achievement of outcomes.
Relevance	The extent to which the objectives of an intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donor's policies.
Risks	Factors, normally outside the scope of an intervention, which may affect the achievement of an intervention's objectives.
Sustainability	The continuation of benefits from an intervention, after the development assistance has been completed.
Target groups	The specific individuals or organizations for whose benefit an intervention is undertaken.

List of Acronyms and Abbreviations

BAQ	Better Air Quality
BAT	Best available technique
BEP	Best environmental practice
BWC-DOLE	Bureau of Working Conditions of the Department of Labour and Employment
COP	Conference of parties
CP	Cleaner Production
CTA	Chief Technical Advisor
EPPB-DOE	Energy Planning and Policy Bureau of the Department of Energy
ESEA	Eastern and South-Eastern Asia
ESM	Environmentally Sound Management
FSP	Full size project
GBT	Green boiler technology
GEF	Global Environment Fund
GHG	Greenhouse gases
GTZ	German Agency for Technical Cooperation
IA	Implementing Agency
ICCT	Institute of Chemistry and Chemical Technology
IR	Inception Report
M&E	Monitoring and evaluation
MIS	Management Information System
MNRE	Ministry of Natural Resources and Environment
MOMT	Ministry of Manpower and Transmigrations
MOU	Memorandum of Understanding
MTE/R	Mid-term evaluation/review

NCU	National Coordination Unit
NIDA	National Institute of Development
NIP	National Implementation Plan
NPC	National project coordinator
NPD	National project director
NPM	National project manager
OFP	Operational focal point
OVI	Objectively verifiable indicators
PCD	Pollution Control Department
PCDD	Polychlorinated dibenzodioxins
PCDF	Polychlorinated dibenzofurans
PET	Project expert team
PIR	Project implementation review
PM	Project manager
POP	Persistent Organic Pollutant
PP	Pollution prevention
PPP	Public-private partnership
PSC	Project Steering Committee
RC	Regional Coordinator
RSTC	Regional Sector Technical Committee
SC	Stockholm Convention
TE	Terminal evaluation
TEQ	Toxic equivalency
TOC	Terms of Cooperation
TOR	Terms of Reference
UNIDO	United Nations Industrial Development Organization
UP-POPs	Unintentionally Produced POPs

Executive summary

A. Introduction

1. The Global Environment Facility (GEF) regional full size project (FSP) “*Demonstration of BAT and BEP in fossil fuel-fired utilities and industrial boilers in response to the Stockholm Convention on POPs*” was implemented from July 2010 to July 2016 by the United Nations Industrial Development Organization (UNIDO). The countries involved in the project were: Cambodia, Indonesia, Lao PDR, Mongolia, Philippines and Thailand. The project was nationally executed by the following: Ministry of Environment (*Cambodia*); Ministry of Environment (*Indonesia*); Ministry of Environment (*Lao PDR*); Ministry of Nature and Environment (*Mongolia*); Department of Environment and Natural Resources (*Philippines*) and Ministry of Natural Resources and Environment (*Thailand*) with the following financing sources:- GEF: \$ 4,000,000; co-financing (cash and in kind): \$ 9,100,000; Total: \$ 13,100,000.

2. The overall objective of the project was to reduce and, where feasible, eliminate UP-POPs releases by capacity building at regional level to implement BAT/BEP measures in the fossil fuel-fired utility and industrial boilers source category including Unintentionally Produced POPs (UP-POPs) monitoring. The project also aimed at simultaneously increasing energy efficiency (Climate Change) and reducing UP-POPs releases (Stockholm Convention) by application of appropriately selected technologies and fuels in the fossil fuel-fired utility and industrial boilers source category.

B. Evaluation findings and conclusions

3. The main purpose of this terminal evaluation was to assess the performance of the project (in terms of relevance, effectiveness and efficiency), and determine its impacts (actual and potential) including their sustainability and to propose a set of recommendations in a view of ongoing and future activities.

4. This project is highly relevant as all the participating countries are parties to the Stockholm Convention. Furthermore, recognizing that the existence of a large number of old fossil-fuel fired boilers in their respective countries were responsible for the release of a significant amount of PCDD/Fs to the environment, they requested through the ESEA forum to have their capacity built on BAT/BEP in order to reduce these releases.

5. The project is consistent with GEF Strategic Program 1, 2 and 3 of POPs focal area strategy and strategic programming for GEF-4 respectively. In particular, in building the countries’ capacities on BAT/BEP, the project is strengthening their capacities for NIP implementation.

6. Effectiveness of the project is considered satisfactory. Most of the stated objectives have been successfully achieved. BAT/BEP guidelines have been developed in all countries and efforts are being made to adopt elements of these guidelines into national legislation and policies. The project has also been successful in implementing BAT/BEP in the demonstration facilities resulting in cleaner production and significant cost savings. The mobilization of significant amount of co-financing, both cash and in-kind, contributed to increased efficiency of the project.

7. The approach originally agreed upon by stakeholders was adopted to implement the project. The overall project management and supervision was satisfactorily done by a UNIDO PM adequately assisted by a team of international consultants for technical aspects of the project. At national level, the project was implemented by the Ministry hosting the project with the assistance of a NPM and nationally contracted high quality consultants. However, delays that occurred due to unpreparedness, lengthy procedures for procurement and signature of TOCs decreased efficiency.

8. Chances for sustainability of project outcomes are considered moderate. Indeed, although institutional framework is adequate and countries are fully committed to fulfil their obligations, the financial mechanism to facilitate implementation of BAT/BEP in small and medium enterprises is not in place in the region.

C. Recommendations

9. The project has successfully been completed achieving most of the stated objectives. For continued relevance and sustainability of project outcomes, the following recommendations look ahead to the post-project phase.

- i. The project has been successful and has produced tangible results. In particular, the project has been quite successful in implementing BAT/BEP in the demonstration facilities resulting in cleaner production and significant cost savings. It is recommended (UNIDO) that these successful show cases be summarized and disseminated across the countries of the region and to other regions.
- ii. The project has generated quite a significant number of valuable technical documents, some developed by the international consultants and others by national experts. There is a need (UNIDO) to collate these reports, standardize their editing and content, peer review, and make the document available to relevant stakeholders including the GEF, the Stockholm Convention Secretariat, parties and other relevant agencies or institutions.

- iii. Convincing industrial partners to participate in the project for BAT/BEP implementation was difficult and contributed to the delay in the implementation process. It is recommended for future projects involving industrial partners to identify these partners during preparatory phase to ensure a quick start of project execution and avoid delays.
- iv. The clearance of custom procedures caused significant delays to project implementation in some countries, and increased transaction cost in some cases. For projects that require the clearance of custom procedures, it is recommended to establish early official communication with customs by national counterparts to avoid delays in project execution.
- v. The demonstration BAT/BEP projects have been very successful, however financial risks have been identified that might jeopardize their sustainability. It is recommended (governments) that an adequate financial mechanism be set up in the countries to facilitate / encourage the promotion of BAT/BEP in other small and medium enterprises.
- vi. For continued relevance and impact of the project, the relevant authorities of the countries should disseminate the BAT/BEP guidelines to the relevant sectors and, as far as possible and feasible, ensure that facilities adopt them. Additionally, where resources are available, awareness raising and training workshops should be regularly held to facilitate the adoption of these guidelines.

D. Lessons Learned

- 10. Valuable lessons emerged during the implementation of this project, which include lessons related to management of the project as well as to technical aspects:
 - i. The implementation of this regional project involving six countries was very challenging and required more time and better planning to meet deadlines. One important lesson that emerged is that the design should be kept simple. For the same set of objectives, the design should consider to have smaller number of components meaning less administrative burden and more flexibility resulting in a better and more successful implementation process.
 - ii. As mentioned just before, it was difficult to convince the industrial sector, more specifically power plants, to participate in the project due to possible disruption to plant operations, or concerns related to the public perception regarding monitoring activities or results at the power plant. However, by adopting the appropriate approach and in demonstrating that they would not only benefit economically (in terms of cost savings) but also in terms of more simple management, more safety for workers, better relationships with the government

and the public was an effective way in convincing industrial partners to participate in project and adopt BAT/BEP for cleaner production.

- iii. Measurement of PCDD/F at the stack of industrial boilers and power plants proved to be challenging in the project. In general, the concentration of PCDD/F measured at the power plants was lower than expected, in some cases much lower than the levels measured at BAT compliant plants in developed countries. Although, appropriate laboratories have been selected to carry out the sampling and analysis, and the process having been supervised by the competent international experts, a lesson that can be learned is that the measurement of PCDD/F is a challenging exercise, and due consideration must be given to risk associated with the capability and experience of the laboratories in undertaking such assignment.

I. Evaluation objectives, methodology and process

I.1 Information on the evaluation

11. This terminal evaluation (TE) was undertaken in compliance with the GEF¹ and the UNIDO² evaluation policies in order to promote accountability for the achievement of the project objectives through the assessment of results, effectiveness, processes and performance of stakeholders involved during project implementation.

12. The evaluation was undertaken from June 2016 – August 2016 by a team of independent consultants constituted by Dr Nee Sun CHOONG KWET YIVE, team leader and Ms Suman LEDERER.

I.2 Scope and objectives of the evaluation

13. The terminal evaluation (TE) covered the whole duration of the project from its starting date in May 2010 to the completion date in June 2016. The TE was conducted in accordance with the UNIDO Evaluation Policy³ and the UNIDO Guidelines for the Technical Cooperation Programme and Project Cycle⁴. In particular, the TE followed the GEF Guidelines for GEF Agencies in Conducting Terminal Evaluations⁵ and the GEF Monitoring and Evaluation Policy⁶ and assessed the project with emphasis on those components for which GEF funds were required.

14. The TE should provide an analysis of the attainment of the project objective(s) and the corresponding technical components or outputs. Through its assessments, the exercise should enable the Government, the national GEF Operational Focal Point (OFP), counterparts, the GEF, UNIDO and other stakeholders and donors to verify prospects for development impact and promoting sustainability, providing an analysis of the attainment of global environmental objectives, project objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators, and management of risks.

15. To enhance project relevance, effectiveness, efficiency and sustainability by proposing a set of recommendations with a view to ongoing and future activities, the TE will additionally make recommendations for UNIDO and the GEF that may help for improving the selection, enhancing the design and implementation of similar future projects and activities in the country and on a global scale upon project completion.

16. The TE will finally draw lessons of wider applicability from experience gained in this regional project for replication across the countries of the region or in other projects/regions.

¹ [http://www.thegef.org/gef/sites/thegef.org/files/documents/TE_guidelines7-31.project document](http://www.thegef.org/gef/sites/thegef.org/files/documents/TE_guidelines7-31.project%20document)

² <http://www.unido.org/en/resources/evaluation/evaluation-policy.html>

³ UNIDO. (2015). Director General's Bulletin: Evaluation Policy (UNIDO/DGB/(M).98/Rev.1)

⁴ UNIDO. (2006). Director-General's Administrative Instruction No. 17/Rev.1: Guidelines for the Technical Cooperation Programme and Project Cycle (DGAI.17/Rev.1, 24 August 2006)

⁵ GEF. (2008). Guidelines for GEF Agencies in Conducting Terminal Evaluations (Evaluation Office, Evaluation Document No. 3, 2008)

⁶ GEF. (2010) The GEF Monitoring and Evaluation Policy (Evaluation Office, November 2010)

I.3 Information sources and availability of information

17. Availability of information for evaluation purposes was satisfactory. Upon request, soft copies of the project documents as well as specific documentation such as progress reports, Project Implementation Review (PIR) reports, consultants' reports, progress reports of countries, reports of contracted activities both at national and international levels, minutes of meetings (both national and regional ones), reports of workshops (e.g. inception, awareness raising, training, etc.) and reports of other activities like seminars and laboratory capacity building training courses were submitted by the UNIDO Project Manager (PM), and by countries through the National Project Managers (NPM)⁷. A list of documents submitted to the evaluation is given in Annex 2.

I.4 Methodological remarks, limitations encountered and validity of the findings

18. The evaluation reviewed the plentiful documentation (Annex 2) submitted by the PM and the countries. Further information / verification of information was gathered / done during the field missions that took place in three of the six participating countries on:

12 – 15 June 2016: Thailand
15 – 18 June 2016: Laos
19 – 22 June 2016: Mongolia

During the field missions the major stakeholders including the National Project Director/ Coordinator (NPD or NPC), the NPM, and the participating companies in the pilot projects were interviewed. For Mongolia however, the evaluation could not get access to the state owned power plant where the project intervention had taken place. Security concern was mentioned by the security, ensured by the regular police force, as the main reason for not giving access; the 11th Asia-Europe Summit (ASEM 11) was scheduled to take place in July 2016, exactly a month after the evaluation mission, and hence security had been tightened ahead of the Summit. Although the site visit was not undertaken, the evaluation could nevertheless interview the representatives of the power plant on 21 June 2016 at the premises of the Ministry of Natural Resources and Environment (MNRE).

19. During these missions, only the companies participating in the pilot projects (except for Mongolia) made presentations on the achievements / impacts of the project. It would have helped the evaluation if the NPMs could have also made presentations on the achievements of the implementation process covering all the components of the project. A list of persons interviewed is given in Annex 3.

20. The evaluation could also interview the major stakeholders from Indonesia and Philippines during the final workshop of the project held in Vienna, Austria on 4 – 6 July 2016. Cambodia was supposed to participate in this final workshop, but due to issues regarding their visa, they could not travel to Vienna. The two international consultants, who were recruited by UNIDO to provide expertise on Best Available Techniques (BAT) and

⁷The documents were submitted to the evaluation either during the field mission in countries and during the final project workshop held in Vienna, 4 – 6 July 2016.

Best Environmental Practices (BEP) on boilers to the six countries, were also interviewed during this workshop.

21. The preliminary findings based on the field missions and interviews in Vienna were presented to UNIDO and the countries on 6 July 2016. The feedback and comments received during this presentation have been considered in this report.

II. Project background and Context

II.1 Project background

22. According to Article 5(a) of the Stockholm Convention (SC) on Persistent Organic Pollutants (POPs), each Party to the Convention shall develop an action plan, or a regional or sub-regional plan to reduce the total release of chemicals listed in Annex C, with the goal of continuing the minimization and where feasible, elimination.

23. The introduction of best available techniques and best environmental practices (BAT/BEP) in the different source categories listed in Annex C of the Convention is the most important practical measure to continuing minimization of unintentionally produced POPs (UP-POPs) releases.

24. Most of developing countries and countries with economies in transition in East and South-East Asia (ESEA) region completed the development of their National Implementation Plans (NIPs) for the Stockholm Convention and a number of issues emerged as priority threats/root causes and barriers to be addressed.

25. One of the obvious priority threats was that, if these countries would miss the momentum to immediately start NIP implementation, the NIPs and the related institutional capacities would become obsolete very soon or could even be lost and consequently could not be used for effective and efficient implementation. Hence capacity building should be continued and NIP implementation should be timely started.

26. A more specific priority threat was the fact that no baseline inventory of UP-POPs had been established due to lack of adequate monitoring capacities. Therefore, the main obligation stipulated in Article 5, namely the continuing minimization of UP-POPs, could easily become a non-reality due to the fact that their release estimates were based on UNEP Toolkit instead of measured chemical analytical data.

27. The implementation of Article 5 was further hampered by the existing gaps in the POPs related legislation, the lack of stakeholders' coordination or even sometimes their conflict of interests. Moreover, in certain cases, stakeholders' awareness of the health and environmental hazards created by UP-POPs was at a very low level.

28. The Conference of Parties (COP) in its first session (UNEP/POPS/COP.1/31/SC-1/20) stated that the incorporation of guidelines and guidance on BAT/BEP was a critical component of NIPs and that it needs to be widely disseminated, demonstrated and

understood by users, stakeholders and decision makers as well as promoted at regional, sub-regional and national levels. The third session of the Conference of the Parties (UNEP/POPS/COP.3/30/SC-3/5) adopted the revised draft guidelines on BAT and provisional guidance on BEP and requested the use of further contribution as appropriate to the document by all Parties.

29. Based on the experience gained through promotion and dissemination of environmentally sound industrial technologies, UNIDO decided to expand its POPs program and to offer technical cooperation to developing countries and countries with economies in transition to fully enable the implementation of the BAT/BEP related provisions of the Convention. UNIDO took a programmatic approach and decided to support establishing global, regional and sub-regional BAT/BEP forums and relevant projects.

30. The ESEA Forum on BAT and BEP was the first regional forum that has been established. The Pollution Control Department (PCD) of the Ministry of Natural Resources and Environment (MONRE) of Thailand, together with relevant ministries and institutions of ESEA and the Stockholm Convention Division of the Environmental Management Branch (ENV) of UNIDO, after a series of consultation meetings, formally launched in October 2007 in Bangkok the Regional Forum for developing and formulating a regional action plan on BAT/BEP.

31. The fossil fuel-fired utilities and industrial boilers source category was identified among the priority sources for the introduction of BAT/BEP in the respective NIPs of Cambodia, Indonesia, Lao PDR, Mongolia, Philippines and Thailand and therefore priority actions were planned.

32. Hence, the Project aimed to set the basis for the introduction in the ESEA region of BAT/BEP in the industrial source category of fossil fuel fired power utilities (or power boilers) and industrial boilers (as identified in Part III: Source categories, Annex C of the SC), that have the potential for comparatively high formation and release of Polychlorinated dibenzo-dioxins/ Polychlorinated dibenzofurans (PCDDs/PCDFs), hexachlorobenzene (HCB) and PCBs to the environment.

33. The strategies proposed by the Project included the promotion of efficient operation of combustion technologies, cleaner production processes, and monitoring activities, supported by the necessary capacity building (especially in the strengthening of analytical laboratories and training of staff) and regulatory framework consistent with (BAT/BEP) guidelines and guidance.

34. According to the survey carried out by UNIDO in November-December 2007 and in February-March 2009, in addition to the traditional fossil fuels, there were some special types of fuels that were being used in some of the participating countries, such as (i) fish residues as fuel in seasonal use in Cambodia, (ii) spent/used oils as boiler fuel, (iii) biomass fuel including wood, wood products, bagasse, charcoal, demolition wood, and (iv) charcoal used for low pressure furnaces and stoves in Mongolia. The issue of these fuels, some of which might even be categorized as hazardous wastes, had to be addressed. In this context, coordination with the Basel Convention regional centers was to be established.

35. Seeking a practical approach to have a good understanding of this very diverse source category, the need to set up an inventory of the power and industrial sector at regional level, to be continuously updated, emerged during the Regional Workshop on “BAT/BEP in fossil fuel-fired utilities and industrial boilers in response to the SC on POPs” held in Vientiane, Lao PDR on 12-14 December 2007. The progress of the project development was also reviewed at a Consultation meeting held in Siem Reap, Cambodia on 21-23 May 2008 and during the BAT/BEP Forum meeting held in Beijing, China on 10-12 December 2008.

36. Specifically designed technical questionnaires were disseminated to collect data on boilers in the power and industrial sectors. In order to obtain a good turnover to the questionnaires, particularly from the owners of the small and medium size fossil fuel-fired utilities and industrial boilers, detailed explanatory notes were also provided.

37. At the same time, it was evident that the methodologies used by the countries for the PCDD/PCDF inventories were varied and therefore it was difficult to compare the results presented. The need for common rules for PCDD/PCDF inventories of the fossil fuel-fired utilities and industrial boilers emerged and substantially agreed among the participating countries.

38. It was anticipated that the project would facilitate the preparation of the baseline inventory of UP-POPs releases in the fossil fuel-fired utilities and industrial boilers source category in each of the six participating countries. From the updated national baseline inventories, a sub-regional baseline was to be projected. Based on these regional/sub-regional projections on the baseline inventories, the implementation of the corresponding regional action plan was supposed to deliver the global environmental benefits of the project. The project was expected to strengthen the overall management and dissemination of BAT/BEP in the fossil fuel-fired utilities and industrial boilers and eventually would have reduced the risk of UP-POPs to human health and the environment at national, regional and global levels.

39. Methodologies introduced in the project were expected to positively contribute to similar projects in this source category. The project was also to contribute valuable data to the further enhancement of the UNEP Toolkit. Likewise, the project was also to expound the significant correlation between energy efficiency and UP-POPs emissions by looking at baseline and BAT options associated to the replacement/retrofit of selected boilers for both UP-POPs and CO₂. In the project implementation, particular attention was to be made on the cost-effectiveness and sustainability of the proposed measures.

II.2 Project summary

Overall objective of the project

40. The project overall objective aimed at reducing and, where feasible, eliminating UP-POPs releases by capacity building at regional level to implement BAT/BEP measures in the fossil fuel-fired utility and industrial boilers source category including UP-POPs monitoring.

41. The project also aimed at simultaneously increasing energy efficiency (Climate Change) and reducing UP-POPs releases (Stockholm Convention) by application of appropriately selected technologies and fuels in the fossil fuel-fired utility and industrial boilers source category.

Immediate Objective of the Project

42. The immediate objectives of the project were to:

- Improve inventories for fossil fuel-fired utilities and industrial boilers in the region by completing the inventory in the power boiler and the large and medium sized industrial boiler sub sectors.
- Establish baseline inventories of UP-POPs releases in fossil fuel-fired utilities and industrial boilers source category through questionnaires and field survey achieved by specifically designed sectoral studies and adoption of common evaluation methodologies.
- Identify industrial boilers which are representative of the boiler population in the region which may be selected as pilot case studies.
- Identify facilities with power boilers where BEP may be implemented and where feasibility analysis of BAT, as well as emission factor measurement, may be carried out.
- Update the values of dioxin emission factors by utilizing the actual measured values during the pilot case studies and other data available in literatures.
- By addressing specific features of and common practices applied in this source category as well as the related socio-economic considerations in the region, formulate region specific guidelines and guidance on BAT/BEP for the reduction of UP-POPs and other emissions (GHG, particulate) associated with the sector.
- Fully incorporate the regional experience gained through the industry-wide application of pollution prevention/cleaner production (PP/CP) measures in the regional guidelines and guidance on BAT/BEP. . Such measures include, but not limited to the use of low waste processes; the use of less hazardous input materials; reuse, recovery and recycling of waste; good housekeeping and house cleaning; avoidance of open and other uncontrolled disposal of wastes, etc.
- Incorporate the promotion of technology transfer and investment by identification and implementation of innovative mechanisms for public-private partnership (PPP).

43. To achieve the project objectives, a number of activities were planned for the following five substantive outcomes to occur:

- **Outcome 1:** Adopted guidelines and guidance on BAT/BEP addressing specific features of industry, common practices in the region and related socio-economic considerations
- **Outcome 2:** Pollution prevention measures (cleaner production) applied prior to introducing BAT/BEP (Annex C, Part V, A)
- **Outcome 3:** UP-POPs baseline inventories derived from representative industrial sources and projected at regional scale
- **Outcome 4:** Establishment of regional coordination of developing human resources
- **Outcome 5:** Adequate capacity in sampling and analysis of UP-POPs

Project duration and costs

44. Table 1 below gives all relevant information on the project namely project costs and co-financing, donors, duration, implementing and executing agencies.

Table 1: Information on Project

Project title:		Demonstration of BAT/BEP in fossil fuel-fired utilities and industrial boilers in response to the Stockholm Convention on POPs
UNIDO Project number: GEFSEC project ID:		GF/RAS/10/003 3732
Project site:		Regional (Cambodia, Indonesia, Lao PDR, Mongolia, Philippines and Thailand)
Implementing agency: Government coordinating agency:		UNIDO Ministry of Industry, Mines and Energy (Cambodia); Ministry of Environment (Indonesia); Department of Environment (Lao PDR); Ministry of Natural Resources and Environment (Mongolia); Department of Environment and Natural Resources (Philippines) and Ministry of Natural Resources and Environment (Thailand)
Planned project duration:		4 years
Start date		April 2010
Actual start date		May 2010
Planned implementation end actual implementation end		April 2014 June 2016
Project costs (\$)	GEF grant : Project: PPG: Support costs: Sub-total	4,000,000 400,000 400,000 4,400,000 (excluding support costs)
	Co-funding: UNIDO (in-kind): Governments (cash & in-kind): Cambodia Indonesia	200,000 400,000 (cash) 900,000 (in-kind) Contribution to be defined later

	Lao PDR	259,000 (cash) 941,000 (in-kind)
	Mongolia	120,000 (cash) 1,080,000 (in-kind)
	Philippines	1,200,000 (in-kind)
	Thailand	4,000,000 (in-kind)
	Sub-total	9,100,000
	Total	13,100,000 (excluding support costs and PPG)

II.3 Project Implementation arrangement and implementation modalities

45. UNIDO was the GEF Implementing Agency (IA) for the project. A project focal point was established within UNIDO to assist with project execution. This focal point consisted of a **Project Manager (PM)** and dedicated core staff, supplemented by support from support staff colleagues on a part-time as required basis, supervised by a senior professional staff engaged in the management and coordination of UNIDO's Stockholm Convention program. UNIDO made these services available as part of its in-kind contribution to the project.

