

UNIDO

Regional (Cambodia, Indonesia, Lao PDR, Mongolia, Philippines, Thailand): Demonstration of BAT and BEP in Fossil Fuel-fired Utility and Industrial Boilers in Response to the Stockholm Convention on POPs

Mid Term Evaluation Report

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2. EXECUTIVE SUMMARY

2.1. BRIEF PROJECT DESCRIPTION

Project objectives. The project entitled “*Regional (Cambodia, Indonesia, Lao PDR, Mongolia, Philippines, Thailand): Demonstration of BAT and BEP in Fossil Fuel-fired Utility and Industrial Boilers in Response to the Stockholm Convention on POPs,*” has the overall objective to *reduce 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 (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.

Budget and timeline. The project has an overall budget of USD 13,100,100 of which 4,000,000 USD GEF contribution and USD 9,100,000 co-financing contribution from participating countries.. In the request for CEO endorsement the project implementation starting date was May 2010; the expected mid term evaluation was April 2012, and expected project closing date was April 2014.

Project components. In addition to monitoring and evaluation, five project components are being implemented: 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; 2) Dissemination of pollution prevention / cleaner production (PP/CP) measures in fossil fuel-fired utilities and industrial boilers source category; 3) Establishment of regional UPPOPs baseline inventory in fossil fuel-fired utilities and industrial boilers source category; 4) Regional coordination in developing human resources; 5) Capacity building in sampling at industrial sources and analysis of UP-POPs. Although it does not emerge from the title of the project outcome, a significant portion of the activities – even on the side of budget – consists in the replacement of obsolete boilers with BAT boiler, or in the adoption of BEP for the reduction of U-POPs release and for reducing fuel consumption.

Project implementation. The project is being implemented in six ESEA countries: The Philippines, Laos, Cambodia, Indonesia, Mongolia and Thailand. At country level, activities are carried out and coordinated by a National Project Manager who reports directly to UNIDO, whilst National Project Coordinators are usually affiliated to the main governmental bodies (Ministries or Departments) participating in the project. UNIDO HQ is the GEF implementing agency for the project. The project focal point has been established in UNIDO HQ to assist the project execution. The ESEA forum board oversees the project implementation to ensure that high-level attention is given to policy and legal objectives of the project. ESEA FB has an advisory function. The project is executed centrally by UNIDO HQ. Budget items (equipment, national experts, analytical services, renting of workshop facilities) are procured after the relevant TORs are developed and cleared by UNIDO: Technical specification of technologies and complex activities (like boilers, or sampling and analytical services) are drafted by UNIDO HQ with the assistance of international experts, and agreed with National counterparts.

2.2. CONTEXT AND PURPOSE OF THE EVALUATION

The evaluation was formally launched during the project Technical Coordination Meeting, held in the UNIDO HQ in Vienna from 17 to 19 October 2012. The meeting was attended by the National Project Managers, the National Project Coordinators, and by international experts. The evaluator during the second day of the meeting introduced the evaluation steps, methodologies and requirements.

The main evaluation questions to which the evaluator was required to provide an answer concerned project impact and sustainability, attainment of objectives, project relevance, efficiency and sustainability.

The key question the evaluator is required to ask is **whether the projects have made a significant contribution to reducing the effects of POPs on human health and the environment.**

To address these questions, a specific questionnaire was developed and submitted to project international experts, National Project Coordinator, and National Project Managers. In addition, the evaluator examined all the reports provided by project partners to integrate the answers received from project stakeholders with its own independent view. SMART analysis of the project document was carried out at the level of expected project Outcomes, Outputs, Activities and Objectively Verifiable Indicators.

Concerning the attainment of outcomes, the analysis was mostly based on the number of objectively verifiable indicators fulfilled, confirmed by interviews and checks of documentary evidence. A specific semi-quantitative approach was developed for this purpose.

2.3. SUMMARY OF EVALUATION RESULTS

2.3.1. PROJECT RELEVANCE AND DESIGN.

Relevance to GEF strategies. The project has been endorsed under the GEF 4 focal area strategy. The project objectives, as well as most of project expected outputs, are relevant to the GEF POPs focal areas strategies as its main purposes are to establish and disseminated BAT and BEP in the industrial sector to reduce the emission of U-POPs.

Relevance to country needs. The project is considered very relevant to the country needs by all the National Project Managers. In general, the expected growth of energy demands in the participating countries makes the project very relevant to the environmental issues which may derive from countries development.

SMART analysis. The project outcomes also rated satisfactory when examined with the SMART (Specificity, Measurability, Achievability, Relevance and Time-Bound) analysis. When the project activities and the Objectively Verifiable Indicators are subjected to the SMART analysis, few activities and their relevant OVIs are rated marginally unsatisfactory, mostly because these are either scarcely measurable or, as they did not started yet after their deadline already expired, have been considered not achievable. Further analysis of the relationship and objectives of project activities and outputs showed the need for a limited simplification of project structure, by merging some activities or deleting duplicate activities. This proposed rearrangement (Table 1) would result in the elimination of 2 outputs and 13 activities.

Relevance to U-POPs reduction. One of the key Objectively Verifiable Indicators (relative to activity 3.3.4) requiring the reduction of 0.31 gTeq/year of dioxin from the pilot facilities) proved to have measurability issues, due to the uncertainties of sampling and analysis of PCDD/F and the limited consolidation of the emission factors which were the basis for setting the target; therefore an amended text for this OVI is proposed as following:

“Approximate reduction of 0.31 g TEQ/year from pilot cases, estimated on the basis of reliable emission factors relevant to the situation before and after BAT/BEP implementation, and supported by the evidence of low emission at the stack after implementation of BAT/BEP”

Relevance to GHG reduction and biomass sustainability. Obviously, promoting the use of more efficient boiler will allow for a significant reduction of GHG release. The evaluator however considers that in all guidance documents pertaining to the use of biomass, an indication on how to avoid the negative effects that an intensive use of biomass could have in certain areas should be included, with particular reference to the exploiting of natural resources and re-mobilization of carbon immobilized in the exploited soils. Rainforest areas are especially sensitive to the issue of biomass exploitation. Reference criteria can be for instance these proposed by the EC Communication COM(2010)11. It should be remembered that the use of biomass does not necessarily allow for a reduction of GHG emission when all the lifecycle components are not considered and reflected in a proper biomass management. In addition, is very important to introduce criteria for the use of spent oil, as spent oil contaminated by PCB may result in a significant amount of U-POPs release.

2.3.2. EFFECTIVENESS: ATTAINMENT OF OBJECTIVES AND PLANNED RESULTS (PROGRESS TO DATE).

The project deliverables and activities can be listed under 5 horizontal categories:

1. **Technical reports**, prepared either by national experts, international experts or the NPMs. The project envisages the drafting of a significant number of technical reports in different sectors (market analysis, BAT /BEP, Health and Safety, reports on the use of specific fuels, energy outlooks, etc.). At this stage, the number of reports delivered by international experts still exceeds the number of reports drafted at the country level.

2. **Training and workshops** delivered by international experts or local universities; training concerned technical aspects (environmentally sound boiler management, sampling and analysis) as well as more general aspects (BAT / BEP, legislation). A specific training curriculum on environmentally sound management of boiler is being developed by the universities of the participating countries. Training would be, therefore, delivered either under specific curricula established by local universities, during workshops (short training) or by international experts on mission. At this stage, curricula have been developed and agreed with the universities of several countries (Thailand, Cambodia, Philippines, Indonesia); most of the trainings have been however delivered until now mostly by international experts on mission. Therefore, also in this case there is the need of a higher country ownership and of a better systematization of training materials to ensure the sustainability and replicability after project ends.
3. **Sampling and analysis of U-POP emission at pilot facilities**, carried out by local or international laboratories and supervised by international experts. To address the issue of the limited analytical capacity available in the participant countries, a significant effort has been paid by UNIDO HQ and international experts in assessing the available analytical capacity of the countries, ensuring that the contracted laboratories have the proper qualification (by means of detailed technical specification and bidding procedures) and supervising all the stages of sampling and analysis. Currently, the first monitoring survey has been completed in all the participant countries, even though in one case (Mongolia) there is the concrete risk that sampling activity is lost as samples are still retained by the Chinese custom at the boundary with Mongolia. This activity provided in some cases unexpected results (very low U-POP emissions, even lower than the best BAT plants in western countries) which called for a reformulation of the Objectively Verifiable Indicator established under activity 3.3.4.
4. **Establishment of BAT or BEP at pilot facilities**, by replacing obsolete boilers with new, BAT-compliant boilers, retrofitting existing boilers or by individuating suitable BEP for reducing at the same time fuel consumption and U-POP emission. The project envisages demonstration in *“maximum of 12 pilot demonstration cases”*. The evaluator consider that the number of 12 plants – which is however a threshold, and not a minimum requirement – is overoptimistic. As of now, the procurement of only one BAT compliant boiler has been concluded (replacement of the industrial boiler located in Cambodia, at Great Honour Textile Factory) and the technical specifications for the procurement of a second boiler (Lao PDR) have been completed. BEP options are being negotiated with representatives of pilot facilities in the remaining countries.
5. **Revision and adoption of new regulations**. The project envisages the gap analysis, drafting and adoption of new legislative measures concerning the environmentally sound management of industrial boiler, in compliance with the Stockholm Convention requirement on U-POP reduction. As of now, this sensitive activity is being carried out in the following countries: In Cambodia, MIME has developed a “prakas” (ministerial regulation) related to boiler safety and is now 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 has amended and approved the amendments of the Environmental Protection Law to include provisions on Cleaner Production. Thailand has an established regulations on boiler safety with environmental considerations. Indonesia has amended its Boiler Act to include environmental provisions and has been submitted for the approval of the Parliament,

The analysis of attainment of objectives by project Components and Outcome is detailed in Chapter 7. A short summary is provided below.

- **Component 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.** Drafting of energy outlooks, which represents an important starting point for planning activities at country level for the upgrading of boilers by adopting BAT/BEP, and drafting of preliminary BAT/BEP guidance documents have been completed. Training material on environmentally sound management of boilers has been prepared by the international consultants. Market analysis of fuel prices, boiler efficiency and BAT/BEP options have also been carried out

under this output. Activities related to the analysis of socio economical effect of U-POPs or occupational accidents in the management of boiler are lagging behind. In most of the participating countries the activity related with the development and adoption new regulations in compliance with the SC started.

- **Component 2: Dissemination of pollution prevention / cleaner production (PP/CP) measures in fossil fuel-fired utilities and industrial boilers source category** Under this output, the main achievements have been the update of boiler inventory (the Philippines and Mongolia), the compilation of a technology market survey for air pollution control system, the completion of technical specifications, term of references and bidding documents for the procurement of a boiler to be delivered to Cambodia, and technical specifications drafted for a second plant in Lao PDR.
- **Component 3: Establishment of regional UPPOPs baseline inventory in fossil fuel-fired utilities and industrial boilers source category:** This component envisages the demonstration of BAT / BEP in up to 12 facilities. After successful bidding one boiler is being delivered to Cambodia. Philippines submitted a final report on biomass and spent oil-fired boilers including economics of shifting from diesel to biomass fuel (Market & Trends of Woods & Biomass As Boiler Fuel Philippines Final Draft) A Draft Study Report has been drafted by the Lao PDR working group on “Waste Vegetable Oil and Waste Lubricant Oil in Lao PDR” A report has been drafted concerning the “Biomass Inventory in Mongolia”. A report on the inventory of low pressure furnace in Mongolia has been also completed. A biomass report drafted by Indonesia is currently being reviewed by UNIDO HQ.: Industrial boiler and power plant for the project demonstration activities have been selected, and Term of Cooperation signed for all the participating countries (except Thailand). Sampling and analysis were conducted in 5 countries: Cambodia, Indonesia (two sampling rounds), Lao PDR, Philippines, and Thailand. In general, the concentration of the PCDD/F measured in the stack gas of the industrial plants, with one exception (the Great Honor plant in Cambodia), was much lower than expected, and in some cases lower than European BAT values. The report drafted by the international expert brought some concerns about the reliability of the results: *“the uncertainties concerned with the adopted methods can raise some doubts on their correct application”*. The need to revise some of the Terms of Cooperation with the industries (for instance in Indonesia) emerged as a consequence of monitoring results.
- **Component 4: Regional coordination in developing human resources.** Relevant institutions were identified in Cambodia, Thailand, Indonesia and the Philippines for conducting the training programs including regular curricula for graduates and government officials and through on-site technical training for boiler operators of private and public sectors. Several training courses / workshops have been carried out by international consultants. Awareness raising activities were carried out mainly by holding awareness raising conferences in Thailand, by printing project information documentation and, in one case, by filming and broadcasting short documentaries.
- **Component 5: Capacity building in sampling at industrial sources and analysis of UP-POPs.** Based on information collected, the activity carried out under output 5.1.was mainly aimed at identifying laboratories for conducting sampling and analysis of U-POPs. A very useful report on the POPs monitoring capabilities of the ESEA countries, pointing out available capacity and existing needs, has been drafted by the international consultant. On the other side, the summary of analytical methods for U-POPs should be considered less necessary given the amount of already available literature published in the field. The activities for promoting *“technology transfer and investment by identification and implementation of innovative mechanisms for PPPs”* (output 5.2) is envisaged for the period 2013-2014.

2.3.3. EFFICIENCY

In general the project activities are considered efficient by all the National Project Managers, and the evaluator agree with this view based on the following considerations:

- Benefits achievable with BAT/BEP, considering also the energy saving that may be achieved, are considered far greater than the cost paid for their implementation;

- The bidding procedures established by UNIDO with the assistance of international experts allow for the selection of options based on the best value/cost ratio;
- The project – though a wider ownership of the participating countries is recommendable– balances in the proper way international expertise with national expertise; the budget allocated for international experts is in the order of 10% of the overall GEF grant. The contribution of UNIDO HQ and international experts is considered highly satisfactory by all the project partners;
- Is necessary to simplify as much as possible the project structure to avoid redundancy and replication so that project efficiency may be further increased.

2.3.4. ASSESSMENT OF SUSTAINABILITY OF PROJECT OUTCOMES:

Actions should be undertaken in the last stage of project implementation to ensure the future sustainability of the project:

Training: there is the need to ensure the handover of the training activities from UNIDO HQ international experts to national institutions. Training of trainers should be completed and should provide measurable results. The system of training curricula should be established.

Legislation: project activities will be really sustainable after project end only once a legislation promoting the use of BAT/BEP compliant boilers is in place.

Development of financial mechanisms: small players may have not enough financial resources to afford the investment of obsolete boilers. Financial mechanisms should be studied to overcome this aspect.

Raising awareness: several owners of small boilers are even not aware of the possibility to achieve economical benefit by replacing their boilers with more efficient, low-emitting boilers. A proper awareness raising campaign with targeted groups, which is still limited, could significantly increase the sustainability of project activities. Confidentiality issues, public perception and relationships with the authorities may be on the other side an obstacle for big players in carrying out environmental and efficiency monitoring. The raising of awareness should show how the adoption of BAT/BEP could also facilitate the relationship with governmental institution and the public.

Sustainable use of biomass: as the project is promoting the use of biomass as an economic and environmentally sound energy source, it is considered important to include in all the guidance documents criteria for ensuring the true sustainability and quality of biomass used.

Sustainable use of recycled fuel: there is a significant risk that recycled or spent oil contains POPs (PCBs). This aspect must be addressed in the reports related to the use of recycled oil or biomass.

Sustainability examples. In the Philippines, the government offers various forms of incentives for boiler operators under the Philippine Renewable Energy Laws (R.A. 9513: Renewable Energy Act of 2008 and R.A. 9367: Biofuels Act of 2006). This is a possible example to be replicated in all the participating countries to ensure project sustainability.

2.3.5. ASSESSMENT OF MONITORING AND EVALUATION SYSTEMS AND PROJECT MANAGEMENT

1. UNIDO HQ in coordination with the ESEA BAT/BEP forum holds regular Technical Coordination Meetings to monitor and manage the project. UNIDO HQ manages the project centrally, from the administrative and technical standpoint, with the assistance of international consultants. At country level, the project is executed by the National Project Managers recruited by UNIDO ; the National Project Coordinators (usually belonging to Ministries or Departments of Environment) and UNIDO COs representatives (to a limited extent) oversee the project implementation. Universities or Research institutions have the task to implement training, establish curricular courses, or perform specific studies. Owner of pilot facilities are in charge of the implementation of the agreed BEP

based on the suggestions of the international consultants. As in some cases NPMs are in charge of both administrative and technical tasks, some countries reported that the resources allocated by UNIDO are not enough for carrying out both the tasks.

2. In most cases a good level of coordination is reported. In few cases, it is reported that the action from government is not very timely. As a general rule, the NPM transmits to the national project coordinator (NPC) the management plan for the relevant period. The NPC calls the relevant agencies to assist in the achievement of the tasks. The guidance and assistance provided by the international experts are considered excellent and very timely by all the project stakeholders.
3. There are different views on the suitability of financial resources for satisfying implementation and sustainability of the project. Some countries consider that, as BEP implementation is in general not expensive, project budget is sufficient. Other countries consider that the available budget is not enough for covering the procurement of suitable boiler equipment and the sampling and analysis of U-POPs. In some cases it was observed a lacking of standard project management reports (APR, QPR, AWP, QWPI); in few cases the available reports were found not very informative.

2.3.6. ASSESSMENT OF PROCESSES AFFECTING ATTAINMENT OF PROJECT RESULTS

The project experienced delays for a number of practical reasons:

1. The difficulties to establish Term of Cooperation (TOC) with the industries (especially Power Generating Companies) due to confidentiality issues, possible interference of project activities with the normal operation of the plants, etc:
2. Problems related to the need for selecting different pilot facilities after the analytical results indicated that in some cases no further reduction of POPs emission could be achieved by implementing BAT / BEP (for instance, the case of the Suralaya plant in Indonesia)
3. Difficulties in gathering / organizing data for the drafting of technical reports;
4. Other unforeseen obstacles, likes clearance of custom procedures at the boundary between China and Mongolia for the delivering samples to be analyzed.

Likely, all the above difficulties (except perhaps the issue with the custom in China) can be solved with limited effort in a relatively short time. However, the establishing of BAT/BEP in the remaining pilot facilities, the completion of other 2 rounds of samples and analysis in all the pilot facilities, the completion of training and awareness raising within the project deadline would require a significant effort, and there is obviously the need to carefully oversee project implementation for deciding whether a further extension would be necessary.

3. EVALUATION OBJECTIVES, METHODOLOGY AND PROCESS

The evaluation was formally launched during the project Technical Coordination Meeting, held in the UNIDO HQ in Vienna from 17 to 19 October 2012 and considers the period July 2012 (official project launching) to December 2012 as inclusive dates for the evaluation . In addition to UNIDO representatives, the meeting was attended by the National Project Managers, the National Project Coordinators, international experts and some representatives from other relevant Ministries. The evaluator also participated in the second day of the meeting with the purpose of introducing evaluation steps, methodologies and requirements.

Within the general context and methodology of mid term evaluation of GEF projects, the evaluator has been specifically request to carry out the following specific evaluation tasks:

- 1) Verify prospects for development impact and 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. The assessment includes re-examination of the relevance of the objectives and other elements of project design according to the project evaluation parameters.
- 2) Enhance project relevance, effectiveness, efficiency and sustainability by proposing a set of recommendations with a view to ongoing and future activities.

- 3) Draw lessons of wider applicability for the replication of the experience gained in this project in other projects/countries.

The key question the evaluator is required to ask is whether the projects have made a significant contribution to reducing the effects of POPs on human health and the environment.

As per TOR, the evaluator was required to carry out an analysis of the following specific aspects:

- A. Project relevance and design;
- B. Effectiveness: attainment of objectives and planned results (progress to date);
- C. Efficiency;
- D. Assessment of sustainability of project outcomes;
- E. Assessment of monitoring and evaluation systems and project management;
- F. Assessment of processes affecting attainment of project results.

To address these questions, a specific questionnaire was developed and submitted to project international experts, National Project Coordinator, and National Project Managers. In addition, the evaluator examined all the reports provided to integrate the answers received from project stakeholders with his own independent view.

The project Relevance / Design was rated on the basis of SMART analysis of Project Outcomes and Outputs, project Activities and of the Objectively Verifiable Indicators. Rating for monitoring and evaluation was based on the availability and examination of project management reports. A limited rearrangement of project outputs and activities has been proposed in the evaluation report with the aim to simplify project management and eliminate redundant or duplicate activities.

Concerning the assessment of the attainment of outcomes, this was mostly based on the number of objectively verifiable indicators fulfilled, confirmed by interviews and cross checked with documentary evidences. A specific semi-quantitative approach was developed for this purpose.

1. The following six-level score proposed in the TOR for project outcomes and outputs has been adopted, with the numeric values associated to each level:

Rating criteria	Associated numeric value
Highly satisfactory (HS). The project had no shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	5
Satisfactory (S). The project had minor shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	4
Moderately satisfactory (MS). The project had moderate shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	3
Moderately unsatisfactory (MU). The project had significant shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	2
Unsatisfactory (U). The project had major shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	1
Highly unsatisfactory (HU). The project had severe shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.	0

2. A six-level rating as above has been used to score separately efficiency, effectiveness and relevance of all the project activities.
3. The three criteria of relevance, efficiency and effectiveness were evaluated also considering that:
 - Relevance implies close logical relationship with, and importance to, the matter under consideration. As the main objective of the project is *“the formulation and/or enhancement of relevant guidelines and guidance on best available techniques and best environmental practices (BAT/BEP) for fossil fuel-fired utilities and industrial boilers by addressing specific features of industry, common practices*

in the region and related socio-economic considerations", a high relevance score was assigned to the activities which if correctly implemented are directly related to this objective, whilst a lower relevance score has been assigned at activities only indirectly related to the objective. It may be assumed that relevance has 3 components:

- Relevance of the activity to core objectives (SC or POPs GEF focal area).
 - Relevance of the activity to the project objectives;
 - Relevance of the deliverable to the objective of the specific activity.
- Effectiveness is the degree to which objectives are achieved and the extent to which targeted problems are solved. In contrast to efficiency, effectiveness is determined without reference to costs and, whereas efficiency means "doing the thing right," effectiveness means "doing the right thing." . Therefore, a high value of effectiveness has been assigned to outputs/outcome which reached their original objective, whereas low value has been assigned to outputs/outcome which reached only partially their intended objective. The effectiveness in carrying out project activities has been evaluated separately with the assessment of attainment of outcomes (Chapter 7).
 - Efficiency is the comparison of what is actually produced or performed with what can be achieved with the same consumption of resources (money, time, labor, etc.). Efficiency is an important factor in determination of productivity, therefore – in the absence of cost/effectiveness information,- a high value has been assigned to activities which have been carried out in due time and which are expected to be carried out without delay.
4. Relevance and effectiveness have been considered as critical criteria. The overall rating of the project for achievement of objectives and results was not therefore scored higher than the lowest rating on either of these two criteria. Practically, the score has been calculated by averaging the relative numerical score (from 0 to 5) of efficiency and effectiveness, and then comparing it with the score (from 0 to 5) of relevance; the lowest score has been adopted as score for that activity.
 5. Subsequently, the score for all the activities within each project components, and among all components, have been averaged to generate the overall project score.
 6. Although this analysis is based on subjective evaluation, the use of coherent criteria and formulas for assigning scores ensured at least the internal consistency of the rating.

4. COUNTRY AND PROJECT BACKGROUND

The project is part of the UNIDO plan to expand its POPs program and 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. The ESEA Forum on BAT and BEP, formally launched in October 2007 in Bangkok by the Ministry of Natural Resources and Environment (MONRE) of Thailand, together with relevant ministries and institutions of ESEA and the Stockholm Convention Unit of the Environmental Management Branch (EMB) of UNIDO, is the first regional forum that has been established with these objectives.

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.

On the basis of information provided by the NIP, in Cambodia the main source categories of PCDD/PCDF releases were power generation and heating and uncontrolled combustion; in Indonesia, power plants represented 66.5% and uncontrolled burning 7.8 % of the U-POPs emission (however these figures were drastically corrected by the project team during the country survey, as these were possibly based on inappropriate emission factors); in Lao, power generation and electricity production represent around 5% of the U-POPs overall emission; in Mongolia, power generation and heating/cooking represent together 5.23% of the U-POPs total emission; in the Philippines, power generation represent around 16% of the U-POPs total emission; in Thailand, this sector represent around 5% of the overall emission.

The project document introduces statistical information on fuel consumption and number of industrial boiler by country; showing the significant contribution of biomass fueled boiler (around 20%) to the overall number of industrial boiler, and the predominant number of oil fired boiler. This scenario obviously varies with countries, being for instance Mongolia the country with the highest relative amount of coal fired boiler (100%) whilst Lao PDR and Indonesia are the country where the use of biomass prevails. On the power generation side, fossil fuels accounts for 95 % of the total number of power units in the region. Cambodia is characterized by a large number of small diesel generator sets (more than 50% of the total), whilst in the

largest countries (Thailand, Indonesia and Philippine), excluding diesel, the most used fuels are natural gas and coal. Natural Gas is extensively used in Thailand, whereas Mongolia uses exclusively coal.

Based on the above data, the project correctly moved its preliminary step on the gathering of more detailed information (energy outlooks, updated boiler inventory, studies on the use and market of specific fuels), which are key for addressing properly the strategies for the selection of representative facilities.

Although in the NIP of the participant countries, the establishment of proper regulatory instruments for establishing BAT/BEP criteria in the energy and power generation plant is a priority, it seems that only Philippine and Thailand already have a legislation in place for regulating the environmental management of industrial boilers or power plants with specific reference to air pollution. In the Philippines, the Republic Act 8749 establishes explicit provisions on the reduction and measurement of dioxins and furans releases into the environment from various sources. It sets the standard emission limits for PCDD/PCDFs at 0.1 ng/Nm³ for treatment facilities using "non-combustion technologies". The provision on banning the use of incinerators under Section 20 of the Act is addressed at further reducing emissions of PCDD/PCDFs into the environment.

In Thailand, under the Enhancement and Conservation of National Environment Quality Act B.E. 2535(1992), several specific Emission Standards have been enacted to control the releases of PCDDs/PCDFs from source categories (incinerators, crematoria, industrial furnaces). Therefore, the establishment of proper legislation instruments for regulating the emission of U-POPs is obviously one of the most important expected outcomes of the project.

4.1. FACT SHEET OF THE PROJECT

The basic information of the project is as following:

Project Title	Demonstration of BAT and BEP in fossil fuel-fired utility and industrial boilers in response to the Stockholm Convention on POPs			
GEF Project ID	3732		At endorsement	At completion (November 2012)
UNIDO Project ID	GF/RAS/10/003	GEF Financing	USD 4,000,000	
Country	Regional (Cambodia, Lao PDR, Mongolia, Philippines and Thailand)	Total Cofinancing	USD 9,100,000	
Region	Regional	Total Project Cost	USD 13,100,000	
Focal Area	POPs	Agency approval date		April 2010
Implementation Start	July 2010	Operational Closing Date	Proposed: April 2014	Actual :
OTHER EXECUTING PARTNER(S): Ministry of Industry, Mines and Energy (Cambodia); Ministry of Environment (Indonesia); Department 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)				

Project Objective: The project overall objective 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 (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.

4.2. BRIEF DESCRIPTION

The project is structured in 5 main technical assistance components, plus a component dedicated to management, monitoring and evaluation, as following:

1. Formulation of regional guidelines and guidance on BAT/BEP for fossil fuel-fired utility and industrial boilers consistent with relevant requirements of Stockholm Convention;
2. Dissemination of pollution prevention/cleaner production (PP/CP) measures in fossil fuel-fired utilities and industrial boilers source category;
3. Establishment of regional UP- POPs baseline inventory in fossil fuel-fired utilities and industrial boilers source category;
4. Regional coordination in developing human resources;
5. Capacity building in sampling at industrial sources and analysis of UP-POPs;
6. Management, monitoring and evaluation;

Although not immediately evident from the wording of the project components, under component 3 the project also aim at replacing obsolete boilers with up-to-date low emission boilers compliant with the SC BAT/BEP guidance in representative sectors.

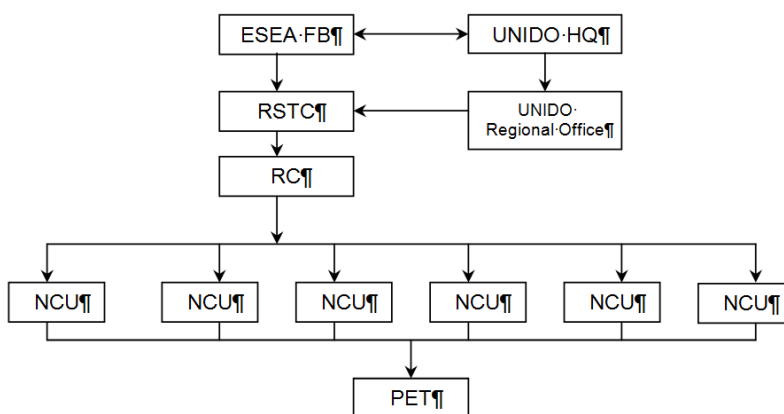
Under the same component, the project envisages carrying out sampling and analysis of the flue gas of selected boilers before and after implementation of BAT / BEP, to demonstrate the effectiveness of these measures in term of U-POP reduction.

The project through the establishment of new guidance and updated regulation on boilers BAT/BEP, training and capacity building in the field of boiler technology and management, monitoring and analysis of UP-POPs, demonstration of BEP and replacement of a limited number of obsolete small / medium size industrial boilers with boilers compliant with BAT/BEP requirements, will strengthen the whole management chain of fossil fuel fired boilers, allowing the participating countries to introduce and monitor BAT/BEP measures for reducing or eliminating unintentional PCDD/PCDF releases in a the fossil-fuel fired utility and industrial boilers (power generation and heating).

The project is being implemented in Cambodia, Lao PDR, Mongolia, Philippines and Thailand.

4.3. PROJECT IMPLEMENTATION ARRANGEMENTS

The project implementation arrangements at project design are summarized in the following diagram:



UNIDO HQ is the GEF implementing Agency for the project. The project focal point has been established in UNIDO HQ to assist the project execution.

The project implementation will be under the oversight of the **ESEA Forum Board (FB)** to ensure that high-level attention is given to policy and legal objectives of the project. UNIDO reports to the ESEA FB which has a Regional Sector Technical Committee during its annual meeting. ESEA FB has an advisory function.

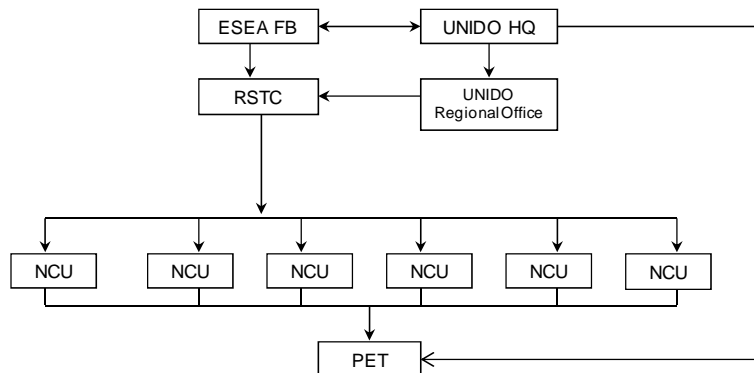
The **Regional Sector Technical Committee (RSTC)** is chaired by a senior government official of the Science, Technology and Environment Agency and consist of full-time professional staff and support staff with additional support provided by consultants on an as-needed basis in Lao PDR. The members of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

Initially, it was envisaged that the RSTC would have been supported by a **Regional Coordinator (RC)**, who should have been under the supervision of UNIDO and works closely with RSTC, and reports to both UNIDO and RSTC. However the recruitment of the RC did not materialize. Currently, it seems that the role of RSTC in project implementation is quite limited.

Project Expert Team (PET). Based on project design, the technical project team should have been formed 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 as required. Currently, in addition to the six national project managers, a team of international consultants is working in coordination with the NPMs, and report directly to UNIDO, whilst the RC has not been appointed.

National Coordination Units (NCUs) have been set up in each participating country. Each NCU is led by National Project Coordinators(NPCs) and National Project Managers (NPMs) and project officers representing the relevant line Ministries as required.

Based on the above, the actual project management structure after implementation is as shown in the following graph:



Concerning administrative arrangement, all the project needs (workshops, national and international consultants, analytical services, equipment) are procured via UNIDO HQ, which also provide technical assistance in drafting the relevant Term of Reference.

4.4. IMPLEMENTATION STATUS:

The project was approved by the GEF in April 2010. The inception workshop for the project was held in July 2010 back to back with the midterm meeting of the ESEA BAT/BEP Forum.

4.5. COUNTERPART ORGANIZATIONS

The main counterparts are: Ministry of Industry, Mines and Energy (*Cambodia*); Ministry of Environment (*Indonesia*); Water Resources and of Environment Administration (*Lao PDR*); Ministry of Nature, Environment and Tourism (*Mongolia*); Department of Environment and Natural Resources (*Philippines*) and Ministry of Natural Resources and Environment (*Thailand*).

5. PROJECT ASSESSMENT

5.1. DESIGN

The evaluation of project design has been carried out at 3 levels:

- 1) Expert judgment of project design, based on interviews with the main project stakeholders and on the experience of the evaluator, with reference to project objectives and the objectives of the Stockholm Convention;
- 2) SMART (Specificity, Measurability, Achievability, Relevance and Time-Bound) analysis of project outcomes, activities and objectively verifiable indicators, having as reference the project objective, the objectives of the Stockholm Convention and the relevant POPs GEF 4 strategic area.
- 3) In addition to the above, a proposal for re-arrangement of project activities and outputs, to avoid duplicate activity or merge redundant activities is submitted to the attention of UNIDO.

5.1.1. PROJECT OBJECTIVES

The overall objective of the project is to *“reduce and eliminate unintentionally produced POPs (UP-POPs) releases by enhancing guidelines and guidance on BAT/BEP for fossil fuel-fired utility and industrial boilers through addressing specific features of industry, common practices in the region and related socio-economic considerations and thus formulating regional guidelines and guidance on BAT/BEP to be introduced in implementing the relevant requirements of Stockholm Convention.”*

The immediate objective of the project is to *“establish UP-POPs baseline inventories in fossil fuel-fired utilities and industrial boilers source category achieved by specifically designed sectoral studies and targeted capacity building.”*

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. The project implementation, however, also envisages technology transfer – like the substitution of obsolete boilers with new, efficient boilers, and sampling and analysis of exhaust gas from the stack of industrial plants before and after the implementation of BAT/BEP. Indeed the project document clarifies that *“The scope of this project also incorporates the promotion of technology transfer and investment by identification and implementation of innovative mechanisms for public-private partnership (PPP).”*

The project objectives do not include any measurable target of UP-POPs reduction. However, under output 3, the approximate reduction of 0.31 g TEQ/year from pilot cases and fuel savings of USD 1.3 m/year is established as Objectively Verifiable Indicator for the activity 3.3.4. Given the high uncertainty associated with the analytical determination of very low concentration levels of dioxin in flue gas emitted from boilers, the direct measurement of this objective may also be affected by a significant uncertainty.

5.1.2. PROJECT OUTCOMES AND OUTPUTS

In

Table 2, a SMART analysis of project outcome is reported. The overall rating of this analysis is S (satisfactory). It should be recalled that SMART analysis only captures the soundness of each specific activity or output without considering the linkage with other activity or output. Therefore it should not be considered surprising that outputs which score satisfactorily under the SMART analysis are proposed for deletion in the analysis of project structure, which is mainly based on relationship among outputs/activities. The following main aspects emerging from the analysis are summarized below:

Specificity (S of SMART). Most of the outcomes and outputs are specific, as they clearly define the expected results and the scope. Some outputs are very specific, for instance: output 3.2, which envisages the drafting of specific studies to be carried out on different fuels in the project countries, or output 3.3, requiring the identification and selection of industrial boilers representatives for establishing UP-POP inventory in the participating country. Some other outputs are not very specific, or are unclear: It is not very well understandable what are the expected results of “adding two columns (on health and economic benefits) to Table 3 of the UNEP/POPS/COP.3/INF/4. Awareness raising (outputs 4.2) is a very broad output which needs to be further specified.

Measurability (M of SMART). Almost all the outputs are easily measurable. As far as activity 4.2 is concerned, the success of awareness raising activities can only be estimated with a proper “before and after” questionnaire / interviews survey, which should be arranged at terminal evaluation. Issues related to the measurability of the required level of PCDD/F reduction (activity 3.3.4) do exist, as that requires a high technical capacity in sampling and analysis, whilst the project itself assumes that this capacity needs to be strengthened.

Achievability (A of SMART). All the results are likely achievable without significant problems, with the exception of output 1.3, as the adoption of government policies is usual beyond project power and may be affected by a significant uncertainty; the same concern is for output 5.2, as the establishment of a Public Private Partnership may only be achieved were suitable market conditions for this commercial modality exist.

Relevance (R of SMART). All the project outputs are relevant to the project objective, to the objective of the Stockholm convention with specific reference to the requirements for UP-POPs release reduction or elimination, and to the strategic objectives of the GEF focal area. The project has been approved under GEF 4, however project outputs are also relevant to the objectives subsequently set by GEF 5 on POPs focal area.

The GEF 4 POPs focal area strategy has the long term objective to *reduce and eliminate production, use and releases of POPs*, and its strategy programs are:

- 1) *Strengthening capacity for NIP (National Implementation Plan) development and implementation*
- 2) *Partnering in investments for NIP implementation*
- 3) *Partnering in the demonstration of feasible, innovative technologies and best practices for POPs reduction*

In addition, the GEF 4 Persistent Organic Pollutants focal area strategy and strategic programming envisages that

- *“Projects addressing unintentionally produced POPs are expected to be mostly of a planning and strategy development nature under GEF-4, thereby preparing the groundwork for more systematic efforts that will be required in future phases of the GEF.”*

The GEF 4 strategic programming 1 “Strengthening Capacities for NIP Implementation” set the following outcomes and indicators:

- *“Outcome: GEF eligible countries have the capacity to implement the measures required to meet their obligations under the Convention, including POPs reduction measures. As such measures will address*

the full range of chemicals (e.g., pesticides, industrial chemicals, and unintentionally produced by-products). Countries will also be implementing measures that will improve their general capacity to achieve the sound management of chemicals.”

“Indicators: The following outcome indicators are proposed as measures of capacity development for NIP implementation:

- *legislative and regulatory framework in place in supported countries for the management of POPs and the sound management of chemicals in general*
- *Strengthened and sustainable administrative capacity, including chemicals management administration within the central government in supported countries*
- *Strengthened and sustainable capacity for enforcement in supported countries”*

The GEF 4 strategic programming 3 “Partnering in the demonstration of feasible, innovative technologies and best practices for POPs reduction and substitution” set the following outcomes and indicators:

- *Outcomes. Feasible and effective environmentally sound alternative products, practices or techniques that avoid POPs production, use or release are demonstrated ;*
- *Indicators: Number of environmentally sound alternative products, practices, or techniques demonstrated that are efficacious and costeffective, out of the total number demonstrated*

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.”*

Therefore it may be affirmed that all the project activities aimed at enhancing capacities in the project countries, at supporting and strengthening the legislative and regulatory framework and the administrative capacity, and at demonstrating technologies, are fully relevant to the GEF 4 POP focal area strategies, whilst the components of the project envisaging the implementation of BAT/BEP are also fully relevant with the GEF 5 POP focal area objectives and priorities.

As some activities may have an indirect rather than a direct impact on GEF outcomes, the relevance rating is set to satisfactory.

Time-Bound. (T of SMART). The project document includes a detailed activities timeline; therefore all the project outputs are assigned with a definite deadline. Several activities are however late, as project timeframe in some case is not strictly enforced. Rating: MS

5.1.1. PROJECT STRUCTURE

Considering the limited budget available and the number of countries involved, the project structure is perhaps too complex. The project is fragmented in 5 project components, plus one M&E component, each one with a significant number of activities, to be implemented in 6 countries characterized by diverse development and technical capacity conditions. In addition to training, drafting of guidance documents, proposal and implementation of upgraded legislation on boilers, the project envisages the procurement, installation and testing of a certain number (at least 6) of industrial boilers, and the conduction of at least two PCDD/F sampling and analysis rounds for each country.

This demanding structure resulted in 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. Although a lot of this supervision effort has been carried out by international consultants hired under UNIDO

HQ, nevertheless the project would have benefitted on the availability of additional resources, trained by the international experts, and deployed at national level.

Based on the outcome of the interviews carried out, the level of awareness of the project structure was not completely satisfying among some of the National Project Managers who, except in two cases, were not able to fill the part of the questionnaire concerning the project result framework.

An analysis of the project achievements also showed that under some project outputs, no significant results can be identified. This is not because the project was lagging behind; instead, some project activities are indeed a duplicate of other activities. This is for instance the case of activities under output 1.2, and 3.1.

To simplify project structure with the purpose to reduce project monitoring effort in the second stage of the project, in Table 1a proposal for the rearrangement of project outputs and activities is submitted to the attention of UNIDO. The rationale underpinning the rearrangement is as following: 1) there is no need to have a separate activity for the publication of the results achieved in another activity (for instance, Activity 3.1.1: *Prepare baseline studies on industrial boilers* and Activity 3.1.2: *Produce relevant publications on the above* should be merged into a single activity); 2) duplicate or largely overlapping activities should be avoided (for instance, Activity 1.2.3: *Investigate the use of wood and other biomass fuels in the boiler sector* is almost the same of activity 3.2.3 *Prepare, undertake, report, publish and disseminate specific studies on use of biomass fuels*, therefore only one of these activities should be kept. Based on this rationale, the proposed rearrangement of project activities and output results in the elimination of 13 activities (to be merged with other activities or simply eliminated being duplicate activities) and .2 outputs.

Table 1 Proposed rearrangement of project activities and outputs

Activity Name	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	Proposal for activity renaming/rearranging	Changes
<i>Activity 1.1.1:</i> Identify relevant health and economic issues of Section VI.D in each participating country.	Report on health and economic considerations	Report on economics of dioxin effects on health and environment (Int. experts)	Dec-12		Moved to new 1.1.3
<i>Activity 1.1.2:</i> Prepare and test guidelines to be used to optimize the collection and comparison of data.	Regional guidelines on collection of comparable data.	Energy outlook of countries (NPMs) BAT/BEP guidelines (int. experts)	Dec-13	<i>Activity 1.1.1:</i> Prepare and test guidelines to be used to optimize the collection and comparison of data.	former 1.1.2, unchanged
<i>Activity 1.1.3:</i> Collect and report data on occupational accidents and occupational exposures to fugitive emissions related to industrial boilers.	Reports on occupational accidents	Reports on occupational accidents (NPMs)	Jan-12	<i>Activity 1.1.2:</i> Collect and report data on occupational accidents and occupational exposures to fugitive emissions related to industrial boilers.	former 1.1.3, unchanged
<i>Activity 1.1.4:</i> Draft regional BAT/BEP guidelines and guidance document by amending Section VI.D.	Regional guidelines on BAT/BEP	Regional BAT/BEP guidelines (NPMs, Int. experts, UNIDO)	Dec-13	<i>New activity 1.1.3:</i> Draft and publish regional BAT/BEP guidelines and guidance document by amending Section VI.D, including health and economic considerations	Incorporate previous activities 1.1.1, 1.1.4 and 1.1.5
<i>Activity 1.1.5:</i> Publish and disseminate regional guidelines in English and local languages of the participating countries.		BAT/BEP publication (UNIDO, NCUs)	Feb-13	<i>New activity 1.1.4:</i> Compare fuel prices and boiler efficiencies in the market for different types of boilers; estimate replacement costs and APCS costs	former 1.1.5 moved to 1.1.3; now contain former 1.2.1 and 1.2.2
<i>Activity 1.1.6:</i> Targeted training programs in application of regional guidelines.	Two regional training programs and at least 20 trainees at each on regional BAT/BEP guidelines		Apr-13	<i>Activity 1.1.5:</i> Targeted training programs in application of regional guidelines.	former 1.1.6
<i>Activity 1.2.1:</i> Compare fuel prices and boiler efficiencies in the market for different types of boilers	Boiler specifications upgraded including achievable dioxin/GHG emission limits	Report on boiler and fuel prices		<i>Delete this output</i>	moved to new 1.1.4
<i>Activity 1.2.2:</i> Estimate replacement costs versus increasing efficiency for different types of boilers.		Report on estimates	Apr-12		moved to new 1.1.4
<i>Activity 1.2.3:</i> Investigate the use of wood and other biomass fuels in the boiler sector	Market study on fuel prices Technical studies on use of biomass fuels including estimates on dioxin/GHG reduction	Country survey on market and trends of use NPMs, Nat. experts Report on biomass as related to GHG reduction c/o S. Chamsuk	Jul-12		Merged with new 3.1,2
<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.	Government policies and regulations adopted to facilitate BAT/BEP implementation	Translated version of Thai Boiler Act and Boiler Certification Framework (Thailand) Distribution of Indonesia Boiler Act and Boiler certification Framework (Indonesia)	Feb-12	<i>New Activity 1.2.1:</i> Identify and assess existing government policies related to Section VI.D and the relevant parts of Section VI.E.; perform gap analysis of the above with reference to the boiler sector	1.3.1 and 1.3.2 merged into 1.2.1
<i>Activity 1.3.2:</i> Analyze gaps in existing standards, regulations and market based	Enforcement mechanisms at government level in place	Workshop on targeted government officials - MoE and Manpower/Labor and	Dec-12		former 1.3.1 and 1.3.2 merged into 1.2.1

Table 1 Proposed rearrangement of project activities and outputs

Activity Name	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	Proposal for activity renaming/rearranging	Changes
incentives relevant to the boiler sector.		Employment/Ministry of Industr (NCUs, UNIDO)			
<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..			Dec-12	<i>New activity 1.2.2:</i> Enhance existing enabling government policies on the above to be implemented at government level with specific reference to Boiler Act..and publish / disseminate the above	1.3.3 and 1.3.4 merged into new activity 1.2.2
<i>Activity 1.3.4:</i> Publish and disseminate approved policies, regulations and standards in English and local languages of the participating countries.	Publish and Disseminate policies	Policy on Boilers (NCUs, UNIDO)	Oct-13		1.3.3 and 1.3.4 merged into new activity 1.2.2
<i>Activity 1.3.5:</i> Targeted training programs in applying those policies, regulations and standards.	Two regional training programs and at least 10 trainees at each on policies, regulations and standards	(NCUs, UNIDO)	Dec-13	<i>Activity 1.2.3:</i> Targeted training programs in applying those policies, regulations and standards.	former activity 1.3.5, unchanged
<i>Activity 2.1.1:</i> Assess and classify boilers in the ESEA region according to their capacity and fuel use.	Updated inventory	Updated Inventory based on fuel type and capacity	Jul-12	<i>New activity 2.1.1:</i> Update and publish boiler inventories, assess and classify boilers in the ESEA region according to their capacity and fuel use.	2.1.1, 3.1.1 and 3.1.2 merged into new 2.1.1
<i>Activity 2.1.2:</i> Identifying the abatement technologies in use	PP/CP methodology guidelines document	Identify abatement technologies	Jul-12	<i>New activity 2.1.2:</i> draft PP/CP methodology guidelines and technical specifications for procurement of environmentally sound boilers	former 2.1.2 and 2.1.4 merged into new 2.1.2
<i>Activity 2.1.3:</i> Carry out market survey for appropriate technologies and boiler technology providers.	Information material on appropriate, affordable and feasible technologies in ESEA region				2.1.3 deleted as it overlaps with new 1.1.4 (former 1.2.1. and 1.2.2)
<i>Activity 2.1.4:</i> Draft, approve and implement non-binding procurement guidelines for environmentally sound boilers as appropriate.	Procurement guidelines (intern. Experts)		Mar-14		former 2.1.2 and 2.1.4 merged into new 2.1.2
<i>Activity 2.1.5:</i> Publication and dissemination of non-binding procurement guidelines.			Mar-14	<i>New activity 2.1.3:</i> procurement of environmentally sound boilers	former 2.1.5 deleted
<i>Activity 2.1.6:</i> Hold awareness workshops for disseminating the procurement guidelines..	At least 2 awareness raising workshops in each of the participating countries		Mar-14		Moved to output 4.1.
<i>Activity 3.1.1:</i> Prepare baseline studies on industrial boilers by processing data collected through questionnaires;	Six national baseline reports on fossil fuel-fired utility and industrial boilers	Boiler inventory updated (NPMs)	Jul-12	<i>Delete this output</i>	Merged with 2.1.1
<i>Activity 3.1.2:</i> Produce relevant publications on the above studies	Regional baseline report on fossil fuel-fired utilities and	Publication	Sep-12		Merged with 2.1.1