46. The organization structure for project implementation is shown in the following schematic diagram and explained in detail in the succeeding sections:

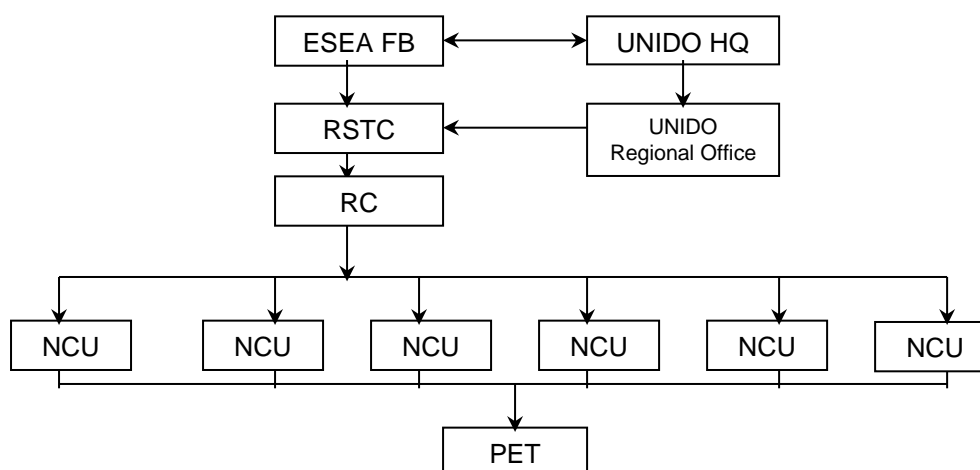


Figure 1: Organogram for project implementation (adapted from the Prodoc)

47. The project implementation was supposed to be under the oversight of the **ESEA Forum Board (FB)** to ensure that high-level attention was given to policy and legal objectives of the project.

48. A **Regional Sector Technical Committee (RSTC)** was to be chaired by a senior government official of the Science, Technology and Environment Agency and consisted of full-time professional staff and support staff with additional support provided by consultants on an as-needed basis in Lao PDR. The members of RSTC were to be senior officials of relevant ministries of each participating country, the NPMs and UNIDO Project Manager. Representatives of major stakeholder companies were also to be invited as members.

49. The RSTC was supposed to be supported by the **Regional Coordinator (RC)**, who was to work closely with the RSTC, and was to report to both UNIDO and the RSTC. The role of the RC included carrying out the day-to-day administration of the project; coordinate the timely inputs of different stakeholders; coordinate the timely involvement of international experts and consultant as required by the progress of the project; plan and schedule the project meetings ensuring the highest coverage by the participating countries; and supervise the project related publications. The PM was to supervise the overall implementation of the project and recommended modifications or change of work plan including budgetary provision when required. The RSTC met once a year as required on a rotational basis.

50. The RSTC kept members of ESEA Forum Board and UNIDO informed on emerging policy issues related to the project including requirements of enhancing existing laws and decrees, as well as strengthening enforcement mechanisms at national and regional levels.

51. **National Coordination Units (NCUs)** were set up in each of the participating countries. Each NCU was constituted by a **National Project Manager (NPM)**, a **National Project Coordinator / Director (NPC or NPD)**, project officers representing the relevant Ministries as required and representatives of pilot facilities.

52. A **Project Expert Team (PET)** constituted by the **Regional Coordinator (RC)**, **six National Project Managers (NPMs)**, policy experts, POPs management and disposal industry experts, chemists, monitoring & evaluation experts and other technical experts was established. These experts assisted NCUs and RSTC through the following activities:

- i) Introduction of successful experiences gained from foreign countries;
- ii) Management and coordination of all project activities;
- iii) Provision of technical support for policy framework, institutional strengthening, demonstration activities, technology selection, awareness raising and education, results and experience dissemination, project monitoring and evaluation, and project management;
- iv) Periodic project implementation progress appraisal; and
- v) Support for development of training materials.

Stakeholders / Institutions involved

53. The implementation of the project required the involvement of a broad range of national stakeholders. During the project development, discussions were undertaken mainly with the representatives of the Ministry (or Department) of Environment of the participating countries. This Ministry, from which the NPC (or NPD) was nominated, was the coordinating agency in each country except Cambodia where the NPC was from the Ministry of Industry, Mines and Energy. For most countries, the same stakeholder pattern as that for the National Implementation Plan (NIP) development was used. These

stakeholders were either directly involved in some of the activities of the project or were invited in training or awareness raising workshops. The Ministry of Industry and Commerce of Laos, for example, was responsible to develop and disseminate the national BAT/BEP guidelines. The academia was directly involved in project activities such as developing a curriculum on green boiler technology or participation in capacity building for PCDD/Fs analysis. Representative of academia of all participating countries were also members of the PET. Power plants (state owned⁸ or private⁹) and private companies were partners of project as pilot demonstration cases for BAT/BEP.

54. Cleaner Production Centres¹⁰, generally located within the Ministry of Industry and Commerce, have been involved in project implementation, in particular, for the development / adoption of BAT/BEP guidelines and guidance document for boilers.

II.4 Positioning of UNIDO

55. UNIDO is committed to assist its developing country Member States in accordance with Article 12 of the Stockholm Convention. The GEF has approved Enabling Activities proposals submitted by UNIDO for about 50 countries, including China and India that have opted to undertake the NIP development through GEF full project cycle. In addition, UNIDO is executing or developing a range of demonstration and capacity building projects geared to support Stockholm Convention implementation in a wide range of developing countries and countries with economies in transition. These activities are compatible with UNIDO's mandate and corporate strategy and will lead towards the Millennium Development Goals.

56. Conscious that the Conference of Parties (COP) of Stockholm Convention requested the Secretariat and urged parties and other donors to initiate activities to promote guidelines on BAT and BEP of regional, sub-regional and national levels, UNIDO has been requested by the Governments of the participating countries to develop and formulate the proposed project.

57. The COP also invited parties to provide to the Secretariat comments on their experience in implementing the revised draft guidelines on BAT and provisional guidance on BEP. The outcomes of this Project will provide a useful contribution to further develop the revised draft guidelines and guidance on BAT and BEP. Hence, UNIDO cooperated with the Governments of the participating countries to achieve this goal.

⁸ For example the state owned Power Plant No4 in Mongolia was the pilot facility for BAT/BEP demonstration.

⁹ In Philippines, Masinloc Power Partners Co Ltd was the power plant that participated in the pilot demonstration.

¹⁰ The BAT/BEP guidelines for Laos were adapted by the Head, Department of Industry and Handicraft of the Ministry of Industry and Commerce, who is also head of the Cleaner Production Center located within that Ministry.

58. UNIDO is within the comparative advantage matrix. UNIDO has advanced experience in POPs management including several global and regional projects. In addition, the organization has experience in investment promotion, which is a component in many UNIDO's projects and important for the present project as well. This experience has helped to raise the required co-financing for the project.

III. Project assessment

A. Design

59. The project document contains relevant, precise and concise information to achieve the overall objective of the project, which was to reduce and, where feasible, eliminate UP-POPs releases by capacity building at regional level to implement BAT/BEP measures in the fossil fuel-fired utility and industrial boilers source category including UP-POPs monitoring. The project was also aiming at simultaneously increasing energy efficiency (Climate Change) and reducing UP-POPs releases (Stockholm Convention) by application of appropriately selected technologies and fuels in the fossil fuel-fired utility and industrial boilers source category.

60. The goal is realistic given that UNIDO has already executed or developed a range of demonstration and capacity building projects geared to support Stockholm Convention implementation in a wide range of developing countries and countries with economies in transition¹¹. Moreover, some of these projects, compatible with UNIDO's mandate, involved National Cleaner Production Centres of the countries where those projects / activities were run¹².

61. A participatory approach was adopted during the preparatory phase. The project was developed during the ESEA Forum on BAT and BEP, which was formally launched in October 2007 in Bangkok. The purpose of this regional forum was to develop and formulate a regional action plan on BAT/BEP, and this project was one of the outcomes of this forum.

62. A clear and comprehensible logical framework (annex 1 of the project document) that describes in details the interventions to be made has been developed for the project.

¹¹ For example, UNIDO is running the programme on Non-combustion technology for PCB decontamination Programme in Philippines and India. Further, UNIDO has completed the regional MSP project, GFRAS10006, "Regional Plan for the Introduction of BAT/BEP Strategies to Industrial Source Categories of Stockholm Convention Annex C of Article 5 in ESEA Region" which had the same six countries and China as participating countries. UNIDO has also implemented a medical waste project in China where capacity has been built through demonstration pilot projects on the use of a number of technologies including microwave disinfection, autoclave and chemical disinfection for the sound management of medical waste.

¹² In 2009, UNIDO implemented the Mediterranean Transfer of Environmentally Sound Technology (MED TEST) project in Egypt, Morocco and Tunisia where the National Cleaner Production Centers of these countries were the national counterparts for the execution of the project.

In general, the proposed indicators and means of verification for each of the activities therein are in general adequate to monitor progress, and the proposed means of verification are also appropriate. However, as stated in the report of the Mid Term Review (MTR), although not listed among the project objectives, one of the project verifiable indicators (OVI for activity 3.1.1) is the “*approximate reduction of 0.31 g TEQ/year from pilot cases and fuel savings of USD 1.3 m/year*”. It is not specified whether this reduction has to be verified by means of adoption of the UNEP toolkit emission factors, other emission factors from the literature, or using the new emission factors that would be developed based on the dioxin analytical results before and after BAT/BEP implementation.

63. Realistic assumptions and potential risks are also mentioned in the logical framework. And the timeframe provided in the project document seems adequate to undertake the planned activities. Similarly, the proposed list of entities responsible for each of the activities / outputs in Section C of the project document appears appropriate for proper implementation.

64. The approach proposed in section C.2 and the set of activities designed and described in Section C.6 of the project document appear to be adequate to produce the intended results and the planned outputs. However, as pointed out by the MTR, duplication or large overlapping of activities (e.g. Activity 1.2.3 and Activity 3.2.3 are very similar) and outputs exist in the original project structure. The MTR recommended to slightly redesign the project by deletion or mergence (with other activities / outputs) of 13 activities and 2 outputs. A new revised project structure¹³, which was taken into consideration during execution of activities in the last phase of the project, was proposed by the MTR. Nevertheless, in general, the proposed activities were likely to operate the indented change by creating awareness at all levels on the need to adopt BAT / BEP practices in order to reduce releases of UP-POPs.

65. Appropriate project implementation arrangements are described in Section C.2 of the project document. A comprehensive organizational structure (see Figure 1) as well as the roles of the different committees, coordinators, managers and national counterparts of the project are also clearly described in this section.

66. The rating on Project Design is **Satisfactory**.

¹³ See “Table **Error! Main Document Only.**: Proposed rearrangement of project activities and outputs” in the MTR report of the project

B. Relevance

Relevance to countries and target groups

67. This regional project is highly relevant as the six participating countries are parties to the Stockholm Convention and they have all submitted their NIP (Table 1). Furthermore, all the six countries identified fossil-fuel fired utility and industrial boilers as a major source of PCDD/Fs release (Table 1). The Deputy Minister of one of the countries confirmed the high relevancy of the project as it responded to the needs of the countries¹⁴. She mentioned that the participating countries pushed for this project at the ESEA forum on BAT/BEP in 2007. In particular, she stated that this project was assisting the participating countries in building their capacities on BAT and BEP to reduce emissions of PCDD/Fs from fossil fired boilers.

Table 1: Signature, ratification and NIP submission dates and PCDD/Fs priority

	Signature	Ratification	NIP submission	Rank of Priority*
Cambodia	23/05/2001	25/08/2006	3/5/2007	3
Indonesia	23/05/2001	28/09/2009	15/04/2010	1
Laos	5/3/2002	28/06/2006	11/8/2010	2
Mongolia	17/05/2002	30/04/2004	8/1/2008	3
Philippines	23/05/2001	27/02/2004	19/06/2006	2
Thailand	22/05/2002	31/01/2005	7/8/2008	4

ranking

*Rank of the source category '*fossil-fired fuel and industrial boilers*' as a source of PCDD/Fs in the NIP of the countries

68. The National Project Director of Mongolia also confirmed the high relevancy of the project, she stated that this was first project BAT/BEP in Mongolia. Before the project, knowledge on BAT/BEP was not very prevalent. With the project, officers of Ministry of Naturel and Environment, inspection officers, academia, and power plant workers have gained further knowledge on BAT/BEP. The latter confirmed that the project built their capacity to operate the boilers appropriately by modifying combustion parameters for better efficiency¹⁵.

69. Project pilot partners indicated the high relevance of the project with regards to increased efficiency of boilers, awareness raised with regards to dioxin release and BAT/BEP, and cleaner production resulting in cost savings. The direct relevance of the project was also confirmed by all the workers at pilot demonstration facilities. For example,

¹⁴ Interview data during field mission in Laos.

¹⁵ Interview data in Mongolia

operators of the boilers at Oleen Company Ltd¹⁶ stated that with the project intervention, it was easier to operate the boiler and easier to trouble shoot problems¹⁷. As a result, significant cost savings were made and reduction in PCDD/Fs as well as mercury releases were achieved (See paragraphs 80, 81 and 82).

Relevance to GEF

70. The project is consistent with GEF Strategic Program 1, 2 and 3 of POPs focal area strategy and strategic programming for GEF-4 respectively:

- “Strengthening Capacities for NIP Implementation through (a) setting up or strengthening of regulatory and policy frameworks in the fossil-fuel fired utilities and industrial boilers sector; (b) formulating a regional specific guidelines and guidance on BAT/BEP; (c) creating a regional capacity in monitoring (sampling and analysis) of UP-POPs releases; and (d) increasing local and regional skills in boilers’ operations.
- “Partnering in Investments for NIP Implementation” to achieve impacts in the reduction of POPs production, use and releases, and reduce the stress on human health and the environment caused by POPs by promoting the use of alternative techniques and practices that prevent or reduce the generation and/or release of POPs as well as promoting various innovative public-private partnership (PPP) mechanisms.
- “Partnering in the demonstration of feasible, innovative technologies and best practices for POPs reduction by (a) introducing the industry-wide application of pollution prevention/cleaner production (PP/CP) measures; and (b) identifying possible options for the simultaneous reduction of dioxins and carbon dioxide from fossil fuel-fired utility and industrial boilers.

71. The MTR pointed out that although the project has been endorsed under GEF 4, the technology component of the project are very relevant also to the GEF 5 objectives and priorities, considering that “*POPs releases to the environment reduced;*” is one of the five outcomes of the Chemical Strategy Objective 1 of the GEF 5: “*Following NIP priorities, investments supported by the GEF will address implementation of best available techniques and best environmental practices (BAT/BEP) for release reduction of unintentionally produced POPs, including from industrial sources and open-burning.*” Furthermore, the project is contributing to the implementation of COP3 resolution SC-3/5: “Guidelines on BAT and provisional guidance on BEP” that invited Parties and others to provide to the Secretariat comments on their experience in implementing the revised draft guidelines on BAT and provisional guidance on BEP; requested to compile and to collect

¹⁶ Interview with workers of Oleen Co Ltd, Thailand, a company involved in palm oil production, and that participated in the project as demonstration facility for BAT/BEP.

¹⁷ Interview data in Thailand

information (e.g., make use of a questionnaire) on experiences gained in using the revised guidelines and guidance through field tests and other means; encouraged Parties and observers to exchange information on their experiences in implementing the guidelines and guidance by electronic means such as electronic discussion groups facilitated; and invited Parties and others in a position to do so to fund awareness-raising and training workshops on the guidelines and guidance on BAT and BEP.

Relevance to UNIDO

72. The project is highly relevant with regard to UNIDO's mandate to support developing countries and countries with economy in transition to achieve sustainable industrial development given the project has focused on implementing BAT interventions and BEP practices to reduce PCCD/Fs from fossil fired utilities and industrial boilers within Operational Program 14 . Furthermore, UNIDO has also implemented a significant number of NIPs and post-NIP projects and contributed to the efforts made in sound management of chemicals. This project has integrated both aspects of technology transfer and cleaner production, which clearly fall in the comparative advantage domain of UNIDO.

73. The rating on Relevance is **Highly Satisfactory**.

C. Effectiveness

74. The project was developed to deliver 10 outputs organized under five components (excluding Project Management Component) and designed to contribute to 5 outcomes as stated in the project document. Following the recommendations of the MTR, the project structure was slightly modified by deletion or mergence (with other activities / outputs) of 13 activities and 2 outputs (see paragraph 54). Implementation of the project in the six countries participating started in the first quarter of 2011. The following paragraphs discuss the achievement of outputs and activities during implementation.

75. **Outcome 1: Adopted guidelines and guidance on BAT/BEP addressing specific features of industry, common practices in the region and related socio-economic considerations.**

76. **Output 1.1: *Adopted regional guidelines and guidance on BAT/BEP on fossil fuel-fired utilities and industrial boilers by adding, among others, two columns to Table 3: "Summary of recommended measures...." of UNEP/POPS/COP.3/INF/4 on health and economic benefits as well as wood and other biomass fuels that are widely used in ESEA region.***

In all the participating countries, except in Philippines having an English version, the UNEP guidelines and guidance on BAT/BEP on fossil fuel-fired utilities and industrial boilers have been adapted and translated into national languages. These guidelines and guidance documents have been disseminated to the relevant sectors through awareness-raising and training workshops. For example, in Laos, workshops targeting boiler owners, officers of

the Ministry of Industry and Commerce at provincial level, and other major stakeholders of the sector were organized in Champasack Province in Feb 2016 and in Saynabouri Province in 6 – 9 June 2016 respectively. Similar workshops have been organized in the other participating countries. However, it is not clear whether a regional version of these guidelines has been developed taking into consideration common practices and related economic considerations of the regions.

77. Prior to introducing BAT/BEP, reports on the energy outlooks of all countries have been produced by contracted national experts. Similarly, reports on “*Market and Trends on the Use of Wood and Biomass as Boiler Fuels*” have been completed and submitted. In Mongolia for example, while coal is the main fuel used in the fossil fuel fired utilities, the amounts of wood and heavy oil used in smaller (or individual) heating boilers represent less than 10% of the sector. Furthermore, although significant amount of biomass (e.g. straw) exist in the country, for practical reasons, such as collection and transportation over great distances, it would be difficult to replace coal by the biomass in the energy sector in Mongolia¹⁸. Review reports on boiler specifications for the region have been carried by international consultants and recommendations made according to the energy outlook of each respective country.

78. Output 1.2: *Enhanced or strengthened specifications for different types of boilers (small/medium/large) and fuels.*

As proposed by the MTR, this output has been deleted and activities for this output have been merged either with those of Output 1.1 or Output 3.1.

79. Output 1.3: *Adopted government policies including regulations, standards, incentives (energy, environment, industry, health, education) supporting reduction of UP-POPs releases from the fossil fuel-fired utilities and industrial boilers (Section VI.D) and from firing installations for wood and other biomass (Section VI.E).*

Activities to deliver this output have been satisfactorily carried out. In all the countries, efforts have been made to adapt the BAT/BEP guidelines or elements of the document into government regulations and policies:

- In Cambodia, the Ministry of Industry, Mines and Energy (MIME) developed a “prakas” (ministerial regulation) related to boiler safety and was under consideration;
- In the Philippines, the goal of the project stems from the provision on dioxins/furans in the Clean Air Act (Republic Act 8745).
- Lao PDR amended and approved the amendments of the Environmental Protection Law to include provisions on Cleaner Production and elements of BAT / BEP.
- Thailand established regulations on boiler safety with environmental considerations taking into consideration BAT / BEP guidelines.

¹⁸ Interview with national expert that did a study on biomass.

- Indonesia amended its Boiler Act to include elements of BAT/BEP and environmental provisions and these have been submitted for the approval of the Parliament.

80. Outcome 2: Pollution prevention measures (cleaner production) applied prior to introducing BAT/BEP (Annex C, Part V, A)

81. Output 2.1: *PP/CP methodology adopted and the corresponding technical capabilities in the fossil fuel-fired utility and industrial boilers sector for use in power generation and in industrial processes strengthened.*

The assessment and classification of boilers as well as identification of abatement technologies in use in the countries was supposed to be done based on an inventory of boilers that was planned to be completed during the preparatory phase of the project. However, for various reasons including unpreparedness to undertake such inventories and lack of resources, the inventory exercise was not completed in most of the participating countries during the preparatory phase. The inventory was in fact completed during the first phase of the project with the technical assistance of the international consultants, who developed the survey questionnaires used in the inventory. This delayed the project by more than 1 year as the identification of pilot facilities was supposed to be done based on this inventory¹⁹ during the preparatory phase.

82. The information gathered in these inventories included the type, capacity and efficiency of boiler, the type of fuel used, the existing air pollution control device at the facility and the location of the facility. The countries produced comprehensive inventory reports that were undertaken by contracted national consultants. The inventories covered the different types of boilers existing in the different industrial sectors including petrochemical, power plant, fertilizer, sugar, textiles and other manufacturing industries. For the power sector, the inventories revealed that many power plants in the participating countries were fossil fired with coal as the main fuel. For example, in Mongolia, all the power plants run on coal as it is one of major coal production countries worldwide. Similarly, in Indonesia and Philippines, production of electricity from coal fired power plants represent a significant share of the market. However, other fossil fuel like diesel and natural gas are also used to produce electricity in these countries. Hydroelectric power plants also exist in the region. For example, in Laos, electricity is mainly produced by hydropower plants given the mountainous profile of the country and its significant annual rainfall. However, a coal fired plant has been constructed in the country to respond to the country's need in electricity. It should be pointed out that Laos exports a significant proportion of the hydro power it produces to neighbouring countries: Thailand: 7,000 MW and Vietnam: 5,000 MW.

¹⁹ Interview with PM, NPMs and international consultants

83. With the assistance of UNIDO and the international consultants, market surveys were undertaken to identify appropriate technologies and boiler technology providers in the region. For example, the Vietnam Boiler Company was identified and was contracted to provide a coal fired boiler for the BAT/BEP pilot project in Laos (see Table 2). The international consultants also helped in the drafting of non-binding procurement guidelines for environmentally sound boilers.

84. Outcome 3: UP-POPs baseline inventories derived from representative industrial sources and projected at regional scale

85. Output 3.1: *Baseline inventories on industrial boilers (through field and detailed survey questionnaires) completed in six participating countries*

This output has been deleted and merged with Output 2.1 as proposed by the MTR.

86. Output 3.2: *Specific studies made on: (i) fish residues as fuel in seasonal use in Cambodia; (ii) use of spent/used oils as boiler fuel; (iii) use of biomass fuels and iv) low pressure furnaces and coal stoves in Mongolia, etc.*

To undertake the planned activities, national consultants have been recruited in each of the participating countries who carried out the studies and reports submitted. The report on fish residues as fuel in seasonal use in Cambodia, for example, revealed that fish oil made in the family scale seem to disappear due to the less amounts of residues received, high cost of input (firewood etc.) and fluctuated prices. On the other hand, the commercial fish producers have shifted to make fish oil instead of fish paste and smoked fish processors for better income.

87. The study on the use of biomass as fuels in Philippines concluded that there is a big room for improvement in terms of adapting to biomass-fired boilers given the significant amount of biomass available. For biomass-fired boiler to be a viable option, concerns such as: sustainable source of fuel, information and education gaps, big space requirements, high investment costs, slow processing of incentives from the government, and competition with imported systems should be addressed first. Reports have also been submitted by Laos and Cambodia on use of spent oils as fuel, and by Mongolia on low pressure furnaces and coal stoves respectively. Some of the reports, simple but comprehensive, and which contained relevant information and data, and included strategic considerations, could have been substantiated with some appropriate recommendations to guide for decision making.

88. Output 3.3: *Fossil fuel-fired utility and industrial boilers that would be representative for establishing regional UP-POPs baseline inventory by determining UP-POPs releases identified and selected.*

Despite the delay of one year that occurred, the activities to deliver this output have been satisfactorily carried out with the technical assistance of a team of two international consultants.

89. According to the project design, the selection of two facilities for BAT/BEP demonstration in each participating country should have been done during the preparatory phase. Despite efforts made to look for candidate companies during country visits, creation of concrete partnership with the private sector was initially not very successful, only one agreement was signed with Suralaya power plant in Indonesia. As a result, project implementation was considerably delayed (by more than 1 year), as the selection process was done during project phase, which included a number of steps, involving the following:

- Pre-selection by countries of facilities to be chosen for demonstration in project, pre-selection was based on the boiler inventory that was already delayed
- Assessment of candidate facilities by the international consultant in each of the six countries²⁰
- Discussion and agreement with facilities on type of intervention to be done by project and agreement on co-finance to be provided by facility.

For the last point, especially co-finance, discussion was difficult with the selected demonstration facilities, as most facilities were reluctant to invest (co-finance) for BAT/BEP implementation. They pointed out that with the intervention of the project, the facility would have to stop operations for the duration of the intervention, which would mean a stop of production during the time period of the intervention. Given the difficulties encountered²¹, only one facility was selected in each country except for Indonesia and Thailand where two companies accepted to participate in the project (Table 2). The two main criteria for the selection of the pilot facilities were: (1) the facility should be representative of the sector for the country (2) the type of boiler would be based on the energy profile of the country. For example, a coal- fired boiler, although more polluting than HFO in terms of PCDD/Fs, whose stack was equipped with a double bag filter²², was selected to replace an old HFO fired boiler in Laos. It was anticipated that coal, being available locally and the price of oil being on the rise at the time of project implementation²³, would be the most appropriate fossil fuel economically for Laos²⁴. It should be highlighted that even for the Suralaya power plant with which an agreement was reached during the preparatory phase, delays occurred owing to personnel and administrative changes at the power plant. The project faced the same above-mentioned difficulty there, i.e. hesitation of the management to participate, due to anticipated significant loss, because of stop in operations at the time of

²⁰ The international consultant undertook at least two visits in each of the six countries for the selection of the demonstration facility

²¹ Interview data with international consultants, NPMs and PM

²² Bag filters are considered BAT for air pollution control devices.