Table 1 Proposed rearrangement of project activities and outputs

Activity Name	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	Proposal for activity renaming/rearranging	Changes
	industrial boilers				
Activity 3.2.1: Prepare, undertake, report, publish and disseminate specific studies on fish residues as fuel in seasonal use in Cambodia fuel.	At least five published specific technical studies addressing specific features of participating countries	Publication	Dec-12	Activity 3.1.1: Prepare, undertake, report, publish and disseminate specific studies on fish residues as fuel in seasonal use in Cambodia fuel.	former 3.2.1, unchanged
Activity 3.2.2: Prepare, undertake, report, publish and disseminate specific studies on use of spent/used oils as boiler		Publication	Dec-12	Activity 3.1.2: Prepare, undertake, report, publish and disseminate specific studies on use of spent/used oils as boiler	former 3.2.2, unchanged
Activity 3.2.3: Prepare, undertake, report, publish and disseminate specific studies on use of biomass fuels.		Publication	Dec-12	Activity 3.1.3: Prepare, undertake, report, publish and disseminate specific studies on use of biomass fuels.	former 3.2.3, merged with 1.2.3
Activity 3.2.4: Prepare, undertake, report, publish and disseminate specific studies on low pressure furnaces and coal stoves in Mongolia, etc		Publication	Dec-12	Activity 3.1.4: Prepare, undertake, report, publish and disseminate specific studies on low pressure furnaces and coal stoves in Mongolia, etc	former 3.2.1, unchanged
Activity 3.3.1: Identify criteria for boiler types selection.	Criteria for boiler types selection and characterization of ed fossil fuel-fired utilities and industrial boilers	Criteria		Activity 3.2.1: Identify criteria for boiler types selection.	former 3.3.1, unchanged
Activity 3.3.2: Select representative boilers in each participating country for demonstration.	Maximum of 12 pilot demonstration cases for the project duration	Representative boilers Drafting of TOC with pilot facility	Dec-11	Activity 3.2.2: Select representative boilers in each participating country for demonstration.	former 3.3.2, unchanged
Activity 3.3.3: Modify and/or optimise technology parameters of selected boilers		Optimization	Dec-13	Activity 3.2.3: Modify and/or optimise technology parameters of selected boilers	former 3.3.3, unchanged
Activity 3.3.4: Set up and carry out pilot monitoring programmes for a few selected boiler types at power generation and industry sectors.	At least 24 monitoring programs performed in 12 selected facilities before and after BAT/BEP implementation Approximate reduction of 0.31 g TEQ/year from pilot cases and fuel savings of USD 1.3 m/year At least 48 analytical tests performed (at least 1 fly ash sample and 1 flue gas sample per monitoring campaign)	Pilot monitoring programs (<i>int. experts, UNIDO</i>)	Dec-13	Activity 3.2.4: Set up and carry out pilot monitoring programmes for a few selected boiler types at power generation and industry sectors.	former 3.3.3, unchanged
Activity 4.1.1: Identify relevant institutions in the energy sector that are able to provide training in the boiler	At least 2 training institutions in ESEA region for the boiler sectors	2 trainings (<i>UNIDO in cooperation with Spirax Sarco</i>)	Feb-12	Activity 4.1.1: Identify relevant institutions in the energy sector that are able to provide training in the boiler sector.	Unchanged

Table 1 Proposed rearrangement of project activities and outputs

Activity Name	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	Proposal for activity renaming/rearranging	Changes
sector.					
<i>Activity 4.1.2:</i> Training of trainers including development of university curricula on environmentally sound boiler technologies.	At least 12 training courses and at least 40 trained staff At least 6 universities that introduce new curricula In-plant training material	Training Drafting of TOC with University partner.(UNIDO and curriculum experts)	Mar-12	<i>Activity 4.1.2:</i> Training of trainers including development of university curricula on environmentally sound boiler technologies.	Unchanged
<i>Activity 4.1.3:</i> Assess training needs and identify required training programs related to BAT and BEP. of private and public sectors.		(UNIDO)	Jun-11	<i>Activity 4.1.3:</i> Assess training needs and identify required training programs related to BAT and BEP. of private and public sectors.	Unchanged
<i>Activity 4.1.4:</i> Carry out different types of targeted training programs for concerned government officials and technical personnel		Refer to 1.3.2 -1.3.3 and 4.1.1	Sep-12		Already identified as unnecessary activity at inception, deleted
<i>Activity 4.2.1:</i> Identify target groups according to their involvement in the boiler sector. .		Regional – review of Philippine brochure (Philippines to revise/UNIDO to print) National – information materials (NPMs / national experts)	Dec-11	<i>Activity 4.2.1:</i> Identify target groups according to their involvement in the boiler sector. .	Unchanged
<i>Activity 4.2.2:</i> Produce awareness raising materials for each target group and information materials for the public at large.	Awareness raising campaign materials produced in local language		Nov-11	<i>Activity 4.2.2:</i> Produce awareness raising materials for each target group and information materials for the public at large.	Unchanged
<i>Activity 4.2.3:</i> Carry out regular awareness raising campaign	At least two targeted awareness raising campaigns in each participating country	Identify national partner to carry out specialized awareness raising and design information materials (NPMs) Carry out at least 3 awareness raising campaigns (targeted-professional org, academe, NGOs, women’s group etc (NPMs – national partners)	Dec-12	<i>New Activity 4.2.3:</i> Carry out regular awareness raising campaign, including green procurement as necessary	Green procurement added to raising awareness to include former activity 2.1.6
<i>Activity 5.1.1:</i> Review all main international guidance documents on POPs monitoring.		(international experts)	Dec-11	<i>Activity 5.1.1:</i> Review all main international guidance documents on POPs monitoring.	Unchanged
<i>Activity 5.1.2:</i> Produce summary of the monitoring guidance documents for adoption and use in the ESEA region.			Dec-11	<i>Activity 5.1.2:</i> Produce summary of the monitoring guidance documents for adoption and use in the ESEA region.	Unchanged
<i>Activity 5.1.3:</i> Survey existing monitoring capacity in the ESEA region.	At least two certified monitoring laboratories in the region		Dec-11	<i>Activity 5.1.3:</i> Survey existing monitoring capacity in the ESEA region.	Unchanged
<i>Activity 5.1.4:</i> Carry out training in sampling;	Two regional training courses in monitoring	PUSARPEDAL (Indonesia) and ERTC(Thailand) staff to be sent on	May-12	<i>Activity 5.1.4:</i> Carry out training in sampling;	Unchanged

Table 1 Proposed rearrangement of project activities and outputs

<i>Activity Name</i>	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	Proposal for activity renaming/rearranging	Changes
		fellowship			
<i>Activity 5.1.5:</i> Carry out training in analysis;	At least 2-3 technicians trained in sampling and analytical testing	NPMs, pilot facilities, academic staff to be sent for general training	Apr-12	<i>Activity 5.1.5:</i> Carry out training in analysis;	Unchanged
<i>Activity 5.1.6:</i> Set up and carry out pilot monitoring programmes for a few selected boiler types at power generation and industry sectors.				.	This appear to be a duplicate of activity 3.3.4 and should be deleted
<i>Activity 5.2.1:</i> Identifying economic incentives to create enabling environment for innovative PPP mechanisms.				<i>Activity 5.2.1:</i> Identifying economic incentives to create enabling environment for innovative PPP mechanisms.	Unchanged
<i>Activity 5.2.2:</i> Implement incentives for promotion technology transfer and investment through PPP	Number of participating countries that introduce PPP incentives			<i>Activity 5.2.2:</i> Implement incentives for promotion technology transfer and investment through PPP	Unchanged

Table 2: SMART analysis of project outcome.

Project Components	Expected Outcomes	Expected Outputs	S	M	A	R	T	SMART index	
1. Formulation of regional guidelines and guidance on BAT/BEP for fossil fuel-fired utility and industrial boilers consistent with relevant requirements of Stockholm Convention	Adopted guidelines and guidance on BAT/BEP addressing specific features of industry, common practices in the region and related socio-economic considerations	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.	2	2	4	4	4	3.2	S
		1.2 Enhanced or strengthened specifications for different types of boilers (small/ medium / large) and fuels.	4	4	4	4	4	4	S
		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).	3	3	2	3	4	3	MS
2. Dissemination of pollution prevention/cleaner production (PP/CP) measures in fossil fuel-fired utilities and industrial boilers source category	Pollution prevention measures (cleaner production) applied prior to introducing BAT/BEP (Annex C, Part V, A)	2.1 Pollution Prevention/Cleaner Production 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.	3	3	3	4	4	3.4	S
3. Establishment of regional UP- POPs baseline inventory in fossil fuel-fired utilities and industrial boilers source category	UP-POPs baseline inventories derived from representative industrial sources and projected at regional scale	3.1 Baseline studies on industrial boilers (through questionnaires completed in six participating countries).	4	4	4	4	4	4	S
		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; and (iii) biomass fuel including wood, wood products, bagasse, charcoal, demolition wood; and (iv) low pressure furnaces and coal stoves in Mongolia, etc.	5	4	4	4	4	4.2	HS
		3.3 Identification and selection of industrial boilers and fossil fuel-fired utilities that would be representative for establishing regional UP- POPs baseline inventory by determining UP-POPs releases.	5	2	3	5	4	3.8	S
4. Regional coordination in developing human resources	Established regional coordination of developing human resources	4.1 Adequate capacity in BAT and BEP built through training programs for government officials and through technical in-plant training for responsible persons for boiler operation of private and public sectors.	4	4	4	4	4	4	S
		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.	2	2	3	4	4	3	MS
5. Capacity building in sampling at industrial sources and analysis of UP-POPs	Adequate capacity in sampling and analysis of UP-POP	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.	3	3	4	4	4	3.6	S
		5.2 Promotion of technology transfer and investment by identification and implementation of innovative mechanisms for PPPs.	3	3	2	3	3	2.8	MS
Averaged values			3	3	3	4	4	3.5	S
			S	S	S	S	S	S	

Table 3 SMART analysis of project activities and OVIs

Activity Name	Objectively Verifiable Indicator	S	M	A	R	T	avg	SMART index
Component 1, Output 1.1								
<i>Activity 1.1.1:</i> Identify relevant health and economic issues of Section VI.D in each participating country.	Report on health and economic considerations	5	1	0	4	1	2.2	MS
<i>Activity 1.1.2:</i> Prepare and test guidelines to be used to optimize the collection and comparison of data.	Regional guidelines on collection of comparable data.	3	2	4	4	1	2.4	MS
<i>Activity 1.1.3:</i> Collect and report data on occupational accidents and occupational exposures to fugitive emissions related to industrial boilers.	Reports on occupational accidents	5	2	3	2	1	2.6	MS
<i>Activity 1.1.4:</i> Draft regional BAT/BEP guidelines and guidance document by amending Section VI.D.	Regional guidelines on BAT/BEP	5	3	2	4	3	3.4	S
<i>Activity 1.1.5:</i> Publish and disseminate regional guidelines in English and local languages of the participating countries.		4	0	2	2	3	2.4	MS
<i>Activity 1.1.6:</i> Targeted training programs in application of regional guidelines.	Two regional training programs and at least 20 trainees at each on regional BAT/BEP guidelines	3	2	4	3	3	3	MS
Component 1, Output 1.2								
<i>Activity 1.2.1:</i> Compare fuel prices and boiler efficiencies in the market for different types of boilers	Market study on fuel prices	2	3	5	4	3	3.4	S
<i>Activity 1.2.2:</i> Estimate replacement costs versus increasing efficiency for different types of boilers.	Boiler specifications upgraded including achievable dioxin/GHGs emission limits	5	2	2	4	1	2.8	MS
<i>Activity 1.2.3:</i> Investigate the use of wood and other biomass fuels in the boiler sector	Technical studies on use of biomass fuels including estimates on dioxin/GHGs reduction	4	2	3	3	1	2.6	MS
Component 1, Output 1.3								
<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.	Government policies and regulations adopted to facilitate BAT/BEP implementation	2	2	2	4	1	2.2	MS
<i>Activity 1.3.2:</i> Analyze gaps in existing standards, regulations and market based incentives relevant to the boiler sector.	Enforcement mechanisms at government level in place	3	3	2	4	1	2.6	MS
<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.		2	2	3	4	1	2	MS
<i>Activity 1.3.4:</i> Publish and disseminate approved policies, regulations and standards in English and local languages of the participating countries.	Publish and Disseminate policies	4	3	1	3	3	2.8	MS
<i>Activity 1.3.5:</i> Targeted training programs in applying those policies, regulations and standards.	Two regional training programs and at least 10 trainees at each on policies, regulations and standards	2	2	1	4	3	2.4	MS
Component 2, Output 2.1								

Table 3 SMART analysis of project activities and OVIs

Activity Name	Objectively Verifiable Indicator	S	M	A	R	T	avg	SMART index
<i>Activity 2.1.1:</i> Assess and classify boilers in the ESEA region according to their capacity and fuel use.	Updated inventory	4	3	3	3	1	2.8	MS
<i>Activity 2.1.2:</i> Identifying the abatement technologies in use	PP/CP methodology guidelines document	5	3	2	5	1	3.2	S
<i>Activity 2.1.3:</i> Carry out market survey for appropriate technologies and boiler technology providers.	Information material on appropriate, affordable and feasible technologies in ESEA region	4	2	3	4	1	2.8	MS
<i>Activity 2.1.4:</i> Draft, approve and implement non-binding procurement guidelines for environmentally sound boilers as appropriate.	Procurement guidelines (intern. Experts)	5	3	1	3	3	3	MS
<i>Activity 2.1.5:</i> Publication and dissemination of non-binding procurement guidelines.		3	3	0	3	3	2.2	MS
<i>Activity 2.1.6:</i> Hold awareness workshops for disseminating the procurement guidelines..	At least 2 awareness raising workshops in each of the participating countries	3	1	1	3	3	2.2	MS
Component 3, Output 3.1								
<i>Activity 3.1.1:</i> Prepare baseline studies on industrial boilers by processing data collected through questionnaires;	Six national baseline reports on fossil fuel-fired utility and industrial boilers	4	3	1	3	1	2.4	MS
<i>Activity 3.1.2:</i> Produce relevant publications on the above studies	Regional baseline report on fossil fuel-fired utilities and industrial boilers	4	3	1	3	1	2.4	MS
Component 3, Output 3.2								
<i>Activity 3.2.1:</i> Prepare, undertake, report, publish and disseminate specific studies on fish residues as fuel in seasonal use in Cambodia fuel.	At least five published specific technical studies addressing specific features of participating countries	5	4	4	3	1	3.4	S
<i>Activity 3.2.2:</i> Prepare, undertake, report, publish and disseminate specific studies on use of spent/used oils as boiler								
<i>Activity 3.2.3:</i> Prepare, undertake, report, publish and disseminate specific studies on use of biomass fuels.								
<i>Activity 3.2.4:</i> Prepare, undertake, report, publish and disseminate specific studies on low pressure furnaces and coal stoves in Mongolia, etc								
Component 3, Output 3.3								
<i>Activity 3.3.1:</i> Identify criteria for boiler types selection.	Criteria for boiler types selection and characterization of selected fossil fuel fired utilities and industrial boilers	4	4	3	4	3	3.6	S
<i>Activity 3.3.2:</i> Select representative boilers in each participating country for demonstration.	Maximum of 12 pilot demonstration cases for the project duration	3	1	2	4	3	2.6	MS
<i>Activity 3.3.3:</i> Modify and/or optimise technology parameters of selected boilers		4	2	2	5	3	3.2	S

Table 3 SMART analysis of project activities and OVIs

Activity Name	Objectively Verifiable Indicator	S	M	A	R	T	avg	SMART index
<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.	At least 24 monitoring programs performed in 12 selected facilities before and after BAT/BEP implementation Approximate reduction of 0.31 g TEQ/year from pilot cases and fuel savings of USD 1.3 m/year At least 48 analytical tests performed (at least 1 fly ash sample and 1 flue gas sample per monitoring campaign)	2	2	2	5	3	2.8	MS
Component 4, Output 4.1								
<i>Activity 4.1.1:</i> Identify relevant institutions in the energy sector that are able to provide training in the boiler sector.	At least 2 training institutions in ESEA region for the boiler sectors	3	2	3	3	3	2.8	MS
<i>Activity 4.1.2:</i> Training of trainers including development of university curricula on environmentally sound boiler technologies.	At least 12 training courses and at least 40 trained staff At least 6 universities that introduce new curricula In-plant training material	3	2	2	3	3	2.6	MS
<i>Activity 4.1.3:</i> Assess training needs and identify required training programs related to BAT and BEP. of private and public sectors.		3	2	1	3	3	2.4	MS
<i>Activity 4.1.4:</i> Carry out different types of targeted training programs for concerned government officials and technical personnel		3	2	1	3	3	2.4	MS
Component 4, Output 4.2								
<i>Activity 4.2.1:</i> Identify target groups according to their involvement in the boiler sector. .		3	3	4	3	3	3	S
<i>Activity 4.2.2:</i> Produce awareness raising materials for each target group and information materials for the public at large.	Awareness raising campaign materials produced in local language	2	2	1	3	3	3	MS
<i>Activity 4.2.3:</i> Carry out regular awareness raising campaign	At least two targeted awareness raising campaigns in each participating country	2	1	1	3	3	2	MS
Component 5, Output 5.1								
<i>Activity 5.1.1:</i> Review all main international guidance documents on POPs monitoring.		3	2	3	3	3	2.6	MS
<i>Activity 5.1.2:</i> Produce summary of the monitoring guidance documents for adoption and use in the ESEA region.		3	2	3	3	3	2.8	MS
<i>Activity 5.1.3:</i> Survey existing monitoring capacity in the ESEA region.	At least two certified monitoring laboratories in the region	4	4	4	4	3	3.8	S
<i>Activity 5.1.4:</i> Carry out training in sampling;	Two regional training courses in monitoring	4	2	4	4	3	3.4	S
<i>Activity 5.1.5:</i> Carry out training in analysis;	At least 2-3 technicians trained in sampling and analytical testing	4	2	5	4	3	3.6	S
<i>Activity 5.1.6:</i> Set up and carry out pilot monitoring programmes for a few selected boiler types at power generation and industry sectors.		4	4	2		3	3.4	S
Component 5, Output 5.2								
<i>Activity 5.2.1:</i> Identifying economic incentives to create enabling environment for innovative PPP mechanisms.		3	1	1	2	3	2	MU

Table 3 SMART analysis of project activities and OVI

Activity Name	Objectively Verifiable Indicator	S	M	A	R	T	avg	SMART index
Activity 5.2.2: Implement incentives for promotion technology transfer and investment through PPP	Number of participating countries that introduce PPP incentives	3	1	1	2	3	2	MU
	Average value	3.6	2.3	2.2	3.4	2.2	2.7	MS
	Smart index	S	MS	MS	S	MS	MS	

5.1.2. TECHNICAL CONSIDERATIONS

The relationship between U-POPs release and boiler efficiency. The project intends to demonstrate BAT/BEP which can simultaneously allow for a reduction of GHG and U-POPs releases in the atmosphere.. While it focuses on the introduction of BAT/BEP measures, it also considers increasing energy efficiency, as required in Annex C Part V B (a)(iv) of the Convention. The project's Annex 8 identifies and analyzes different ways of achieving this simultaneous reduction:

- Enhancing the efficiency of the boilers;
- Replacing the boilers with new, more efficient ones;
- Switching to cleaner fuels.

Although warnings are raised on the option of replacing fossil fuel with biomass as the emissions of dioxins may increase if fuel substitution is not associated with proper BAT/BEP technologies, nevertheless the conclusion is that *"The replacement of coal fired boiler with a FBC biomass boiler makes the best economic sense."*

Recommendation 1: *a warning should be added concerning the side effect that an intensive use of biomass could have in certain areas, particularly on the exploiting of natural resources and re-mobilization of carbon. Rainforest areas are especially sensitive to the issue of biomass exploitation. Specific criteria for assessing the sustainability of biomass have been proposed by the EC Communication COM(2010)11 where concerns are raised and quality criteria proposed on the issues of deforestation, depauperation of biodiversity, and carbon loss. It should be remembered that the use of biomass do not necessarily allow for a reduction of GHG emission when all the lifecycle components are not considered and reflected in a proper biomass management.*

Recommendation 2. *Specific criteria for biomass quality should also be introduced in the course of training and awareness raising to ensure that the shifting from fossil fuels to biomass do not result in the increase of U-POPs emission.*

Recommendation 3. *Although the use of spent oil may present environmental advantages, the risk that contaminants (PCBs) contained in spent oil generate POPs during their combustion should be carefully evaluated. Contamination of low quality spent / used oil by PCBs is common and should be properly considered in the reports.*

The demonstration of the effectiveness of BAT/BEP in reducing U-POPs release. One of the project objectives is to demonstrate and measure the effectiveness – in term of U-POPs release reduction – of BATs and BEPs for boiler. The experimental approach is based on sampling and analysis at the stack of selected boilers before and after BAT/BEP implementation. The project also intends to update UNEP toolkit's emission factor as *"measurements of dioxin emissions during the planned pilot demonstration case studies will provide more reliable figures that will be used to accurately define the necessary emission factors for industrial boilers and maybe incorporated in the UNEP Toolkit."* The updating of the values of dioxin emission factors is one of the immediate objectives of the project.

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.

The project document introduces the following data concerning U-POP release in the participating countries and the intention to refine the methodology for calculating PCDD/PCDF emissions:

"The total releases in power generation, heat industry and domestic heating and cooking sectors in the six participating countries were estimated at about 334.5g TEQ/year, according to some revisions carried out for

the inventories reported in the NIPs. However, there was a strong consensus that methodology was still underestimated. The PCDD/PCDF releases should be revisited/recalculated based on a different methodology, e.g. the countrywide energy/fossil fuel consumptions in order to continuously update the inventories.”

In the understanding of the evaluator, the project experimental paradigm is therefore as following:

- 1) U-POPs emission from old, non-efficient boiler will be measured before the implementation of BAT/BEP or the replacement of old boiler ;
- 2) the measurement (sampling and analysis) will be carried out by means of local laboratories or international laboratories operating in the area, after a proper procurement process to ensure quality of sampling and analytical work;
- 3) U-POPs analytical results will be used for updating or integrating the emission factors listed in the UNEP toolkit
- 4) based on U-POP results and plant features, BAT/BEP will be recommended and applied;
- 5) U-POPs emission sampling and analysis will be carried out again after the implementation of BAT/BEP or the replacement of old boiler, to measure the benefit of the adoption of these measures;
- 6) New, more accurate emission factors will be established based on the results of point 1-5.

It should be noted that this type of paradigm can be successfully demonstrated only in two cases:

- In presence of a sound experimental framework , fully controlled and supervised, with an adequate QA/QC implemented and systems for measuring uncertainty in all phases of the process and for all the relevant parameters;
- When a large experimental data base – from which it is possible to measure uncertainty on a statistical basis – is available and exhaustively characterized.

However, in the project under evaluation, the resources available, to be shared among six of countries implementing each one several activities, may be not enough to cover the intensive analytical effort which would be required to ensure the quality control of such ambitious experimental design.

In addition It should be highlighted that the quantification of the expected reduction of dioxin emission (0.31 g/TEQ from the pilot facilities) is based on an estimate made on the basis of emission factors (the UNEP toolkit or other literature source), whilst the measurement of the reduction of PCDD/F release would be obtained by means of sampling and analysis of the residues (flue gases and ashes) of the pilot plants.

As – in the case of boilers – the relationship between U-POPs emission factors and analytical data at the stack cannot be considered fully consolidated, the direct measurement by means of analytical methods the compliance with a reduction amount which has been committed on the basis of the UNEP toolkit may be misleading.

In other words:

1. The reduction (0.31 gTEq) has been committed on the basis of an estimate of the U/POP releases for non BAT/BEP technologies (the “before” scenario) against the BAT/BEP (the “after scenario”); this estimate is affected by a large uncertainty, as the emission factors are based on a limited number of cases; this uncertainty is currently not quantifiable.
2. The sampling and analysis of U-POPs at the stack of industrial boilers is also affected by a significant variability; beside the analytical uncertainty – which is usually measured by means of the implementation of proper QA/QC measures (blank, spiking with markers, etc.) –parameters contributing to the uncertainty of measurement are among others, fuel properties, combustion conditions, accuracy of sampling operations, sampling design, etc. Obviously, the analytical determinations “before” and “after” the implementation of BAT or BEP are both affected by the same, partially unquantifiable uncertainty.
3. Therefore it is clear that as the uncertainty described in 1. and 2 is not completely quantifiable, using analytical measurements (2). for verifying the compliance with a value estimated on the basis of

unconsolidated emission factors (1).may lead to inconsistent conclusions. It may even happen that, in case of large power boiler with very low emission of U-POPs, the amount of U-POPs after the implementation of BAT/BEP is found higher than before.

Recommendation. Sampling and analysis of the “before” and “after” scenario should not be used for verifying compliance with the committed reduction of U-POPs (dioxin). Instead, this verification should be made adopting the very same calculation scheme adopted for calculating the committed reduction (i.e. on the basis of emission factors). Sampling and analysis should be used mainly for verifying that the BAT/BEP procedures implemented allow for concentration at the stack which is compliant with the recommended BAT / BEP emission values (<0.1ng/Teq)

6. PROJECT CONTRIBUTION TO REDUCING THE EFFECTS OF POPS ON HUMAN HEALTH AND THE ENVIRONMENT.

At this stage, there are not enough data available yet for quantifying the project contribution in reducing POPs releases. As most the benefit of the project in term of reduction of POPs and mercury releases in the environment depends on the continuation and replication of the activities and of the good practices established at the pilot facilities, sustainability is probably the main criterion for evaluating the project success. The expected direct reduction envisaged at project design stage is quite low (0.31 gTeq). Moreover, the industrial boilers sector is not the largest one in term of emission of UP-POPs. Nevertheless, the replication of BAT/BEP is facilitated in the industrial boiler sector due to the possibility to be associated with increase of efficiency, resulting in net savings for the operators. Therefore, compared with other sectors for which the reduction of BAT/BEP release is a pure cost, the reduction of POPs in the industrial boiler sector has a greater potential of replicability and sustainability.

7. ATTAINMENT OF OBJECTIVES BY COUNTRY AND OUTCOME

7.1. OVERALL RATING FOR EFFICIENCY, EFFECTIVENESS AND RELEVANCE, AND ESTIMATED PERCENTAGE OF COMPLETION.

In the table below the overall rating for efficiency, effectiveness and relevance, based on the analysis of project objectively verifiable indicators, is reported.

The detailed analysis, by output and outcome, of project effectiveness, efficiency and relevance is reported in the chapters 7.2 to 7.7.

The estimated percentage of project completion is 52%. Considering that the project deadline is April 2014, the project is moderately late. Therefore, a planning for addressing the delays and securing completion by deadline should be urgently agreed with project partners.

Table 4 Summary of ratings for attainment of objectives.

Criteria	Effectiveness	Efficiency	Relevance	Completion rate (%)	Average score
Numerical score	2.7	2.6	3.4	52	2.5
Score	MS	MS	S		MS

7.2. 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. (initial deadline: march 2011).

Status of implementation. Under this output, significant results have been achieved, like for instance the drafting of energy outlooks, which represents an important starting point at country level for planning activities for the upgrade of boilers by adopting BAT/BEP; or preliminary BAT/BEP regional guidance documents. Significant is also the training material developed by the international consultants. On the basis of available information, activities 1.1.1 did not started yet, whilst activities 1.1.3 and 1.1.5 achieved very limited results. The other activities need to be consolidated.

Recommendations: *UNIDO HQ and the international consultants have been the main driving force for activities carried out under this output. A greater involvement of NPMs, national experts and national institutions – in other words, a better country ownership - is necessary for achieving more sustainable results. Reports concerning the activities already carried out are dispersed in a number of separate documents (annexes to the Project Document, presentations, training reports, preliminary documents, mission reports) It is recommended to collate all the relevant reports and materials already drafted or under preparation in a well structured and consistent package for future reference and use for dissemination. This should include materials from the training courses on boiler technology which should be consolidated in a training booklet for future trainings.*

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

Status of implementation. The implementation of activities under this output is in advance state of completion. Review reports on boiler specification, carried out by different international consultants but not yet collated in a single document have been completed; some of the activities envisaged under this output were completed during the project preparation stage. It has to be noted that one of the activity carried out under this output (activity 1.2.3, investigation on the use of wood and other biomass fuel) overlaps with activity 3.2.2.

Recommendations: *as for output 1.2 a better country ownership is necessary for achieving more sustainable results. it is recommended to collate all the relevant reports and materials already drafted or under preparation in a well structured and consistent package for future reference and use for dissemination. It is necessary to verify overlapping among activity 1.2.3 and activity 3.2.2 with the sake to simplify project design by deleting one of the two activities. Activities 1.2.1 and 1.2.2 envisage studies on sectors tightly interrelated, and could be effectively integrated into one single activity, which could have as deliverable a single report containing fuel prices, boiler efficiencies, replacement costs, and cost of APCS. In addition, it is suggested to move activities 1.2.1. and output 1.2.2 as a single activity under output 1.1, and merge activity 1.2.3 with activity 3.2.2. In this way the whole output 1.2 would be redistributed under other outputs.*

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) (initial deadline: June 2011)

Results achieved. Most of the activities envisaged under Output 1.3 did not started or, if started, are still far from completion. An exception is represented by the Philippines, where a significant effort has been conducted to review and amend existing regulation: the Philippine Clean Air Act (R.A. 8749) provisions pertaining to dioxins/furans were reviewed; the Philippine Boiler Rule (Rule 1160 of the Labor Code) was also reviewed and amendments to this rule proposed to include environmental provisions on safety measures related to pressure, temperature and other operational conditions. In Cambodia, drafting the Ministerial Decision on boiler in Khmer is completed. The successful completion of activities under output 1.2 would greatly improve the sustainability of the project.

Recommendations. *It could be useful to hold a meeting / workshop to understand the status of activities related to the upgrading of national legislation and the willingness of the participant countries in upgrading / amending their legislation and in adopting amended legislation within the project timeframe. Considering that this output should have been completed at latest in June 2011, understanding the reason for the delay and possible countermeasure for ensure its successful completion it is crucial. This output is unnecessarily complex, and its activities should be rearranged in no more than 3 activities as detailed in Table 1*

Table 5 Evaluation table for Output 1.1. Overall averaged rating for attainment of objectives: MS

Activity Name	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	New Deadline set at inception	Status	eftv n	effic	rel	%	av g	S C O
Activity 1.1.1: Identify relevant health and economic issues of Section VI.D in each participating country.	Report on health and economic considerations	Report on economics of dioxin effects on health and environment (Int. experts)	Jun-10	Dec-12	Activity planned for 2013	-	-	-	-	-	-
Activity 1.1.2: Prepare and test guidelines to be used to optimize the collection and comparison of data.	Regional guidelines on collection of comparable data.	Energy outlook of countries (NPMs) BAT/BEP guidelines (int. experts)	Jun-10	Dec-13	Energy outlook reports drafted. Regional guidelines on the collection of comparable data were already drafted in the course of Project Preparation activities, and included as an annex in the PD (These guidelines are currently being updated).	4	4	4	100	4S	
Activity 1.1.3: Collect and report data on occupational accidents and occupational exposure to fugitive emissions related to industrial boilers.	Reports on occupational accidents	Reports on occupational accidents (NPMs)	Sep-10	Jan-12	In Thailand, a consultant has been assigned with the task to draft a report on "Occupational Accidents in Industrial Boilers in Thailand". Indonesia has in place a rule for "Zero accidents awards on boiler" Country reports on occupational accidents related with boiler and pressure vessel in Indonesia for period of January – July 2012 has been collected and submitted. Country reports on occupational accidents in other countries are under preparation. Difficulties have been found in establishing the causes of the accidents. In Lao and Cambodia no official data are available	2	2	2	30	2	MU
Activity 1.1.4: Draft regional BAT/BEP guidelines and guidance document by amending Section VI.D.	Regional guidelines on BAT/BEP	Regional BAT/BEP guidelines (NPMs, Int. experts, UNIDO)	Dec-10	Dec-13	Regional guidelines on BAT/BEP (Guidelines for sound operation of industrial boilers) – not only for operators but also for authorities – have been drafted. Still missing the section on power boiler and adoption by countries.	4	4	4	70	4S	
Activity 1.1.5: Publish and disseminate regional guidelines in English and local languages of the participating countries.		BAT/BEP publication (UNIDO, NCU)	Dec-10	Feb-13	Indonesia: Boiler Act and Accreditation Competencies for Boiler Operator and Inspector have been translated to English version, submitted to UNIDO HQ; Thailand, Philippines and Indonesia have existing boiler regulations. Indonesia has revised boiler act which included provision on environment subject to parliament approval. Philippines to meet with agencies to harmonize existing act to include environmental concerns. PCD- Thailand is drafting the Guidelines for Dioxin reduction for boiler s. Cambodia drafted a ministerial decision on boiler in the process of approval. Laos amended Environmental Protection Law to include Cleaner Production approved by National Assembly. Ministry of Industry developing Boiler safety Management Agreement	3	3	3	60	3	MS
Activity 1.1.6: Targeted training programs in application of regional guidelines.	Two regional training programs and at least 20 trainees at each on regional		Mar-11	Apr-13	Training sessions hold by M. Gobbi on November 2012 in Cambodia on the following aspects: Boiler basics; Improving efficiency in existing boilers; Boiler safe operation; Boiler room care; Boiler safety - accidents –codes; Boiler maintenance tips; Pollutants emitted from industrial boilers; Occupational health and safety risks; Smoke control; Excess air control	3	4	3	40	3	MS

Table 6 Evaluation table for Output 1.2. Overall averaged rating for attainment of objectives: S

<i>Activity Name</i>	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	New Deadline set at inception	Status	efftn	effic	rel	%	avg	SCO
<i>Activity 1.2.1: Compare fuel prices and boiler efficiencies in the market for different types of boilers</i>	Boiler specifications upgraded including achievable dioxin/GHGs emission limits	Report on boiler and fuel prices	Jun-10		(Accomplished) Review report of boilers specifications (Carried out by Aler Abit, UNIDO) activities also carried out by PET but not merged in a single document . The Philippines submitted final report on the survey of biomass market issues and trends of use as boiler fuel	4	4	4	100	4	S
<i>Activity 1.2.2: Estimate replacement costs versus increasing efficiency for different types of boilers.</i>		Report on estimates	Sep-10	Apr-12	This activity has been carried out in the project preparation stage, and detailed under Annex 7 (Dioxin Reduction and Cost Effectiveness Analyses of Pilot Demonstration Cases) and Annex 8 (Simultaneous reduction of Dioxins and CO2 from fossil fueled utility and industrial boilers in response to Stockholm Convention and Climate Change requirements) of the project document. A worksheet on cost replacement also drafted (to be consolidated). Reports on this activity included in mission reports from MG ("Potential investments for retrofitting/replacing industrial boilers in ESEA countries" and "Sensitivity analysis of the effect of change of boiler efficiency and emission factors values on calculations of release of PCDD/PCDF" Documents prepared before project start, to be updated and consolidated	4	2	4	90	3	MS
<i>Activity 1.2.3: Investigate the use of wood and other biomass fuels in the boiler sector</i>	Market study on fuel prices Technical studies on use of biomass fuels including estimates on dioxin/GHGs reduction	Country survey on market and trends of use NPMs, Nat. experts Report on biomass as related to GHG reduction c/o S. Chamsuk	Dec-10	Jul-12	Biomass inventory ongoing; a standard form drafted for ensuring inventory consistency. Philippines submitted final report on biomass and spent oil-fired boilers including economics of shifting from diesel to biomass fuel. Some documents are the same with documents for activity 3.2.2. In Indonesia questionnaires have been sent to 38 companies as per September 2012, and a report is currently under peer review by UNIDO HQ. Laos: a report has been drafted on availability of coal (not very relevant to biomass)	4	3	3	80	3	MS

SCO=Score; efftn = effectiveness; effic = efficiency; R = relevance; % accomplishment

Table 7 Evaluation table for Output 1.3. Overall averaged rating for attainment of objectives: MS

Activity Name	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	New Deadline set at inception	Status	eftvn	effic	rel	%	avg	SCO
Activity 1.3.1: Identify and assess existing government policies related to Section VI.D and the relevant parts of Section VI.E.	Government policies and regulations adopted to facilitate BAT/BEP implementation	Translated version of Thai Boiler Act and Boiler Certification Framework (Thailand) Distribution of Indonesia Boiler Act and Boiler certification Framework (Indonesia)	Dec-10	Feb-12	An international consultant has been assigned with the task to collect all the country regulations and carrying out gap analysis with reference to international regulation. In Cambodia, MIME (Ministry of Industry, Mining and Energy) is developing a legislation related to boiler safety. That will cover also emission of PCDD/F. A report In the Philippines, the Philippine Clean Air Act (R.A. 8749) on provisions pertaining to dioxins/furans was reviewed; the Philippine Boiler Rule (Rule 1160 of the Labor Code) was also reviewed and amendments to this rule proposed to include environmental provisions on the rule on top of safety measures related to pressure, temperature and other operational conditions. In Cambodia, Drafting the Ministerial Decision on boiler in Khmer is completed. (Translation in English is ongoing). A report on the situation of boiler, including legislation, has been drafted. Mongolia: The gaps between Mongolian and Indonesian boiler acts are analysed and submitted to UNIDO. Existing relevant legislation translated to English.	3	3	4	60	3	MS
Activity 1.3.2: Analyze gaps in existing standards, regulations and market based incentives relevant to the boiler sector.	Enforcement mechanisms at government level in place	Workshop on targeted government officials - MoE and Manpower/Labor and Employment/Ministry of Industr (NCUs, UNIDO)	Dec-10	Dec-12		3	2	4	60	2.5	MS
Activity 1.3.3: Enhance existing enabling government policies on the above to be implemented at government level with specific reference to Boiler Act..				Dec-12	One of the activities foreseen in Thailand under activity 1.3.3 of this output, was the analysis and translation of the "Law regulating boiler from Thai to English". This activity is mentioned in several meetings (6 January, 2011; March 21, 2011; April 7, 2011), but is still ongoing as of December 2012. The Thailand Pollution Control Department is currently drafting a notification which will contain obligations on boiler. These will be mostly based on the UNEP guidance Documents not transmitted to the evaluators. Boiler Act and Accreditation Competencies for Boiler Operator and Inspector have been translated to English version, submitted to HQ and distributed to all participating countries. Thailand, Philippines and Indonesia have existing boiler regulations. Indonesia has revised boiler act which included provision on environment subject to parliament approval. Philippines to meet with agencies to harmonize existing act to include environmental concerns. PCD- Thailand is drafting the Guidelines for Dioxin reduction for boiler s. Cambodia drafted a ministerial decision on boiler in the process of approval. Laos amended Environmental Protection Law to include Cleaner Production approved by National Assembly. Ministry of Industry developing Boiler safety Management Agreement	3	3	4	60	3	MS
Activity 1.3.4: Publish and disseminate approved policies, regulations and standards in English and local languages of	Publish and Disseminate policies	Policy on Boilers (NCUs, UNIDO)	Jun-11	Oct-13	Activities mainly related to activity 1.3.5	3	3	3	70	3	MS

the participating countries.											
<i>Activity 1.3.5:</i> Targeted training programs in applying those policies, regulations and standards.	Two regional training programs and at least 10 trainees at each on policies, regulations and standards	(NCUs, UNIDO)	Jun-11	Dec-13	In the Philippines, 2 awareness-raising workshops (1 scheduled on Feb. 2013) were conducted with program including environmental policies on boilers, and safety and regulatory standards. Agenda, reports and list of participant not transmitted to the evaluators. Workshop ppt. files prepared by one international consultant available	3	4	4	100	3.5	S

SCO=Score; efftn = effectiveness; effc = efficiency; R = relevance; % accomplishment

7.3. OUTCOME 2 : POLLUTION PREVENTION MEASURES (CLEANER PRODUCTION) APPLIED PRIOR TO INTRODUCING BAT/BEP (ANNEX C, PART V, A)

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.

Results achieved: Under this output, the main achievement have been the update of boiler inventory (the Philippines and Mongolia), the compilation of a technology market survey for air pollution control system, the completion the procurement of a boiler to be delivered to Cambodia, and Technical Specification drafted for a second plant in Mongolia.

Recommendations: *This output is unnecessarily complex, as it envisages 6 activities, which could be effectively rearranged into a maximum of three activities: 1) inventory update, 2) desk studies for the definition of technology specifications, including feasibility studies 3) procurement. Indeed, procurement of boilers could also be moved to output 3.3. Awareness raising activities are not considered relevant to procurement, and in any case should be conducted under the specific awareness raising output 4.2. It is therefore recommended to delete activity 2.1.6 and to include the relevant part of awareness raising under output 4.2. It has also to be noted that from the analysis of the TORs, no mechanism for the incentives envisaged under activity 5.1.1 "Implement incentives for promotion technology transfer and investment through PPP" could be identified.*

7.4. 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 (initial deadline: March 2011).

Results achieved: No information were provided on activities under this output.

Recommendations. *This output seems a duplication of activities being carried out under other outputs/activities. For instance, activity 3.1.1 (Prepare baseline studies on industrial boilers by processing data collected through questionnaires;) seems a duplication of activity 2.1.1 (Assess and classify boilers in the ESEA region according to their capacity and fuel use) which indeed has as OVI "Updated inventory". In addition, is not meaningful to have the publication of reports under this activity as a further, separate activity. It is recommended to change project structure by deleting the whole Output 3.1. and adding tasks under activity 3.1.1 and 3.1.2 under activity 2.1.1.*

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 (initial deadline: September 2011).

Results achieved: Except for the demonstration of BAT / BEP, which is experiencing delay in implementation, most of the activities envisaged under this output have been completed or are under completion. Philippines submitted a final report on biomass and spent oil-fired boilers including economics of shifting from diesel to biomass fuel (Market & Trends of Woods & Biomass As Boiler Fuel Philippines Final Draft) A Draft Study Report has been drafted by the Lao PDR working group on "Waste Vegetable Oil and Waste Lubricant Oil in Lao PDR" A report has been drafted concerning the "Biomass Inventory in Mongolia". This is a simple though comprehensive report, which includes data and strategic considerations, A report on the inventory of low pressure furnace in Mongolia was also made available (Inventory on low pressure stoves and Boilers in Mongolia). this is a detailed report on low pressure furnace boilers, including data analysis and consideration, However, this is the same report constituting the activities on inventory update. A biomass report drafted by Indonesia is currently under review by UNIDO HQ.