²³ However, the oil prices have gone down by more than 50% in 2014/2015 and is still low in 2016.

²⁴ Interview data with the international consultants

project intervention. However, owing to the full support of the Ministry of Energy and the Ministry of Environment and Forestry of Indonesia, the management of the Suralaya power plant accepted to participate in the project²⁵.

90. Once the facilities were selected, terms of cooperation (TOC) or memorandum of understanding (MOU) were signed between these facilities and the relevant authorities in all the participating countries. The drafting and signature of these TOCs / MOUs also took longer than anticipated in most cases and contributed to further delays in the implementation process. In some cases, there was need to revise the agreement as a consequence of monitoring results (very low level of PCDD/Fs, discussed in paragraph 82). The procurement of equipment followed the UNIDO standard procedures and was very demanding in terms of effort and time as it involved very lengthy procedures including technical assessment of facility, agreement of type and technical specifications of equipment to be purchased, drafting of TOR for equipment, publishing of procurement by UNIDO for international tender, allocation of tenders, issuance of contracts to successful bidders, and checking and commissioning of purchased equipment by international consultant and commissioning. Furthermore, if the cost of contract was more than \$ 200,000, approval of a procurement committee was required²⁶, which further added delays to delivery of equipment.

Table 2: Demonstration facilities, costs investments and yearly savings

Country	Facility	Type of intervention	GEF (\$)	Co-funds (\$) In kind + cash	Yearly savings (\$)
Cambodia	Great Honour Textile Factory Ltd	Purchase of new wood boiler 3 t/h steam	250,000	123,000	103,837
Indonesia	Suralaya PT Power Plant	Tuning a 600 MW power boiler	230,000	4,068,005	2,934,000
	Goodyear Co Ltd	Retrofit 10.5 t/hr coal boiler	-	100,000	213,752
Laos	Lao Agro Industry Co Ltd	Purchase of new coal boiler 5t/hr steam	400,000	470,000	1,639,239
Mongolia	Power Plant No 4	Tuning a 420 t/hr steam power boiler	377,000	1,340,318	56,400
Philippines	Masinloc Power Plant	Tuning a 300 MW coal power boiler	215,000	9,700,000	1,642,298
Thailand	Red Bull Co Ltd	Use of HFO-ethanol micro-emulsion as fuel in boiler	20,000	126,993	669,447
	Oleen Co Ltd	Retrofit of a 16 t/h coal boiler	36,000	7,268	877,353
Total			1,528,000	15,935,584	8,146,326

(Source: Figures in table obtained from international consultants and UNIDO PM)

91. The main aim of the interventions was to increase the efficiency of the boiler through the introduction of BAT/BEP that would result in cleaner production and cost

²⁵ Interviews with PM, and NPC & NPM of Philippines

²⁶ Interview with PM

savings as a result of savings on fuel. For the power plants, efficiency was increased by fine tuning the combustion parameters and for the other facilities either the boiler was retrofitted (Goodyear and Oleen) or a new boiler was purchased to replace the old one (Great Honour textile factory and Lao Agro Industry). As mentioned earlier, the procurement process was very lengthy (paragraph 80), in the case of Great Honour Textile Company, Cambodia, the project was further delayed due to the supplier providing a wrong fuel feeding system, which resulted in breakdown of the equipment. After lengthy discussions that took months, the supplier agreed to provide a new fuel feeding system²⁷. Nevertheless, the impact of the interventions have been very effective. At all the facilities, the capacity of the operators have been built to run boilers efficiently. They have been trained on how to change / modify the combustion parameters in order to improve or keep combustion efficiency high. For example, at Oleen Co Ltd, in Thailand, the boiler operation has been fully automated which improved the efficiency of the boiler by almost 20% resulting in significant savings on amount of coal required to produce the same amount of steam (savings of about 300 to 400 tons of coal monthly). The figures in Table 2 indicate that the project interventions have been very effective in terms of cost savings: a total cost saving of \$8,146,326 was achieved against a total GEF investment of \$1,528,000. These cost savings are much higher (more than 10 times higher) than what were planned in the project document: \$755,128²⁸.

92. Monitoring of flue gases (PCDD/Fs, Hg, CO₂ and other pollutants) was done as planned in the six countries. This task that was very demanding also caused delays to implementation as it involved the bidding for analytical services, preparation (including building of infrastructures where necessary) of sampling campaigns, sampling execution and supervision, and PCDD/F laboratory analysis in the pilot facilities industrial. The collection and analysis was done by contracted specialized laboratories. In some countries, laboratories with the appropriate capacity were available (e.g. Thailand). For others (e.g. Mongolia or Laos) where adequate expertise was not available, laboratories from neighbouring countries were contracted to undertake the collection and analysis of flue gas samples. For example, SGS Thailand and SGS Shanghai were contracted to provide services for Laos and Mongolia respectively. This arrangement however caused significant delays and increased transaction costs for the project and partners. At the borders, the contracted laboratories had to pay custom duty on the equipment they were carrying and that were required for sampling. Moreover, for the Indonesia sampling mission, as the team did not have the required funds to pay the duty, the equipment was blocked for more than one week at the customs, which resulted in increased costs. In Mongolia, after the sampling mission, the SGS team were not allowed to travel with the collected samples, which were blocked at the customs. It took more than six months to clear the custom procedures before the samples were delivered to SGS, Shanghai.

²⁷ Interview with international consultant

²⁸ Figures taken from Table 17 of project document

93. In general, the concentration of PCDD/F in the stack flue gases of the pilot facilities, with the exception of Great Honour, Cambodia and Oleen, Thailand, was much lower than expected values. For example, for the power plants, the levels measured were already at BAT level (less than 0.1 ng TEQ/nm³) even before the intervention of the project. The international consultants raised concerns regarding the reliability of the results: *“the uncertainties concerned with the adopted methods can raise some doubts on their correct application”*²⁹. Consequently, the monitoring of PCDD/Fs after intervention of the project was not done in Mongolia. In Indonesia, the confirming campaign after BAT/BEP was not carried out due to the length of the contracting process and the ending of the project. As far as small boilers are concerned, in Cambodia the final monitoring was not carried out due to internal issues of the company and in Lao PDR is going to be conducted. Therefore, the reduction in PCDD/Fs release after intervention of the project was solely based on the saving of fuel as a result of increased efficiency and using the UNEP toolkit emission factors and not on measured monitoring data produced by the project. An annual reduction of about 0.19 gTEQ was thus observed after intervention of the project at the pilot facilities, lower than the 0.31 gTEQ planned in the project document. For CO₂, the reduction was also not very effective, a reduction of 174,784 tons³⁰ (representing a 2.4% reduction) was estimated after the intervention of project at the pilot facilities. For mercury, monitoring was not done at all the facilities. However, at the two facilities where monitoring was done, a significant reduction of 82% (power plant, Philippines) and 93% (Oleen, Thailand) of mercury in the flue gases were observed respectively. This estimation was based on measured data before and after intervention of the project at the two facilities.

94. Outcome 4: Establishment of regional coordination of developing human resources

95. Output 4.1: Adequate capacity in BAT and BEP built through training programs including regular curricula for graduates and government officials and through technical in-plant training for responsible persons for boiler operation of private and public sectors

Relevant institutions, exclusively academic institutions, have been identified in all the participating countries and TOCs signed with these institutions. The curriculum of a training course on Green Boiler Technology (GBT) with emphasis on BAT/BEP was developed by the University of Santo Tomas, Philippines. After a regional training workshop of trainers in Bangkok, Thailand, in March 2012, this GBT curriculum was adopted by the identified academic institutions in all the participating countries and offered as part of an engineering course. Further reinforced training of trainers workshops were conducted in each of the six countries. For instance, in Philippines, a training of trainers'

²⁹ Text taken from consultants' report and from discussion during interviews in Vienna, 4 – 6 July 2016

³⁰ Figures estimated by the international consultant based on the reduction of fuel used annually at the facilities.

workshop on GBT course was held at the University of Santo Tomas on May 27-28, 2015. Around 40 faculty members from 8 universities in Metro Manila, Philippines, participated in the training. Similar training workshops have been carried out in the other countries. As recommended by the MTR, assessment of participants as well as that of trainers was undertaken after the workshops. For example, after the training of trainers' workshop held in Phnom Penh, Cambodia, 13-14 August 2013, the trainees that included faculty members and students from 5 academic institutions rated themselves, through survey questionnaires delivered to them, on the assimilation and understanding of the course content of the training. The survey revealed that the trainees appreciated the course content the most³¹. They were also invited to give their feedback on the quality of the training and effectiveness of the trainers. The feedback obtained was considered very satisfactory given the language barrier as trainers were using English language only during the training³². Currently, the GBT curriculum is being offered continuously in courses run in academic institutions in all the participating countries.

96. Workshops on BAT / BEP for boiler operations targeting government officials and technical personnel of private and public sectors have also been adequately carried out with the international consultant as the main resource. For cost effectiveness, these workshops have been planned while the international consultants were on mission to implement BAT / BEP in the demonstration facilities.

97. Output 4.2: Awareness raising campaigns for specific target groups such as government policy makers, community leaders, managers of state owned industries and owners of private industries, schools, etc., and for the public at large undertaken

Awareness-raising activities targeting operators of the energy sector and sectors using industrial boilers, government officials, and other relevant stakeholders have been carried out in all the countries. For example, as mentioned previously (paragraph 66), awareness-raising workshops targeting boiler operators and other relevant stakeholders have been undertaken in two provinces in Laos. Brochures, pamphlets, posters and other awareness-raising material including videos and motion clips have also been produced and disseminated in all participating countries. In most cases, the awareness-raising materials have been produced in local languages as English language is not very well understood by the general population. For example, in Cambodia, the brochure was in Khmer language, similarly most of the awareness material developed in Thailand was in Thai language.

98. Outcome 5: Adequate capacity in sampling and analysis of UP-POPs

99. Output 5.1: Adequate regional capacity created by strengthening national and regional centers of excellence (national laboratories, private laboratories) in

³¹ Trainees scored marks in the range 2.7 to 3.3 for a maximum of 4 for very good.

³² Scores ranging from 2.8 to 3.3 were obtained.

monitoring and assessment, specifically in sampling, analysis, and reporting of UP-POPs.

While institutions in Indonesia (PUSARPEDAL³³), in Philippines (Environmental Management Bureau (EMB) Research and Development Division), in Thailand (Environment Research Training Center, ERTC, MNRE) and in Mongolia (Institute of Chemistry and Chemical Technology (ICCT), Mongolian Academy of Sciences) have already been identified during the preparatory phase for strengthening their capacities for sampling and analysis of UP-POPs, it was agreed that such capacity would not be built in Cambodia and Laos.

100. Scientists and laboratory staff from these identified institutions went for training on sampling at the Tsinghua University, Beijing, China. They also went for training on sample preparation and UP-POPs analysis at the Wadsworth Center, New York, USA. The ICCT staff, interviewed during field mission, highlighted the relevance of the trainings and confirmed their appropriateness. There are indications that the countries are investing to set up the capacities for the actual sampling and monitoring of UP-POPs. In Mongolia, for instance, the government has invested \$ 250,000 to equip ICCT with the adequate analytical capacity (GC/MS/MS) for UP-POPs analysis and the project has provided ICCT with a flue gas sampler (\$ 40,000). In Thailand, a National Laboratory, located within ERTC and having the capacity to analyse dioxin and furans, was launched in 2012³⁴. The Thai government invested \$630,000 to set up this laboratory.

101. Output 5.2: Promotion of technology transfer and investment by identification and implementation of innovative mechanisms for PPPs

Initiatives have been undertaken to set in place a proper mechanism for PPP for promotion of technology transfer (BAT/BEP) to other facilities in the participating countries. However, as it was not possible to identify the appropriate financial institution³⁵ to put in place such a mechanism in the region, and on recommendation of the MTR, this output was cancelled.

102. Outcome 6: Established project management office, stakeholder partnerships, and relevant meetings

103. Output 6.1: Project management structure established

A simpler project management structure as envisaged in the project document was established. As planned, a Project Manager (PM), assisted by adequate supporting staff at UNIDO Head Quarters supervised overall project implementation. Additionally, the PM relied on the support of a team of contracted international consultants for the technical aspects related to (BAT/BEP) technology transfer to demonstration facilities (e.g.

³³ Pusarpedal is an environmental laboratory under the Indonesian Environment Ministry, performing environmental quality testing and monitoring: <http://pusarpedal.menlh.go.id/>

³⁴ Interview with NPC, Thailand: This laboratory was supposed to be launched in 2011, but due to flooding that caused some damages to the building, it was launched in 2012.

³⁵ PM: A number of financial institutions including the Asian Development Bank were contacted but all of them were reluctant to get involved in the project.

retrofitting of boilers) as well as technical aspects related to sampling and monitoring of UP-POPs, boiler inventory and on the development of curricula and training workshops.

104. Although the ESEA Forum Board (FB) was established and constituted by representatives³⁶ of the six participating countries plus China and Vietnam, NPCs, NPMs, UNIDO and co-opted members such as the international consultants, the MTR found that the role of the ESEA FB did not emerge and had a limited contribution to the project. To rectify this, it was decided that the project technical coordination meeting would be made back-to-back with the forum board meeting. The Regional Sector Technical Committee (RSTC) was also established and was constituted by UNIDO, NPMs, NPCs and co-opted members such as representatives of demonstration facilities and international consultants.

105. At national level NPMs were recruited and National Coordination Units (NCUs) established. The process of identifying and selecting the right candidate with the adequate background and experience for the position of NPM took time in all the countries. Indeed, while all the countries signed project document in July 2010, the NPM in Mongolia, for example, was recruited in December 2010 and the one in Laos was contracted beginning of 2011. The NCUs were generally constituted by NPC, who was also the chair, the NPM and representatives of demonstration facilities. National consultants, directly contracted by UNIDO, were recruited to undertake all studies / surveys / inventories at country level. For example, the studies on market and trends of biomass fuel in all the countries were undertaken by national consultants.

106. Output 6.2: An M&E framework designed and implemented according to GEF M&E procedures

The regional inception workshop attended by all NPMs, NPCs and UNIDO was held in Bangkok, 27 – 29 July 2010, which was also the national inception workshop for Thailand. At country level, the inception workshops were held in early 2011 except for Laos whose inception workshop was held in 2012. The workshops were generally attended by the major stakeholders including representatives of relevant ministries (e.g. Health, Energy or Industry and Commerce), cleaner production centres, GEF and POPs focal points, academia, energy and manufacturing sectors, international consultants and UNIDO³⁷.

107. In general, at country level the progress of the project was effectively monitored by the NPMs. Quarterly and annual reports, and work-plans were drafted and timely submitted to the UNIDO PM. As highlighted by the MTR, in general the reports were informative and followed agreed standard formats, and detailed to the activity level that allowed proper monitoring of progress. However, for some of the reports (barely half a page for quarterly progress reports and one page for annual reports) the format was not adequate and they were very simple and contained minimum information without details regarding dates, costs or difficulties, challenges encountered, or other relevant information. Moreover, these reports did not contain work-plans for forthcoming quarters. To monitor progress and plan activities, the NCUs met at least twice yearly. During the implementation

³⁶ They were high level government officials, e.g. Director General level

³⁷ UNIDO was represented by representatives of the country office (e.g. in Philippines)

of BAT/BEP at the demonstration facilities however, the NCU met more frequently³⁸. Generally, copies of the notes of these meetings were available, but for two of the countries, copies were not provided to the evaluation. According to feedback gathered, the different project partners were in general satisfied with the coordination and supervision of activities at country level³⁹.

108. Over the project duration, the ESEA FB met three times (in 2012; Manila, Philippines, 16-17 December 2013; and Bangkok, Thailand, 10-12 December 2014). As mentioned earlier (paragraph 93), the last two meetings were held back to back with the project RSTC meeting. During these meetings, the PM, NPMs, facility owners and consultants (national and international) were invited to report on the progress of project or on activities in which they were directly involved. For example, during the second ESEA FB meeting held in December 2013 in Manila, the curriculum consultants reported on the status of adoption of GBT by institutions of their respective countries, while facilities owners reported on BEP measures implemented at their respective facilities. During these meetings, work plans as well as financial status of the project were also presented and discussed. What did not emerge clearly from the reports of these meetings were the recommendations on the way forward by the ESEA FB.

109. The Project Implementation Review (PIR) reports that contained relevant information on project progress were adequately drafted and timely submitted by the PM. As mentioned by the PM, the NPM of Philippines assisted her in gathering information for these PIRs. The MTR was undertaken in February 2013 and the report submitted. Project funds were adequately monitored as UNIDO projects normally undergo external auditing annually and project financial sheets were available. Although, in some of the progress and annual country reports or reports of consultants mention is made on the impact of the project (e.g. monitoring data on PCDD/Fs or Hg or cost savings), the planned annual measurement of impact indicators was not undertaken. Similarly, a project website⁴⁰ was created, but is no longer accessible as the annual contract with the website host has not been renewed since two years; the Management Information System (MIS) has not been established.

110. A number of challenges emerged during project implementation like delays in procurement of services and equipment or difficulties in identifying the right facility for demonstration, the project has nevertheless been successful in achieving most of the stated objectives, for these reasons the rating on Effectiveness is **Satisfactory**.

D. Efficiency

111. The CEO endorsement date was 05 April 2010 November, the project implementation start date was 20 May 2010, and the regional inception workshop was held

³⁸ Interview with NPMs of Thailand and Laos

³⁹ Interviews with PM, pilot facilities, and NPCs

⁴⁰ www.unido-esea.org

on 27 – 29 July 2010, in Bangkok, Thailand (paragraph 95). The countries signed the project document on 27 July 2010. The official closure date was supposed to be 30 April 2014, but due to delays, the official closure date was extended to 31 July 2016⁴¹. The final workshop of the project to which the evaluation team was invited to attend was held in Vienna, Austria, 4 – 6 July 2016.

112. As already discussed in previous sections, the project was delayed due to a number of reasons including:

- Delays in recruitment of NPMs (paragraph 95)
- Selection of demonstration facilities (paragraph 79)
- Drafting and signing of MOU / TOC (paragraph 80)
- Lengthy procedures for procurement of services and equipment (paragraph 81)
- Delays in procurement and executing of chemical analyses of flue gases at demonstration facilities (paragraph 82).
- Clearance of custom procedures at borders (paragraph 82)

113. UNIDO applied a full agency mode of execution managing all the GEF funds (\$ 4,000,000). This centralized approach and the project applying UNIDO procurement / disbursement procedures ensured that funds were adequately managed and timely disbursed according to the planned project budget⁴². However, given the scope of the work and the number of countries, the project funds were limited for the replacement of small boilers or for the adoption of BEP. Aware of this limitation and in agreement with demonstration facility owners, the international consultants always selected by means of a properly implemented bidding procedure the options based on the best value/cost ratio. For instance, as far as it was possible, regional service providers were preferred to international service providers or providers from other regions⁴³. For example, the Vietnam Boiler Company was contracted to replace the boiler at the Lao Agro Industry and Great Honour Textile (Table 2). Similarly regional analytical laboratories were contracted for the monitoring of flue gases at the demonstration facilities (see paragraph 82). The mobilization of significant in-kind and cash co-finance amounting to more than \$ 16 M (Table 2 and paragraph 90) also contributed to high efficiency.

114. In June 2016, a total of \$ 3,974,812 (99.4%) of the GEF funds has been spent. As can be seen in Table 3, the subcontracts, equipment and international experts represent 29.2%, 16.9% and 14.6% (total: 60.7%) of total expenditure respectively. These expenses could be considered to be funds invested mainly for the implementation of BAT/BEP at the demonstration facilities. Given that an annual total cost savings of \$ 8,146,326 has been estimated (Table 2), the project can thus be considered to have been cost effective. However, the costs for the recruitment of international consultants who assisted in the identification of demonstration facilities, and which should have been done during the preparatory phase, somewhat reduced efficiency. On the other hand, the delay of two

⁴¹ Dates taken from the ToRs for this terminal evaluation exercise

⁴² Section E1 of the project document

⁴³ Interview with facilities, international consultants and PM

years that occurred during project implementation did not impact significantly on project costs. The most significant impact would have been the extension of the NPMs' contracts. Actually, as all the NPMs had contracts of 4 years duration, corresponding to the actual duration of the project, the impact of delays on project cost was thus minimal. For example, the contract for the Mongolian NPM was from Dec 2011 to Dec 2015. The NPMs however mentioned that although their contract was over, they still devoted time to the project whenever required until closure in July 2016.

115. Although the project has been delayed by 2 years, the project has been effective in terms of cost savings and for these reasons the rating on efficiency is **Satisfactory**.

Table 3: Expenditures as at 30 June 2016 (GEF funds only)

Item	Total disbursement (\$) (As at 08 Dec 2015)	%*
Sub-contracts	1,170,520.31	29.2
Equipment	677,071.30	16.9
International experts	585,264.11	14.6
International meetings / workshops	406,570.90	10.2
Project Travel	125,510.96	3.1
National Consultants /Staff	814,330.46	20.4
Training / Fellowship / Study	124,076.54	3.1
Sundries	71,468.41	1.8
Total (in USD)	3,974,812.99	99.4

*% with respect to total GEF funds, \$ 4,000,000 (Figures provided by UNIDO)

E. Sustainability of project outcomes

Financial risks

116. One of the project immediate objectives was to incorporate the promotion of technology transfer and investment by identification and implementation of innovative mechanisms for public-private partnership (PPP) and Output 5.2 was designed accordingly to achieve this objective. However, as it was not possible to identify a suitable regional financial institution, this output was cancelled (paragraph 91). As seen in Table 2, although the return on investment was very profitable, the implementation of BAT/BEP required a significant amount of initial investment from the facilities. Whilst most big enterprises would be in a position to make such initial investments, most small and medium enterprises in the participating countries cannot afford these initial financial efforts. For these reasons, the evaluation considers that there are financial risks regarding sustainability of project outcomes.

Sociopolitical risks

117. All the participating countries are parties to the Stockholm Convention and have submitted their NIPs (Table 1). The countries are fully committed to implement the SC, and in particular the authorities have shown strong support by providing adequate staffing and financial support (e.g. direct investment for setting up of laboratories having the capacity to analyze PCDD/Fs) to implement the project. Furthermore, many of the participating countries have or are implementing other POPs project (e.g. non-combustion PCB project in Philippines or PCB project in Mongolia). Considering these reasons, sociopolitical risks are considered low.

Institutional framework and governance risks

118. As mentioned earlier (paragraph 69) all the countries have made efforts to adapt the BAT/BEP guidelines or elements of the document into government regulations and policies. Additionally, courses on green boiler technology are being offered continuously in academic institutions of all the countries. However, there is the need to establish sustainable mechanisms (incentives, trainings) to promote BAT/BEP. Nevertheless, the evaluation considers that risks related to institutional framework and governance are low.

Environmental risks

119. The project is considered ecologically sustainable as it promotes the use of more efficient boilers that results in decrease of GHG and U-POPs emissions. Furthermore, no environmental risk that can influence or jeopardize the project outcomes and future flow of project benefits has been identified, therefore this risk is considered to be low.

120. Although institutional framework is adequate, due to financial risks identified, the overall rating on **sustainability** is **moderately likely**.

F. Assessment of monitoring and evaluation systems

Monitoring and evaluation design

121. The design for monitoring & evaluation (M & E) is consistent with UNIDO's standard procedures. The proposed plan in the project document is adequate and allows for monitoring progress and impact at output level. The project logical framework (annex 1 of the project document) proposes objectively verifiable indicators, their sources of verification and assumptions & risks for the project objectives, outcomes and outputs. The parties responsible for each of the activity of the different outputs are also given in the project document. The evaluation however considers that while all the outputs are achievable, there are issues regarding the measurement of success for some of the proposed activities. For example, success of awareness-raising activities can only be estimated with a proper "before and after" questionnaire / interviews survey. Similarly, measurability of the required level of PCDD/F reduction (activity 3.3.4) is an issue and this requires a high technical capacity in sampling and analysis, whilst the project itself assumes that this capacity needs to be strengthened in the countries.

122. An adequate costed monitoring and evaluation plan amounting to \$ 158,800 (Table 46 of project document) that allows for monitoring progress at project level has been proposed. This plan includes: inception report, reports on impact indicators, progress and final project reports, PIRs, annual RSTC meetings, annual financial reporting, and audits, establishment of management information system, mid-term and terminal evaluations; the timing of these activities and the parties responsible for each of them.

123. The overall approach to monitoring progress and project evaluation in terms of activities and deliverables (reports) is adequate and clearly linked to project reporting, oversight and governance. For these reasons, rating on Monitoring and Evaluation Design is **Highly Satisfactory**.

Monitoring & evaluation Implementation

124. As mentioned earlier (paragraph 96), the inception workshop in all the countries were held and reports drafted. These workshops were generally organized by the Ministry of Environment of the country, the host institution of the project, and attended by the major stakeholders and partners of the project such as Ministry of Education, Ministry of Industry and Commerce, academia, representative of cleaner production centers, NGOs, and private sectors. In all cases, the welcome address was given by a high official of the host ministry indicating the high importance given to the project. For example, the welcoming address to the inception workshop for Cambodia (held on 24 – 25 February 2011) was given by Director General of Technical Affairs to the Ministry of Environment. Generally, the purpose of the BAT/BEP project as well as planned activities and outcomes were presented to the participants. These are reflected in the reports submitted to the evaluation⁴⁴.