Recommendation: *The study of biomass fuel should better identify sustainability issues deriving from the exploitation of biomass, and quality criteria for biomass. The study concerning spent oil should include methodologies / proposal for identifying contamination of PCBs in spent oil, and establish criteria. Proper dissemination of these reports, after their peer review, should be ensured. The reports could be arranged in a single integrated publication for dissemination*

Table 8 Evaluation table for Output 2.1. Overall averaged rating for attainment of objectives: MS

Activity Name	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	New Deadline set at inception	Status	efftn	effc	rel	%	avg	SCO
Activity 2.1.1: Assess and classify boilers in the ESEA region according to their capacity and fuel use.	Updated inventory	Updated Inventory based on fuel type and capacity	Sep-10	Jul-12	Inventory on boiler in the ESEA region performed with need of updating. Document "Type of power and industrial boilers in the ESEA region" attached to the Project Document. Philippines: the final report on the update of the inventory of boilers in the Philippines was submitted (Inventory update of Industrial Boilers in the Philippine).. Mongolia: the final report on the update of inventory of boilers in the country submitted (Inventory of Low Pressure Stoves and Boilers in Mongolia)	3	2	3	50	2.5	MS
Activity 2.1.2: Identifying the abatement technologies in use	PP/CP methodology guidelines document	Identify abatement technologies	Sep-10	Jul-12	Scarce information on the abatement technologies in use found, mainly due to the reason that the use of them is rare. Information reported in the document "Type of power and industrial boilers in the ESEA region" and in "ABATEMENT TECHNOLOGIES AND MARKET SURVEY OF TECHNOLOGIES	4	4	5	100	4	S
Activity 2.1.3: Carry out market survey for appropriate technologies and boiler technology providers.	Information material on appropriate, affordable and feasible technologies in ESEA region		Sep-10		Market survey carried out (ask Gobbi for further data) A document named "Considerations on boiler efficiency improvement and related investments" drafted.A document named "Reduction Of Dioxins And C02 In Industrial Boilers In The Esea Region" also drafted.	4	4	4	100	4	S
Activity 2.1.4: Draft, approve and implement non-binding procurement guidelines for environmentally sound boilers as appropriate.	Procurement guidelines (intern. Experts)		Dec-10	Mar-14	Bidding completed for Cambodia, and Technical Specification drafted for a second plant in another country. Procurement guidelines drafted and approved (ask UNIDO for final document)	3	2	3	40	2.5	MS
Activity 2.1.5: Publication and dissemination of non-binding procurement guidelines.			Dec-10	Mar-14	Bidding document published for procurement purposes – not for dissemination.	4	2	3	80	3	MS
Activity 2.1.6: Hold awareness workshops for disseminating the procurement guidelines..	At least 2 awareness raising workshops in each of the participating countries		Jun-12	Mar-14	Limited dissemination. Awareness raising workshop specifically on bidding guidelines probably unnecessary as an awareness raising activity already exist. BAT/BEP boiler topic is part of training material.	3	3	3	40	3	MS

SCO=Score; efftn = effectiveness; effc = efficiency; R = relevance; % accomplishment

Table 9 Evaluation table for Output 3.1. Overall averaged rating for attainment of objectives: U

Activity Name	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	New Deadline set at inception	Status	eftvn	effic	rel	%	avg	SCO
Activity 3.1.1: Prepare baseline studies on industrial boilers by processing data collected through questionnaires;	Six national baseline reports on fossil fuel-fired utility and industrial boilers	Boiler inventory updated (NPMs)	Dec-10	Jul-12	Indonesia: Questionnaire sent to 17 new companies; Mongolia (see activity 3.2.4) and Philippines have finished the boiler inventory in 2012. Rest of countries have started with inventory.	3	3	3	50	3	MS
Activity 3.1.2: Produce relevant publications on the above studies	Regional baseline report on fossil fuel-fired utilities and industrial boilers	Publication	Mar-11	Sep-12	No info	0	0	3	0	0	HU

Evaluation table for Output 3.2. Overall averaged rating for attainment of objectives: MS

Activity Name	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	New Deadline set at inception	Status	eftvn	effic	rel	%	avg	SCO
Activity 3.2.1: Prepare, undertake, report, publish and disseminate specific studies on fish residues as fuel in seasonal use in Cambodia fuel.	At least five published specific technical studies addressing specific features of participating countries	Publication	Sep-11	Dec-12	A consultant has been recruited. The study is being currently carrying out.	2	2	3	50	2	MU
Activity 3.2.2: Prepare, undertake, report, publish and disseminate specific studies on use of spent/used oils as boiler		Publication	Sep-11	Dec-12	Philippines submitted final report on biomass and spent oil-fired boilers including economics of shifting from diesel to biomass fuel (Market & Trends of Woods & Biomass As Boiler Fuel in the Philippines Final Draft) A Draft Study Report has been drafted by the Lao PDR working group on "Waste Vegetable Oil and Waste Lubricant Oil in Lao PDR"	4	4	3	100	3	MS
Activity 3.2.3: Prepare, undertake, report, publish and disseminate specific studies on use of biomass fuels.		Publication	Sep-11	Dec-12	A report has been drafted concerning the "Biomass Inventory in Mongolia". This is a simple though comprehensive report, which includes data and strategic considerations. Philippines also submitted a report.	4	4	4	100	4	S
Activity 3.2.4: Prepare, undertake, report, publish and disseminate specific studies on low pressure furnaces and coal stoves in Mongolia, etc		Publication	Sep-11	Dec-12	A report on the inventory of low pressure furnace in Mongolia available (Inventory on low pressure stoves and Boilers in Mongolia). this is a detailed report on low pressure furnace boilers, including data analysis and consideration, However, this is the same report constituting the activities on inventory update.	4	4	3	100	3	MS

SCO=Score; efftn = effectiveness; effc = efficiency; R = relevance; % accomplishment

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 (Deadline: march 2014 for the last sampling activity)

Results achieved: Industrial boiler and power plant for the project demonstration activities have been selected, and Terms of Cooperation signed for all the participating countries . Need to revise some of the agreement emerged as a consequence of monitoring results (very low level of PCDD/F). Sampling and analysis conducted in 5 countries: Cambodia, Indonesia (two sampling rounds, Lao PDR, Philippines, Thailand. This was one of the two most demanding tasks of the project, as it envisaged 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 a number of different industrial facilities. In general, the concentration of the PCDD/F in the stack gas of the industrial plants, with one exception (the Great Honor plant in Cambodia), was much lower than the expected values. Additionally, the report drafted by the international expert brings some concerns about the reliability of the results: *“the uncertainties concerned with the adopted methods can raise some doubts on their correct application”*

Recommendations. *Due to the very low concentrations measured in the stack gas of some of the plants (for instance, the Suralaya power plant), quantifying the effect of the implementation of BAT/BEP in term of measured reduction of PCDD/F may prove difficult. Due to uncertainty of PCDD/F analytical results in the low range of the sensitivity of the analytical methods, and due to the unaddressed uncertainty of emission factors for boilers, it may even happen that a higher concentration will be measured at the stacks after BAT/BEP implementation. That would make impossible certifying the achievement of a reduction of 0.31 g TEQ for the pilot facilities. Therefore, it is suggested to consider the analysis at the stack as a demonstrative exercise, carried out with the main purpose to increase countries capacity in U-POPs monitoring, and verifying compliance with the recommended limit at the stack after implementation of BAT/BEP. In the absence of a proper QA/QC system, it is therefore recommended to amend the OVI for activity 3.3.4 as following:*

“Approximate reduction of 0.31 g TEQ/year from pilot cases, estimated on the basis of reliable emission factors relevant to the situation before and after BAT/BEP implementation, and supported by the evidence of low emission at the stack after implementation of BAT/BEP”

Where resources are enough, it is also recommended to tightly supervise – with the assistance of international experts or by means of duplicate sampling and analysis – the whole process of sampling and analysis at least in the most difficult or contradictory cases.

Table 10 Evaluation table for Otput 3.3. Overall averaged rating for attainment of objectives: S

<i>Activity Name</i>	Objectively Verifiable Indicator	Task assigned after inception (responsible party)	Deadline	New Deadline set at inception	Status	eftvn	effic	rel	%	avg	SCO
<i>Activity 3.3.1: Identify criteria for boiler types selection.</i>	Criteria for boiler types selection and characterization of selected fossil fuel-fired utilities and industrial boilers	Criteria	Jun-11		(Fully accomplished) Criteria have been identified in the course of PPG and listed in the PD. A report "Industrial Boiler Selection" drafted.	4	4	4	100	4	S
<i>Activity 3.3.2: Select representative boilers in each participating country for demonstration.</i>	Maximum of 12 pilot demonstration cases for the project duration	Representative boilers Drafting of TOC with pilot facility	Jun-11	Dec-11	Cambodia: Terms of Cooperation signed with Great Honour Textile Factory. Indonesia: agreement with the Suralaya Power Plant - new TOC to be defined with other industries. Philippines: Terms of Cooperation signed with Masinloc Coal-fired Power Plant. Lao PDR: Terms of cooperation signed with Lao Agro Industry Co, Ltd, (Food Processing Factory) Thailand: terms of cooperation signed with the Oleen factory, and Red Bull factory	4	3	4	70	3.5	S
<i>Activity 3.3.3: Modify and/or optimise technology parameters of selected boilers</i>		Optimization	Mar-14	Dec-13	In the Philippines, BAT/BEP measures to be implemented were discussed and agreed with the plant management. The implementation of agreed BEP measures has been set on March 2013 during the scheduled maintenance shutdown. In Cambodia, the Project will consist in replacing the old boiler installed at Great Honor Textile Factory with a new boiler, and undertake all necessary measurement to test the performances of the old and new boiler with particular reference to the efficiency improvement and related economics, and to reduction of pollutants emissions, with particular reference to carbon dioxide, dioxins and mercury. In Indonesia, Short list of suggestion for BAT/BEP implementation has been drafted. Options range from the coal feeding and mixing, selection of better coal, improve of oxygen ration, selection of alternative pilot facilities.	3	2	5	30	2.5	MS
<i>Activity 3.3.4: Set up and carry out pilot monitoring programmes for a few selected boiler types at power generation and industry sectors.</i>	At least 24 monitoring programs performed in 12 selected facilities before and after BAT/BEP. Approximate reduction of 0.31 g TEQ/year from pilot cases and fuel savings of USD 1.3 m/year. At least 48 analytical tests performed	Pilot monitoring programs (int. experts, UNIDO)	09/2011 (I), 06/2012 (II) 03/2013(III) 03/2014(IV)	Dec-13	Term of references for procuring sampling and analysis services drafted for Cambodia, Indonesia, Lao PDR, Mongolia, Philippines, Thailand. Sampling and analysis conducted in 5 countries: Cambodia, Indonesia (two sampling rounds)-G2, Lao PDR, Philippines, Thailand. Difficulties to demonstrate PCDD/F reduction due to sampling and analytical issues. In Indonesia, 1st and 2nd sampling results showed that Dioxin and Furan emission is below minimum emission limit. Therefore, the team decided to discontinue BAP/BEP implementation with Suralaya Pilot Plant.	4	4	5	40	4	S

SCO=Score; eftvn = effectiveness; effc = efficiency; R = relevance; % accomplishment

7.5. OUTCOME 4: ESTABLISHED REGIONAL COORDINATION OF DEVELOPING HUMAN RESOURCES

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 (deadline: September 2012).

Results achieved: Relevant institutions identified in Cambodia, Thailand, Indonesia and the Philippines. Part of the envisaged training course carried out in the same countries.

Recommendation. *Although some of the envisaged training activities have been carried out, most of the activities on training have still to be arranged. The mechanism for training evaluation and reporting is apparently not in place. It is suggested to establish the following formats for measuring and improving training effectiveness: 1) ensure proper registration of trainees; 2) measure the level of knowledge of trainees before and after the training, by means of tests and questionnaire; 3) measure the level of proficiency of the trainers, by means of questionnaire to be filled by the trainees.*

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, educational institutions and for the public at large (initial deadline: June 2013)

Results achieved. The awareness raising activity was mainly based on the dissemination of project brochures, and on Awareness Workshops carried out in Lao PDR, Mongolia, the Philippines.

Recommendation. *Awareness raising activities should be carried out in all countries. If resource are available, a second awareness raising cycle, more focused at identifying solutions for the widening of the "green boiler" market, should be carried out.*

7.6. OUTCOME 5: ADEQUATE CAPACITY IN SAMPLING AND ANALYSIS OF UP-POPS

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 (initial deadline: June 2011)

Results achieved. Based on information collected, the activity carried out under output 5.1. was mainly aimed at identifying laboratories for conducting sampling and analysis of U-POPs. A very useful report on the POPs monitoring capabilities of the ESEA countries, pointing out available capacity and existing needs, has been drafted by the international consultant. On the other side, the summary of analytical methods for U.POPs is considered less necessary given the amount of already available literature published,

Recommendation. *Recommendation on training as for output 4.1.*

Output 5.2: Promotion of technology transfer and investment by identification and implementation of innovative mechanisms for PPPs (Deadline: June 2012).

Results achieved: no information on this activity reported. It should be noted that, on the basis of examination of TOR, no mechanism for the implementation if incentive for public private partnerships (PPP) has been identified.

Recommendation. *It should be verified whether the activities envisaged under this output are still considered useful or feasible by the countries. If indeed activities under this output have been carried out, these should be reported. Otherwise, the output should be deleted and the resources moved to other activities (monitoring or procurement of boilers)*

Table 11 Evaluation table for Output 4.1. Overall averaged rating for attainment of objectives: MS

Activity Name	Objectively Verifiable Indicator	Task assigned at inception (responsible party)	Deadline	New Deadline	Status	efftn	effic	rel	%	avg	SCO
Activity 4.1.1: Identify relevant institutions in the energy sector that are able to provide training in the boiler sector.	At least 2 training institutions in ESEA region for the boiler sector s	2 trainings (UNIDO in cooperation with Spirax Sarco)	Sep-10	Feb-12	Cambodia: A Cooperation Agreement has been signed between Institute of Technology of Cambodia , Ministry of Environment and UNIDO Thailand: the Center of Excellence for Environmental and Hazardous Waste Management (EHWM) will incorporate the guideline on BAT/BEP into a Master degree environmental management course as a two- - hour topic "Energy Consumption & Its Adverse impacts on Climate Change and Environmental Health" in order to reinforce the understanding on BAT/BEP. Moreover, special course is also taught at Map Ta Phut area by National Institute of Development Administration (NIDA).Indonesia: TOC with Sultan Ageng Tirtayasa University has been signed. TOC with Gadjah Mada University has been prepared and submitted to GMU to be reviewed Pre communication with Sepuluh November Institute of Technology for the TOC agreement of Boiler Curriculum was conducted. Prof. Laurito will do the TOT. MOU with UNTIRTA signed in October and we have signed MOU in november at UGM. Training material already prepared by prof Laurito.	4	4	3	100	3	MS
Activity 4.1.2: Training of trainers including development of university curricula on environmentally sound boiler technologies.	At least 12 training courses and at least 40 trained staff At least 6 universities that introduce new curricula In-plant training material	Training Drafting of TOC with University partner.(UNIDO and curriculum experts)	03 2011	Mar-12	Cambodia: A presentation concerning boiler occupational health an safety have been held in Cambodia by one of the international experts (MG) Thailand: Training of Trainers: Green Boiler Technology Workshop held in Bangkok, Thailand, 19-20 November 2012 – participants from all project countries. Indonesia: MOE (two personnel) and Sultan Ageng Tirtayasa University participations in the Training of Trainer on Boiler Curriculum. Mongolia and Laos: Two engineers from selected pilot faculty (Mongolia) and 3 persons from the pilot facilities has been chosen for the Spirax Sarco training at Singapore. Two faculty members from Mongolian University science and technology along with the national project manager were trained on the course being implemented at the Faculty of Engineering, University of Santo Tomas, Manila, Philippines and the TOC with the partner University is signed.	3	2	3	15	2.5	MS
Activity 4.1.3: Assess training needs and identify required training programs related to BAT and BEP. of private and public sectors.		(UNIDO)	Jun-11	Jun-11	All the participating countries sent their representative to Italy for a study tour where visits were arranged to the Ansaldo manufacturing plant, combustion facilities, clean coal facilities. Tthe main objective of the training and facility visit was to introduce operations of facilities employing BAT/BEP in order to optimize their operations. It was also aimed at introducing technologies that maybe used to clean fuel and improve plant efficiency.	3	3	3	50	3	MS
Activity 4.1.4:		Refer to 1.3.2 -1.3.3 and 4.1.1	Sep-12	Sep-12	Incorporated in 1.3.2, 1.3.3. and 4.1.1						

SCO=Score; efftn = effectiveness; effc = efficiency; R = relevance; % accomplishment

Table 12 Evaluation table for Otput 4.2. Overall averaged rating for attainment of objectives: MU

<i>Activity Name</i>	Objectively Verifiable Indicator	Task assigned at inception (responsible party)	Deadline	New Deadline	Status	eftvn	effc	rel	%	avg	SCO
<i>Activity 4.2.1:</i> Identify target groups according to their involvement in the boiler sector. .		Regional – review of Philippine brochure (<i>Philippines to revise/UNIDO to print</i>) National – information materials (<i>NPMs / national experts</i>)	Jun-11	Dec-11	Target groups from all countries have been identified during the early stages of project implementation	4	4	4	100	4	S
<i>Activity 4.2.2:</i> Produce awareness raising materials for each target group and information materials for the public at large.	Awareness raising campaign materials produced in local language		Sep-11	Nov-11	Indonesia reports this activity as completed. Mongolia: Brochure about dioxin and furan in Mongolian printed. A15 min video about dioxin and furan filmed. Lao PDR: 1.000 copies of of project brochures printed and distributed; a National Awareness workshop on Combating POPs through Application of BAT/BEP for Industrial Boiler Sector carried out from 7-8 August 2012 ; In cooperation with department of Pollution Control (MoNRE) one awareness training program for high school teachers and student in Vientiane Capita (80 Participants). Cambodia: project brochures printed.	3	3	3	0	0	MS
<i>Activity 4.2.3:</i> Carry out regular awareness raising campaign	At least two targeted awareness raising campaigns in each participating country	Identify national partner to carry out specialized awareness raising and design information materials (<i>NPMs</i>) Carry out at least 3 awareness raising campaigns (targeted-professional org, academe, NGOs, women's group etc (<i>NPMs – national partners</i>))	Dec-12	Dec-12	Mongolia: an awareness workshop for customs officers and specialized inspectors from Zamiin-Uud port organized. the following targeted workshops conducted: Cambodia – 1 general, 1 boiler operators, Indonesia 1-general; Mongolia – 1 general, 1-local authorities; Philippines 2-general; Thailand – 1 general, 2-academie, 2-industrial sectors	3	3	4	60	3	MS

SCO=Score; eefftn = effectiveness; effc = efficiency; R = relevance; % accomplishment

Table 13 Evaluation table for Otput 5.1. Overall averaged rating for attainment of objectives:MS

Activity Name	Objectively Verifiable Indicator	Task assigned at inception (responsible party)	Deadline	New Deadline	Status	eftvn	effc	rel	%	avg	SCO
Activity 5.1.1: Review all main international guidance documents on POPs monitoring.		(international experts)	Mar-11	Dec-11	A report on methods for U-POPs monitoring drafted by an international consultant. (this report is probably unnecessary considering the amount of technical literature available)	4	4	3	100	3	MS
Activity 5.1.2: Produce summary of the monitoring guidance documents for adoption and use in the ESEA region.			Mar-11	Dec-11	Activity conducted under 5.1.1	4	4	3	100	3	MS
Activity 5.1.3: Survey existing monitoring capacity in the ESEA region.	At least two certified monitoring laboratories in the region		Mar-11	Dec-11	A preliminary survey conducted and used for the identification of possible labs. A report on "Report on UP-POPs monitoring capabilities in ESEA countries" drafted by an international consultant. This is an excellent report which is very useful for further activities in the area.	5	4	4	100	4	S
Activity 5.1.4: Carry out training in sampling;	Two regional training courses in monitoring	PUSARPEDAL (Indonesia) and ERTC(Thailand) staff to be sent on fellowship	Mar-11	May-12	Training on sampling carried out by the international expert on sampling and monitoring.	4	4	4	100	4	S
Activity 5.1.5: Carry out training in analysis;	At least 2-3 technicians trained in sampling and analytical testing	NPMS, pilot facilities, academic staff to be sent for general training	Jun-11	Apr-12	Technicians from the pilot countries were sent to Tsinghua University, China to train in the sampling and analysis of dioxins/furans.	4	4	4	100	4	S

Table 14 Evaluation table for Otput 5.2. Overall averaged rating for attainment of objectives:HU

Activity Name	Objectively Verifiable Indicator	Task assigned at inception	Deadline	New Deadline	Status	EV	ER	%	A)	B)	C)
Activity 5.2.1: Identifying economic incentives to create enabling environment for innovative PPP mechanisms.			Jun-11		There are no tracks or information concerning the outcome of the talking on this aspect. Philippines and Thailand has existing incentive mechanisms on fuel switching/clean fuel use. Local banks in Philippines has loan window for local companies. UNIDO held several discussions with ADB on provision of loans.	1	1	3	20	1	U
Activity 5.2.2: Implement incentives for promotion technology transfer and investment through PPP	Number of participating countries that introduce PPP incentives		Jun-12		There are limited information concerning the introduction of PPP incentives in any country. Implementation of a PPP mechanism does not emerge from the bidding documents drafted. Under this activity, Mongolia reports the purchase of a dioxin sampler from WESTECH, UK (more relevant to output 5.1)	1	1	3	10	1	U

SCO=Score; eftvn = effectiveness; effc = efficiency; R = relevance; % accomplishment

7.7. OUTCOME 6: ESTABLISHED PROJECT MANAGEMENT OFFICE, STAKEHOLDER PARTNERSHIPS, AND RELEVANT MEETINGS

Output 6.1: Project management structure established (Deadline: March 2011)

Results achieved: although somewhat simpler than envisaged in the project document, the project management structure is in place. The project is supervised at country level by the National Project Managers; UNIDO HQ relies on the support of a team of international consultants on all the technical aspects related to the boiler technology, and on all the technical aspects related to sampling and monitoring of U-POPs, and on on the development of curricula and training.

It is not very clear how the advisory function of the ESEA FB were implemented, as that did not emerge either from the examination of project reports or from the interviews.

All the National Project Managers monitor the project properly by drafting and submitting to UNIDO HQ quarterly and annual progress reports and project work-plans. In general these reports are informative and follow the standard; in some cases the report are detailed up to the activity level and included attachments and proper references. In few cases the annual reports are not informative or contain information which is not very relevant and which instead should be placed into separate annexes (for instance, CVs of experts, job description, commercial proposals, etc.). There is the need to better communicate with the NPMs on the proper use of standard QPR and APR formats.

Table 15 Evaluation Table for Output 6.1.

Activity Name	Objectively Verifiable Indicator	Deadline	Status	Rating
Activity 6.1.1: Establish the Regional Forum Board (FB) and Regional Sector Technical Committee (RSTC) and appoint regional project coordinator.		06/2010	Initially, it was envisaged that The RSTC will be supported by the Regional Coordinator (RC), who should have been under the supervision of UNIDO and works closely with RSTC, and reports to both UNIDO and RSTC.. Currently, the role of RSTC in project implementation was quite limited	S
Activity 6.1.2: Establish Regional Coordination and National Coordination Units (R/NCUs).		06/2010	The recruitment of the RC did not materialize	S
Activity 6.1.3: Recruit the Regional Coordinator (RC), National Project Managers (NPMs) and technical experts to constitute.		03/2011	All the national project managers have been recruited.	S
Activity 6.1.4: Establish the local project management offices in the participating countries		03/2011	Local project management offices in the participating countries established	S

Table 16 Evaluation table for Output 6.2: M&E framework of the project established

Activity Name	Objectively Verifiable Indicator	Deadline	Status	Rating
Activity 6.2.1: Hold project Inception		Jun-10	Accomplished	S
Activity 6.2.2: Prepare Inception Report		Jun-10	Accomplished	S
Activity 6.2.3: Measure impact indicators on annual basis		06/2011, 06/2012, 06/2013	Not communicated	U
Activity 6.2.4: Prepare Annual Project Reports and Project Implementation Reports		06/2011, 06/2012, 06/2013	Partially accomplished	MS
Activity 6.2.6 Hold annual Tripartite Review meetings		06/2011, 06/2012,	First review meeting in Bangkok on October 2011 Second Review meeting held in Vienna in October 2012	S

		06/2013		
Activity 6.2.7: Carry out mid-term external evaluation		Mar-12	Ongoing	NE
Activity 6.2.8: Carry out annual project financial audits		06/2011, 06/2012, 06/2013	UNIDO projects undergo external auditing annually. Projects finances available.	S
Activity 6.2.9: Carry out annual visits to selected field sites		06/2011, 06/2012, 06/2013	Ongoing	HS
Activity 6.2.10: Establish a project management information system (MIS) including project website to disseminate information to the stakeholders.		03/2014	Website of the ESEA Forum where the project is appended is available	MU
Activity 6.2.11: Carry out final external evaluation		03/2014		
Activity 6.2.12: Complete project terminal Report		03/2014		

8. RELEVANCE

As stated in Chapter 5.1, the project general objectives, its expected output and outcomes are to be considered very relevant either from the point of view of the SC requirements, or with reference with the GEF POPs focal area objectives. In addition, most of the objective and outcomes are clear, practicable and feasible. The activities carried out are in most cases relevant to the objectives of each activity; therefore the project relevance scores as S Satisfactory.

In your view, were the project's objectives and components clear, practicable, and feasible within its time frame?	With few exceptions, the project objectives are considered clear and feasible. Main difficulties were found in reaching an agreement with power plant pilot facilities, due to several issues including interruptions in their operations, confidentiality in the disclosure of sampling results, whilst the cooperation with academic institutions is considered as easier. There are also issues on the availability of some data.
Is the project relevant to national development and environmental agendas?	The project is considered very relevant by all the project managers. In Cambodia, MIME is developing a legislation related to boiler safety. That will cover also emission of PCDD/F. In the Philippines the goal of the project stems from the provision on dioxins/furans in the Clean Air Act (Republic Act 8745). The growth of Philippine economy which calls for even higher energy demand makes the project very relevant to national development. In Mongolia it is considered very important to fill gaps on legislation which does not contain provision on dioxin
Were the capacities of the executing institution(s) and its counterparts properly considered when the project was designed?	Not all the project managers considered the capacities of the executing institutions and their counterparts properly taken into account, as the interaction with counterpart institutions in the project design stage was quite limited.
Were lessons from other relevant projects properly incorporated in the project design?	The participation of countries institutions on project design was limited. The evaluator considers that lesson from other relevant project was not fully incorporated in project design, with particular reference to the difficulty to demonstrate effectiveness of BAT/BEP by means of a limited number of sampling and analyses in countries where the analytical capacity is limited, which was already experienced in similar, though smaller, projects, like for instance the UNIDO bilateral project on BAT/BEP demonstration implemented in China and co-financed by China and Italy.
Were the partnership arrangements properly identified and roles and responsibilities	Notwithstanding the limited number of meetings with national institutions before project approval, the partnership arrangements established by the project are considered satisfactorily identifying roles and responsibilities

negotiated prior to project approval?	
Is the project relevant to target groups like companies, civil society, beneficiaries of capacity building and training?	All the target groups, contacted in the course of project implementation by the National Project Managers interviewed, considered the project relevant. The project represents an opportunity for pilot facility personnel and project partners which are sent to trainings abroad for capacity-building.
Was the project formulated with the participation of national counterpart and/or target beneficiaries?	The involvement of target beneficiaries in the project formulation was low. The involvement of national counterparts was fair; however the opportunity of exchange in the course of project design was not enough. The project was however based on the preliminary inventory of boilers in project countries, which ensured proper consideration of the needs of target beneficiaries.

9. EFFECTIVENESS

The project experienced delays due to some reasons: difficulties in achieving agreements with industrial partners; biddings difficulties; issues on the shipment of samples; slow start of training activities, with special reference with the establishment of training curricula; slow involvement in governmental stakeholders in reviewing relevant legislation and proposing amendments. Although none of these delays was so severe to endanger project results, nevertheless is necessary that a credible and practicable planning for ensuring that the remaining activities are completed within the deadline is drafted and agreed with all the project partners. It is probable that for the completion of some critical project activities (installment and testing of new boilers, second round of sampling and analysis, training, improvement of legislation) a limited extension is necessary. Rating for effectiveness is Marginally Satisfactory (MS)

Are the actual project outcomes commensurate with the original or modified project objectives?	The project experienced some delays. In Mongolia the first sampling was delayed because of bid failure, and there are currently delays for clearing custom procedures for shipping samples. In other countries, delays were caused by difficulties in achieving agreements with pilot facilities. With few exceptions, almost all the project activities are late.
Does the project impact significantly your country / organisation?	All the national project managers consider the project has a significant impact in the respective countries. The project pilot facilities have been selected based on the respective countries energy outlooks, therefore it proves to be very significant in the countries development and environmental agenda. Training activities, including the establishment of curricular course on boiler operations are considered very promising and important.
Do you see any catalytic or replication effect of the project?	As the project is a regional one, a replication model is already being built, because it will allow for the demonstration in a number of countries with diverse environmental and development capacities. At each country's level, the project catalyzes governments in the establishment of the proper regulatory and technical tools for reducing U-POPs in the boiler sector, although replication effects seems still far.

10. EFFICIENCY

The centralized execution by UNIDO HQ ensures that the activities are efficient in term of cost/value ratio. The activities related to the simultaneous implementation of measures aimed at reducing GHG emission, increase plant efficiency, and reduce U-POP emission are intrinsically efficient. However, the slow implementation of some activities has also an impact on their cost, therefore reducing their efficiency; the project structure is somehow unnecessarily and characterized by a quite high management cost. The project efficiency is rated MS (Marginally Satisfactory).

Was the project cost effective?	In general the project may be considered cost effective. First of all, benefits achievable with BAT/BEP are considered far greater than the cost paid for their implementation. A
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	sound analysis of cost effectiveness of the operations, especially on the side of pilot plants, should be carried out before project closure.
Was the project the least cost option?	In addition, it should be considered that at country level, the project had to deal with a limited budget for the replacement of small boiler or for the adoption of BEPs. Aware of this limitation, the project experts, in agreement with pilot facility owners, always selected - by means of a properly implemented bidding procedure - the options based on the best value/cost ratio.
Was project implementation delayed, and, if it was, did that affect cost effectiveness?	There was some delay, which however apparently had only a limited effect on the cost (variation of equipment price with time). Delay was mainly because of the following reasons: the time required for the legal departments of the parties to the term of cooperation to review the terms; bidding failures (Mongolia, analytical services); clearance of custom operations (Mongolia).
Have the donor, UNIDO and Government/counterpart inputs been provided as planned and were adequate to meet requirements?	On technical assistance: countries are satisfied with the inputs provided by UNIDO HQ and the international experts. Reportedly, the delivering of financial resources from UNIDO HQ (GEF), government/counterpart was smooth. The evaluator however recommend to put in place a satisfactory accounting mechanism for monitoring in kind and grant co-financing
Was the quality of UNIDO inputs and services as planned and timely?	Quality of UNIDO inputs and services are highly appreciated and provided as planned and also timely

11. STAKEHOLDER INVOLVEMENT

The involvement of stakeholders in the project is high. All the governmental stakeholders (Ministries/Department of Environment and/or Ministries/Department of Industry) are involved in the Project Steering Committees as Project Coordinators, and are constantly updated of the project progress thanks to the interaction with the National Project Managers. Industrial stakeholders are informed and are one of the key beneficiary of the project. There is still the need to establish a better coordination with relevant NGOs, addressing at the same time the confidentiality / public perception concerns raised by the Industries. In the table below, the analysis of stakeholder involvement resulting from interviews outcomes and evaluator considerations is reported.

Are the information generated by the project properly disseminated at the country level, and how.	Dissemination activities like publications and workshops were carried out. In Mongolia a video about dioxin was produced and broadcasted by TV. A better coordination and collation of all the dissemination material would be beneficial to the project.
What are the NGOs operating in the field of reduction of industrial emissions and air quality in the country?	There are several NGOs operating in the project countries, and it would be very important to consolidate the relationship with these organizations at least by sharing with them the main project objectives and achievements. The following have been mentioned by the National Project Managers: in the Philippines: Better Air Quality (BAQ), Greenpeace, Eco-waste Coalition; in Mongolia NGOs (name?) ; in Indonesia_ WALHI (Indonesia Forum for Environment) and YBUL (Foundation of Environment Development). in the other countries only limited NGOs activity is reported. NGOs have participated in trainings and awareness raising workshops in Cambodia, Lao PDR and Thailand. In Thailand, Environmental Engineering Association of Thailand, an NGO, co-organized the national environmental conference with UNIDO.
How and if these NGOs participated in project implementation and decision making	However, in general NGOs did not participate in project implementation and decision making, due to, in some cases, resistance from the government, and in other cases, confidentiality clauses in TOC (as NGOs are not parties in the TOCs)
How in your view participation of NGOs could be improved	As of now, a greater involvement of NGOs is not considered feasible, and no concrete proposal for increasing their involvement has been formulated. The project will endeavour to involve NGOs in relevant activities.
How partnership and collaborative relationships	Partnership and collaborative relationships has been developed by the project mainly in 2 ways: participation of the relevant institutions in meetings, workshops and

developed by the project with local, national and international entities has been established, and the effects they have had on project implementation.	trainings; signing of Terms of Cooperation
Which government institutions were involved in project implementation?	Cambodia: MIME, MoE, University of Phnom Penh, Institute of Technologies of Cambodia which belong to government sectors. The Philippines: The lead implementing government agency in the Philippines is the Environmental Management Bureau of the Department of Environment and Natural Resources (EMB-DENR), with the Energy Planning and Policy Bureau of the Department of Energy (EPPB-DOE), and the Bureau of Working Conditions of the Department of Labor and Employment (BWC-DOLE) in supporting roles. Mongolia: Ministry of Nature and Green Development; Ministry of Health is also somehow involved; Since August we have Ministry of Industry and Agriculture, not yet involved. In Indonesia: Ministry of Environment, Pusarpedal, Ministry of Energy and Mineral Resources and Ministry of Manpower and Transmigrations; in Lao PDR: Ministry of Natural Resources and Environment and Ministry of Industry and Commerce
How government institutions were involved in project implementation?	In the Philippines, EMB-DENR through its regional offices assisted in the identification of the prospective pilot facility, and in the conduct of the regional awareness-raising workshops. EMB-DENR provided the office space for the project. Other government agencies were instrumental in the gathering of the the necessary data for the surveys. EPPB-DOE provided the energy outlook of the country. BWC-DOLE, oversees the boiler registration and regulation in the country, provided data for the boiler inventory update. In Indonesia: MOE : Provide the office space, supporting the coordination with the private sectors etc.; MEMR : Provide the connection with the National Electric Company (owned by government), Ministry of Manpower and Transmigrations will help to disseminate the regulation on Boiler. In other countries, governmental institutions are involved in several ways (meetings, membership in project steering committees, etc.) In all participating countries, their respective Ministries of Industries and in some cases, Ministries of Energy were involved in the project activities especially on the drafting of regulations which is under their mandate.
To which extent the government supported the project?	The governments are in general very supportive to the project. In Cambodia, Ministry of Industry is responsible for boiler safety and they are very concerned due to the number of boiler. MIME is controlling and monitoring all boilers. In Mongolia, The government is supporting the project by building a Laboratory for Dioxin Analysis. In the budget of 2013 there is the provision for building such lab. In kind support includes providing office space and assistance on administrative tasks

12. COUNTRY OWNERSHIP AND 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 multicountry projects?	One of the thing that need to be positively highlighted is that the project document has been drafted on the basis of a significant analysis of the regional and national situations.. Preliminary inventory of boilers in the ESEA region, (Country Specific Detailed Analysis of the Fossil Fuel-fired Utility and Industrial Boiler Sector) cost analysis for the replacement or retrofitting of obsolete boilers, were carried out in the course of project preparation. Thanks to this careful design, the project concept is in line with countries sectoral and development priorities. Some lacking of coordination among relevant stakeholders is, however, observed by some of the National Project Managers.
Are project outcomes contributing to national development priorities and plans?	It is unanimously recognized that the project outcomes will contribute to the national development and plans in both the sectors of energy and environmental protection. In all the countries energy development is a key for the development of the economy. The number and size of boilers is increasing in several countries (for instance Cambodia) and the

	harmonization of economy growth with stringent environmental standards is crucial.
Were the relevant country representatives from government and civil society involved in the project?	Relevant country representatives from government are represented in all the countries. Civil society representatives are usually not represented "due to the delicate issue of results disclosure". This may represent an issue even on the side of future dissemination of project results.
Did the recipient government maintain its financial commitment to the project?	Preliminary information confirm that the co-financing from project institutions is maintained as envisaged in the project document. It is suggested to establish as soon as possible a set of co-financing accounting criteria to ensure proper representation of data at final evaluation
Has the government—or governments in the case of multicountry projects—approved policies or regulatory frameworks in line with the project's objectives?	Indonesia: Boiler Act and Accreditation Competencies for Boiler Operator and Inspector have been translated to English version, submitted to UNIDO HQ; Thailand, Philippines and Indonesia have existing boiler regulations. Indonesia has revised boiler act which included provision on environment subject to parliament approval. Philippines to meet with agencies to harmonize existing act to include environmental concerns. PCD- Thailand is drafting the Guidelines for Dioxin reduction for boiler s. Cambodia drafted a ministerial decision on boiler in the process of approval. Laos amended Environmental Protection Law to include Cleaner Production approved by National Assembly. Ministry of Industry developing Boiler safety Management Agreement.

13. SUSTAINABILITY

In the view of the evaluator, the following aspects need to be strengthened to ensure sustainability of project outcomes:

1. **Training.** The project training activities are still at their early stages. Although agreement has been established with national universities to develop curricula on general and specific aspects on environmentally safe management of boilers, the main driving force of the training are still the international experts recruited by UNIDO. There is the need to ensure the handover of the training activities from UNIDO HQ to national institutions.
2. **Legislation.** Project activities will be sustainable after project end as long as a legislation promoting the use of BAT/BEP compliant boilers will be in place. In the absence of regulatory instruments there is the substantial risk that activities promoted by the project will be discontinued once project ends. A substantial effort has been made in translating and in some cases analyzing the gaps of the current legislation with the SC requirements. However the results in term of new legislation proposed or at least discussed with the regulatory bodies are still limited to few participating countries.
3. **Development of financial mechanisms.** Although the investment costs of replacement of obsolete boilers with more efficient boiler may in some cases be repaid in short time due to the saving of fuels, small players may have not enough financial resources to afford the investment of obsolete boilers. Financial mechanisms should be studied to overcome this aspect.
4. **Raising awareness.** Several owners of small boilers are even not aware of the possibility to achieve economical benefit with replacing their boilers with more efficient and environmentally sound boilers. A proper awareness raising campaign, which is still missing, could significantly increase the sustainability of project activities. Confidentiality, public perception and relationships with the government may be an obstacle for big players in carrying out environmental and efficiency monitoring. The raising of awareness should show how the adoption of BAT/BEP could also facilitate the relationship with governmental institution and the public.
5. **Sustainable use of biomass.** As the project is promoting the use of biomass as an economic and environmentally sound energy source, it is considered urgent to include in all the guidance documents criteria for ensuring the true sustainability of biomass use and the quality of biomass used.
6. **Sustainability examples.** Finally, it should be noted that in the Philippines, the government offers various forms of incentives for boiler operators under the Philippine Renewable Energy Laws (R.A. 9513: Renewable Energy Act of 2008 and R.A. 9367: Biofuels Act of 2006). The experience

gathered in the application of this mechanism should be made available to the project as a possible example to be replicated in all the participating countries.

In the table below, the analysis of sustainability resulting from interviews outcomes and evaluator considerations is reported.

Has been a sustainability strategy implemented / planned?	In Cambodia, the strategy for sustainability includes: delivery of boiler management curriculum in the technology Institute, with the possible establishment of a "Boiler Institute". Experts involved in the project will work as teachers or expert in the future. Similar activities in other countries like Mongolia. Implementation of a sustainability strategy seems still far and should be more practically supported by the project.
Are market condition favourable for the diffusion of BAT/BEP boilers in your country?	In countries where the cost of fuel is high there is a bigger driving force toward the implementation of fuel saving technologies which at the same time can ensure the reduction of U-POPs emissions. However the cost small companies have to sustain for the replacement of old boiler with BAT compliant boiler may be to high in some of the project countries.
How the legal framework of the country may sustain or obstacle the diffusion of BAT/BEP in boiler technology?	Implementation of U-POPs emission limits among boiler legislation requirements is one of the key stem to sustain the diffusion of BAT/BEP. With BAT/BEP as the only sensible option to reduce dioxin/furan emissions, the sector will be forced to apply these measures. One of the key bottleneck to this measure is however the reduced number of laboratories that can perform sampling and analysis of U-POPs in the participating countries.
Is there enough stakeholder ownership to sustain project outcomes after project ends?	The stakeholder ownership will increase once project objectives are demonstrated. Involvement of the government is considered necessary.
Have been economic / financial istruments established to sustain the installation of BAT/BEP boilers in the country?	Only in the Philippines, The government offers various forms of incentives for boiler operators under the Philippine Renewable Energy Laws (R.A. 9513: Renewable Energy Act of 2008 and R.A. 9367: Biofuels Act of 2006). In the other countries these instruments are not in place yet

14. PROJECT COORDINATION AND MANAGEMENT

A specific analysis of project coordination and management is reported in chapter 7.7. In the table below, the analysis of project coordination and management resulting from interviews outcomes and evaluator considerations is reported.

Describe how selection, recruitment, assignment of experts, consultants and national counterpart staff is performed	All national consultants are recruited by applying a standard criteria which is: drafting of JD and TORs which are cleared by UNIDO; interviews with potential candidates, which have to register through UNIDO website.
Describe how UNIDO CO and Government collaborate together in the execution of the above tasks	Usually UNIDO, through the national coordinator, keeps the government informed about the procedure. UNIDO also consult with government on the selection of consultants.
Describe how tasks and responsibilities are assigned among the project stakeholders	At country level, the project is executed by the UNIDO CO's (if available) National Project Managers; the National Project Coordinators (usually belonging to Ministries or Departments of Environment) oversees the project implementation. Universities or Research institutions have the task to implement training, establish curricular courses, or perform specific studies. Owner of pilot facilities are responsible for the implementation of the agreed BEP based on the suggestions of the international consultants. UNIDO HQ manages the project centrally, from the administrative and technical standpoint, with the help of international consultants, and UNIDO staff.

Quality and timeliness of inputs by UNIDO HQ to the project, and the extent to which this may have affected the smooth implementation of the project	UNIDO HQ in coordination with the ESEA BAT/BEP forum holds regular Technical Coordination Meetings to monitor and manage the project.
Quality and timeliness of inputs by Government to the project, and the extent to which this may have affected the smooth implementation of the project	In most cases a good level of coordination is reported. In few cases, it is reported that the action from government is not very timely. As a general rule, the NPM transmit to the national project coordinator (NPC) the management plan for the relevant period. The NPC calls the agencies concerned to assist in the achievement of the tasks.
Quality and timeliness of inputs and guidance by international experts responsible for providing inputs to the project, and the extent to which this may have affected the smooth implementation of the project	When the task required the expertise of the international consultants, request for advise was made online and if necessary travel to the country arranged. The international expert guidance is considered excellent and very timely.
Describe how enactment of necessary legislation / permits may have affected implementation of sustainability of the project	There were no issues on permitting or licensing new facilities - indeed only one new boiler has been procured till now. When different standards are in place, international experts asked labs to perform analysis by adopting both the methods required by the national legislation and the international rules. In Mongolia, on July 2012 a new environmental legislation was enacted which also includes rules on industrial emissions (please provide the title).
Describe how the financial budget and modality of budgetary provisions may have positively or negatively affected implementation and sustainability of the project	There are different views on the suitability of financial resources for satisfying implementation and sustainability of the project. Some countries consider that, as BEP implementation is in general not expensive, project budget is sufficient. Other countries consider that the available budget is not enough either for procuring suitable boiler equipment or for completing sampling and analysis of U-POPs. Some countries consider the 4:1 co-financing too high.
If there was a difference in the level of expected cofinancing and the cofinancing actually realized, what were the reasons for the variance? Did the extent of materialization of cofinancing affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?	Based on preliminary information gathered, it seems there are no significant departure from the original co-financing commitment. Co-financing from industries, especially power plant, represents a significant fraction of the overall project budget. In some cases it may be that the actual co-financing is even greater than the committed co-financing. To demonstrate this, it's crucial to establish, at this stage, a sound co-financing accounting system, so that figures can be duly reported to GEF in the course of terminal evaluation.

15. ANNEX 4. OVERALL RATINGS TABLE

Criterion	Evaluator's Summary Comments	Evaluator's Rating
Attainment of project objectives and results (overall rating)		MS

Criterion	Evaluator's Summary Comments	Evaluator's Rating
Sub criteria (below)		
Effectiveness	Most of the intended deliverables have been completed within the new deadline set. Delays, with specific regard to sampling and analysis and procurement of new equipment may hinder the successful completion of the project	S
Relevance	The project main objectives are relevant to the POPs GEF focal area. Project activities are relevant to the project objectives. Deliverable are relevant to intended activity objectives. Few activities are unnecessary or unclear.	S
Efficiency	The project in general is based on an efficient approach which would ensure selection of cost/effective option. A moderate rearrangement of component intended outcomes and activities may further improve project efficiency. More uniform management and supervision approach is needed at the country level to ensure consistent outputs.	MS
Sustainability of Project outcomes (overall rating) Sub criteria (below)		S
Financial	With few exceptions, the incentive mechanisms and PPP management scheme are not yet in place at this stage. Most of the small players still cannot afford the investment of new more efficient boilers even if with new boiler they can have savings in term of fuel consumption.	MU
Socio Political	The majority of the countries have strong and long term support from government on the project objectives.	S
Institutional framework and governance	There is the need to establish sustainability mechanisms (incentives, trainings). In most of the countries, legislation and guidance on boilers including BAT/BEP is being adopted.	MS
Ecological	The project is ecologically sustainable as it promotes the use of more efficient boilers, resulting in lower GHG and U-POPs emission. Care should be paid to the issue of exploitation of natural resources deriving from a possible intensive use of biomass	S
Monitoring and Evaluation (overall rating) Sub criteria (below)		MS
M&E Design	In addition to the standard UNIDO M&E plan, the M&E design include additional reporting like a "Technical report list", a "Periodic Thematic Reports" which however have not been drafted. The great number of documents produced by the project need to be shared among	MS
M&E Plan Implementation (use for adaptive management)	Some of the monitoring and management reports drafted by the NPMs are not very informative. The evaluator received only part of the planned M&E reports. Compliance with the established M&E plan should be ensured	MS
Budgeting and Funding for M&E activities	The budget and funding for the M&E activities are reasonable	S
UNIDO specific ratings		
Quality at entry		
Implementation approach		
UNIDO Supervision and backstopping		
Overall Rating		

16. CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNT

16.1. CONCLUSIONS

1. The project is relevant to the objectives of Stockholm Convention, article 5, Measures to reduce or eliminate releases from unintentional production and more specifically with its intended objective to promote the use of Best Available Technologies and Best Environmental Procedures in the sector of industrial boilers and power generation.
2. The project is relevant to the GEF 4 POPs focal area, as the GEF 4 POPs focal area strategy has the long term objective to *reduce and eliminate production, use and releases of POPs*, and its strategy programs are: strengthening capacity for NIP (National Implementation Plan) development and implementation; partnering in investments for NIP implementation; partnering in the demonstration of feasible, innovative technologies and best practices for POPs reduction, which are at the same time core objective of the project.
3. The project objective to reduce at the same time PCDD/F emission and increase boiler efficiency constitutes indeed a win-win approach, as it facilitate the implementation of PCDD/F reduction measures bringing at the same time the economical benefits associated with a reduction in fuel consumption. The two objectives should always be pursued together, however it is important to be aware that in some cases, economic optimization of the plant may not automatically translate in U-POPs reduction (for instance the use of “dirty” biomass or of used oils). This risk should be properly identified and communicated.
4. The technical objective to quantify / upgrade the emission factors for boiler is probably overly ambitious, as this objective would require a project specifically designed for this purpose, with a tighter control of the experimental conditions (i.e. sampling procedures, operational parameter of the plant, fuel characteristics, combustion parameters, etc.); the project is however providing useful data for populating the database of emissions of U-POPs from industrial sources in ESEA countries. Due to analytical issues (analytical results relevant to the PCDD/F content at the stack of power plants unreasonably low) the measurability of U-POPs reduction after BEP implementation in some plants proved problematic.
5. One of the most important project product is the updating of the inventory of boilers in the ESEA countries, as well as the amount of information concerning the energy outlooks, the use and market of specific fuels (biomass, spent oils, others), the analysis of the market of boiler and APCS in the ESEA countries, the cost/benefit analysis of BAT versus BEP options, etcetera. This important amount of analysis and information reports needs to be better organized in a consistent manner to be really accessible by the interested stakeholders.
6. The project is establishing an excellent training scheme on boiler operation as well as on sampling and analysis of U-POPs. For the sustainability of the project is crucial that the handover of the training, from international experts to national experts, is successfully completed.

16.2. RECOMMENDATIONS

Few recommendations may be individuated at this stage to improve project performance and ensure the successful and timely completion of project activities. As required, the recommendations are arranged by addressee.

UNIDO HQ:

The project generated quite a relevant number of technical documents, of which part has been drafted by the international consultants hired under UNIDO HQ, and part by the national experts. There is the need to collate these reports, standardize their editing and content, peer review, and make the report available

(possibly differentiating among reports that should be made available to project stakeholders, and reports that should be made available to the large public). This operation should also reduce overlapping of the activity and boost sustainability of the project.

Although the project management structure envisaged initially the coordination with the ESEA Forum Board, the advisory function of the ESEA forum did not emerge clearly from project documentation gathered by the evaluator. The evaluator perception was that, limited to the contribution to this project, the ESEA FB did not reach the critical mass to act as an autonomous institution. UNIDO and the ESEA FB should clarify the respective role in the project to ensure proper collaboration in the second stage of project life.

If the remaining financial resource are enough, UNIDO HQ should hold a conference specifically addressed at

- introducing existing legislation and short term perspectives concerning BAT/BEP and atmospheric emission of industrial boilers in the ESEA countries;
- project outcomes and planned activities on the legislation improvement;
- gathering stakeholder (including NGOs and industries) opinion on the matter.