125. As planned, at national levels NPMs were recruited, NCUs established and generally constituted by NPM, NPC, facility representatives and co-opted members from other ministries such as Ministry of Commerce and Industry or from cleaner production centers (e.g. in Laos) (paragraph 95). Project progress was adequately monitored by the NPMs and relevant reports submitted timely (paragraph 97). Similarly, NCU met regularly to plan and organize work, which are reflected in the notes of meeting (paragraph 97).

126. As already discussed, the planned ESEA FB meetings as well as RSTC meetings were held to discuss and monitor project progress (paragraphs 97 and 98). The PIR reports, available to the evaluation team, were timely submitted. The midterm review was undertaken in 2013 (paragraph 98) and the recommendations made were taken into consideration during the last phase of project implementation. Although the different reports contained information on quantified impact of the project like cost savings or monitoring data, the annual measure of impact indicators was not undertaken.

127. The rating for **M&E implementation** is **satisfactory**.
Budgeting and funding for M&E activities

⁴⁴ Inception reports of 4 countries only were submitted to the evaluation

128. The project budget included the costs for M&E activities (see paragraph 112). A total of \$ 158,800, representing 4.0% of total GEF funds, has been allocated for the M&E plan. In general, the budgets planned for the different activities seem adequate⁴⁵.

129. **Budgeting and funding for M&E activities** is rated **satisfactory**.

130. The overall rating for **monitoring & evaluation** is **satisfactory**.

G. Monitoring of long-term changes

131. Although an annual measurement of the following impact indicators was planned:

- Number of institutions adopting BEP and/or cleaner production measures
- Number of facilities adopting BAT
- Quantitative and qualitative change in the process management targeted to the decrease of UP-POPs emissions
- Quantitative reduction of UP-POPs emissions
- Level of the stakeholder awareness of and participation in adopting BAT/BEP
- Status of the inventories
- Social and economic benefits from adoption of BAT/BEP

this did not materialize. The project design did not include a long-term monitoring system.

H. Assessment of processes affecting achievement of project results

Preparation and readiness

132. As discussed in Section III.A (Design, paragraphs 49 to 55), the project document contains relevant, precise and concise information to achieve the objectives of the project. A participatory approach through the ESEA Forum on BAT and BEP⁴⁶ was adopted to develop the project based on the gaps and barriers identified during the preparatory phases and on a significant analysis of the regional and national situations such as preliminary inventory of boilers in the ESEA region⁴⁷ or cost analysis for the replacement or retrofitting of obsolete boilers. As pointed out earlier (paragraph 71) however, the inventories of boilers were only preliminary and were actually completed during project phase. Similarly, the identification and selection of demonstration facilities, which was also supposed to have been completed during the preparatory phase, and was actually done during the project, caused delays to project implementation and decreased efficiency

⁴⁵ Table 26 in Section F of project document.

⁴⁶ Launched in October 2007, Bangkok, Thailand.

⁴⁷ Country Specific Detailed Analysis of the Fossil Fuel-fired Utility and Industrial Boiler Sector as mentioned in the project document

(paragraph 79). On the other hand, laboratories that participated in the project were already identified during the preparatory phase (paragraph 89).

133. The M&E plan proposed is also adequate to monitor progress (Section III.F, paragraphs 111 – 113). Except for the demonstration facilities that were not yet identified, all the other major stakeholders / partners were fully aware and prepared at the start of the project as they were involved since the preparatory phases (e.g. Ministry of Environment, Ministry of Industry and Commerce, academia, etc.).

134. At the start of the implementation process, demonstration facilities were not identified yet, which decreased efficiency of the project, and for these reasons the rating on preparation and readiness is **moderately satisfactory**.

Quality at entry

135. Recruitment of international and national experts was done through a transparent selection process by UNIDO. For national consultants, the selection process was done in agreement and / or on recommendations with / of local counterparts (generally the NPC). The national experts / consultants that were involved in the project generally came from prestigious institutions e.g. Lao National University, Mongolian Academy of Sciences, or the National Institute of Development Administration (NIDA)⁴⁸ in Thailand. Similarly, the laboratory personnel of the participating countries were trained in reputed and prestigious institutions (Tsinghua University, China and Wadsworth Centre, USA). Finally, internationally recognized laboratories (SGS, Thailand and SGS, Shanghai) were contracted to undertake the analysis of flue gases at the demonstration facilities.

Country ownership

136. Country ownership is high. As mentioned earlier (paragraph 57), this project is highly relevant to all the participating countries. Additionally, the project document has been developed on the basis of a significant analysis of the regional and national situations and needs (paragraph 122). The project concept has thus taken into consideration the countries' energy and environmental protection sectoral and development priorities.

137. Furthermore, given the economic development that the countries are experiencing, it is expected that the demand in energy would be on the rise. For instance, the number and size of boilers is increasing in several countries (e.g. in Cambodia and Indonesia). The countries have thus recognized that the harmonization of economy growth with stringent environmental standards is crucial to protect the health of its population and the environment. They are anticipating that the project, which aims at cleaner production and reduction in release of GHG, PCDD/Fs and other toxic pollutants, will contribute

⁴⁸ One of the founding school of NIDA, the NIDA Business School, was the first graduate school in Thailand that offered an MBA program in Thailand.

significantly to the development and plans in both the energy and environmental protection sectors.

138. Rating on **Country ownership** is **satisfactory**.

Stakeholder involvement

139. The involvement of the major stakeholders has been satisfactory. For example, all the NPCs were officers from Ministry / Department of Environment and / or Industry and Commerce. NCUs were constituted by governmental officers (Environment and or Industry and Commerce) and representatives of demonstration facilities and were constantly updated on the project progress by the NPMs during regularly held meetings (paragraph 97). Nationally executed activities were undertaken by national consultants contracted by UNIDO, and they were generally from the academia.

140. Besides being members of NCUs, the governmental bodies were involved directly in a number of activities or assisted by providing data or information. In the Philippines for example, Environmental Management Bureau of the Department of Environment and Natural Resources (EMB-DENR) through its regional offices assisted the international consultant in the identification of the potential pilot facilities, and in the conduct of the regional awareness-raising workshops. Other government agencies like the Energy Planning and Policy Bureau of the Department of Energy (EPPB-DOE) provided the energy outlook of the country and Bureau of Working Conditions of the Department of Labour and Employment (BWC-DOLE) provided data for the boiler inventory update. In Indonesia, the Ministry of Environment (MOE) provided office space to host the project management unit, and through the NPC, who was assisted by the NPM, was responsible for coordination of project activities. The Ministry of Manpower and Transmigrations (MOMT) assisted in the dissemination of regulation on boilers. The major stakeholders excluding private sector involved in the different countries are listed below:

- Cambodia: Ministry of Industry, Mining and Energy, Ministry of Environment, University of Phnom Penh, Institute of Technologies of Cambodia.
- Philippines: EMB-DENR, EPPB-DOE, BWC-DOLE, University of Santo Tomas
- Mongolia: Ministry of Environment, Green Development and Tourism; Ministry of Health, Ministry of Industry and Commerce, Institute of Chemistry and Chemical Technology (ICCT), Mongolian Academy of Sciences.
- Indonesia: Ministry of Environment, Pusarpedal, Ministry of Energy and Mineral Resources (MEMR) and MOMT.
- Lao PDR: Ministry of Natural Resources and Environment and Ministry of Industry and Commerce, National University of Laos

- Thailand: Pollution Control Department, Ministry of Natural Resources and Environment, Department of Industrial Work, Ministry of Industry, Electricity Generating Authority of Thailand, Chulalongkorn University, NIDA

141. Except in Philippines, Thailand and Indonesia, where participation of NGOs was reported, their participation in the project was very limited⁴⁹ in the other countries. Generally, the NGOs participated in trainings and awareness-raising activities. They were not involved in project implementation and decision making, in some cases due to confidentiality clauses in the TOC⁵⁰. Some of the NGOs that participated in the project are listed below:

- Philippines: Better Air Quality (BAQ), Greenpeace, and Eco-waste Coalition
- Indonesia: WALHI (Indonesia Forum for Environment) and YBUL (Foundation of Environment Development)
- Thailand: Environmental Engineering Association⁵¹ of Thailand, an NGO, co-organized the national environmental conference with UNIDO.

142. **Stakeholder involvement** is rated **satisfactory**.

Financial planning

143. A full agency mode of execution was applied for the project, with UNIDO managing all the GEF funds (paragraph 103). UNIDO standard procedures were applied for the disbursement of funds, sub-contracting, procurement of services or equipment, and for payment. For example, for payments of consultants (international and national), reports or progress reports were always requested before disbursements of funds. Similarly, although lengthy, the procedures for procurement of equipment for demonstration facilities for procurement of analytical services were closely followed (paragraph 80). Moreover, allocation and disbursement of funds for the different activities were done according to the planned project budget⁵².

144. For nationally contracted services or expenses at national levels, funds were either transferred to UNIDO country office (e.g. Philippines) or to the UNDP country office in countries where UNIDO did not have an office (e.g. Laos), then payment undertaken. Although some delays in payment was noted in some cases, this mode of execution generally worked satisfactorily. Nevertheless, to reduce administration procedures, it was felt that some funds could have been managed by countries for local expenses such as national workshops or training activities⁵³.

145. Generally, for most of the countries, the funds available for project implementation were considered satisfactory, especially in countries where BEP implementation was

⁴⁹ Interviews with NPMs

⁵⁰ NGOs were not signatories of the TOCs

⁵¹ Co-organized the national environmental conference with UNIDO

⁵² Budget lines of Section E1 of project document

⁵³ Interviews with NPMs and NPCs.

chosen. However, the other countries considered that the available budget was not enough either for procuring suitable equipment such as boilers in the case of BAT implementation or for completion of sampling and analysis of UP-POPs in flue gases. In these cases, a country project approach would have been more appropriate rather than a regional approach as more funds would have been available⁵⁴.

146. Rating on **financial planning** is **satisfactory**.

UNIDO supervision and backstopping

147. UNIDO supervision of the project was done through progress and annual progress reports submitted by NPMs, reports of contracted activities, ESEA FB and RSTC meetings, and field visits. During the project duration, the PM undertook at least one visit in each of the six countries. These country visits generally coincided either with planned ESEA FB or RSTC meetings or with national workshops. For example, during her participation at a RSTC meeting in Bangkok, Thailand (14 – 19 October 2011), during which NPMs reported on the progress of project, the project logframe reviewed and work plans discussed, the PM also visited the candidate pilot facilities.

148. The PM participated at the three ESEA FB meetings (paragraph 98) and at all the RSTC meetings, for which she was the chairperson. During the RSTC meetings, the progress made in each of the six countries was closely monitored by the PM. All partners including NPMs, consultants and demonstration facilities had to report on progress made and explain delays or difficulties encountered. Generally, the PM acknowledged the progress made, provided guidance and made recommendations to improve on reporting or on execution of activities. For example, at the RSTC meeting held in Chiang Mai, Thailand, 13 – 15 August 2014, the PM recommended the NPMs to use the PIR format as template for progress reports and containing clear and quantifiable references. She also told the NPMs that the recommendations of the MTR should be addressed and these should be reflected in the annual and final reports. According to feedback received during the evaluation mission, the UNIDO PM provided useful guidance to NPMs for project implementation. Regular communication took place between the PM and the NPMs, mainly via e-mail and as required via telephone. The PM was available for any queries and responded in a very timely manner, which facilitated the work of the NPMs.

149. For all technical aspects of the project such as selection of demonstration facilities, implementation of BAT/BEP in demonstration facilities (e.g. purchase or retrofitting of boilers), or monitoring of flue gases, the PM was supported by a team of two contracted international consultants. As per feedback gathered during the evaluation mission, the different stakeholders interviewed (e.g. NPMs, NPCs, national consultants, and demonstration facilities) highly appreciated the guidance and technical assistance provided by the PM and the international consultants.

150. The rating on **UNIDO supervision and backstopping** is **highly satisfactory**.

⁵⁴ Interviews with NPCs.

Co-financing and project outcomes

151. Besides the in-kind contribution of the countries such involvement of a number of government officers in project activities and provision of office and laboratory space, the project has been very successful in mobilizing a significant amount of cash co-financing. For instance, while some of the countries invested in laboratories to build capacity for dioxin analysis (paragraph 90), the demonstration facilities agreed to invest significantly to participate in the project (Table 2), which contributed to increased efficiency of the project.

Delays of project outcomes and sustainability

152. As discussed in depth previously (paragraph 102), the delays encountered were mainly due to selection of demonstration facilities (paragraph 79), drafting and signing of MOU / TOC (paragraph 80), lengthy procedures for procurement of services and equipment (paragraph 81) and analytical services (paragraph 82), and customs clearance (paragraph 82), which decreased efficiency to some extent. Despite these delays, the impact of the project has been significant in terms of cost savings (Table 2) and also in terms of reduction in the release of PCDD/Fs, GHG and Hg (paragraph 83). Furthermore, these delays would not impact on the sustainability of project outcomes, as mentioned earlier (paragraph 106). Sustainability of project outcomes would in fact depend on the initial significant investment required to implement BAT/BEP at the facilities.

Implementation approach

153. The implementation approach originally agreed upon by stakeholders was adopted to execute the project. UNIDO applied a full agency mode of execution and managed all the GEF funds (paragraph 103). The overall project management and supervision was done by the UNIDO PM with adequate administrative assistance by a full time dedicated supporting staff that the evaluation team met during the final workshop of the project⁵⁵. Additionally, the PM was assisted by a team of contracted international consultants that provided guidance for technical issues (paragraph 93). The planned RC was not recruited due to budgetary constraint. Despite her busy schedule, the PM however fulfilled this role to the extent⁵⁶ feasible and practical.

154. At national level, the project was executed by the Ministry hosting the project, Environment for all countries. A NPM was recruited to supervise and manage the project, and local experts/consultants were contracted to undertake most of the activities/studies such as boiler inventories or market and trends of biomass. The implementation of BAT/BEP at the demonstration facilities was done with the technical guidance of international consultants.

155. By planning a mid-term and terminal evaluation, the project design was set to promote accountability for the achievement of the project objectives through the assessment of results, effectiveness, processes and performance of stakeholders involved during project implementation.

⁵⁵ 4 – 6 July 2016, Vienna

⁵⁶ Interview with PM

156. The approach adopted by directly involving all the major stakeholders since the preparatory phases was set to promote ownership of the project. As mentioned earlier, ownership is very high amongst all the stakeholders, however chances for sustainability of the project are moderate, as there are financial risks identified that might influence project outcomes (paragraph 106).

I. Project coordination and management

157. As planned, the project was implemented by UNIDO, where the current PM took over the project in 2010 with a full time supporting staff providing assistance in project execution. The PM was not involved in the formulation of the project, but did not have any problem in its management, as she was in constant contact with the original PM, who was involved in the development of the project, the former Chief of the Stockholm Convention Division, to which the current PM also belongs. However, the PM stated that, being a regional project involving 6 countries, it was highly challenging. Owing to the different dynamics in the six different participating countries, the effort involved in implementation, monitoring and coordination of activities was also different in each country and challenging at the same time. The PM attended all the annual RSTC meetings, two of which were back-to-back with the ESEA FB meetings. As mentioned earlier, the PM was able to meet the different partners of the project and could discuss the progress made by the different countries (paragraph 137).

158. At national level, NPMs were recruited, and NCUs were set up in 2011 in all the participating countries for the coordination and management of the project. NCUs were located within the Ministry hosting the project and was constituted by the NPC, who was from the host Ministry, the NPM, representatives of other relevant governmental bodies (e.g. Ministry of Industry and Commerce for Laos), representatives of demonstration facilities and national consultants when required. The NCUs met regularly to monitor and coordinate project activities (paragraph 97). The NPMs were involved in all project activities and were highly appreciated by the project partners in particular the demonstration facilities who stated that the NPMs greatly facilitated implementation of BAT/BEP at their facilities. For example, English, which was the language of communication for the international consultants, in many cases (e.g. in Laos, Mongolia, or in Cambodia) the NPMs acted as translators at training workshops, as many of the workers at the demonstration facilities did not understand English. In general, the PM was satisfied with the performance of the NPMs.

159. The rating on **project coordination and management** is **satisfactory**.

J. Gender mainstreaming

160. The project was not designed to make explicit provisions gender consideration, as gender consideration was not a requirement under GEF-4. Nonetheless, both genders

were involved in the project activities including supervision and coordination, though with a majority of them being male. For example, the PM as well as two of the NPCs were females. Many of the laboratory staff that went for training in China and USA (paragraph 90) were females. The evaluation team met some of them during the field mission in Laos and Mongolia.

K. Procurement issues

161. As mentioned earlier, the UNIDO standard procedures were followed for the procurement of equipment and services. The procedures were lengthy and contributed delays in project implementation (paragraph 80).

L. Overall assessment

162. According to the TOR of this evaluation (annex 1), it is required to assess and rate the different categories of the project, according to the GEF format, from Highly Satisfactory (HS) to Highly Unsatisfactory (HU). Rating for sustainability sub-criteria are as follows: Likely (L), Moderately Likely (ML), Moderately Unlikely (MU) and Unlikely (U). Table 4 below reports the assessment of the different categories based on the documents submitted (see Annex 2) and interviews carried out during the field mission.

Table 4: Summary assessment and ratings

	Evaluator's summary comments	Evaluator's rating
Attainment of project objectives and results (overall rating) Sub criteria (below)	Despite delays, most stated objectives achieved	S
Design	Despite some overlapping in the design of activities, the project document contains precise, concise and relevant information for successful implementation	S
Effectiveness	BAT/BEP effectively implemented in demonstration facilities and guidelines developed and adopted to some extent	S
Relevance	High relevance as assisting countries in building their capacities to reduce emissions of PCDD/Fs from fossil fired boilers	HS
Efficiency	Project quite cost effective as significant cost savings	S
Sustainability of project outcomes (overall rating) Sub	Financial risks identified that may jeopardize project outcomes	ML

	Evaluator's summary comments	Evaluator's rating
criteria (below)		
Financial risks	Financial mechanism not in place to facilitate implementation of BAT/BEP in small enterprises	MU
Socio political risks	Countries fully committed to fulfill their obligation towards the Stockholm Convention	L
Institutional framework and governance risks	Adequate framework in place in all countries	L
Ecological risks	No environmental risk identified	L
Monitoring and evaluation (overall rating) Sub criteria (below)		S
M&E Design	Standard UNIDO M&E procedure	S
M&E Plan Implementation (use for adaptive management)	Planned monitoring and evaluation activities undertaken	S
Budgeting and funding for M&E activities	Adequate	S
UNIDO specific ratings		
Quality at entry / Preparation and readiness	High quality experts engaged, however delays due to unpreparedness	MS
Implementation approach	Agreed approach adopted	S
UNIDO supervision and backstopping	Adequate supervision	HS
Overall rating	Most immediate project objectives achieved	S

- Highly satisfactory (HS): The project had no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Satisfactory (S): The project had minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately satisfactory (MS): The project had moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately unsatisfactory (MU): The project had significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

- Unsatisfactory (U) The project had major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Highly unsatisfactory (HU): The project had severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Likely (L): There are no risks affecting this dimension of sustainability.
- Moderately likely (ML). There are moderate risks that affect this dimension of sustainability.
- Moderately unlikely (MU): There are significant risks that affect this dimension of sustainability.
- Unlikely (U): There are severe risks that affect this dimension of sustainability.

IV. Conclusions, recommendations and lessons learned

A. Conclusions

163. The overall objective of the project was to reduce and, where feasible, to eliminate UP-POPs releases by capacity building at regional level to implement BAT/BEP measures in the fossil fuel-fired utility and industrial boilers source category including UP-POPs monitoring. The project also aimed at simultaneously increasing energy efficiency (Climate Change) and reducing UP-POPs releases (Stockholm Convention) by application of appropriately selected technologies and fuels in the fossil fuel-fired utility and industrial boilers source category.

164. The main purpose of this terminal evaluation was to assess the performance of the project (in terms of relevance, effectiveness and efficiency), and determine its impacts (actual and potential) including their sustainability and to propose a set of recommendations with a view towards ongoing and future activities.

165. This project is highly relevant as all the participating countries are parties to the Stockholm Convention. Furthermore, recognizing that the existence of a large number of old fossil-fuel fired boilers in their respective countries were responsible for the release of a significant amount of PCDD/Fs to the environment, they requested through the ESEA forum to have their capacity built on BAT/BEP in order to reduce these releases.

166. The project is consistent with GEF Strategic Program 1, 2 and 3 of POPs focal area strategy and strategic programming for GEF-4 respectively. In particular, in building the countries' capacities on BAT/BEP, the project is strengthening their capacities for NIP implementation.

167. Effectiveness of the project is considered satisfactory. Most of the stated objectives have been successfully achieved. BAT/BEP guidelines have been developed in all countries and efforts are being made to adopt elements of these guidelines into national

legislation and policies. The project has also been successful in implementing BAT/BEP in the demonstration facilities resulting in cleaner production and significant cost savings. The mobilization of significant amount of co-financing, both cash and in-kind, contributed to increased efficiency of the project.

168. The approach originally agreed upon by stakeholders was adopted to implement the project. The overall project management and supervision was satisfactorily done by a UNIDO PM adequately assisted by a team of international consultants for technical aspects of the project. At national level, the project was implemented by the Ministry hosting the project with the assistance of a NPM and nationally contracted high quality consultants. However delays that occurred due to unpreparedness, lengthy procedures for procurement and signature of TOCs decreased efficiency.

169. The likelihood of sustainability of project outcomes is considered to be moderate. Indeed, although institutional framework is adequate and countries are fully committed to fulfil their obligations, the financial mechanism to facilitate implementation of BAT/BEP in small and medium enterprises is not in place in the region.

B. Recommendations

170. The project has successfully been completed achieving most of the stated objectives. For continued relevance and sustainability of project outcomes, the following recommendations look ahead to the post-project phase.

- i. The project has been successful and has produced tangible results. In particular, the project has been quite successful in implementing BAP/BEP in the demonstration facilities resulting in cleaner production and significant cost savings. It is recommended (UNIDO) that these successful show cases be summarized documented and disseminated across the countries of the region and to other regions.
- ii. The project has generated quite a significant number of valuable technical documents, some developed by the international consultants and others by national experts. UNIDO should collate these reports, standardize their editing and content, peer review, and make the document available to relevant stakeholders including the GEF, the Stockholm Convention Secretariat, parties and other relevant agencies or institutions.
- iii. Convincing industrial partners to participate in the project for BAT/BEP implementation was difficult and contributed to delay the implementation process. It is recommended for future projects involving industrial partners to identify these partners during preparatory phase to ensure a quick start of project execution and avoid delays.

- iv. The clearance of custom procedures caused significant delays to project implementation, and increased transaction cost in some cases. For projects that require the clearance of custom procedures, it is recommended to establish early official communication with customs by national counterparts to avoid delays in project execution.
- v. The demonstration BAT/BEP projects have been very successful, however, financial risks have been identified that might jeopardize their sustainability. It is recommended (to governments) that an adequate financial mechanism be set up in the countries to facilitate / encourage the promotion of BAP/BEP in other small and medium enterprises.
- vi. For continued relevance and impact of the project, the relevant authorities of the countries should disseminate the BAT/BEP guidelines to the relevant sectors and, as far as possible and feasible, ensure that facilities adopt them. Additionally, where resources are available, awareness raising and training workshops should be regularly held to facilitate the adoption of these guidelines.

C. Lessons Learned

171. Valuable lessons emerged during the implementation of this project, which include lessons related to management of the project as well as to technical aspects:

- i. The implementation of this regional project involving six countries was very challenging and required more time and better planning to meet deadlines. One important lesson that emerged is that the design should be kept simple. For the same set of objectives, the design should consider to have smaller number of components meaning less administrative burden and more flexibility resulting in a better and more successful implementation process.
- ii. As mentioned just before, it was difficult to convince the industrial sector, more specifically power plants, to participate in the project due to possible disruption to plant operations, or concerns related to the public perception regarding monitoring activities or results at the power plant. However, by adopting the appropriate approach and in demonstrating that they would not only benefit economically (in terms of cost savings) but also in terms of more simple management, more safety for workers, better relationships with the government and the public was an effective way in convincing industrial partners to participate in project and adopt BAT/BEP for cleaner production.

- iii. Measurement of PCDD/F at the stack of industrial boilers and power plants proved to be challenging in the project. In general, the concentration of PCDD/F measured at the power plants was lower than expected, in some cases much lower than the levels measured at BAT compliant plants in developed countries. Although, appropriate laboratories have been selected to carry out the sampling and analysis, and the process having been supervised by the competent international experts, a lesson that can be learned is that the measurement of PCDD/F is a challenging exercise, and due consideration must be given to risk associated with the capability and proven experience of the laboratories in undertaking such assignment.