UNIDO HQ, with the support of National Project Managers and national and international experts, should make a reasonable and practicable plan to verify whether the activities can be reasonably completed within project deadline (April 2014), with special reference to the following:

1. procurement of all the boilers envisaged by the project (right now, the procurement of only one equipment has been completed);
2. completion of implementation of BAT/BEP at pilot facilities;
3. completion of the monitoring activities at pilot facilities;
4. completion of the upgrade of existing legislation;
5. establishment of training curriculum and completion of at least one curriculum cycle.

UNIDO should verify whether the proposed simplification of the project structure (Table 1 Proposed rearrangement of project activities and outputs) is practicable and possibly suggest further or alternative measures to simplify to the project structure.

UNIDO should consider amending the OVI for activity 3.3.4 as following:

“Approximate reduction of 0.31 g TEQ/year from pilot cases, estimated on the basis of reliable emission factors relevant to the situation before and after BAT/BEP implementation, and supported by the evidence of low emission at the stack after implementation of BAT/BEP”

Where resources are enough, UNIDO is also recommended to tightly supervise – with the assistance of international experts or by means of duplicate sampling and analysis – the whole process of sampling and analysis at least in the most difficult or contradictory cases.

UNIDO COs, NPM

UNIDO COs and National Project Managers. The quarterly / annual reports produced by NPM, although based on the same standard form, are not standardized in term of type of information reported. UNIDO COs and NPM should ensure that the reports contain clear and quantitative reference to the activities carried out. A list of relevant documents or deliverables should be always attached to the reports.

UNIDO COs should require a more verifiable format for the training activities, including: pre-training tests; post-training tests; feedback from the attendees. This information should always be attached to the training reports.

Governments, Counterpart Organizations.

Governments should verify which options are the best for ensuring the adoption of upgraded legislative tools on BAT / BEP of boilers within project deadline. It is likely that, in countries where key steps toward the implementation of an upgraded legislation have not been carried out yet, is now too late for upgrading “hard” legislation within project timeframe; in these cases, a shift toward the implementation of “soft” laws (guidance, ministerial decrees) should be considered.

In carrying out studies on biomass and spent oil, the national experts should consider other environmental aspects like: risk of exploitation of natural resources (sustainability of biomass); quality of biomass (for instance, use of wasted biomass which is contaminated by paints, preservatives, etc.); presence of other POPs (particularly PCBs) on spent or used oil.

16.3. LESSONS LEARNT

One of the difficulties faced by the national project teams was the reluctance of the power plant management in participating in the project due to possible disruption to plant operations, or concerns related to the public perception of monitoring activities or results. That issue required a substantial effort from the project teams (mainly the Philippines and Indonesia) which had to elaborate complex Terms of Cooperation, including confidentiality clauses, clear assignment of responsibilities, etc.

Another aspect concerns replacement of equipment in fast growing firms. In Lao, Agro Industry raised the issue of replacing the existing, obsolete boiler with a new one, with a substantially larger capacity required to accommodate the expected increasing production. Although they declared to be available in supporting the difference of investment compared with a smaller boiler, difficulties concerning the procurement of an equipment with only partially support from UN funds have not been solved yet.

The Term of Cooperation and strategy developed by the project is an important thesaurus of know-how for facilitating the active involvement of industrial partners in future projects. It must be understood that not always economic consideration (like the saving that may be obtained with a greater efficiency) may be effective in convincing industrial partners in adopting innovative environmental schemes, like BAT/BEP. When relevant legislation is missing or incomplete, the introduction of new technologies and environmental monitoring must always be proposed to industrial partners in association with a set of well defined rules and condition which may protect all the partners from undesired results and ensure the reliability of findings. Although the project was seeking “low-performance” plants for demonstrating the usefulness of BAT/BEP, it must be considered that when the monitoring prove that the plant is indeed performing bad, while on one side this is an opportunity for the project, on the other side that it may represent the demonstration of improper management of the plant, which is obviously not the most welcomed result on the industrial side. Demonstrating how their life would be simplified (in term of management, safety, better relationships with the government and the public) is the key of success for the involvement of industrial partners. That would require a much more focused awareness raising activity.

Another important lesson is that regional projects must be kept simple. A good indicator of the complexity of a multi-country project is the number of project components by the participating countries. Indeed, a project with five components and six countries is indeed more complex than a theoretical one-country project with thirty components, even though nobody would propose such a thirty component project. A smaller number of project components and a smaller number of activities by components means a lighter administrative burden and greater flexibility, which eventually translates in a more successful project.

Finally, an important lesson concerns the measurement of PCDD/F at the stack of industrial boilers and power plant. In general, the concentration of PCDD/F was lower than expected – in some cases much lower than the value measured in BAT compliant plants in Europe – which if on a side is a good news, on the other hand generated questions on the reliability of sampling and analysis. The careful bidding procedure adopted for lab selection, and the supervision carried out by the international experts was clearly the correct set of measures to ensure the reliability of sampling and analysis. Nevertheless, the project design did not take in due consideration the risk associated with limited capability of the laboratories, and indeed for some analytical result seems still affected by an uncertainty not completely explained.

17. ANNEXES

17.1. LIST OF INTERVIEWEES

Carmela Centeno	UNIDO HQ, Project manager
Massimo Gobbi	International Expert on Boiler, UNIDO HQ Consultant
Andrea Sbrilli	International Expert on Sampling and Analysis, UNIDO HQ Consultant
Anton Purnomo	Indonesia, National Project Manager
Phonethip PHETSOMPHOU	Lao PDR, National Project Manager
Avid BUDEEBAZAR	Mongolia, National Project Manager
Carl Renan ESTRELLAN	The Philippines, National Project Manager
Siwatt PONGPIACHAN	Thailand, National Project Manager
Choviran KEN	Cambodia, National Project Manager
Monemany Nhoybouakong	Lao PDR, Ministry of Environment
Teeraporn Wiriwutikokorn	Thailand, Pollution Control Department
Kwanchai Jieamchawi	Thailand, Oleen co, Ltd
Atip Srisupha-Olarn	Thailand, Red Bull Distillery, (1988) Co, Ltd
Tawatchai Supma	Thailand, Oleen co, Ltd
Khamphone KEODALAVONG	Lao PDR, Director of Industrial Environment and Chemistry division of MIC
Sengratry KYTVAHONE	Lao PDR, Assoc. Prof. at Faculty of Engineering, Nat. University of Laos
Kjammanithip VONGXAY	Ass. Managing Director, Lao Agro Industry Co, Ltd

17.2. 16. LIST OF DOCUMENTS REVIEWED

The evaluator received around 300 documents, of which 234 were considered relevant to the project. The documents have been arranged in a simple database in Excel, to facilitate searching of documents by activity and country. The complete list of documents reviewed, with links, is reported in the table below.

1	Indonesia	1.1	1.1.2	Indonesia Energy Statistic Leaflet 2010.pdf	Indonesia Energy Statistic Leaflet 2010	Technical Report
2	UNIDO HQ	1.1	1.1.2	1 ENERGY OUTLOOKS -ESEA - 2012.pdf	1 ENERGY OUTLOOKS -ESEA -2012	Technical Report
3	UNIDO HQ	1.1	1.1.2	4 Energy consumptions outlook.pptx	4 Energy consumptions outlook	Technical Report
4	UNIDO HQ	1.1	1.1.2	CAMBODIA ENERGY DEMAND OUTLOOK-GOBBI.pdf	CAMBODIA ENERGY DEMAND OUTLOOK-GOBBI	Technical Report
5	Indonesia	1.1	1.1.3	Zero Accident Award.pdf	Information on Indonesia Zero Accident Award	Technical Report
6	UNIDO	1.1	1.1.4	BAT BEP report 1.doc	BAT BEP report_1	Technical

	HQ					Report
7	UNIDO HQ	1.1	1.1.6	1 BAT-BEP PROJECT PRESENTATION CAMBODIA.pptx	1 BAT-BEP PROJECT PRESENTATION CAMBODIA	Presentation
8	UNIDO HQ	1.1	1.1.6	3 EFFICIENCY DEFINITIONS.pptx	3 EFFICIENCY_DEFINITIONS	Presentation
9	UNIDO HQ	1.1	1.1.6	4 Ways to improve the average efficiency of a power plant.pptx	4 Ways to improve the average efficiency of a power plant	Presentation
10	UNIDO HQ	1.1	1.1.6	4bis EXCESS AIR CONTROL.pptx	4bis_EXCESS AIR CONTROL	Presentation
11	UNIDO HQ	1.1	1.1.6	4 AIR HEATER AND EFFICIENCY.pptx	4_AIR HEATER AND EFFICIENCY	Presentation
12	UNIDO HQ	1.1	1.1.6	BAT-BEP in Power and heat boilers.pptx	BAT-BEP in Power and heat boilers	Presentation
13	UNIDO HQ	1.1	1.1.6	GOBBI-Ulaan B. Workshop.pptx	GOBBI-Ulaan B. Workshop	Presentation
14	UNIDO HQ	1.1	1.1.6	Presentaton_Combined effect of dioxins and CO2 invio ufficiale	Presentaton_Combined effect of dioxins and CO2 invio ufficiale	Presentation
15	UNIDO HQ	1.1	1.1.6	REDUCTION OF DIOXINS AND CO2.doc	REDUCTION OF DIOXINS AND CO2	Technical Report
16	UNIDO HQ	1.1	1.1.6	Thailand-Dioxins reduction on power and heat sectors.pdf	Thailand-Dioxins reduction on power and heat sectors	Presentation
17	UNIDO HQ	1.1	1.1.6	Thailand-Dioxins reduction on power and heat sectors.pptx	Thailand-Dioxins reduction on power and heat sectors	Presentation
18	Cambodia	1.3	1.3.1	Report -legislation.docx	Final Report on legislation	Technical Report
19	Thailand	1.3	1.3.1	Appendix 7-Minute of Meeting.pdf	Appendix 7-Minute of Meeting	Minute of Meeting
20	Indonesia	2.1	2.1.1	QuestionnaireDioxFurgengver[1]1.1.pdf	Questionnaire of Rehabilitation Simultaneously With Dioxin Furan Reducing	Questionnaire / Form
21	Indonesia	2.1	2.1.1	Kuesioner Anton Irawan-FT Untirta[1].pdf	Kuesioner Anton Irawan-FT Untirta[1]	Questionnaire / Form
22	Mongolia	2.1	2.1.1	Short information about boilers used in Mongolia.docx	Short information about boilers used in Mongolia	Technical Report
23	Philippines	2.1	2.1.1	BoilerInventory_FinalReport_09282012.pdf	Inventory Update of Industrial Boiler in the Philippines, sept 28, 2012	Technical Report
24	UNIDO HQ	2.1	2.1.4	Cambodia boiler TOR_26 Sept12 rev 27 sept.docx	Cambodia boiler TOR_26 Sept12 rev 27 sept	Technical Report
25	UNIDO HQ	2.1	2.1.4	GOBBI -INDUSTRIAL BOILERS SELECTION.doc	GOBBI -INDUSTRIAL BOILERS SELECTION	Technical Report
26	Lao PDR	3.2	3.2.2	MISSION_TO_LAO[1] Spent oil.pdf	MISSION TO LAO[1] Spent oil	Mission report
27	Lao PDR	3.2	3.2.2	Waste Vegetable oil and Waste Lubricant oil survey report revised by Phonethip.pdf	Waste Vegetable oil and Waste Lubricant oil survey report revised by Phonethip	Technical Report
28	Philippines	3.2	3.2.2	Market & Trends of Woods & Biomass As Bioler Fuel_Final Draft.p	Market & Trends of Woods & Biomass As Bioler Fuel_Final Draft.p	Term of Reference
29	Mongolia	3.2	3.2.4	Low pressure furnace boiler inventory Mongolia.pdf	Low pressure furnace boiler inventory Mongolia	Technical Report
30	Cambodia	3.3	3.3.2	Technical wrap up report12-01-2012.doc	Preliminary Assessment of the Pilot Facility in Cambodia	Technical Report
31	Cambodia	3.3	3.3.2	TOC Signed.pdf	Term of Cooperation with the Great Honor Textile Factory	Agreement / MOU / TOC
32	Indonesia	3.3	3.3.2	Attach 4 - Minutes of Coordination Meeting at MOE.doc	Attach 4 - Minutes of Coordination Meeting at MOE with Suralaya Power Plant representatives	Minute of Meeting
33	Indonesia	3.3	3.3.2	Attach 6-Proposed Interventions-Unit 6_FINAL.doc	Attach 6-Proposed Intervention on the Suralaya Power Plant	Agreement / MOU / TOC
34	Indonesia	3.3	3.3.2	Intervention January 2012.pdf	Result January 2012 Intervention BAT-BEP Application During Inspection Suralaya Coal Steam Power Plant Unit 6	Minute of Meeting
35	Indonesia	3.3	3.3.2	Attach 3 -Min of Meeting 20 June Aftrn-Coordination for Perf.pdf	Attach 3 -Min of Meeting 20 June Aftrn-Coordination for Performance	Minute of Meeting
36	Indonesia	3.3	3.3.2	BTOR Suralaya-Anna 20-25 June 2011.pdf	Report on the Mission to the Suralaya Power Plant	Mission report
37	Indonesia	3.3	3.3.2	List Partc 20 June AFTRN-Coordination for Performance Test.pdf	List of participant to the meeting on June 20 - Performance	List of Participants
38	Indonesia	3.3	3.3.2	Attachment 2-List of Participants 180711.pdf	Attachment 2-List of Participants meeting with Indonesia Power 180711	List of Participants

39	Indonesia	3.3	3.3.2	Attachment 2-MOM 18 July 2011.doc	Attachment 2-Minutes of meeting with Indonesia Power 18 July 2011	Minute of Meeting
40	Indonesia	3.3	3.3.2	Attachment 2-MOM.docx	Attachment 2-Minutes of meeting with Indonesia Power 18 July 2011	Minute of Meeting
41	Indonesia	3.3	3.3.2	Attachment 3-Daftar Hadir 19 Juli 2011.pdf	Attachment 3-Daftar Hadir 19 Juli 2011	List of Participants
42	Indonesia	3.3	3.3.2	Attachment 3-MOM 19 July 2011.doc	Attachment 2-Minutes of meeting with Indonesia Power 19 July 2011	Minute of Meeting
43	Indonesia	3.3	3.3.2	Attachment 4-List of Participants 22 July 2011.pdf	Attachment 4-List of Participants meeting with Indonesia Power 22 July 2011	List of Participants
44	Indonesia	3.3	3.3.2	Attachment 4-MOM 22 July 2011.doc	Attachment 2-Minutes of meeting with Indonesia Power 22 July 2011	Minute of Meeting
45	Indonesia	3.3	3.3.2	Attachment 5-List of Participants 240811.jpg	Attachment 5-List of Participants Meeting with Indonesia Power 240811	List of Participants
46	Indonesia	3.3	3.3.2	Attachment 5-MOM 24 August.doc	Attachment 5-MOM 24 August.doc	Minute of Meeting
47	Indonesia	3.3	3.3.2	Attachment 6-List of Participants 130911.pdf	Attachment 6-List of Participants with Indonesia Power 130911	List of Participants
48	Indonesia	3.3	3.3.2	Attachment 6-MOM 13 Sept.doc	Attachment 2-Minutes of meeting with Indonesia Power 13 set 2011	Minute of Meeting
49	Indonesia	3.3	3.3.2	Minutes of the 16 July 2012 Mtg Boiler Project at MEMR.pdf	Minutes of the 16 July 2012 Mtg Boiler Project at MEMR	Minute of Meeting
50	Indonesia	3.3	3.3.2	2-4Nov2011mission report.1.pdf	2-4Nov2011mission report to Suralaya, Good Year and Dunlop	Mission report
51	Indonesia	3.3	3.3.2	Daftar Hadir 22 Juli 2011.pdf	List of participant meeting 22 Juli 2011	List of Participants
52	Indonesia	3.3	3.3.2	DAFTAR HADIR 12 OKT 2011.pdf	List of participant meeting 12 oct 2011	List of Participants
53	Indonesia	3.3	3.3.2	Minute of Meetings12 Oct 2011.pdf	Minute of Meetings12 Oct 2011 Indonesia Power	Minute of Meeting
54	Indonesia	3.3	3.3.2	MINUTES OF MEETING3 Nov 2011.pdf	MINUTES OF MEETING3 Nov 2011 Indonesia Power, Suralaya	Minute of Meeting
55	Indonesia	3.3	3.3.2	MOM12122011.2.pdf	MINUTES OF MEETING3 Dec. 2011 Indonesia Power, Suralaya	Minute of Meeting
56	Indonesia	3.3	3.3.2	MoU KLH Deputy IV MLH (3).pdf	MOU with Indonesia Power on BAT / BEP demonstration	Agreement / MOU / TOC
57	Indonesia	3.3	3.3.2	Notulens 22 Juli 2011 English Ver.pdf	Minutes of meeting with Suralaya staff, 22 jul 2011	Minute of Meeting
58	Indonesia	3.3	3.3.2	Notulensi 27 Mei 2011EngVer.pdf	Minutes of meeting with Suralaya staff, 27 May 2011	Minute of Meeting
59	Indonesia	3.3	3.3.2	Terms of cooperation RED BULL.doc	Terms of cooperation RED BULL	Agreement / MOU / TOC
60	Lao PDR	3.3	3.3.2	Preliminary Assessment of the Pilot Facility in Laos.docx	Preliminary Assessment of the Pilot Facility in Laos	Technical Report
61	Lao PDR	3.3	3.3.2	Terms of cooperation LAO PDR.doc	Terms of cooperation LAO PDR	Agreement / MOU / TOC
62	Mongolia	3.3	3.3.2	Technical report on pilot faculty for Mongolia.docx	Technical report on pilot facility for Mongolia	Technical Report
63	Mongolia	3.3	3.3.2	Terms of cooperation MONGOLIA final from Avid 29 dec2011.doc	Terms of cooperation MONGOLIA final from Avid 29 dec2011	Agreement / MOU / TOC
64	Philippines	3.3	3.3.2	Masinloc Mission 2011 & Inception Workshop.doc	Mission report on meeting with Masinloc and Inception Workshop	Mission report
65	Philippines	3.3	3.3.2	TOC UST Signed PHILIPPINES.pdf	TOC UST Signed PHILIPPINES	Agreement / MOU / TOC
66	Thailand	3.3	3.3.2	Terms of cooperation Oleen Factory-REV1.docx	Terms of cooperation Oleen Factory-REV1	Agreement / MOU / TOC
67	UNIDO HQ	3.3	3.3.2	GOBBI-CAMBODIA - LAO MISSION REPORT1_March2011[1].pdf	GOBBI-CAMBODIA -LAO MISSION REPORT1 March2011[1]	Mission report
68	UNIDO HQ	3.3	3.3.2	2 EFFICIENCY IMPROVEMENT IN SEMARANG.pptx	2_ EFFICIENCY IMPROVEMENT IN SEMARANG	Presentation
69	UNIDO HQ	3.3	3.3.2	2 EFFICIENCY IMPROVEMENT IN SURALAYA.pptx	2_ EFFICIENCY IMPROVEMENT IN SURALAYA	Presentation
70	UNIDO HQ	3.3	3.3.2	3 CAMBODIA - BOILER SELECTION.pptx	3 CAMBODIA - BOILER SELECTION	Presentation
71	UNIDO HQ	3.3	3.3.2	3 CRITERIA FOR INDUSTRIAL BOILERS SELECTION-ESEA 2012.pdf	3 CRITERIA FOR INDUSTRIAL BOILERS SELECTION-ESEA 2012	Term of Reference
72	UNIDO HQ	3.3	3.3.2	3 PILOT BOILERS.pptx	3 PILOT BOILERS	Technical Report
73	Cambodia	3.3	3.3.4	Draft%20Full%20Report_Cambodia	Draft Full Report The First monitoring of Boiler stack	Managemen

				01%20f1.pdf	at Great Honour Textile Factory Co, Ltd., Cambodia. During August 22-25, 2012	t Report
74	Cambodia	3.3	3.3.4	Report of sampling.docx	Sampling campaign in Grat Honou Factory, Cambodia Comments from Andrea Sbrilli	Field Activity Report
75	Cambodia	3.3	3.3.4	SGS Proposal for UNIDO Cambodia & Lao 24 Nov	PROPOSAL Sampling and Analysis of PCDD/PCDF, Mercury, Total Chlorine and Relevant Parameters in Selected Industrial Boilers in Cambodia and Lao PDR	Commercial proposal
76	Cambodia	3.3	3.3.4	Site Survey Report for UNIDO Cambodia & Lao.	Site Survey for Platform Installation During 7-9 April 2012	Field Activity Report
77	Cambodia	3.3	3.3.4	TOR-Boiler%20 7june12[1].docx	Draft Terms of Reference For sampling and analysis of PCDD/PCDF, Mercury, Total Chlorine and relevant parameters in selected industrial boilers in Cambodia and Lao PDR	Term of Reference
78	Cambodia	3.3	3.3.4	TOR sampling and analysis Cambodia-Lao PDR.d	Draft Terms of Reference For sampling and analysis of PCDD/PCDF, Mercury, Total Chlorine and relevant parameters in selected industrial boilers in Cambodia and Lao PDR	Term of Reference
79	Indonesia	3.3	3.3.4	Attach 5-TOR for Sampling and Analysis - 3 April 2011.doc	TERMS OF REFERENCE For sampling and analysis of PCDD/PCDF, Mercury, Total Chlorine and relevant parameters in Suralaya power plant, Unit 6, Indonesia	Term of Reference
80	Indonesia	3.3	3.3.4	Min of Meeting-presentation GEES.pdf	Minutes of meeting on presentation of analytical results	Minute of Meeting
81	Indonesia	3.3	3.3.4	Attach 1-Min of Meeting 8 June-Survey GEES.pdf	Attach 1-Min of Meeting 8 June on monitoring at Suralaya	Management Report
82	Indonesia	3.3	3.3.4	Attach 2 -Min of Meeting 20 June Morn-Coordination for Sampl.pdf	Attach 2 -Min of Meeting 20 June Morn. Coordination for Sampling	Minute of Meeting
83	Indonesia	3.3	3.3.4	List Partc 20 June Morn-Coordination for Sampling.jpg	List of participant to the meeting on June 20 - Sampling	List of Participants
84	Indonesia	3.3	3.3.4	List Partc 8 June-Survey GEES to Suralaya.pdf	List of participant June-Survey GEES to Suralaya	List of Participants
85	Indonesia	3.3	3.3.4	laporan 12-16 Dec2011 eng ver [1].pdf	Report on Suralaya second sampling	Field Activity Report
86	Indonesia	3.3	3.3.4	List of Participants 21 June 2011.pdf	List of Participants 21 June 2011 with Indonesia Power	List of Participants
87	Indonesia	3.3	3.3.4	List of Participants 27 May 2011.pdf	List of Participants 27 May 2011 Indonesia Power	List of Participants
88	Indonesia	3.3	3.3.4	NOTULEN RAPAT 1 Nov 2011 eng ver.1.pdf	Minutes of meeting on Dioxin analytical results	Minute of Meeting
89	Indonesia	3.3	3.3.4	NOTULENPARK HOTEL28 11 2011EngVer.pdf	Minutes of meeting on planning for further Dioxin sampling at suralaya	Minute of Meeting
90	Indonesia	3.3	3.3.4	Notulensi 21 Juni 2011English Ver.pdf	Minutes of meeting with Suralaya staff, 21 Jun 2011	Minute of Meeting
91	Indonesia	3.3	3.3.4	PIC SAMPLING DIOXIN FURAN 12 Dec 2011.pdf	PIC SAMPLING DIOXIN FURAN 12 Dec 2011	Technical Report
92	Lao PDR	3.3	3.3.4	Site Survey in Laos.pdf	Site Survey in Laos	Field Activity Report
93	Thailand	3.3	3.3.4	Appendix-2-311012.pdf	SGS report on sampling and analysis	Field Activity Report
94	UNIDO HQ	3.3	3.3.4	Corrected Final TOR sampling and analysis Thailand 15 June 2012.doc	Corrected Final TOR sampling and analysis Thailand 15 June 2012	Term of Reference
95	UNIDO HQ	3.3	3.3.4	Final TOR sampling and analysis Cambodia-Lao PDR 12 January 2012.docx	Final TOR sampling and analysis Cambodia-Lao PDR 12 January 2012	Term of Reference
96	UNIDO HQ	3.3	3.3.4	FINAL UNIDO Cambodia boiler TOR 7 June2012.docx	FINAL UNIDO Cambodia boiler TOR 7 June2012	Term of Reference
97	UNIDO HQ	3.3	3.3.4	FINAL-TOR for Sampling and Analysis Saralaya Indonesia - 24 Oct 2011.doc	FINAL-TOR for Sampling and Analysis Saralaya Indonesia - 24 Oct 2011	Term of Reference
98	UNIDO HQ	3.3	3.3.4	FINAL-TOR Indonesia Suralaya- 24 Oct 2011.doc	FINAL-TOR Indonesia Suralaya- 24 Oct 2011	Term of Reference
99	UNIDO HQ	3.3	3.3.4	NEW FINAL TOR Masinloc PowerPlant 22 August 2012.doc	NEW FINAL TOR Masinloc PowerPlant 22 August 2012	Term of Reference
100	UNIDO HQ	3.3	3.3.4	POPs monitoring results in ESEA countries-Boiler project1.docx	POPs monitoring results in ESEA countries-Boiler project1	Technical Report
101	UNIDO HQ	3.3	3.3.4	Revised TOR for Sampling and Analysis for Mongolia 6 March 2012.doc	Revised TOR for Sampling and Analysis for Mongolia 6 March 2012	Term of Reference
102	UNIDO	3.3	3.3.4	Sbrilli - Mission Report-Lao-	Sbrilli - Mission Report-Lao-Cambodia March 2011	Mission