Annex 1 Terms of reference

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

TERMS OF REFERENCE

Independent terminal evaluation of the UNIDO project:

***Demonstration of BAT and BEP in Fossil Fuel-fired Utility and Industrial Boilers in
Response to the Stockholm Convention on POPs***

UNIDO project number: GFRAS10003

UNIDO SAP ID: 104066

GEF ID: 3732

DECEMBER 2015

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I. Project background and overview

1. Project factsheet

Project Title	Demonstration of BAT and BEP in Fossil Fuel-fired Utility and Industrial Boilers in Response to the Stockholm Convention on POPs
UNIDO project No. and/or SAP ID	GFRAS10003 / SAP ID: 104066
GEF project ID	3732
Region	Asia and the Pacific
Country(ies)	Cambodia, Indonesia, Lao People's Democratic Republic, Mongolia, Philippines, Thailand
GEF focal area(s) and operational programme	GEF-4: POPs SP-1; SP-2; SP-3
GEF implementing agency(ies)	UNIDO
GEF executing partner(s)	Ministry of Industry, Mines and Energy (Cambodia), Department of Environment (Lao PDR), Ministry of Environment (Indonesia), Ministry of Nature and Environment (Mongolia), Department of Environment and Natural Resources (Philippines), and Ministry of Natural Resources and Environment (Thailand)
Project size (FSP, MSP, EA)	FSP
Project CEO endorsement / Approval date	05 April 2010
Project implementation start date (First PAD issuance date)	20 May 2010
Expected implementation end date (indicated in CEO endorsement/Approval document)	30 April 2014
Revised expected implementation end date (if applicable)	30 June 2016
Actual implementation end date	June 2016
GEF project grant (excluding PPG, in USD)	4,000,000
GEF PPG (if applicable, in USD)	400,000

UNIDO co-financing (in USD)	200,000 (In-kind)
Total co-financing at CEO endorsement (in USD)	9,100,000(cash+in-kind)
Materialized co-financing at project completion (in USD)	
Total project cost (excluding PPG and agency support cost, in USD; i.e., GEF project grant + total co-financing at CEO endorsement)	13,500,000
Mid-term review date	October 2012
Planned terminal evaluation date	April-May 2016

(Source: Project document)⁵⁷

2. Project background and context

According to Article 5(a) of the Stockholm Convention (SC) on Persistent Organic Pollutants (POPs), each Party to the Convention shall develop an action plan, or a regional or sub-regional plan to reduce the total release of chemicals listed in Annex C, with the goal of continuing the minimization and where feasible, elimination.

	Signature, Succession to Signature (d)	Ratification, Acceptance (A), Approval (AA), Accession (a)	Deadline for transmission of NIP	Date when NIP was transmitted	UNIDO NIP project
Cambodia	23/05/2001	25/08/2006	23/11/2008	3/5/2007	
Indonesia	23/05/2001	28/09/2009	27/12/2011	15/04/2010	X
Lao People's Democratic Republic	5/3/2002	28/06/2006	26/09/2008	11/8/2010	X
Mongolia	17/05/2002	30/04/2004	29/07/2006	8/1/2008	X
Philippines	23/05/2001	27/02/2004	27/05/2006	19/06/2006	
Thailand	22/05/2002	31/01/2005	1/5/2007	7/8/2008	

Source: Website of the Secretariat of the Stockholm Convention

Most of the developing countries and countries with economies in transition in East and South-East Asia (ESEA) region have completed the development of their NIPs for the Stockholm Convention and a number of issues have emerged as priority threats/root causes and barriers to be addressed.

The introduction of best available techniques (BAT) and best environmental practices (BEP) in the different source categories in Annex C of the Convention is the most important practical measure to continuing minimization of unintentionally-produced POPs (UP-POPs) releases.

⁵⁷ Project information data throughout these TOR are to be verified during the inception phase.

The Conference of Parties (COP) in its first session (UNEP/POPS/COP.1/31/SC-3/5) stated that the incorporation of guidelines and guidance on BAT/BEP was a critical component of NIPs and that it needs to be widely disseminated, demonstrated and understood by users, stakeholders and decision makers as well as promoted at regional, sub-regional and national levels. The third session of the COP (UNEP/POPS/COP.3/30/SC-3/5) adopted the revised draft guidelines on BAT and provisional guidance on BEP and requested the use of further contribution by all Parties to the Convention.

The ESEA Forum on BAT and BEP is the first regional forum that has been established. The Pollution Control Department (PCD) of the Ministry of Natural Resources and Environment (MONRE) of Thailand, together with relevant ministries and institutions of ESEA and the Stockholm Conventional Unit at UNIDO, formally launched the Regional Forum for developing and formulating a regional action plan on BAT/BEP in October 2007 in Bangkok. All the 6 afore-mentioned countries are members of the Regional BAT/BEP Forum for ESEA countries.

The fossil fuel-fired utilities and industrial boilers source category was identified among the priority sources for the introduction of BAT/BEP in the respective NIPs of Cambodia, Indonesia, Lao PDR, Mongolia, Philippines and Thailand. The project aims to set the basis for the introduction of BAT/BEP in the industrial source category of fossil fuel fired power utilities (or power boilers) and industrial boilers (as identified in Part III: Source categories, Annex C or the SC) that have the potential for comparatively high formation and release of Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDFs), hexachlorobenzene (HCB) and polychlorinated biphenyls (PCBs) to the environment.

PCDD/PCDFs and other UP-POPs can potentially be produced in the main combustion chamber of boilers at its cold spots and active sites suitable for their formations, and in the cooling zones in the heat exchanger section.

The project overall objective aims at reducing and eliminating UP-POPs releases by enhancing guidelines and guidance on best available techniques and best environmental practices (BAT/BEP) for fossil fuel-fired utilities and industrial boilers through addressing specific features of industry, common practices in the region and related socio-economic considerations. In addition, the project also targets the identification of possible options for the simultaneous reduction of dioxins and CO₂ from fossil fuel-fired utility and industrial boilers in response to Stockholm Convention and Climate Change requirements.

The project is funded through a GEF grant, amounting to USD 4,000,000 (and PPG Grant of USD 400,000), a UNIDO contribution of USD 200,000 (In-kind); and the counterparts' co-financing of USD 8,900,000 (cash and in kind), which amount to total project budget of USD 13,500,000.

Project implementation started in May 2010 and the initial project end date was in April 2014. The same was revised to June 2016. **Actual implementation end date is June 2016**

The project will be subject to GEF Monitoring and Evaluation rules and practices of the GEF and UNIDO. A mid-term review (MTR), as well as a terminal evaluation (TE), is foreseen in the project document. Within the frame of the project monitoring and evaluation plan, an external MTR was carried out in October 2012 (MTR report, February 2013).

3. Project objective and structure

The overall objective of the project aims at reducing, and where feasible, eliminating UP-POPs releases by capacity building at regional level to implement BAT/BEP measures in the fossil fuel fired utility and industrial boilers source category including UP-POPs monitoring. The project also aims at simultaneously increasing energy efficiency and reducing UP-POPs releases by application of appropriately selected technologies and fuels in the fossil fuel-fired utility and industrial boilers source category.

6 substantive outcomes have been developed to achieve the project objectives:

Outcome 1: Adopted guidelines and guidance on BAT/BEP addressing specific features of industry, common practices in the region and related socio-economic considerations

Outcome 2: Pollution prevention measures (cleaner production) applied prior to introducing BAT/BEP (Annex C, Part V, A)

Outcome 3: UP-POPs baseline inventories derived from representative industrial sources and projected at regional scale

Outcome 4: Established regional coordination of developing human resources

Outcome 5: Adequate capacity in sampling and analysis of UP-POPs

Outcome 6: Established project management office, stakeholder partnerships, and relevant meetings

4. Project implementation and execution arrangements

UNIDO: is the implementing agency for the project. A project focal point was to be established within UNIDO to assist in the project execution

ESEA Forum Board (FB): was to oversee project implementation

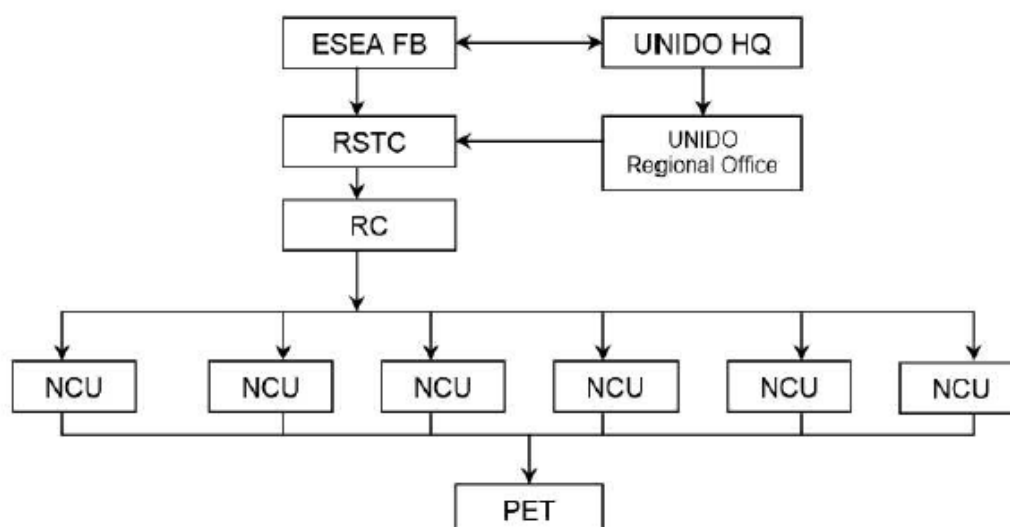
Regional Sector Technical Committee (RSTC): members of the RSTC were to be senior officials of relevant ministries of each participating country, the NPMs and UNIDO PM.

Regional Coordinator (RC): was to support the RSTC, and carry out amongst other, the day-to-day administration of the project, coordinate the timely inputs of various stakeholders

National Coordination Units (NCU): was to be set up in each participating country and was to have a **National Project Manager (NPM)**

Project Expert Team (PET): was to include the RC, the NPMs, policy experts, POPs management and disposal industry experts, chemists, as well as other technical experts

The project management structure is illustrated below:



5. Mid-term Review (MTR)

The **MTR** was carried out by an independent evaluation consultant in October 2012.

Main findings of the MTR are as follows (see MTR report, February 2013):

The project should be considered mainly as a capacity building project, as the key outputs are training, upgrading of the existing legislation to include SC requirements, drafting and implementation of guidelines and guidance, and the establishment of a UP-POPs baseline inventory.

Overall rating of project outcomes, based on the SMART analysis, was satisfactory. Considering the limited budget available and the number of countries involved, the project structure was considered to be too complex. This complex project structure demanded a significant supervision effort to be carried out mostly at central level, supporting the supervision / coordination at regional or country level where it was not completely effective. An analysis of the project achievements also showed that under some project outputs, no significant results could be identified, as some project activities were a duplication of other activities. Rearrangement of project outputs and activities was proposed. Most of the project activities, at the time of the MTR, were moderately satisfactory, and some were satisfactory.

Further details can be obtained from the MTR report (February 2013).

6. Budget information

The project is funded through a GEF grant, amounting to USD 4,000,000 (and PPG Grant of USD 400,000), a UNIDO co-financing of USD 200,000 (in-kind); and the counterparts' total co-financing of USD 8,900,000 (cash and in-kind) which amount to total project budget of USD 9,100,000.

Financing plan summary for the project (in USD):

	<i>Project Preparation</i>	<i>Project</i>	<i>Total</i>
GEF financing	400,000	4,000,000	4,400,000
Co-financing (Cash and In-kind)	300,000	9,100,000	9,400,000
Total	700,000	13,100,000	13,800,000

(Source: CEO endorsement document)

Project budget:

Project outcomes	GEF (\$)	Co-Financing (\$)	Total (\$)
1. Formulation of regional guidelines and guidance on BAT/BEP for fossil fuel fired utility and industrial boilers consistent with relevant requirements of the Stockholm Convention	700,000	1,990,000	2,690,000
2. Dissemination of pollution prevention / cleaner production (PP/CP) measures in fossil fuel-fired utilities and industrial boilers source category	400,000	255,000	655,000
3. Establishment of regional UP-POPs baseline inventory in fossil fuel-fired utilities and industrial boilers source category	1,900,000	1,900,000	3,800,000
4. Regional coordination in developing human resources	410,000	1,405,000	1,815,000
5. Capacity building in sampling at industrial sources and analysis of UP-POPs	340,000	3,010,000	3,350,000
Project Management and M&E	250,000	540,000	790,000
Total	4,000,000	9,100,000	13,100,000

(Source: CEO endorsement document)

Expected co-financing source breakdown is as follows:

Name of Co-financier (source)	Classification	Type	Project
Cambodia	Government	Cash	400,000
		In-kind	900,000
Indonesia	Government	To be defined later	
Lao PDR	Government	Cash	259,000
		In-kind	941,000
Mongolia	Government	Cash	120,000
		In-kind	1,080,000
Philippines	Government	In-kind	1,200,000
Thailand	Government	In-kind	4,000,000
Total Co-Financing			8,900,000

(Source: CEO endorsement document)

UNIDO GEF-grant disbursement breakdown:

Item	Disbursement (expenditure, incl. commitment) in 2012	Disbursement in 2013	Disbursement in 2014	Disbursement in 2015	Total disbursement (in USD) (2012-present) (08 Dec. 2015)
Contingencies					
Contractual Services	336,354.08	-31.04	425,558.15	194,710.02	956,591.21
Equipment	32,302.14	550,379.63	92,532.49	1,681.29	676,895.55
Internat. Cons/Staff	313,298.46	101,070.48	65,661.44	48,091.15	528,121.53
Internat. meetings	224,992.19	43,082.45	69,326.12	9,642.78	347,043.54
Local Travel	67,666.43	27,336.75	17,131.57	3,869.72	116,004.47
Nat. Consult./Staff	288,988.76	232,938.37	157,819.66	131,728.87	811,475.66
Other Direct Costs	45,650.97	12,202.83	11,511.59	217.76	69,583.15
Premises				54.08	54.08
Staff Travel		178.92			178.92
Train/Fellowsh/Study	69,807.94	33,746.12	14,901.30	3,481.67	121,937.03
Total (in USD)	1,379,060.97	1,000,904.51	854,442.32	393,477.34	3,627,885.14

(Source: SAP database, 08 Dec. 2015)

II. Scope and purpose of the evaluation

The terminal evaluation (TE) will cover the whole duration of the project from its starting date in May 2010 to the estimated completion date in April 2016. It will assess project performance against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

From the knowledge management perspective, the TE has an additional purpose of drawing lessons and developing recommendations for UNIDO and the GEF that may help improving the selection, enhancing the design and implementation of similar future projects and activities in the country and on a global scale upon project completion. The terminal evaluation report should include examples of good practices for other projects in the focal area, country, or region.

The terminal evaluation should provide an analysis of the attainment of the project objective(s) and the corresponding technical components or outputs. Through its assessments, the terminal evaluation should enable the Government, the national GEF Operational Focal Point (OFP), counterparts, the GEF, UNIDO and other stakeholders and donors to verify prospects for development impact and promoting sustainability, providing an analysis of the attainment of global environmental objectives, project objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators, and management of risks. The assessment includes re-examination of the relevance of the objectives and other elements of project design according to the project evaluation parameters defined in chapter VI.

The key question of the terminal evaluation is whether the project has achieved or is likely to achieve its main objective of reducing, and where feasible, eliminating UP-POPs releases by capacity building at regional level to implement BAT/BEP measures in the fossil fuel fired utility and industrial boilers source category including UP-POPs monitoring

III. Evaluation approach and methodology

The terminal evaluation will be conducted in accordance with the UNIDO Evaluation Policy⁵⁸, the UNIDO Guidelines for the Technical Cooperation Programme and Project Cycle⁵⁹, the GEF Guidelines for GEF Agencies in Conducting Terminal Evaluations⁶⁰, the GEF Monitoring and Evaluation Policy⁶¹ and the GEF Minimum Fiduciary Standards for GEF Implementing and Executing Agencies⁶².

It will be carried out as an independent in-depth evaluation using a participatory approach whereby all key parties associated with the project are kept informed and regularly consulted throughout the evaluation. The evaluation team will liaise with the UNIDO Office for Independent Evaluation (ODG/EVA) on the conduct of the evaluation and methodological issues.

The evaluation team will be required to use different methods to ensure that data gathering and analysis deliver evidence-based qualitative and quantitative information, based on diverse sources, as necessary: desk studies and literature review, statistical analysis, individual interviews, focus group meetings, surveys and direct observation. This approach will not only enable the evaluation to assess

⁵⁸ UNIDO. (2015). Director General's Bulletin: Evaluation Policy (UNIDO/DGB/(M).98/Rev.1)

⁵⁹ UNIDO. (2006). Director-General's Administrative Instruction No. 17/Rev.1: Guidelines for the Technical Cooperation Programme and Project Cycle (DGAI.17/Rev.1, 24 August 2006)

⁶⁰ GEF. (2008). Guidelines for GEF Agencies in Conducting Terminal Evaluations (Evaluation Office, Evaluation Document No. 3, 2008)

⁶¹ GEF. (2010) The GEF Monitoring and Evaluation Policy (Evaluation Office, November 2010)

⁶² GEF. (2011). GEF Minimum Fiduciary Standards: Separation of Implementation and Execution Functions in GEF Partner Agencies (GEF/C.41/06/Rev.01, 3 November 2011, prepared by the Trustee)

causality through quantitative means but also to provide reasons for why certain results were achieved or not and to triangulate information for higher reliability of findings. The specific mixed methodological approach will be described in the inception report.

The evaluation team will develop interview guidelines. Field interviews can take place either in the form of focus-group discussions or one-to-one consultations.

The methodology will be based on the following:

1. A desk review of project documents, including, but not limited to:
 - (a) The original project document, monitoring reports (such as progress and financial reports to UNIDO and UNIDO-GEF annual Project Implementation Reports (PIRs)), mid-term review report, output reports (case studies, action plans, sub-regional strategies, etc.), back-to-office mission report(s), end-of-contract report(s) and relevant correspondence.
 - (b) If applicable, notes from the meetings of committees involved in the project (e.g. approval and steering committees).
 - (c) Other project-related material produced by the project.
2. The evaluation team will use available models of (or reconstruct if necessary) theory of change for the different types of intervention (enabling, capacity, investment, demonstration). The validity of the theory of change will be examined through specific questions in interviews and possibly through a survey of stakeholders.
3. Counterfactual information: In those cases where baseline information for relevant indicators is not available, the evaluation team will aim at establishing a proxy-baseline through recall and secondary information.
4. Interviews with project management and technical support including staff and management at UNIDO HQ and in the field and – if necessary - staff associated with the project's financial administration and procurement.
5. Interviews with project partners and stakeholders, including, among others, government counterparts, GEF OFP, project stakeholders, and co-financing partners as shown in the corresponding sections of the project documents.
6. On-site observation of results achieved in at least 3 selected participating countries, including interviews of actual and potential beneficiaries of improved technologies. Selection of the participating countries to be done in agreement with the UNIDO PM and ODG/EVA and is to be specified in the inception report.
7. Interviews and telephone interviews with intended users for the project outputs and other stakeholders involved in the project. The evaluation team shall determine whether to seek additional information and opinions from representatives of any donor agency(ies) or other organizations.
8. Interviews with the relevant UNIDO Field Offices in the 6 participating countries, to the extent that they were involved in the project, and the project's management members and the various national and sub-regional authorities dealing with project activities as necessary. If deemed necessary, the evaluation team shall also gain broader perspectives from discussions with relevant GEF Secretariat staff.
9. Other interviews, surveys or document reviews as deemed necessary by the evaluation team and/or UNIDO, ODG/EVA.

10. The inception report will provide details on the methodology used by the evaluation team and include an evaluation matrix.

IV. Evaluation team composition

Owing to the size and scope of the project, the evaluation team will be composed of two international evaluation consultants. Both consultants will be contracted by UNIDO. The tasks of each team member are specified in the job descriptions annexed to these terms of reference.

The evaluation team is required to provide information relevant for follow-up studies, including terminal evaluation verification on request to the GEF partnership up to three years after completion of the terminal evaluation.

Members of the evaluation team must not have been directly involved in the design and/or implementation of the projects/programme under evaluation.

The UNIDO project manager and the project teams in the participating countries will support the evaluation team. The UNIDO GEF Coordinator and the GEF OFP will be briefed on the evaluation and provide support to its conduct. GEF OFP will, where applicable and feasible, also be briefed and debriefed at the start and end of the evaluation mission.

V. Time schedule and deliverables

The evaluation is scheduled to take place from June 2016 – July 2016. The evaluation mission is planned for July 2016. At the end of the field mission, there will be a presentation of the preliminary findings for all stakeholders involved in this project/programme in the participating countries.

At the end of the evaluation field mission, a debriefing should also be conducted inviting local stakeholders (incl. government and parties involved in the evaluation). After the evaluation mission, the evaluation team will come to UNIDO HQ for debriefing and presentation of the preliminary findings of the terminal evaluation. The draft TE report will be submitted 4 to 6 weeks after the end of the mission. The draft TE report is to be shared with the UNIDO PM, ODG/EVA, the UNIDO GEF Coordinator and the GEF OFP and other relevant stakeholders for receipt of comments. The ET is expected to revise the draft TE report based on the comments received, edit the language and form and submit the final version of the TE report in accordance with UNIDO ODG/EVA standards.

VI. Project evaluation parameters

The evaluation team will rate the projects. The **ratings for the parameters described in the following sub-chapters A to J will be presented in the form of a table** with each of the categories rated separately and with **brief justifications for the rating** based on the findings of the main analysis. An overall rating for the project should also be given.

A. Design

The evaluation will examine the extent to which:

- The project's design is adequate to address the problems at hand;
- A participatory project identification process was instrumental in selecting problem areas and national counterparts;
- The project has a clear thematically focused development objective, the attainment of which can be determined by a set of verifiable indicators;
- The project was formulated based on the logical framework (project results framework) approach;
- Is the expected result chain (impact, outcomes, outputs) clear and logical? Are outcomes, outputs and activities clearly defined, logical, coherent and appropriate to achieve the project objectives?
- Was there a need to reformulate the project design and the project results framework given changes in the country and operational context?
- The project was formulated with the participation of national counterparts, stakeholders and/or target beneficiaries through a participatory and broad public consultation approach;
- Relevant country representatives (from government, industries, gender groups, customs officers and civil society), including the GEF OFP, have been appropriately involved and were participating in the identification of critical problem areas and the development of technical cooperation strategies;
- All GEF-4 projects have incorporated relevant environmental and social risk considerations into the project design, established at the time of project design.

B. Relevance

The evaluation will examine the extent to which the project is relevant to the:

- National development and environmental priorities and strategies of the Government and the population, and regional and international agreements. See possible evaluation questions under "Country ownership/drivenness" below.
- Target groups: relevance of the project's objectives, outcomes and outputs to the different target groups of the interventions (e.g. companies, civil society, beneficiaries of capacity building and training, etc.).
- GEF's focal areas/operational programme strategies: In retrospect, were the project's outcomes consistent with the GEF focal area(s)/operational program strategies? Ascertain the likely nature and significance of the contribution of the project outcomes to the wider portfolio of POPs SP-1; SP-2; SP-3.
- UNIDO's thematic priorities: Were they in line with UNIDO's mandate, objectives and outcomes defined in the Programme and Budget and core competencies?
- Does the project remain relevant taking into account the changing environment?

C. Effectiveness

- The evaluation will assess the objectives and final results at the end of the project
- The evaluation will assess to what extent results at various levels, including outcomes, have been achieved. In detail, the following issues will be assessed: To what extent have the expected outputs, outcomes and long-term objectives been achieved or are likely to be achieved? Has the

project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?

- Are the project outcomes commensurate with the original or modified project objectives? If the original or modified expected results are merely outputs/inputs, the evaluators should assess if there were any real outcomes of the project and, if there were, determine whether these are commensurate with realistic expectations from the project.
- How do the stakeholders perceive the quality of outputs? Were the targeted beneficiary groups actually reached?
- What outputs and outcomes has the project achieved so far (both qualitative and quantitative results)? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?
- Identify actual and/or potential longer-term impacts or at least indicate the steps taken to assess these (see also below “monitoring of long term changes”). Wherever possible, evaluators should indicate how findings on impacts will be reported in future.
- Describe any catalytic or replication effects: the evaluation will describe any catalytic or replication effect both within and outside the project. If no effects are identified, the evaluation will describe the catalytic or replication actions that the project carried out. No ratings are requested for the project’s catalytic role.

D. Efficiency

The extent to which:

- The project cost was effective? Was the project using the most cost-efficient options?
- Has the project produced results (outputs and outcomes) within the expected time frame? Was project implementation delayed, and, if it was, did that affect cost effectiveness or results? Wherever possible, the evaluator should also compare the costs incurred and the time taken to achieve outcomes with that for similar projects. Are the project’s activities in line with the schedule of activities as defined by the project team and annual work plans? Are the disbursements and project expenditures in line with budgets?
- Have the inputs from the donor, UNIDO and Government/counterpart been provided as planned, and were they adequate to meet the requirements? Was the quality of UNIDO inputs and services as planned and timely?
- Was there coordination with other UNIDO and other donors’ projects, and did possible synergy effects happen?
- Were there delays in project implementation and if so, what were their causes?

E. Assessment of risks to sustainability of project outcomes

Sustainability is understood as the likelihood of continued benefits after the GEF project ends.

Assessment of sustainability of outcomes will be given special attention but also technical, financial and organization sustainability will be reviewed. This assessment should explain how the risks to project outcomes will affect continuation of benefits after the GEF project ends. It will include both exogenous and endogenous risks. The following four dimensions or aspects of risks to sustainability will be addressed:

- **Financial risks.** Are there any financial risks that may jeopardize sustainability of project outcomes? What is the likelihood of financial and economic resources not being available once GEF assistance ends? (Such resources can be from multiple sources, such as the public and private sectors or income-generating activities; these can also include trends that indicate the

likelihood that, in future, there will be adequate financial resources for sustaining project outcomes.) Was the project successful in identifying and leveraging co-financing?

- **Sociopolitical risks.** Are there any social or political risks that may jeopardize sustainability of project outcomes? What is the risk that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? Do the various key stakeholders see that it is in their interest that project benefits continue to flow? Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?
- **Institutional framework and governance risks.** Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits? Are requisite systems for accountability and transparency and required technical know-how in place?
- **Environmental risks.** Are there any environmental risks that may jeopardize sustainability of project outcomes? Are there any environmental factors, positive or negative, that can influence the future flow of project benefits? Are there any project outputs or higher level results that are likely to have adverse environmental impacts, which, in turn, might affect sustainability of project benefits? The evaluation should assess whether certain activities will pose a threat to the sustainability of the project outcomes.

F. Assessment of monitoring and evaluation (M&E) systems

- **M&E design.** Did the project have an M&E plan to monitor results and track progress towards achieving project objectives? The evaluation will assess whether the project met the minimum requirements for the application of the Project M&E plan (see annex 3).
- **M&E plan implementation.** The evaluation should verify that an M&E system was in place and facilitated timely tracking of progress toward project objectives by collecting information on chosen indicators continually throughout the project implementation period; annual project reports were complete and accurate, with well-justified ratings; the information provided by the M&E system was used during the project to improve performance and to adapt to changing needs; and the project had an M&E system in place with proper training for parties responsible for M&E activities to ensure that data will continue to be collected and used after project closure. Was monitoring and self-evaluation carried out effectively, based on indicators for outputs, outcomes and impacts? Are there any annual work plans? Was any steering or advisory mechanism put in place? Did reporting and performance reviews take place regularly?
- **Budgeting and Funding for M&E activities.** In addition to incorporating information on funding for M&E while assessing M&E design, the evaluators will determine whether M&E was sufficiently budgeted for at the project planning stage and whether M&E was adequately funded and in a timely manner during implementation.

G. Monitoring of long-term changes

The M&E of long-term changes is often incorporated in GEF-supported projects as a separate component and may include determination of environmental baselines; specification of indicators; and provisioning of equipment and capacity building for data gathering, analysis, and use. This section of the evaluation report will describe project actions and accomplishments towards establishing a long-term monitoring system. The evaluation will address the following questions:

- a. Did the project contribute to the establishment of a long-term monitoring system? If it did not, should the project have included such a component?

- b. What were the accomplishments and shortcomings in establishment of this system?
- c. Is the system sustainable — that is, is it embedded in a proper institutional structure and does it have financing? How likely is it that this system continues operating upon project completion?
- d. Is the information generated by this system being used as originally intended?

H. Assessment of processes affecting achievement of project results

Among other factors, when relevant, the evaluation will consider a number of issues affecting project implementation and attainment of project results. The assessment of these issues can be integrated into the analyses of project design, relevance, effectiveness, efficiency, sustainability and management as the evaluators deem them appropriate (it is not necessary, however it is possible to have a separate chapter on these aspects in the evaluation report). The evaluation will consider, but need not be limited to, the following issues that may have affected project implementation and achievement of project results:

- a. **Preparation and readiness / Quality at entry.** Were the project's objectives and components clear, practicable, and feasible within its time frame? Were counterpart resources (funding, staff, and facilities), and adequate project management arrangements in place at project entry? Were the capacities of executing institution and counterparts properly considered when the project was designed? Were lessons from other relevant projects properly incorporated in the project design? Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to project approval?
- b. **Country ownership/drivenness.** Was the project concept in line with the sectoral and development priorities and plans of the country—or of participating countries, in the case of multi-country projects? Are project outcomes contributing to national development priorities and plans? Were relevant country representatives from government and civil society involved in the project? Was the GEF OFP involved in the project design and implementation? Did the recipient government maintain its financial commitment to the project? Has the government—or governments in the case of multi-country projects—approved policies or regulatory frameworks in line with the project's objectives?
- c. **Stakeholder involvement and consultation.** Did the project involve the relevant stakeholders through continuous information sharing and consultation? Did the project implement appropriate outreach and public awareness campaigns? Were the relevant vulnerable groups and powerful supporters and opponents of the processes involved in a participatory and consultative manner? Which stakeholders were involved in the project (e.g., NGOs, private sector, other UN Agencies) and what were their immediate tasks? Did the project consult with and make use of the skills, experience, and knowledge of the appropriate government entities, nongovernmental organizations, community groups, private sector entities, local governments, and academic institutions in the design, implementation, and evaluation of project activities? Were perspectives of those who would be affected by project decisions, those who could affect the outcomes, and those who could contribute information or other resources to the process taken into account while taking decisions?
- d. **Financial planning.** Did the project have appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds? Was there due diligence in the management of funds and financial audits? Did promised co-financing materialize? Specifically, the evaluation should also include a breakdown of final actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co-financing.

- e. **UNIDO's supervision and backstopping.** Did UNIDO staff identify problems in a timely fashion and accurately estimate their seriousness? Did UNIDO staff provide quality support and advice to the project, approve modifications in time, and restructure the project when needed? Did UNIDO provide the right staffing levels, continuity, skill mix, and frequency of field visits for the project?
- f. **Co-financing and project outcomes and sustainability.** Did the project manage to mobilize the co-financing amount expected at the time of CEO Endorsement? If there was a difference in the level of expected co-financing and the co-financing actually mobilized, what were the reasons for the variance? Did the extent of materialization of co-financing affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?
- g. **Delays and project outcomes and sustainability.** If there were delays in project implementation and completion, what were the reasons? Did the delays affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?
- h. **Implementation and execution approach.** Is the implementation and execution approach chosen different from other implementation approaches applied by UNIDO and other agencies? Does the approach comply with the principles of the Paris Declaration? Is the implementation and execution approach in line with the GEF Minimum Fiduciary Standards: Separation of Implementation and Execution Functions in GEF Partner Agencies (GEF/C.41/06/Rev.01) and the relevant UNIDO regulations (DGAI.20 and Procurement Manual)? Does the approach promote local ownership and capacity building? Does the approach involve significant risks? In cases where Execution was done by third parties, i.e. Executing Partners, based on a contractual arrangement with UNIDO was this done in accordance with the contractual arrangement concluded with UNIDO in an effective and efficient manner?
- i. **Environmental and Social Safeguards.** If a GEF-4 project, has the project incorporated relevant environmental and social risk considerations into the project design? What impact did these risks have on the achievement of project results?

The evaluation team will rate the project performance as required by the GEF. The ratings will be given to four criteria: Project Results, Sustainability, Monitoring and Evaluation, and UNIDO related issues as specified in Annex 2. The ratings will be presented in a table with each of the categories rated separately and with brief justifications for the rating based on the findings of the main analysis. An overall rating for the project should also be given. The rating system to be applied is specified in the same annex. As per the GEF's requirements, the report should also provide information on project identification, time frame, actual expenditures, and co-financing in the format in annex 5, which is modeled after the GEF's project identification form (PIF).

I. Project coordination and management

The extent to which:

- The national management and overall coordination mechanisms have been efficient and effective? Did each partner have assigned roles and responsibilities from the beginning? Did each partner fulfil its role and responsibilities (e.g. providing strategic support, monitoring and reviewing performance, allocating funds, providing technical support, following up agreed/corrective actions)?
- The UNIDO HQ-based management, coordination, monitoring, quality control and technical inputs have been efficient, timely and effective (e.g. problems identified timely and accurately;

quality support provided timely and effectively; right staffing levels, continuity, skill mix and frequency of field visits)?

J. Assessment of gender mainstreaming

The evaluation will consider, but need not be limited to, the following issues that may have affected gender mainstreaming in the project:

- Did the project/programme design adequately consider the gender dimensions in its interventions? If so, how?
- Was a gender analysis included in a baseline study or needs assessment (if any)?
- How gender-balanced was the composition of the project management team, the Steering Committee, experts and consultants and the beneficiaries?
- Have women and men benefited equally from the project's interventions? Do the results affect women and men differently? If so, why and how? How are the results likely to affect gender relations (e.g., division of labour, decision-making authority)?
- To what extent were socioeconomic benefits delivered by the project at the national and local levels, including consideration of gender dimensions?

VII. Reporting

Inception report

These terms of reference (TOR) provide some information on the evaluation methodology, but this should not be regarded as exhaustive. After reviewing the project documentation and initial interviews with the project manager, the evaluation team will prepare a short inception report that will operationalize the TOR relating to the evaluation questions and provide information on what type of and how the evidence will be collected (methodology). It will be discussed with and approved by the responsible in the UNIDO Office for Independent Evaluation. The inception report will focus on the following elements: preliminary project theory model(s); elaboration of evaluation methodology including quantitative and qualitative approaches through an evaluation framework ("evaluation matrix"); division of work between the international evaluation consultants; mission plan, including places to be visited, people to be interviewed and possible surveys to be conducted and a debriefing and reporting timetable⁶³.

Evaluation report format and review procedures

The draft report will be delivered to UNIDO Office for Independent Evaluation (the suggested report outline is in annex 1) and circulated to UNIDO staff, the GEF OFP, and national stakeholders associated with the project for factual validation and comments. Any comments or responses, or feedback on any errors of fact to the draft report provided by the stakeholders will be sent to UNIDO, ODG/EVA for collation and onward transmission to the project evaluation team who will be advised of any necessary revisions. On the basis of this feedback, and taking into consideration the comments received, the evaluation team will prepare the final version of the terminal evaluation report.

⁶³ The evaluator will be provided with a Guide on how to prepare an evaluation inception report prepared by the UNIDO Office for Independent Evaluation.

The evaluation team will present its preliminary findings to the local stakeholders at the end of the field visit and take into account their feed-back in preparing the evaluation report. A presentation of preliminary findings will take place at UNIDO HQ after the field mission.

The terminal evaluation report should be brief, to the point and easy to understand. It must explain the purpose of the evaluation, exactly what was evaluated, and the methods used. The report must highlight any methodological limitations, identify key concerns and present evidence-based findings, consequent conclusions, recommendations and lessons. The report should provide information on when the evaluation took place, the places visited, who was involved and be presented in a way that makes the information accessible and comprehensible. The report should include an executive summary that encapsulates the essence of the information contained in the report to facilitate dissemination and distillation of lessons.

Findings, conclusions and recommendations should be presented in a complete, logical and balanced manner. The evaluation report shall be written in English and follow the outline given in annex 1.

Evaluation work plan

The "Evaluation Work Plan" includes the following main products:

1. Desk review, briefing by project manager and development of methodology: Following the receipt of all relevant documents, and consultation with the Project Manager about the documentation, including reaching an agreement on the methodology, the desk review could be completed.
2. Inception report: At the time of departure to the field mission, all the received material has been reviewed and consolidated into the Inception report.
3. Field mission: The principal responsibility for managing this evaluation lies with UNIDO. It will be responsible for liaising with the project team to set up the stakeholder interviews, arrange the field missions, coordinate with the Government. At the end of the field mission, there will be a presentation of preliminary findings to the key stakeholders in the country where the project was implemented.
4. Preliminary findings from the field mission: Following the field mission, the main findings, conclusions and recommendations would be prepared and presented in the field and at UNIDO Headquarters.
5. A draft terminal evaluation report will be forwarded electronically to the UNIDO Office for Independent Evaluation and circulated to main stakeholders.
6. Final terminal evaluation report will incorporate comments received.

Evaluation phases	Deliverables
Desk review	Development of methodology approach and evaluation tools
Briefing with UNIDO Office for Independent Evaluation, Project Managers and other key stakeholder at HQ	Interview notes, detailed evaluation schedule and list of stakeholders to interview during field mission
Data analysis	Inception evaluation report
Field mission Present preliminary findings and recommendations to key stakeholders in the field	Presentation of main findings to key stakeholders in the field.

Debriefing at UNIDO HQ	Present preliminary findings and recommendations to the stakeholders at UNIDO HQ Additional interviews and analysis
Analysis of the data collected	Draft terminal evaluation report
Circulation of the draft report to UNIDO/relevant stakeholders and revision	Final terminal evaluation report

VIII. Quality assurance

All UNIDO evaluations are subject to quality assessments by the UNIDO Office for Independent Evaluation. Quality assurance and control is exercised in different ways throughout the evaluation process (briefing of consultants on methodology and process by the UNIDO, ODG/EVA, providing inputs regarding findings, lessons learned and recommendations from other UNIDO evaluations, review of inception report and evaluation report by UNIDO, ODG/EVA). The quality of the evaluation report will be assessed and rated against the criteria set forth in the Checklist on evaluation report quality, attached as Annex 4. The applied evaluation quality assessment criteria are used as a tool to provide structured feedback. UNIDO, ODG/EVA should ensure that the evaluation report is useful for UNIDO in terms of organizational learning (recommendations and lessons learned) and is compliant with UNIDO's evaluation policy and these terms of reference. The draft and final evaluation report are reviewed by the UNIDO Office for Independent Evaluation, which will submit the final report to the GEF Evaluation Office and circulate it within UNIDO together with a management response sheet.

Annex 1 - Outline of an in-depth project evaluation report

Executive summary

- Must provide a synopsis of the storyline which includes the main evaluation findings and recommendations
- Must present strengths and weaknesses of the project
- Must be self-explanatory and should be maximum 3-4 pages in length

I. Evaluation objectives, methodology and process

- Information on the evaluation: why, when, by whom, etc.
- Scope and objectives of the evaluation, main questions to be addressed
- Information sources and availability of information
- Methodological remarks, limitations encountered and validity of the findings

II. Country and project background

- Brief country context: an overview of the economy, the environment, institutional development, demographic and other data of relevance to the project
- Sector-specific issues of concern to the project⁶⁴ and important developments during the project implementation period
- Project summary:
 - Fact sheet of the project: including project objectives and structure, donors and counterparts, project timing and duration, project costs and co-financing
 - Brief description including history and previous cooperation
 - Project implementation arrangements and implementation modalities, institutions involved, major changes to project implementation
 - Positioning of the UNIDO project (other initiatives of Government, other donors, private sector, etc.)
 - Counterpart organization(s)

III. Project assessment

This is the key chapter of the report and should address all evaluation criteria and questions outlined in the TOR (see section VI - Project evaluation parameters). Assessment must be based on factual evidence collected and analyzed from different sources. The evaluators' assessment can be broken into the following sections:

- A. Design
- B. Relevance (report on the relevance of project towards countries and beneficiaries)
- C. Effectiveness (the extent to which the development intervention's objectives and deliverables were achieved, or are expected to be achieved, taking into account their relative importance)
- D. Efficiency (report on the overall cost-benefit of the project and partner countries' contribution to the achievement of project objectives)
- E. Sustainability of project outcomes (report on the risks and vulnerability of the project, considering the likely effects of sociopolitical and institutional changes in partner countries, and its impact on continuation of benefits after the GEF project ends, specifically the financial, sociopolitical, institutional framework and governance, and environmental risks)
- F. Assessment of monitoring and evaluation systems (report on M&E design, M&E plan implementation, and budgeting and funding for M&E activities)

⁶⁴ Explicit and implicit assumptions in the logical framework of the project can provide insights into key-issues of concern (e.g., relevant legislation, enforcement capacities, government initiatives)

- G. Monitoring of long-term changes
- H. Assessment of processes affecting achievement of project results (report on preparation and readiness / quality at entry, country ownership, stakeholder involvement, financial planning, UNIDO support, co-financing and project outcomes and sustainability, delays of project outcomes and sustainability, and implementation approach)
- I. Project coordination and management (report project management conditions and achievements, and partner countries commitment)
- J. Gender mainstreaming

At the end of this chapter, an overall project achievement rating should be developed as required in annex 2. The overall rating table required by the GEF should be presented here.

IV. Conclusions, recommendations and lessons learned

This chapter can be divided into three sections:

A. Conclusions

This section should include a storyline of the main evaluation conclusions related to the project's achievements and shortfalls. It is important to avoid providing a summary based on each and every evaluation criterion. The main conclusions should be cross-referenced to relevant sections of the evaluation report.

B. Recommendations

This section should be succinct and contain few key recommendations. They should be:

- Based on evaluation findings
- Realistic and feasible within a project context
- Indicating institution(s) responsible for implementation (addressed to a specific officer, group or entity who can act on it) and have a proposed timeline for implementation if possible
- Commensurate with the available capacities of project team and partners
- Taking resource requirements into account.

Recommendations should be structured by addressees:

- UNIDO
- Government and/or counterpart organizations
- Donor

C. Lessons learned

- Lessons learned must be of wider applicability beyond the evaluated project but must be based on findings and conclusions of the evaluation
- For each lesson, the context from which they are derived should be briefly stated

Annexes should include the evaluation TOR, list of interviewees, documents reviewed, a summary of project identification and financial data, including an updated table of expenditures to date, and other detailed quantitative information. Dissident views or management responses to the evaluation findings may later be appended in an annex.

Annex 2 - Overall rating table

Criterion	Evaluator's summary comments	Evaluator's rating
Attainment of project objectives and results (overall rating), sub criteria (below)		
Design		
Effectiveness		
Relevance		
Efficiency		
Sustainability of project outcomes (overall rating), sub criteria (below)		
Financial risks		
Sociopolitical risks		
Institutional framework and governance risks		
Environmental risks		
Monitoring and evaluation (overall rating), sub criteria (below)		
M&E Design		
M&E Plan implementation (use for adaptive management)		
Budgeting and Funding for M&E activities		
Project management		
UNIDO specific ratings		
Quality at entry / Preparation and readiness		
Implementation approach		
UNIDO Supervision and backstopping		
Overall rating		

RATING OF PROJECT OBJECTIVES AND RESULTS

- Highly satisfactory (HS): The project had no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Satisfactory (S): The project had minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately satisfactory (MS): The project had moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately unsatisfactory (MU): The project had significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Unsatisfactory (U) The project had major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Highly unsatisfactory (HU): The project had severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Please note: Relevance and effectiveness will be considered as critical criteria. The overall rating of the project for achievement of objectives and results **may not be higher** than the lowest rating on either of these two criteria. Thus, to have an overall satisfactory rating for outcomes a project must have at least satisfactory ratings on both relevance and effectiveness.

RATINGS ON SUSTAINABILITY

Sustainability will be understood as the probability of continued long-term outcomes and impacts after the GEF project funding ends. The evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits beyond project completion. Some of these factors might be outcomes of the project, i.e. stronger institutional capacities, legal frameworks, socio-economic incentives /or public awareness. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes.

Rating system for sustainability sub-criteria

On each of the dimensions of sustainability of the project outcomes will be rated as follows.

- Likely (L): There are no risks affecting this dimension of sustainability.
- Moderately likely (ML). There are moderate risks that affect this dimension of sustainability.
- Moderately unlikely (MU): There are significant risks that affect this dimension of sustainability.
- Unlikely (U): There are severe risks that affect this dimension of sustainability.

All the risk dimensions of sustainability are critical. Therefore, overall rating for sustainability will not be higher than the rating of the dimension with lowest ratings. For example, if a project has an Unlikely rating in either of the dimensions then its overall rating cannot be higher than Unlikely, regardless of whether higher ratings in other dimensions of sustainability produce a higher average.

RATINGS OF PROJECT M&E

Monitoring is a continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing project with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds. Evaluation is the systematic and objective assessment of an on-going or completed project, its design, implementation and results. Project evaluation may involve the definition of appropriate standards, the examination of performance against those standards, and an assessment of actual and expected results.

The Project M&E system will be rated on M&E design, M&E plan implementation and budgeting and funding for M&E activities as follows:

- Highly satisfactory (HS): There were no shortcomings in the project M&E system.
- Satisfactory(S): There were minor shortcomings in the project M&E system.
- Moderately satisfactory (MS): There were moderate shortcomings in the project M&E system.
- Moderately unsatisfactory (MU): There were significant shortcomings in the project M&E system.
- Unsatisfactory (U): There were major shortcomings in the project M&E system.
- Highly unsatisfactory (HU): The Project had no M&E system.

M&E plan implementation will be considered a critical parameter for the overall assessment of the M&E system. The overall rating for the M&E systems will not be higher than the rating on M&E plan implementation.

All other ratings will be on the GEF six-point scale:

HS	= Highly satisfactory	Excellent
S	= Satisfactory	Well above average
MS	= Moderately satisfactory	Average
MU	= Moderately unsatisfactory	Below average
U	= Unsatisfactory	Poor
HU	= Highly unsatisfactory	Very poor (appalling)

Annex 3 - GEF Minimum requirements for M&E⁶⁵

Minimum requirement 1: Project design of M&E

All projects will include a concrete and fully budgeted M&E plan by the time of work program entry for full-sized projects (FSP) and CEO approval for medium-sized projects (MSP). This M&E plan will contain as a minimum:

- SMART indicators for project implementation, or, if no indicators are identified, an alternative plan for monitoring that will deliver reliable and valid information to management;
- SMART indicators for results (outcomes and, if applicable, impacts), and, where appropriate, indicators identified at the corporate level;
- Baseline for the project, with a description of the problem to be addressed, with indicator data, or, if major baseline indicators are not identified, an alternative plan for addressing this within one year of implementation;
- Identification of reviews and evaluations that will be undertaken, such as mid-term reviews or evaluations of activities; and
- Organizational set-up and budgets for monitoring and evaluation.

Minimum requirement 2: Application of project M&E

Project monitoring and supervision will include implementation of the M&E plan, comprising:

- SMART indicators for implementation are actively used, or if not, a reasonable explanation is provided;
- SMART indicators for results are actively used, or if not, a reasonable explanation is provided;
- The baseline for the project is fully established and data compiled to review progress reviews, and evaluations are undertaken as planned; and
- The organizational set-up for M&E is operational and budgets are spent as planned.

⁶⁵ http://www.thegef.org/gef/sites/thegef.org/files/documents/ME_Policy_2010.pdf

Annex 4 - Checklist on terminal evaluation report quality

Independent terminal evaluation of UNIDO-GEF project:

Project Title:

Project NO:

Checklist on evaluation report quality

Report quality criteria	UNIDO Office for Independent Evaluation: Assessment notes	Rating
A. The terminal evaluation report presented an assessment of all relevant outcomes and achievement of project objectives in the context of the focal area program indicators if applicable.		
B. The terminal evaluation report was consistent, the evidence presented was complete and convincing, and the ratings were well substantiated.		
C. The terminal evaluation report presented a sound assessment of sustainability of outcomes.		
D. The lessons and recommendations listed in the terminal evaluation report are supported by the evidence presented and are relevant to the GEF portfolio and future projects.		
E. The terminal evaluation report included the actual project costs (totals, per activity, and per source) and actual co-financing used.		
F. The terminal evaluation report included an assessment of the quality of the M&E plan at entry, the operation of the M&E system used during implementation, and the extent M&E was sufficiently budgeted for during preparation and properly funded during implementation.		

Rating system for quality of evaluation reports

A number rating 1-6 is used for each criterion: Highly satisfactory = 6, Satisfactory = 5, Moderately satisfactory = 4, Moderately unsatisfactory = 3, Unsatisfactory = 2, Highly unsatisfactory = 1, and unable to assess = 0.

Annex 5 – Required project identification and financial data

The evaluation report should provide information on project identification, time frame, actual expenditures, and co-financing in the following format, which is modeled after the project identification form (PIF).

I. Dates

Milestone	Expected date	Actual date
Project CEO endorsement/approval date		
Project implementation start date (PAD issuance date)		
Original expected implementation end date (indicated in CEO endorsement/approval document)		
Revised expected implementation end date (if any)		
Terminal evaluation completion		
Planned tracking tool date		

II. Project framework

Project component	Activity type	GEF financing (in USD)		Co-financing (in USD)	
		Approved	Actual	Promised	Actual
1.					
2.					
3.					
4.					
5.					
6. Project management					
Total (in USD)					

Activity types are:

- a) Experts, researches hired
- b) technical assistance, Workshop, Meetings or experts consultation scientific and technical analysis, experts researches hired
- c) Promised co-financing refers to the amount indicated on endorsement/approval.

III. Co-financing

Source of co-financing (name of specific co-financiers)	Type of co-financier (e.g. government, GEF agency(ies), Bilateral and aid agency (ies), multilateral agency(ies), private sector, NGO/CSOs, other)	Type of co-financing	Project preparation – CEO endorsement/ approval stage (in USD)		Project implementation stage (in USD)		Total (in USD)	
			Expected	Actual	Expected	Actual	Expected	Actual
	...							
Total co-financing (in USD)								

Expected amounts are those submitted by the GEF agencies in the original project appraisal document. Co-financing types are grant, soft loan, hard loan, guarantee, in kind, or cash.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

TERMS OF REFERENCE FOR PERSONNEL UNDER INDIVIDUAL SERVICE AGREEMENT (ISA)

Title:	International evaluation consultant, team leader
Main Duty Station and Location:	Home-based
Missions:	Missions to Vienna, Austria and Mongolia, Thailand and Cambodia
Start of Contract (EOD):	June 1, 2016
End of Contract (COB):	July 30, 2016
Number of Working Days:	30 working days spread over 2 months

1. ORGANIZATIONAL CONTEXT

The UNIDO Office for Independent Evaluation (ODG/EVA) is responsible for the independent evaluation function of UNIDO. It supports learning, continuous improvement and accountability, and provides factual information about result and practices that feed into the programmatic and strategic decision-making processes. Evaluation is an assessment, as systematic and impartial as possible, of a programme, a project or a theme. Independent evaluations provide evidence-based information that is credible, reliable and useful, enabling the timely incorporation of findings, recommendations and lessons learned into the decision-making processes at organization-wide, programme and project level. ODG/EVA is guided by the UNIDO Evaluation Policy, which is aligned to the norms and standards for evaluation in the UN system.