	HQ			Cambodia March 2011.doc		report
103	UNIDO HQ	3.3	3.3.4	Sbrilli -Mission report- Mongolia and Thailand June 2011.docx	Sbrilli -Mission report- Mongolia and Thailand June 2011	Mission report
104	UNIDO HQ	3.3	3.3.4	Sbrilli-Mission report - Philippine November 2011.docx	Sbrilli-Mission report - Philippine November 2011	Mission report
105	UNIDO HQ	3.3	3.3.4	Sbrilli-Mission Report Indonesia Philippine November 2010.doc	Sbrilli-Mission Report Indonesia Philippine November 2010	Mission report
106	UNIDO HQ	3.3	3.3.4	Sbrilli-POPs monitoring capabilities in ESEA countries.docx	Sbrilli-POPs monitoring capabilities in ESEA countries	Technical Report
107	UNIDO HQ	3.3	3.3.4	Sbrilli-POPs monitoring methods.docx	Sbrilli-POPs monitoring methods	Technical Report
108	UNIDO HQ	3.3	3.3.4	TOR for Sampling and Analysis for Mongolia_16 feb 2012.doc	TOR for Sampling and Analysis for Mongolia 16 feb 2012	Term of Reference
109	Indonesia	3.3	3.3.5	Daftar hadir-presentation GEES.pdf	List of participants to the meeting on analytical results	List of Participants
110	Indonesia	4.1	4.1.1	Attach 3-Completed-Institutional Survey (UNIDO-ESEA Project).xls	Institutional Survey on Training Courses on Clean Production and Best Available Techniques/Best Environmental Practices	Questionnaire / Form
111	Indonesia	4.1	4.1.1	Draft TOC-Min of Manpower.doc	Draft Term of Cooperation with the Ministry of Manpower	Agreement / MOU / TOC
112	Indonesia	4.1	4.1.1	Minutes of the 15 September 2012 Mtg Boiler Project with Dr. Panut Mulyono.pdf	Minutes of the 15 September 2012 Mtg Boiler Project with Dr. Panut Mulyono	Minute of Meeting
113	Indonesia	4.1	4.1.1	Draft TOC Education Institution.1.1.2.doc	Draft TOC Education Institution.1.1.2	Agreement / MOU / TOC
114	Indonesia	4.1	4.1.1	Minutes of Meeting 10 Oktober 2011.1.pdf	Minutes of Meeting 10 October 2011 with the faculty of Industrial Technology	Minute of Meeting
115	Indonesia	4.1	4.1.1	Cooperative Agreement UNIDO MOE UGM.pdf	Cooperative Agreement UNIDO MOE UGM	Agreement / MOU / TOC
116	Indonesia	4.1	4.1.1	Cooperative Agreement UNTIRTA.pdf	Cooperative Agreement UNTIRTA	Agreement / MOU / TOC
117	Thailand	4.1	4.1.1	Appendix 5-Minute of Meeting.pdf	Appendix 5-Minute of Meeting	Minute of Meeting
118	Thailand	4.1	4.1.1	Appendix 6-Minute of Meeting.pdf	Appendix 6-Minute of Meeting	Minute of Meeting
119	Thailand	4.1	4.1.1	Appendix 8-Minute of Meeting.pdf	Appendix 8-Minute of Meeting	Minute of Meeting
120	Thailand	4.1	4.1.1	Appendix 9-Minute of Meeting.pdf	Appendix 9-Minute of Meeting	Minute of Meeting
121	Thailand	4.1	4.1.1	BAT-BEP Training-NIDA Quotation.jpg	BAT-BEP Training-NIDA Quotation	Commercial proposal
122	Thailand	4.1	4.1.1	BATBEP Training Athens Quotation.jpg	BATBEP Training Athens Quotation	Commercial proposal
123	Thailand	4.1	4.1.1	BATBEP Training SSP Quotation.pdf	BATBEP Training SSP Quotation	Commercial proposal
124	Indonesia	4.1	4.1.2	Attach 2-Accreditation Procedure for Boiler Inspector and Op.doc	Accreditation Procedures for Boiler Inspectors and Boiler Operators	Technical Report
125	Indonesia	4.1	4.1.2	Min of Meeting-TOC discussion.pdf	Short minute of meetings on cooperation with Universities	Minute of Meeting
126	Mongolia	4.1	4.1.2	Customs Inspectors Training.docx	Customs Inspectors Training	Agenda of Meeting
127	Mongolia	4.1	4.1.2	WS Agenda BAT 08 2011.doc	WS Agenda BAT 08 2011	Agenda of Meeting
128	Thailand	4.1	4.1.2	Boiler Training of Trainers.doc	Agenda for the training of trainers in Bangkok	Agenda of Meeting
129	Indonesia	4.2	4.2.1	Minutes of the 09 June 2012 Mtg Boiler Project with Dr. Irawan.pdf	Minutes of the 09 June 2012 Mtg Boiler Project with Dr. Irawan	Minute of Meeting
130	Indonesia	4.2	4.2.1	ProposalIndustrialBoiler%20Awareness%20rev[1].4.1.pdf	Proposal for a workshop on industrial boiler awareness	Commercial proposal
131	Indonesia	4.2	4.2.2	MainProposal Solid Fuel rev.4.1.pdf	MainProposal Solid Fuel	Commercial proposal
132	Indonesia	4.2	4.2.2	Proposal%20Boiler%20Awareness%20Power%20Generation%20v[1].7..pdf	Proposal on raising awareness workshop	Commercial proposal
133	Indonesia	4.2	4.2.3	Anton Irawan Efficiency Energy in Green Boiler.pdf	Anton Irawan Efficiency Energy in Green Boiler	Presentation
134	Indonesia	4.2	4.2.3	Attendance list Green Boiler 03 oct 2012.pdf	Attendance list Green Boiler 03 oct 2012	List of Participants
135	Indonesia	4.2	4.2.3	Dioxin Furan Boiler Project_Cilegon_Anton.pdf	Introduction of the Dioxin Furan Boiler Project	Presentation

136	Indonesia	4.2	4.2.3	Implementasi-POPs.pdf	Implementation of Stockholm Convention in Indonesia	Presentation
137	Indonesia	4.2	4.2.3	Proceeding of Green Boiler Workshop.pdf	Proceeding of Green Boiler Workshop	Presentation
138	Indonesia	4.2	4.2.3	SSO Awareness for Cilegon.pdf	SSO Awareness for Cilegon	Presentation
139	Lao PDR	4.2	4.2.3	Draft MoM Lao IW Industrial Boiler 03-04 March 2011- Eng.pdf	Draft MoM Lao IW Industrial Boiler 03-04 March 2011- Eng	Minute of Meeting
140	Lao PDR	4.2	4.2.3	Laos Awareness Workshop Report 7-8 Aug 2012.pdf	Laos Awareness Workshop Report 7-8 Aug 2012	Minute of Meeting
141	Mongolia	4.2	4.2.3	Minutes of Meeting_darkhan.docx	Minutes of Meeting darkhan	Minute of Meeting
142	Philippines	4.2	4.2.3	BTOMR Cebu Regional Awareness-raising Workshop.doc	Mission Report of the Cebu Regional Awareness raising Workshop	Mission report
143	Philippines	4.2	4.2.3	Cebu Attendance Sheets.pdf	Attendance sheet to the Cebu Regional Awareness Workshop	List of Participants
144	Philippines	4.2	4.2.3	Cebu Workshop Agenda.doc	Agend of the Cebu Regional Awareness Workshop	Agenda of Meeting
145	Thailand	4.2	4.2.3	Appendix 1-311012.pdf	SGS technical proposal on sampling	Commercial proposal
146	Thailand	4.2	4.2.3	Appendix 11-Presentation.pdf	Andrea Sbrilli presentation on PCDD/F and mercury	Presentation
147	Thailand	4.2	4.2.3	Appendix 12-Presentation.pdf	Andrea Sbrilli presentation on sampling and analysis	Presentation
148	Thailand	4.2	4.2.3	Appendix 13-Presentation.pdf	Massimo Gobbi Dioxin and CO2 reduction from power and heat sectors	Presentation
149	Thailand	4.2	4.2.3	Appendix 14-Presentation.pdf	Massimo Gobbi Dioxin releases from power and heat sectors	Presentation
150	Thailand	4.2	4.2.3	Appendix 15-Presentation.pdf	Siwatt Pongpiachan Overview of BAT and BEP	Presentation
151	Thailand	4.2	4.2.3	Appendix 16-Presentation.pdf	Siwatt Pongpiachan Demonstration of BAT and BEP	Presentation
152	Thailand	4.2	4.2.3	Appendix 17-proposal for IRPC.pdf	Appendix 17-proposal for IRPC	Commercial proposal
153	Thailand	4.2	4.2.3	Appendix 3-Climate Change Lecture.pdf	NIDA Climate Change Lecture	Presentation
154	UNIDO HQ	4.2	4.2.3	revised Schedule National Workshop-13062011.docx	revised Schedule National Workshop-13062011	Technical Report
155	Indonesia	5.1	5.1.5	BTOMR Dioxin Sampling and Ananalysis Training_Beijing_Anton.pdf	Back to Office Mission Report on Dioxin Sampling and Ananalysis Training in Beijing	Mission report
156	Indonesia	5.1	5.1.5	Proposal%20Sampling%20and%20Analysis%20rev[1].1.pdf	Proposal for sampling and analysis workshop	Commercial proposal
157	Cambodia	6.2	6.2.2	Cambodia-Proceedings of the workshop.pdf	National Inception Workshop of the Project on Demonstration of BAT and BEP in fossil fuel-fired utilities and industrial boilers in response to the Stockholm Convention on POPs; February 24-25, 2011 in Phnom Penh, Cambodia Ministry of Environment.	Minute of Meeting
158	Mongolia	6.2	6.2.2	Report of the inception workshop.docx	Report of the inception workshop	Management Report
159	Philippines	6.2	6.2.2	BAT-BEP participants.xlsx	List of Participant to the Inception Workshop, Nov. 2011	List of Participants
160	Philippines	6.2	6.2.2	Inception Workshop Program.doc	Agenda of the Inception Workshop, Nv 2011	Agenda of Meeting
161	Cambodia	6.2	6.2.4	3 rd quarterly report 2012.pdf	Third quarterly report 2012	Management Report
162	Cambodia	6.2	6.2.4	4 quarterly report 2012.pdf	Fourth quarterly report 2012	Management Report
163	Cambodia	6.2	6.2.4	Cambodia Final Report_October_11, 2011.pdf	Cambodia Final_Report_October, 11, 2011	Management Report
164	Cambodia	6.2	6.2.4	Cambodia Final Report_September.18, 2012.pdf	Cambodia Final Report, September, 18, 2012	Management Report
165	Cambodia	6.2	6.2.4	Progress_Report.pdf	Progress Report, March 2011	Management Report
166	Indonesia	6.2	6.2.4	Attach 7-Quarter 2-Forthcoming Work Plan 2011-Indonesia.xls	Attach 7 Quarter 2 Forthcoming Work Plan 2011-Indonesia	Management Report
167	Indonesia	6.2	6.2.4	Attachments.doc	List of Attachments to the progress report	Management Report
168	Indonesia	6.2	6.2.4	Progress_Report QUARTER 1-Indonesia.doc	Quarterly Progress Report Jan-March 2011	Management Report
169	Indonesia	6.2	6.2.4	1st Quarterly Progress Report 2012.pdf	1st Quarterly Progress Report 2012	Management Report
170	Indonesia	6.2	6.2.4	Workplan2012-Q2.doc	Workplanfor the second quarter of 2012	Management Report

171	Indonesia	6.2	6.2.4	2nd Quarterly Progress Report.pdf	2nd Quarterly Progress Report Apr-June 2011	List of Participants
172	Indonesia	6.2	6.2.4	Attach 4 -Workplan Quarter 3 & 4.pdf	Attach 4 -Workplan Quarter 3 & 4 2011	Management Report
173	Indonesia	6.2	6.2.4	Progress_Report QUARTER 2-Indonesia.doc	Progress Report covering 2nd Quarter 2012 from April 2012 to June 2012	Management Report
174	Indonesia	6.2	6.2.4	Workplan Q2-Q3 in 2012.xlsx	Workplan for Q2 and Q3, 2012	Management Report
175	Indonesia	6.2	6.2.4	FORTHCOMING WORKPLAN QUARTER 4.docx	Workplan for Q4, 2012	Management Report
176	Indonesia	6.2	6.2.4	Indonesia Progress Report Presentation.ppt	Indonesia Progress Report Presentation	Presentation
177	Indonesia	6.2	6.2.4	Indonesia Workplan Q4 2012, Q1-4 2013_rev01.xlsx	Indonesia Workplan Q4 2012, Q1-4 2013 rev01	List of Participants
178	Indonesia	6.2	6.2.4	INDONESIA-Midterm Review Report on Boiler Project 2012.doc	Unido Annual Project Implementation Report 2012	Management Report
179	Indonesia	6.2	6.2.4	Progress_Report QUARTER 3-Indonesia.doc	Progress_Report JUL-SEP 2012	Management Report
180	Indonesia	6.2	6.2.4	DRAFT2 Progress_Report QUARTER 4-Indonesia.feb12[1].pdf	Progress Report Covering 4th Quarter 2011 from October 2011 to December 2011	Management Report
181	Indonesia	6.2	6.2.4	FORTHCOMING WORKPLAN 2012 QUARTER 1.docx	FORTHCOMING WORKPLAN 2012 QUARTER 1	Management Report
182	Indonesia	6.2	6.2.4	Indonesia Workplan Q1-4 2013_rev02.xlsx	Indonesia Workplan Quarter IV of the 2012 and Quarter I-IV of the 2013	Management Report
183	Lao PDR	6.2	6.2.4	1Q Report of Laos 2012.doc	1Q Report of Laos 2012	Management Report
184	Lao PDR	6.2	6.2.4	2 Q Rreport of Laos 2012.pdf	2 Q Rreport of Laos 2012	Management Report
185	Lao PDR	6.2	6.2.4	Draft Full Report Laos rev01[1].pdf	Draft Full Report Laos rev01[1]	Management Report
186	Lao PDR	6.2	6.2.4	Lao Annual Report on Boiler Project 2011.pdf	Lao Annual Report on Boiler Project 2011	Management Report
187	Lao PDR	6.2	6.2.4	Laos 3Q Report- 2012.pdf	Laos 3Q Report- 2012	Management Report
188	Lao PDR	6.2	6.2.4	Laos Annaul Report- 2012.pdf	Laos Annaul Report- 2012	Management Report
189	Lao PDR	6.2	6.2.4	Laos Boiler Plan 2011.xlsx	Laos Boiler Plan 2011	Management Report
190	Lao PDR	6.2	6.2.4	Laos Boiler Plan 2013.xlsx	Laos Boiler Plan 2013	Management Report
191	Mongolia	6.2	6.2.4	Final Report Oct Dec 2012.docx	Final Report Oct Dec 2012	Management Report
192	Mongolia	6.2	6.2.4	Final Report 2011.docx	Final Report 2011	Management Report
193	Mongolia	6.2	6.2.4	Progress_Report April September 2012.docx	Progress Report April September 2012	Management Report
194	Mongolia	6.2	6.2.4	Progress report first quarter 2011.doc	Progress report first quarter 2011	Management Report
195	Mongolia	6.2	6.2.4	Progress report first quarter 2012.doc	Progress report first quarter 2012	Management Report
196	Mongolia	6.2	6.2.4	Progress report second quarter 2011.docx	Progress report second quarter 2011	Management Report
197	Mongolia	6.2	6.2.4	Progress_Report third quarter 2011.docx	Progress Report third quarter 2011	Management Report
198	Mongolia	6.2	6.2.4	UNIDO report 06 2010 06 2012_mongolia.docx	UNIDO Project Implementation report 06 2010 06 2012 mongolia	Management Report
199	Mongolia	6.2	6.2.4	work plan 2011.docx	work plan 2011	Management Report
200	Philippines	6.2	6.2.4	Progress_Report April 11 June 11.doc	Progress Report April 11 June 11	Management Report
201	Philippines	6.2	6.2.4	Progress_Report April 12 June 12.doc	Progress Report April 12 June 12	Management Report
202	Philippines	6.2	6.2.4	Progress_Report Jan11 March11.doc	Progress Report Jan11 March11	Management Report
203	Philippines	6.2	6.2.4	Progress_Report January 12 March 12.doc	Progress Report January 12 March 12	Management Report
204	Philippines	6.2	6.2.4	Progress_Report July 11 September 11.doc	Progress Report July 11 September 11	Management Report
205	Philippines	6.2	6.2.4	Progress_Report July 12 September 12.doc	Progress Report July 12 September 12	Management Report

206	Philippines	6.2	6.2.4	Progress_Report_October_11_December_11.doc	Progress Report October 11 December 11	Management Report
207	Philippines	6.2	6.2.4	Progress_Report_October_12_December_12.doc	Progress Report October 12 December 12	Management Report
208	Thailand	6.2	6.2.4	Draft-Siwatt-150911.pdf	Unido Annual Project Implementation Report 2011	Management Report
209	Thailand	6.2	6.2.4	Final_Report_Thailand-311012.pdf	Final Report Thailand-311012	Management Report
210	Indonesia	6.2	6.2.6	BANGKOK REPORT (REVISI).pdf	BANGKOK REPORT (REVISI)	Mission report
211	UNIDO HQ	6.2	6.2.6	contact list.pdf	List of participant to the technical coordination meeting in Vienna, 17.19 October 2012	List of Participants
212	UNIDO HQ	6.2	6.2.7	List_Individuals_Organizations_involved_in_BATBEP_Project_in_Indonesia.docx	List of individual organization involved in the project in Indonesia	List of Participants
213	UNIDO HQ	6.2	6.2.7	MTE.pptx	Power point presentation - consideration on Mid Term Evaluation, 18 October 2012	Presentation
214	Indonesia	6.2	6.2.9	Attach_1-BTOR_IRA-Boiler_Project_Mission_to_Indonesia_1-5_N.pdf	Attach Back to Office Report IRA Palupi-Boiler Project Mission to Indonesia_ 1-5 Nov. 2010	Mission report
215	Cambodia			Cambodia_Report_of_factory_visit.pdf	Report on the Visit of garment factories in Cambodia February-March 2011	Mission report
216	UNIDO HQ	3.3		0_GOBBI-Indonesia-Philippines-Mongolia_mission_report_November	0 GOBBI-Indonesia-Philippines-Mongolia mission report November	Mission report
217	UNIDO HQ	3.3		0_UNIDO_BATBEP_PROJECT_AND_DIOXINS_EMISSIONS_IN_THE_PHILIPPINE	0 UNIDO BATBEP PROJECT AND DIOXINS EMISSIONS IN THE PHILIPPINE	Presentation
218	UNIDO HQ	3.3		10_GOBBI_-_Mission_to_Cambodia-November_2012.rtf	10 GOBBI - Mission to Cambodia-November 2012	Mission report
219	UNIDO HQ	3.3		1_EFFICIENCY_IMPROVEMENT_IN_MASINLOC.pptx	1_ EFFICIENCY IMPROVEMENT IN MASINLOC	Presentation
220	UNIDO HQ	3.3		1_UNIDO_PROJECT_FOR_REDUCING_DIOXINS_AND_CO2_EMISSIONS_INDONESI	1_UNIDO PROJECT FOR REDUCING DIOXINS AND CO2 EMISSIONS INDONESI	Presentation
221	UNIDO HQ	3.3		2_CAMBODIA_INVENTORIES_AND_BOILER_CHARACTERISTICS.pptx	2 CAMBODIA INVENTORIES AND BOILER CHARACTERISTICS	Presentation
222	UNIDO HQ	3.3		2_BOILER_EFFICIENCY-ESEA_2012.pdf	2 BOILER EFFICIENCY-ESEA 2012	Technical Report
223	UNIDO HQ	3.3		3.1_PHILIPPINES_INVENTORIES.pptx	3.1 PHILIPPINES INVENTORIES	Presentation
224	UNIDO HQ	3.3		4_EMISSION_ABATEMENT_TECHNOLOGIES_SURVEY_AND_COSTS-ESEA_2012.p	4 EMISSION ABATEMENT TECHNOLOGIES SURVEY AND COSTS-ESEA 2012.p	Technical Report
225	UNIDO HQ	3.3		6_GOBBI-CAMBODIA-LAO_MISSION_REPORT1_March2011.pdf	6 GOBBI-CAMBODIA -LAO MISSION REPORT1 March2011	Mission report
226	UNIDO HQ	3.3		7_GOBBI-Thailand_-_Cambodia-Lao_mission_report_November_2011.pdf	7 GOBBI-Thailand - Cambodia-Lao mission report November 2011.pdf	Mission report
227	UNIDO HQ	3.3		8_GOBBI-Indonesia-Philippines-Mongolia_mission_report_November	8 GOBBI-Indonesia-Philippines-Mongolia mission report November	Mission report
228	UNIDO HQ	3.3		9_GOBBI_-_Mission_to_Thailand_Lao_Philippines_May_2012.pdf	9 GOBBI - Mission to Thailand_Lao_Philippines May 2012	Mission report
229	UNIDO HQ	3.3		ANNEX_..ECONOMIC_VALUATION_ASSOCIATED_TO_REDUCTION_OF_DIOXINS_A	ANNEX ..ECONOMIC VALUATION ASSOCIATED TO REDUCTION OF DIOXINS A	Technical Report
230	UNIDO HQ	3.3		Biomass_inventory_in_Mongolia.pdf	Biomass_inventory in Mongolia	Technical Report
231	UNIDO HQ	3.3		MISSION_TO_LAO.pdf	MISSION TO LAO	Mission report
232	UNIDO HQ	3.3		MISSION_TO_PHILIPPINES.pdf	MISSION TO PHILIPPINES	Mission report
233	UNIDO HQ	3.3		Mission_to_Thailand_Lao_Philippines_May_2012.pdf	Mission to Thailand_Lao_Philippines May 2012	Mission report
234	UNIDO HQ	3.3		UNIDO_-_Indonesia_Mission_Report.doc	UNIDO - Indonesia Mission Report	Mission report