2. PROJECT CONTEXT

According to Article 5(a) of the Stockholm Convention (SC) on Persistent Organic Pollutants (POPs), each Party to the Convention shall develop an action plan, or a regional or sub-regional plan to reduce the total release of chemicals listed in Annex C, with the goal of continuing the minimization and where feasible, elimination. The introduction of best available techniques (BAT) and best environmental practices (BEP) in the different source categories in Annex C of the Convention is the most important practical measure to continuing minimization of unintentionally-produced POPs (UP-POPs) releases.

The fossil fuel-fired utilities and industrial boilers source category was identified among the priority sources for the introduction of BAT/BEP in the respective NIPs of Cambodia, Indonesia, Lao PDR, Mongolia, Philippines and Thailand. The project overall objective aims at reducing and eliminating UP-POPs releases by enhancing guidelines and guidance on best available techniques and best environmental practices (BAT/BEP) for fossil fuel-fired utilities and industrial boilers through addressing specific features of industry, common practices in the region and related socio-economic considerations.

Detailed background information of the project can be found the terms of reference (TOR) for the terminal evaluation.

3. DUTIES AND RESPONSIBILITIES

MAIN DUTIES	Concrete/ Measurable Outputs to be achieved	Working Days	Location
1. Review project documentation and relevant country background information (national policies and strategies, UN strategies and general economic data); determine key data to collect in the field and adjust the key data collection instrument of 3A accordingly (if needed); Assess the adequacy of legislative and regulatory framework relevant to the project's activities and analyze other background info.	<ul style="list-style-type: none"> Adjust table of evaluation questions, depending on country specific context; Draft list of stakeholders to interview during the field missions; Brief assessment of the adequacy of the country's legislative and regulatory framework. 	7 days	Home-based
2. Briefing with the UNIDO Office for Independent Evaluation, project managers and other key stakeholders at UNIDO HQ. Preparation of the Inception Report	<ul style="list-style-type: none"> Detailed evaluation schedule with tentative mission agenda (incl. list of stakeholders to interview and site visits); mission planning; Division of evaluation tasks with the International Evaluation Consultant. Inception Report 	2 days	Vienna, Austria
3. Conduct field mission to xxxx, xxxx, xxxx in April 2016 ⁶⁶ .	<ul style="list-style-type: none"> Conduct meetings with relevant project stakeholders, beneficiaries, the GEF Operational Focal Point (OFP), etc. for the collection of data and clarifications; Agreement with the International Evaluation Consultant on the structure and content of the evaluation report and the distribution of 	3 days Bangkok; 2 days Pnohm Penh, 2 days Mongolia (including travel)	Bangkok, Pnohm Penh, Ulaanbaatar

⁶⁶ The exact mission dates will be decided in agreement with the Consultant, UNIDO HQ, and the country counterparts.

MAIN DUTIES	Concrete/ Measurable Outputs to be achieved	Working Days	Location
	writing tasks; <ul style="list-style-type: none"> Evaluation presentation of the evaluation's initial findings prepared, draft conclusions and recommendations to stakeholders in the country, including the GEF OFP, at the end of the mission. 		
4. Present overall findings and recommendations to the stakeholders at UNIDO HQ	<ul style="list-style-type: none"> After field mission(s): Presentation slides, feedback from stakeholders obtained and discussed 	2 days	Vienna, Austria
5. Prepare the evaluation report, together with the International Evaluation Consultant, according to the TOR; Coordinate the inputs from the International Evaluation Consultant and combine with her/his own inputs into the draft evaluation report. Share the evaluation report with UNIDO HQ and national stakeholders for feedback and comments.	<ul style="list-style-type: none"> Draft evaluation report. 	8 days	Home-based
6. Revise the draft project evaluation report based on comments from UNIDO Office for Independent Evaluation and stakeholders and edit the language and form of the final version according to UNIDO standards.	<ul style="list-style-type: none"> Final evaluation report. 	4 days	Home-based
	TOTAL	30	

MINIMUM ORGANIZATIONAL REQUIREMENTS

Education:

Advanced degree in environment, energy, engineering, development studies or related areas

Technical and functional experience:

- Minimum of 10 years' experience in environmental/energy project management and/or evaluation (of development projects)
- Knowledge about GEF operational programs and strategies and about relevant GEF policies such as those on project life cycle, M&E, incremental costs, and fiduciary standards
- Experience in the evaluation of GEF projects and knowledge of UNIDO activities an asset

- Knowledge about multilateral technical cooperation and the UN, international development priorities and frameworks
- Working experience in developing countries

Languages:

Fluency in written and spoken English is required.

Reporting and deliverables

- Presentation of initial findings at the end of the country mission(s) to key national stakeholders;
- Presentation and discussion of preliminary findings at UNIDO HQ
- Draft report;
- Final report

All reports and related documents must be in English and presented in electronic format.

Absence of conflict of interest:

According to UNIDO rules, the consultant must not have been involved in the design and/or implementation, supervision and coordination of and/or have benefited from the programme/project (or theme) under evaluation. The consultant will be requested to sign a declaration that none of the above situations exists and that the consultants will not seek assignments with the manager/s in charge of the project before the completion of her/his contract with the UNIDO Office for Independent Evaluation.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

TERMS OF REFERENCE FOR PERSONNEL UNDER INDIVIDUAL SERVICE AGREEMENT (ISA)

Title:	International evaluation consultant
Main Duty Station and Location:	HQ and Home-based
Missions:	Missions to Vienna, Austria and Thailand, Cambodia and Mongolia
Start of Contract (EOD):	April 1, 2016
End of Contract (COB):	May 31, 2015
Number of Working Days:	30 working days spread over 2 months

4. ORGANIZATIONAL CONTEXT

The UNIDO Office for Independent Evaluation (ODG/EVA) is responsible for the independent evaluation function of UNIDO. It supports learning, continuous improvement and accountability, and provides factual information about result and practices that feed into the programmatic and strategic decision-making processes. Evaluation is an assessment, as systematic and impartial as possible, of a programme, a project or a theme. Independent evaluations provide evidence-based information that is credible, reliable and useful, enabling the timely incorporation of findings, recommendations and lessons learned into the decision-making processes at organization-wide, programme and project level. ODG/EVA is guided by the UNIDO Evaluation Policy, which is aligned to the norms and standards for evaluation in the UN system.

5. PROJECT CONTEXT

According to Article 5(a) of the Stockholm Convention (SC) on Persistent Organic Pollutants (POPs), each Party to the Convention shall develop an action plan, or a regional or sub-regional plan to reduce the total release of chemicals listed in Annex C, with the goal of continuing the minimization and where feasible, elimination. The introduction of best available techniques (BAT) and best environmental practices (BEP) in the different source categories in Annex C of the Convention is the most important practical measure to continuing minimization of unintentionally-produced POPs (UP-POPs) releases.

The fossil fuel-fired utilities and industrial boilers source category was identified among the priority sources for the introduction of BAT/BEP in the respective NIPs of Cambodia, Indonesia, Lao PDR, Mongolia, Philippines and Thailand. The project overall objective aims at reducing and eliminating UP-POPs releases by enhancing guidelines and guidance on best available techniques and best environmental practices (BAT/BEP) for fossil fuel-fired utilities and industrial boilers through addressing specific features of industry, common practices in the region and related socio-economic considerations.

Detailed background information of the project can be found the terms of reference (TOR) for the terminal evaluation.

6. DUTIES AND RESPONSIBILITIES

MAIN DUTIES	Concrete/ Measurable Outputs to be achieved	Working Days	Location
1. Review project documentation and relevant country background information (national policies and strategies, UN strategies and general economic data); determine key data to collect in the field and adjust the key data collection instrument of 3A accordingly (if needed); Assess the adequacy of legislative and regulatory framework relevant to the project's activities and analyze other background info.	<ul style="list-style-type: none"> Adjust table of evaluation questions, depending on country specific context; Draft list of stakeholders to interview during the field missions; Brief assessment of the adequacy of the country's legislative and regulatory framework. 	7 days	Home-based
2. Briefing with the UNIDO Office for Independent Evaluation, project managers and other key stakeholders at UNIDO HQ. Preparation of the Inception Report, together with the team leader.	<ul style="list-style-type: none"> Detailed evaluation schedule with tentative mission agenda (incl. list of stakeholders to interview and site visits); mission planning; Division of evaluation tasks with the team leader. Inception Report 	2 days	Vienna, Austria
3. Conduct field mission to Bangkok, Pnohm Penh and Ulaanbaatar in July 2016 .	<ul style="list-style-type: none"> Conduct meetings with relevant project stakeholders, beneficiaries, the GEF Operational Focal Point (OFP), etc. for the collection of data and clarifications; Agreement with the team leader on the structure and content of the evaluation report and the distribution of writing tasks; Evaluation presentation of the evaluation's initial findings prepared, draft conclusions and recommendations to stakeholders in the country, including the GEF OFP, at the end of the mission. 	3 days Bangkok; 2 days Pnohm Penh, 2 days Mongolia (including travel)	Bangkok, Pnohm Penh, Ulaanbaatar
4. Present overall findings and recommendations to the stakeholders at UNIDO HQ	<ul style="list-style-type: none"> After field mission(s): Presentation slides, feedback from stakeholders obtained 	2 days	Vienna, Austria

MAIN DUTIES	Concrete/ Measurable Outputs to be achieved	Working Days	Location
	and discussed		
5. Prepare the evaluation report, together with the team leader, according to the TOR; Share the evaluation report with UNIDO HQ and national stakeholders for feedback and comments.	• Draft evaluation report.	8 days	Home-based
6. Revise the draft project evaluation report, together with the team leader, based on comments from UNIDO Office for Independent Evaluation and stakeholders and edit the language and form of the final version according to UNIDO standards.	• Final evaluation report.	4 days	Home-based
	TOTAL	30	

MINIMUM ORGANIZATIONAL REQUIREMENTS

Education:

Advanced degree in environment, energy, engineering, development studies or related areas

Technical and functional experience:

- Minimum of 5 years' experience in the field of industrial development and evaluation, including experience at the international level involving technical cooperation in developing countries
- Knowledge about GEF operational programs and strategies and about relevant GEF policies such as those on project life cycle, M&E, incremental costs, and fiduciary standards
- Experience in the evaluation of GEF projects and knowledge of UNIDO activities an asset
- Knowledge about multilateral technical cooperation and the UN, international development priorities and frameworks
- Working experience in developing countries

Languages:

Fluency in written and spoken English is required.

Absence of conflict of interest:

According to UNIDO rules, the consultant must not have been involved in the design and/or implementation, supervision and coordination of and/or have benefited from the programme/project (or theme) under evaluation. The consultant will be requested to sign a declaration that none of the above situations exists and that the consultants will not seek assignments with the manager/s in charge of the project before the completion of her/his contract with the UNIDO Office for Independent Evaluation.

Annex 7 – Project results framework

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
Outcome 1: Adopted guidelines and guidance on BAT/BEP addressing specific features of industry, common practices in the region and related socio-economic considerations			
Output 1.1 : Adopted regional guidelines and guidance on BAT/BEP on fossil fuel-fired utilities and industrial boilers in ESEA by adding, among others, two columns to Table 3: “Summary of recommended measures....” of UNEP/POPS/COP.3/INF/4 on health and economic benefits as well as wood and other biomass fuels that are widely used in ESEA region			
<p><i>Activity 1.1.1:</i> Identify relevant health and economic issues of Section VI.D in each participating country.</p> <p><i>Activity 1.1.2:</i> Prepare and test guidelines to be used to optimize the collection and comparison of data.</p> <p><i>Activity 1.1.3:</i> Collect and report data on occupational accidents and occupational exposures to fugitive emissions related to industrial boilers.</p> <p><i>Activity 1.1.4:</i> Draft regional BAT/BEP guidelines and guidance document by amending Section VI.D.</p> <p><i>Activity 1.1.5:</i> Publish and disseminate regional guidelines in English and local languages of the participating countries.</p> <p><i>Activity 1.1.6:</i> Targeted training programs in application of regional guidelines.</p>	<ul style="list-style-type: none"> ➤ Regional guidelines on collection of comparable data ➤ Report on health and economic considerations ➤ Country reports on occupational accidents ➤ Regional guidelines on BAT/BEP ➤ Two regional training programs and at least 20 trainees at each on regional BAT/BEP guidelines 	<ul style="list-style-type: none"> ➤ Country Technical reports ➤ Regional Technical reports ➤ Training reports 	<ul style="list-style-type: none"> ➤ Country reports timely available ➤ Regional reports timely available ➤ Lack of human resources, delayed human resource allocations, or personnel changes at key stakeholder agencies could cause delays in project implementation
Output 1.2: Enhanced or strengthened specifications for different types of boilers (small/medium/large) and fuels			

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p><i>Activity 1.2.1:</i> Compare fuel prices and boiler efficiencies in the market for different types of boilers.</p> <p><i>Activity 1.2.2:</i> Estimate replacement costs versus increasing efficiency for different types of boilers.</p> <p><i>Activity 1.2.3:</i> Investigate the use of wood and other biomass fuels in the boiler sector</p>	<ul style="list-style-type: none"> ➤ Boiler specifications upgraded including achievable dioxin/GHGs emission limits ➤ Market study on fuel prices ➤ Technical studies on use of biomass fuels including estimates on dioxin/GHGs reduction 	<ul style="list-style-type: none"> ➤ Review report of boilers specifications ➤ Workshop reports on specific technical studies ➤ Review of cost-effectiveness analyses 	<ul style="list-style-type: none"> ➤ Specifications for different types of boilers and fuels not timely drafted ➤ Review reports timely carried out ➤ Technical capabilities in SME sector to carry out cost-effectiveness analysis
<i>Output 1.3: Adopted government policies including regulations, standards, incentives (energy, environment, industry, health, education) supporting reduction of UP-POPs releases from the fossil fuel-fired utilities and industrial boilers (Section VI.D) and from firing installations for wood and other biomass (Section VI.E)</i>			
<p><i>Activity 1.3.1:</i> Identify and assess existing government policies related to Section VI.D and the relevant parts of Section VI.E.</p>	<ul style="list-style-type: none"> ➤ Government policies and regulations adopted to facilitate BAT/BEP implementation 	<ul style="list-style-type: none"> ➤ Workshop reports of national BAT/BEP implementation 	<ul style="list-style-type: none"> ➤ BAT/BEP implementation is a national priority
<p><i>Activity 1.3.2:</i> Analyze gaps in existing standards, regulations and market based incentives relevant to the boiler sector.</p> <p><i>Activity 1.3.3:</i> Enhance existing enabling government policies on the above to be implemented at government level with specific reference to Boiler Act.</p> <p><i>Activity 1.3.4:</i> Publish and disseminate approved policies, regulations and standards in English and local languages of the participating countries.</p> <p><i>Activity 1.3.5:</i> Targeted training programs in applying those policies, regulations and standards.</p>	<ul style="list-style-type: none"> ➤ Enforcement mechanisms at government level in place ➤ Two regional training programs and at least 10 trainees at each on policies, regulations and standards 	<ul style="list-style-type: none"> ➤ Training reports on policies, regulations and standards 	<ul style="list-style-type: none"> ➤ Delays in adoption of legal framework and specific policy and technical guidance ➤ Delays in the adoption of regional guidelines and guidance on BAT/BEP on fossil fuel-fired utilities and industrial boilers ➤ Laws and regulations not fully and consistently enforced
Outcome 2 : Pollution prevention measures (cleaner production) applied prior to introducing BAT/BEP (Annex C, Part V, A)			

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
Output 2.1: PP/CP methodology and the corresponding technical capabilities in the fossil fuel-fired utility and industrial boilers sector for use in power generation and in industrial processes			
<p><i>Activity 2.1.1:</i> Assess and classify boilers in the ESEA region according to their capacity and fuel use.</p> <p><i>Activity 2.1.2:</i> Identifying the abatement technologies in use.</p> <p><i>Activity 2.1.3:</i> Carry out market survey for appropriate technologies and boiler technology providers.</p> <p><i>Activity 2.1.4:</i> Draft, approve and implement non-binding procurement guidelines for environmentally sound boilers as appropriate.</p> <p><i>Activity 2.1.5:</i> Publication and dissemination of non-binding procurement guidelines.</p> <p><i>Activity 2.1.6:</i> Hold awareness workshops for disseminating the procurement guidelines.</p>	<ul style="list-style-type: none"> ➤ PP/CP methodology guidelines document ➤ Information material on appropriate, affordable and feasible technologies in ESEA region ➤ Procurement guidelines ➤ At least 2 awareness raising workshops in each of the participating countries 	<ul style="list-style-type: none"> ➤ Regional CP reports ➤ Market survey on technologies ➤ Published procurement guidelines ➤ Published procurement guidelines ➤ Reports on awareness raising workshops 	<ul style="list-style-type: none"> ➤ Close cooperation with CP centers in the ESEA region ➤ PP/CP methodology and corresponding technical capabilities in the fossil fuel-fired utilities and industrial boilers sector is not implemented. ➤ The classification and identification of boilers and abatement devices may be delayed due to lack of trained staff ➤ Procurement guidelines not timely delivered may delay project activities ➤ Higher cost of CP measures may cause stakeholders to abandon project activities

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
Outcome 3 : Unintentional POPs baseline inventories derived from representative industrial sources and projected at regional scale			
Output 3.1: Baseline studies on fossil fuel-fired utility and industrial boilers (through questionnaires completed in six participating countries)			
<p><i>Activity 3.1.1:</i> Prepare baseline studies on industrial boilers by processing data collected through questionnaires;</p> <p><i>Activity 3.1.2:</i> Produce relevant publications on</p>	<ul style="list-style-type: none"> ➤ Six national baseline reports on fossil fuel-fired utility and industrial boilers ➤ Regional baseline report on fossil fuel-fired utilities and industrial boilers 	<ul style="list-style-type: none"> ➤ National and regional reports available at sector coordinator 	<ul style="list-style-type: none"> ➤ Questionnaires made timely available ➤ Local experts with adequate knowledge and experience are available in time to carry out the studies

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
the above studies			➤ Baseline studies and inventories on fossil fuel-fired utility and industrial boilers will not provide enough data for project requirements
Output 3.2: Specific studies made on: (i) fish residues as fuel in seasonal use in Cambodia; (ii) use of spent/used oils as boiler fuel; (iii) use of biomass fuels; and (iv) pressure furnaces and coal stoves in Mongolia.			
<p><i>Activity 3.2.1:</i> Prepare, undertake, report, publish and disseminate specific studies on fish residues as fuel in seasonal use in Cambodia</p> <p><i>Activity 3.2.2:</i> Prepare, undertake, report, publish and disseminate specific studies on use of spent/used oils as boiler fuel.</p> <p><i>Activity 3.2.3:</i> Prepare, undertake, report, publish and disseminate specific studies on use of biomass fuels.</p> <p><i>Activity 3.2.4:</i> Prepare, undertake, report, publish and disseminate specific studies on; low pressure furnaces and coal stoves in Mongolia.</p>	<ul style="list-style-type: none"> ➤ At least five (5) published specific technical studies addressing specific features of participating countries 	<ul style="list-style-type: none"> ➤ Workshop reports on specific technical studies 	<ul style="list-style-type: none"> ➤ Studies timely carried out ➤ Relevant institutional cooperation secured
Output 3.3: Identification and selection of fossil fuel-fired utility and industrial boilers that would be representative for establishing regional UP- POPs baseline inventory by determining UP-POPs releases			
<p><i>Activity 3.3.1:</i> Identify criteria for boiler types selection.</p> <p><i>Activity 3.3.2:</i> Select representative boilers each in participating country for demonstration.</p> <p><i>Activity 3.3.3:</i> Modify and/or optimise technology parameters of selected boilers</p>	<ul style="list-style-type: none"> ➤ Criteria for boiler types selection and characterization of selected fossil fuel-fired utilities and industrial boilers ➤ Maximum of 12 pilot demonstration cases for the project duration ➤ Approximate reduction of 0.31 g TEQ/year from pilot cases and fuel 	<ul style="list-style-type: none"> ➤ Selection criteria and detailed technical specifications on identified pilot boilers ➤ Results and data gathered from pilot cases ➤ Analytical reports ➤ Publications 	<ul style="list-style-type: none"> ➤ Trained monitoring staff timely available ➤ Conflict of interest in the process of identification and selection of boilers for baseline inventory ➤ Difficulty in identifying suitable facilities in the two sectors to carry out pilot monitoring programmes

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p><i>Activity 3.3.4:</i> Set up and carry out pilot monitoring programmes for a few selected boiler types at power generation and industry sectors.</p>	<p>savings of USD 1.3 m/year</p> <ul style="list-style-type: none"> ➤ At least 24 monitoring programs performed in 12 selected facilities before and after BAT/BEP implementation ➤ At least 48 analytical tests performed (at least 1 fly ash sample and 1 flue gas sample per monitoring campaign) 		
Outcome 4: Established regional coordination of developing human resources			
<i>Output 4.1: Adequate capacity in BAT and BEP built through training programs including regular curricula for graduates and government officials and through technical in-plant training for boiler operators of private and public sectors</i>			
<p><i>Activity 4.1.1:</i> Identify relevant institutions in the energy sector that are able to provide training in the boiler sector.</p> <p><i>Activity 4.1.2:</i> Training of trainers including development of university curricula on environmentally sound boiler technologies.</p> <p><i>Activity 4.1.3:</i> Assess training needs and identify required training programs related to BAT and BEP.</p> <p><i>Activity 4.1.4:</i> Carry out different types of targeted training programs for concerned government officials and technical personnel of private and public sectors.</p>	<ul style="list-style-type: none"> ➤ At least 2 training institutions in ESEA region for the boiler sector ➤ At least 12 training courses and at least 40 trained staff ➤ At least 6 universities that introduce new curricula ➤ In-plant training materials 	<ul style="list-style-type: none"> ➤ Reports on training courses ➤ Effectiveness reports of curricula 	<ul style="list-style-type: none"> ➤ Industry involvement secured ➤ Newly trained graduates remain in the sector ➤ Training not fully enforced due to lack of relevant institutions
<i>Output 4.2: Awareness raising campaigns for specific target groups such as government policy makers, community leaders, managers of state owned industries and owners of private</i>			

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
industries, educational institutions and for the public at large			
<p><i>Activity 4.2.1:</i> Identify target groups according to their involvement in the boiler sector.</p> <p><i>Activity 4.2.2:</i> Produce awareness raising materials for each target group and information materials for the public at large.</p> <p><i>Activity 4.2.3:</i> Carry out regular awareness raising campaigns.</p>	<ul style="list-style-type: none"> ➤ At least two (2) targeted awareness raising campaigns in each participating country ➤ Awareness raising campaign materials produced in local language 	<ul style="list-style-type: none"> ➤ Reports on awareness campaigns 	<ul style="list-style-type: none"> ➤ Specifically targeted groups and public at large actively participate

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
Outcome 5: Adequate capacity in sampling and analysis of UP-POPs			
<i>Output 5.1: Adequate regional capacity created by strengthening national and regional centers of excellence (national laboratories, private laboratories) in monitoring and assessment, specifically in sampling, analysis, and reporting of UP-POPs</i>			
<p><i>Activity 5.1.1:</i> Review all main international guidance documents on POPs monitoring.</p> <p><i>Activity 5.1.2:</i> Produce summary of the monitoring guidance documents for adoption and use in the ESEA region.</p> <p><i>Activity 5.1.3:</i> Survey existing monitoring capacity in the ESEA region.</p> <p><i>Activity 5.1.4:</i> Carry out training in sampling;</p> <p><i>Activity 5.1.5:</i> Carry out training in analysis;</p> <p><i>Activity 5.1.6:</i> Set up and carry out pilot</p>	<ul style="list-style-type: none"> ➤ At least two (2) certified monitoring laboratories in the region ➤ Two (2) regional training courses in monitoring ➤ At least 2-3 technicians trained in sampling and analytical testing 	<ul style="list-style-type: none"> ➤ Certification reports ➤ Training course reports ➤ Sampling and analytical records ➤ Pilot monitoring programme reports 	<ul style="list-style-type: none"> ➤ National and regional laboratories actively cooperate ➤ Regional certified laboratories providing training programs ➤ Participating countries agree in identifying pilot monitoring programmes based on common interest ➤ Staff is inadequately skilled in sampling and analysis of POPs ➤ Laboratory capacity building resources are inadequate to accomplish project

monitoring programmes for a few selected boiler types at power generation and industry sectors.			<p>monitoring tasks</p> <ul style="list-style-type: none"> ➤ Difficulty in identifying suitable facilities in the two sectors to carry out pilot monitoring programmes ➤ Technical staff participating in the monitoring campaigns will be excessively exposed to harmful POP-contaminated waste
Output 5.2: Promotion of technology transfer and investment by identification and implementation of innovative mechanisms for PPPs			
<p><i>Activity 5.2.1:</i> Identifying economic incentives to create enabling environment for innovative PPP mechanisms.</p> <p><i>Activity 5.2.2:</i> Implement incentives for promotion technology transfer and investment through PPP.</p>	<ul style="list-style-type: none"> ➤ Number of participating countries that introduce PPP incentives 	<ul style="list-style-type: none"> ➤ Case studies on PPPs 	<ul style="list-style-type: none"> ➤ Active participation of private sector ➤ Lack of private sector interest in SMEs
<i>Interventions</i>	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
Outcome 6: Established project management office, stakeholder partnerships, and relevant meetings			
Output 6.1: Project management structure established			

<p><i>Activity 6.1.1:</i> Establish the Regional Forum Board (FB) and Regional Sector Technical Committee (RSTC) and appoint regional project coordinator.</p> <p><i>Activity 6.1.2:</i> Establish Regional Coordination and National Coordination Units (R/NCUs).</p> <p><i>Activity 6.1.3:</i> Recruit the Regional Coordinator (RC), National Project Managers (NPMs) and technical experts to constitute.</p> <p><i>Activity 6.1.4:</i> Establish the local project management offices in the participating countries.</p>	<ul style="list-style-type: none"> ➤ FB and RSTC established and regional project coordinator identified. ➤ RCUs and NCUs established and staffed ➤ PET established and RC, NPMs and experts recruited 	<ul style="list-style-type: none"> ➤ List of FB membership ➤ List of RCUs and NCUs membership ➤ PET members ➤ Terms of References for experts, copy of appointment notice 	<ul style="list-style-type: none"> ➤ Changes in project input prices and exchange rates may increase project costs ➤ Delays in project implementation and low quality performance
<p><i>Output 6.2: M&E framework of the project established</i></p>			

<p><i>Activity 6.2.1:</i> Hold project Inception Workshop.</p> <p><i>Activity 6.2.2:</i> Prepare Inception Report</p> <p><i>Activity 6.2.3:</i> Measure impact indicators on an annual basis.</p> <p><i>Activity 6.2.4:</i> Prepare Annual Project Reports and Project Implementation Reports</p> <p><i>Activity 6.2.5:</i> Hold annual RSTC meetings.</p> <p><i>Activity 6.2.6:</i> Hold annual Tripartite Review meetings.</p> <p><i>Activity 6.2.7:</i> Carry out mid-term external evaluation</p> <p><i>Activity 6.2.8:</i> Carry out annual project financial audits</p> <p><i>Activity 6.2.9:</i> Carry out annual visits to selected field sites</p> <p><i>Activity 6.2.10:</i> Establish a project management information system (MIS) including project website to disseminate information to the stakeholders.</p>	<ul style="list-style-type: none"> ➤ Inception Workshop held ➤ Inception Workshop report submitted ➤ Updated impact indicators ➤ Financial audit completed ➤ Annual reports and PIRs completed ➤ Annual RSTC and TPR meetings held ➤ Mid-term evaluation completed ➤ Annual financial audits conducted ➤ Annual visits carried out ➤ Project MIS established ➤ Final external evaluation conducted ➤ Project Terminal Report completed 	<ul style="list-style-type: none"> ➤ Monitoring reports ➤ Inception report ➤ Progress Reports ➤ Copy of audit reports ➤ Copies of annual reports and PIRs ➤ RSTC meetings reports ➤ TPR meeting proceedings ➤ Copy of mid-term evaluation report ➤ Evaluation of annual visits ➤ Website in operation ➤ Copy of final external evaluation report ➤ Copy of project terminal report 	<ul style="list-style-type: none"> ➤ Various ministries of participating countries agree on and support the project. ➤ Delays in project implementation and low quality performance.
<i>Interventions</i>	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
<p><i>Activity 6.2.11:</i> Carry out final external evaluation</p> <p><i>Activity 6.2.12:</i> Complete project terminal report</p>	<ul style="list-style-type: none"> ➤ 	<ul style="list-style-type: none"> ➤ 	<ul style="list-style-type: none"> ➤

Annex 2 List of documents consulted

1. Project document
2. PIF of the project
3. Report of the Mid Term Evaluation of the project
4. Mission report of PM to Bangkok, Thailand 14 – 19 October 2011
5. Mission report of PM to Bangkok, Thailand, 15 – 23 March 2013
6. Mission report of PM to Vientiane, Laos and Bangkok, Thailand, 2 – 9 November 2014
7. Mission report of PM to Chiang Mai, Thailand and Manila, Philippines, 10 – 25 August 2014
8. Mission report of PM to Indonesia, Thailand, Philippines and Cambodia, 14 March – 9 April 2014
9. Mission report of PM to Mongolia, Thailand and Laos, 23 June – 6 July 2013
10. Copies of all PIRs
11. UNIDO Progress report covering period July – December 2010
12. The 2nd ASEAN Energy Demand Outlook
13. Report on results of the first monitoring campaigns in the selected facilities by Andrea Sbrilli, International Expert on Sampling and Analysis
14. Documents from Cambodia:
 - 1) Final report covering period: November 2010 – October 2011
 - 2) Final report covering period: October 2011 to September 2012
 - 3) Progress report covering period: December 2010 - March 2011
 - 4) 3rd Quarterly report 2012
 - 5) 4th Quarterly report 2012
 - 6) Progress report for 1st Quarter 2013
 - 7) Progress reports for months of: May to Sept 2013
 - 8) Progress reports for months of: Feb to Dec 2014
 - 9) Proceedings of National Inception Workshop
 - 10) Report to two factory visits by NPM and international consultants
 - 11) Report on Preliminary Assessment of the Pilot Facility in the Cambodia
 - 12) BAT/BEP Guidelines in Khmer (English version not available)
 - 13) Power presentation on Energy Outlook for Cambodia
 - 14) Market and Trends on the Use of Wood and Biomass as Boiler Fuels in the Cambodia
 - 15) Prokas on establishment of general requirements of boiler management of the Kingdom of Cambodia, Ministry of Industry, Mines and Energy
 - 16) Inventory update of industry boilers in Cambodia

- 17) Fish Residue Use and Generation: A case study of provinces around Tonle Sap Lake region and Phnom Penh capital
 - 18) Draft Survey Report on Lubricant Oil Residue in Cambodia. Case Study in Phnom Penh Capital City, Kandal Province, Siem Reap Province and Battambang Province
 - 19) Report on Green Boiler Technology Curriculum development and implementation
 - 20) Awareness raising brochure in Khmer (English version not available)
 - 21) Report on The First monitoring of Boiler stack at Great Honour Textile Factory Co, Ltd., Cambodia. During August 22-25, 2012
 - 22) Report on the inventory of boilers and legislation, and proposition for Prokas on establishment of general requirements of boiler management of the Kingdom of Cambodia
 - 23) Report on Sampling campaign in Great Honour Factory, Cambodia
 - 24) Proposal from SGS for sampling and Analysis of PCDD/PCDF, Mercury, Total Chlorine and Relevant Parameters in Selected Industrial Boilers in Cambodia and Lao PDR
 - 25) Site survey report from SGS for sampling and analysis for Laos and Cambodia
 - 26) Technical wrap up report
 - 27) Signed TOC with Great Honour Textile Factory Ltd
 - 28) TORs for sampling and analysis of PCDD/PCDF, Mercury, Total Chlorine and relevant parameters in selected industrial boilers in Cambodia and Lao PDR
 - 29) TORs for the supply of equipment and technical services for the replacement of a boiler at Great Honour Textile Factory Ltd
 - 30) Co-finance report from Cambodia
15. Documents from Laos
- 1) Annual report for 2011
 - 2) 1st Quarterly report for 2012
 - 3) 2nd Quarterly report for 2012
 - 4) 3rd Quarterly report for 2012
 - 5) Annual report for 2012
 - 6) Monthly Progress reports for: July to Oct 2013
 - 7) Progress report January 2014
 - 8) Monthly Progress reports for: April to July 2014
 - 9) Progress report July – Sept 2014
 - 10) Annual report for 2014
 - 11) Copies of annual work plans for 2011, 2013, 2014 and 2015

- 12) Full report on monitoring of Boiler stack at Lao Agro Industry Co, Ltd., Vientiane, Lao PDR June 26-28,2012
 - 13) Report of awareness workshop August 2012, Vientiane
 - 14) SGS site survey for Laos
 - 15) Power point presentations made during Inception Workshop, 3 – 4 March 2011
 - 16) Lao co-finance report for 2013
 - 17) Energy outlook for Laos presentation
 - 18) Chapter 10, Lao PDR Country Report
 - 19) Report on boiler accidents (1 page report by NPM)
 - 20) Biomass market issues and trends of use wood and biomass as boiler fuel in Lao PDR
 - 21) Agreement on Management of Boilers at processing industry and handicraft factories, Ministry of Industry and Commerce, Lao PDR
 - 22) Inventory update of industrial boilers in the Lao PDR (English version very incomplete, seems that Lao version is complete)
 - 23) Waste Vegetable oil and Waste Lubricant oil survey report. Case study in Vientiane capital and Bolikhamxay province
 - 24) Full report from SGS on: Sampling and Analysis of Total Halogens, PCBs, Total Chlorine and Pentachlorophenol (PCP) in Samples of Spent oils in selected facilities in Laos PDR During March 27-28, 2015
 - 25) Preliminary Assessment of the Pilot Facility in Laos
 - 26) Copy of TOC between Lao Agro Industry, Ministry of Natural Resources and Environment, Laos, and UNIDO
 - 27) Final Report on: Green Boiler Technology Curriculum Development at Faculty of Engineering, National University of Laos
 - 28) Awareness raising brochure in Lao language (English version not available)
 - 29) Awareness raising workshop report: combating U-POPs through application of BAP/BEP for industrial boiler sector Vientiane, Lao PDR, 7-8 August 2012
16. Documents from Indonesia
- 1) 1st Quarterly Progress report for 2011 (plus 7 attachments)
 - (i) Attach 1-BTOR IRA-Boiler Project Mission to Indonesia - 1-5 N
 - (ii) Attach 2-Accreditation Procedure for Boiler Inspector and Op
 - (iii) Attach 3-Completed-Institutional_Survey_(UNIDO ESEA Project)
 - (iv) Attach 4 - Minutes of Coordination Meeting at MOE
 - (v) Attach 5-TOR for Sampling and Analysis - 3 April 2011
 - (vi) Attach 6-Proposed Interventions-Unit 6_FINAL

- (vii) Attach 7-Quarter 2-Forthcoming Work Plan 2011-Indonesia
- 2) 2nd Quarterly Progress report for 2011 (plus 4 attachments and annexes)
 - (i) Attach 1-Min of Meeting 8 June-Survey GEES
 - (ii) Attach 2 -Min of Meeting 20 June Morn-Coordination for Sampling
 - (iii) Attach 3 -Min of Meeting 20 June Aftn-Coordination for Performance
 - (iv) Attach 4 -Workplan Quarter 3 & 4
 - (v) Mission report BTOR Suralaya- NPM- 20-25 June 2011
 - (vi) Mission report BTOR Ulaan Bator-NPM- 6-8 June 2011
 - (vii) List Participants - 8 June-Survey GEES to Suralaya
 - (viii) List Participants 20 June AFTRN-Coordination for Performance Test
- 3) 3rd Quarterly Progress report for 2011 (plus 5 attachments and annexes)
 - (i) Attachment 2-MOM 18 July 2011
 - (ii) Attachment 3-MOM 19 July 2011
 - (iii) Attachment 4-MOM 22 July 2011
 - (iv) Attachment 5-MOM 24 August
 - (v) Attachment 6-MOM 13 Sept
 - (vi) Forthcoming work plan for quarter 4
 - (vii) Main Proposal Solid Fuel rev.4.1
 - (viii) Proposal for awareness raising workshop
 - (ix) Proposal for sampling and analysis
 - (x) Questionnaire of Rehabilitation Simultaneously With Dioxin Reducing
- 4) 4th Quarterly Progress report for 2011 (plus attachments and annexes)
 - (i) Minutes of Meetings 12 Oct 2011
 - (ii) Minutes of meeting 12 Dec 2011
 - (iii) Minutes of meeting 1 Nov 2011
 - (iv) Minutes of meeting 28 Nov 2011
 - (v) 2-4Nov2011mission report.1
 - (vi) Draft TOC Education Institution.1.1.2
 - (vii) Indonesia Energy Statistic Leflet 2010
 - (viii) MoU KLH Deputi IV MLH (3)
 - (ix) Sampling schedule for dioxin furan and mercury 12 Dec 2011
- 5) 1st Quarterly Progress report for 2012 (plus attachments and annexes)
 - (i) Minutes of Meeting-TOC discussion
 - (ii) Minutes of Meeting-presentation GEES
 - (iii) Draft TOC-Min of Manpower
 - (iv) Report of project Intervention at Suralaya power plant January 2012

- (v) Information on Zero Accident Award
- (vi) Workplan2012-Q2
- 6) 2nd Quarterly Progress report for 2012 (plus attachments and annexes)
 - (i) Minutes of the 09 June 2012 Mtg Boiler Project
 - (ii) Assessment and Evaluation of the ESEA BAT_Indonesia
 - (iii) BTOMR Dioxin Sampling and Analysis Training_Beijing_Anton
 - (iv) Workplan Q2-Q3 in 2012
- 7) 3rd Quarterly Progress report for 2012 (plus attachments and annexes)
 - (i) Minutes of the 16 July 2012 Mtg Boiler Project at MEMR
 - (ii) Minutes of the 15 September 2012 Mtg
 - (iii) Indonesia-Midterm Review Report on Boiler Project 2012
 - (iv) Work plan Q4 2012, Q1-4 2013_rev01
- 8) 4th Quarterly Progress report for 2012 (plus attachments and annexes)
 - (i) Work plan Q1-4 2013
 - (ii) Indonesia-Midterm Review Report on Boiler Project 2012
- 9) 1st Quarterly Progress Report for 2013 (plus attachment)
 - (i) Work plan Q2-4 2013
- 10) 2nd Quarterly Progress Report for 2013
- 11) 3rd Quarterly Progress Report for 2013 (4 attachments)
 - (i) Reports for months of June to Sept 2013
- 12) 4th Quarterly Progress Report for 2013
 - (i) Monthly report for Oct 2013
- 13) Monthly Progress reports for 2014: Feb, March, May, June, July, Aug and Sept plus annex
 - (i) Work plan Q1-Q4 2015
- 14) Final Report April 2015 (plus annex)
 - (i) Work plan Q4
- 15) Proceedings of Green Boiler Workshop 3 October 2012 (annexes of report)
 - (i) PPT on Efficiency Energy in Green Boiler
 - (ii) PPT on Dioxin Furan Boiler Project
 - (iii) PPT on Steam System Optimization
 - (iv) PPT on Implementation of Stockholm Convention in Indonesia
 - (v) Attendance list Green Boiler Workshop 03 oct 2012
- 16) Copy of Cooperative Agreement UNIDO MOE UGM
- 17) Proceedings of training of trainers green boiler technology course, Oct 2013
- 18) Energy Outlook Indonesia 2010

- 19) Statistics on Occupational Accident in Indonesia
 - 20) Report on Market and Trends of Biomass Use in Indonesia
 - 21) Copies of draft Indonesian regulation, law or circulars to pertaining to steam, and other relevant activities to boilers, and safety at boiler facilities
 - 22) Report on updated Boiler Inventory for Indonesia
 - 23) Report for Market and Trends of Biomass Use, Indonesia
 - 24) Copy of TOC with Indonesia Power Plant Suralaya
 - 25) 3 Reports on monitoring results at Power UBP Suralaya
 - 26) Copy of TOC Gadjah Mada University Indonesia
 - 27) Copy of TOC Sultan Ageng Tirtayasa University Indonesia
 - 28) Copy of awareness raising brochure
 - 29) Proceedings of awareness raising workshop on BAT-BEP Implementation for Dioxin Furan Reduction Simultaneous with Boiler Energy Efficiency
 - 30) Proceedings and cooperative agreement signing and Green boiler workshop
 - 31) Co-financing commitment letter from Suralaya Power Plant
17. Documents from Mongolia:
- 1) Progress report first quarter 2011
 - 2) Progress report second quarter 2011
 - 3) Final Report 2011
 - 4) Technical report on pilot faculty for Mongolia
 - 5) Report on Thermal Power Plant No4 by international consultant
 - 6) Progress report first quarter 2012
 - 7) Progress Report April to September 2012
 - 8) Final Report Oct to Dec 2012
 - 9) Contribution to PIR 06 2010 to 06 2012 Mongolia
 - 10) Monthly progress reports for 2013: May to August and Oct 2013
 - 11) Final report for 2014
 - 12) Progress report covering period Nov 2013 to April 2014
 - 13) Monthly progress reports from May 2014 to Oct 2014
 - 14) Final report covering period January to April 2015
 - 15) 8 mission reports of NPM: 2012, Indonesia; 2012, Italy; 2012, Thailand; 2012, Tsinghua University; 2013, Philippines; 2013, Thailand; 2014, Chiang Mai; and 2014, Bangkok
 - 16) Energy outlook of Mongolia, 2012
 - 17) BAT/BEP guidelines (only Mongolian version was available)
 - 18) Biomass inventory in Mongolia

- 19) Circular related to the boiler safety in Mongolia, 2012
 - 20) Inventory on low pressure stoves and boilers in Mongolia, 2012
 - 21) Final report of intervention of ENEL (international service provider) at Power Plant No4, 2015
 - 22) SGS final report and results for testing at Power Plant No4, 2013
 - 23) Copy of TOC with Power Plant No 4
 - 24) Copy of TOC with University of Science and Technology, Mongolia
 - 25) Copy of course content for Green Boiler Technology in Mongolian Language
 - 26) Copy of awareness raising brochure in Mongolian language
 - 27) Copies of videos on the Stockholm convention and BAT/BEP (Mongolian version)
 - 28) Full inception workshop report with all annexes
 - 29) Report of workshop for personnel of Energy sector, June 2013
 - 30) Report of workshop for technical personnel
18. Documents from Philippines
- 1) Final_Report_Aug. 20 2012
 - 2) Final_Report_Oct. 30 2013
 - 3) Final_Report_April 30 2014
 - 4) Annual_Report_January 13_December 2013
 - 5) 7 monthly progress reports for 2013
 - 6) 9 monthly progress reports for 2014
 - 7) 5 monthly progress reports for 2015
 - 8) Work plans for 2014 and 2015
 - 9) Philippines PIR Oct 2013
 - 10) Philippines PIR April 2014
 - 11) Philippines PIR Nov 2014
 - 12) Philippines PIR April 2015
 - 13) Minutes of meeting of NCU, May 2013
 - 14) 8 mission reports of NPM
 - 15) Summary_Report_Training_Molina_NewYork
 - 16) Report on Market & Trends of Woods & Biomass Boiler Fuel
 - 17) Biomass-Fired Boiler Survey
 - 18) Boiler Inventory Final Report
 - 19) Final Report on Code of Practice on Boiler Operation
 - 20) Report on Used Oil and Biomass Fuelled Boiler Assessment in the Philippines, Dec 2011
 - 21) Prof. Laurito_Interim Report- 31-July 2015

- 22) Copy of TOC with Masinloc
 - 23) Copy of TOC with University of Santo Tomas
 - 24) Programme of Regional Awareness-raising Workshop, Davao City, Sept 2013
 - 25) Regional Awareness-raising Workshop, Cebu City, July 2012
 - 26) Report Training on Safe Operation and Maintenance of Boilers, June 18, 2014, Masinloc
 - 27) Summary report 1 – Masinloc power station baseline combustion evaluation and station data and information collection by HRL Technology, Australia
 - 28) Co-financing letters from DENR, Masinloc and University of Santo Tomas
 - 29) Copy of amended_rule_in_boiler_1160
 - 30) Philippines Energy plan 2012 – 2030
 - 31) Report on Occupational Accidents for 2009_Summary provided by Ministry of Labor and Employment Statistics
 - 32) Copy of brochure for awareness raising
19. Documents from Thailand
- 1) Final report 2011
 - 2) Final report 2012
 - 3) Final report 2013
 - 4) Final report 2014
 - 5) Final report 2015
 - 6) 14 monthly / quarterly progress reports for 2013 and 2014
 - 7) Thailand PIR Nov 2011
 - 8) Copies of 4 motion clips on Stockholm Convention, POPs, PCDD/Fs and BAT/BEP
 - 9) Copy of curriculum for Master Programme at NIDA that includes a major course on BAT/BEP
 - 10) Minutes of meeting of the following NCUs: 6 Jan 2011, 10 Feb 2011, 21 March 2011, 7 April 2011, 22 April 2011,
 - 11) SGS full report on Sampling and Analysis of PCDD/PCDF, Mercury, Total Chlorine and Relevant Parameters at Olen Co Ltd, Aug 2012
 - 12) Copy of Guidelines on BAT/BEP (Thai version only)
 - 13) Techno- Commercial Proposal from Forbes Marshall Boiler Automation & Efficiency Management System with Field Instrument For Olen Boiler 16 TPH 12 Bar Coal Fired
 - 14) Report on occupational accidents in industrial boiler use in Thailand, April 2013
 - 15) Report on Biomass in Thailand
 - 16) Outline of Report of Boiler Inventory in Thailand

20. 25 mission reports by Massimo Gobbi, international consultant on BAT/BEP for boilers
21. 11 mission reports by Andrea Sbrilli, International Expert on Sampling and Analysis

Annex 3 List of persons interviewed and sites visited

Name	Organization	Position	Role in Project
Vienna			
Ms. Carmela Centeno	UNIDO	Industrial Development Officer	Project Manager
Mr. Klaus Tyrkko	UNIDO	Chief POPs Unit	
Thailand			
13.-14.06.2016			
Oleen Co. Ltd.			Pilot site
Mr. Tawatehai Supma	Oleen Co Ltd	Head of Utility	
Mr. Suphat Savadisavi	Oleen Co Ltd	Division Manager	
Mr. T. Einsten Jeneu	Forbes Marshall	Manager Application Engineering	Supplier
Mr. Valentin Philips	Forbes Marshall	Country Manager	Supplier
Red Bull Distillery Co. Ltd.			Pilot site
Ms. Nopwarin Duangdee	Red Bull Distillery Co. Ltd.	Engineering Manager	
Ms. Teeraporn Wiriwutikorn	Ministry of Natural Resources and Environment	Chief of Hazardous Substance Division	National Project Coordinator
Mr. Siwatt Pongpiachan	National Institute of Development Administration	Director of NIPA Centre for R&D	National Project Manager
Ms. Sitapa Promsiri	SGS Environmental Services	Sales Engineer	
Mr. Edward Clarence-Smith	UNIDO Regional Office	UNIDO Representative	
Lao PDR			
16.-17.06.2016			
Lao Agro Industry Co. Ltd.			Pilot site
Mr. Khammanithip Vongxay	Lao Agro Industry Co. Ltd.	Asst. Managing Director	
Mr. Sommai Faming	UNIDO	Head of UNIDO Operations	
HE Ms. Monemany Nhoibouakong	Ministry of Natural Resources and Environment	Deputy Minister	Former National Project Coordinator
Mr. Phonethip Phetsomphou	Ministry of Natural Resources and Environment	Director, Lao National Mekong Committee Secretariat	National Project Manager
Mr. Khamphone Keodalavong	Ministry of Industry and Commerce	Director of Industrial Environment and Chemistry Division	National Expert
Mr. Sengratry Kythavone	National University of Laos	Assoc. Prof. Department of Mechanical Engineering	National Expert
Mongolia			
20-21.06.2016			

Mr. Batsaikhan G	Mongolian State Power Plant	Boiler Section Engineer	
Mr. Ganbat E.	Mongolian State Power Plant	R&D Department Engineer	
Ms. Jargalsaikhan Lkhasuren	Ministry of Environment and Green Development	Secretary of National Chemicals Management Council and Senior Officer of Department of Environment and Natural Resources	National Project Coordinator
Mr. Avid Budeebazar	Mongolian Academy of Sciences	Senior Researcher	NPM
Mr. Khiirav Jigjidsuren Dugarjav	Mongolian Academy of Sciences	Doctor Phd, Research Worker	National Expert
Ms. Radnaa Ariunbileg	Ministry of Environment and Green Development	Project Coordinator	
Ms. Dr. Bayarjargal Munkhuu	Mongolian Academy of Sciences Institute of Chemistry and Chemical Technology	Senior Researcher, Lab of Biochemistry	
Ms. S. Jargalmaa	Mongolian Academy of Sciences Institute of Chemistry and Chemical Technology	Coal Laboratory	
Vienna Final Workshop	7/4/2016		
Indonesia			
Mr. Edward Nixon Pakpahan	Ministry of Environment	Deputy Director for Handling of Hazardous Substances	National Project Coordinator
Mr. Anton Purnomo			National Project Manager
Mr. Wahid Pinto Nugroho	Directorate General of Electricity	Electrical Inspector	
Philippines			
Mr. Renato T. Cruz	Department of Environment and Natural Resources		National Project Coordinator
Mr. Carl Renan Estrellan			National Project Manager
Mr. Harris Sune	Masinloc Power Plant	Environmental Engineer	Pilot Project
Mr. Alberto A. Laurito	University of Santo Tomas, Faculty of Engineering	External Linkage Officer	National Expert on Green Boiler Technology Course
Ms. Evelyn R. Laurito		GBT Trainer	
International Experts			

Mr. Massimo Gobbi		UNIDO International Expert	
Mr. Andrea Sbrilli		UNIDO International Expert	

