GEF/UNDP project Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam

Mid Term Evaluation Report

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Project Status	IA Approved
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Description	Several extensive and highly contaminated dioxin hotspots exist in Viet Nam. Several barriers (management, technical capacity, unavailability of data, institutional capacity, financial resources, communication and education) have limited Viet Nam in its ability to deal with these hotspots. Without the project, dioxins accumulated at hotspots will continue to become bio-available and dispersed in the local and global environment, through soil particles and organic materials that bind dioxin and are carried by water currents, wild life, and air. The project will address the barriers described above in order to effectively contain/remediate the highly dioxin contaminated material in the three main hotspots areas at Phu Cat, Bien Hoa and Da Nang as well as address the technical, institutional, financial as well as societal root causes for enabling Viet Nam to address additional sites of concern.
PDF B Amount	25,000 USD
Project Cost	37,312,500 USD
GEF Agency Fees	450,000 USD
GEF Project (CEO Endo.)	4,977,000 USD
Co-financing Total (CEO Endo.)	32,335,550 USD
Project Cost (CEO Endo.)	37,312,550 USD
GEF Agency Fees (CEO Endo.)	450,000 USD

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1. EXECUTIVE SUMMARY

1.1. BRIEF INTRODUCTION TO THE PROJECT

The TCDD contamination in Viet Nam originated from the operations carried out by the US army during the armed conflict lasted from 1961 to 1971. The so-called Operation "Ranch-Hand" (May 1964 – January 1971) involved spraying an estimated 20 million U.S. gallons (76,000 m^3) of defoliants and herbicides over rural areas of South Vietnam in an attempt to deprive the Viet Cong of food and vegetation cover. As the pesticides used for the Ranch Hand operation (and more specifically the so-called "Agent Orange") were contaminated by TCDD, the operation resulted in an extensive contamination by TCDD of large part of the country. 40 years later, whilst the TCDD level in the sprayed area declined to lower levels, high level of contamination remained in a number of "hot spots", among which the most severely contaminated are the three air bases where the Ranch Hand operation was based: the Bien Hoa Airbase, the Phu Cat Airbase, and the Da Nang Airbase.

As reported in the Project Document, the situation of TCDD contamination in the three air bases is as following:

- In the At Bien Hoa Airbase, there are at least three areas of very high contamination. The main area, a loading area (aka "Z1 area" – see Annex 1), has dioxin concentrations in the soil surface (0-30 cm layer) as high as 409,818ppt I-TEQ and an estimated average of over 15,864 ppt I-TEQ, with elevated dioxin concentrations found down to at least 1.5m depth; following the estimates provided by the inception report, the total amount of soil requiring decontamination / containment is from 195,500 to 235,000 m3, out of which still requiring containment from 101,500 to 141,500.
- In the Da Nang Airport and Airbase, there are three geographically proximate areas of very high contamination. This includes the former "mixing and loading areas", where maximum dioxin levels reach 365,000ppt I-TEQ and the estimated average is well over 50,000ppt I-TEQ. The nearby storage/dumping area has a highest dioxin level of 134,802ppt I-TEQ with the average estimated as 39,883ppt I-TEQ.
- In the Phu Cat Airport and Airbase, dioxin concentration in the former herbicide storage area is very high, reaching up to 238,000ppt I-TEQ, and the average toxicity is estimated at 26,248ppt I-TEQ (over 97% of which is TCDD) (see Annex 1). The topography of the site suggests that water flow could have resulted in contamination of three nearby lakes, but samples taken from the drainage canal and lake sediment revealed comparatively low dioxin concentrations. The amount of soil to be contained, as revised at inception report, was of 12,000 m^3

The Project "Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam" as originally approved has the objective to remove the barriers that limit Vietnam in dealing with the hotspot contaminated by Dioxin, namely:

a) The lack of an overall plan to deal with the hotspots and an overall regulatory framework regarding dioxin contamination;

b) Limited availability of high quality data on site contamination and effects on environments and people;

c) Technological capacities (access to technologies and essential equipment, knowledge, experience) for problem analysis and for remediation of dioxin contamination;

d) Institutional capacities for coordination of national and international partners, and for planning and managing site remediation;

e) Financial resources for remediation to internationally accepted norms;

f) Capacities for public education and local land use planning to address the sensitive issue of highly toxic materials near populated areas.

The following assessments of dioxin contamination in the three areas were made prior to the project submission to GEF by the Vietnamese government, UNDP and donors:

- The Z1 (Bien Hoa airbase, 1994/1995), Z2 (Da Nang airbase, 1997/1998) and Z3 (Phu Cat airbase, 1999/2002) project by the Vietnamese Ministry of Defence;
- The collaboration between US EPA and VAST (Viet Nam Academy for Science and Technology) on sampling and contamination analysis;
- The project "*Assessment of Dioxin Contamination in the Environment and Human population in the vicinity of the Da Nang airbase, 2006/2007*" by Office 33 and Hatfield Consultants Limited (Vancouver, Canada), with funding from Ford Foundation;
- Soil and sediment samples taken and analyzed under the UNDP preparation project, by the Viet Nam - Russia Tropical Centre (VRTC) under the MOD and Hatfield Consultants.

The project built upon work conducted by international organizations or their contracted consultants in association with national partners, all of which are coordinated by the Office 33 of the Ministry of Natural Resources & Environment, which at the same time is the project implementation counterpart.

The project envisages the achievement of 3 outcomes:

- Outcome 1: Dioxin in core hotspot areas contained and remediated;
- Outcome 2: Land use on and around hotspots eliminates risks and contributes to environmental recovery;
- Outcome 3: Strengthened national regulations and institutional capacities.

1.2. SUMMARY OF EVALUATION RESULTS

Project design.

1. The project structure is very simple and straightforward, as it was arranged in 3 technical components plus one project management component. At project design the project scope was delimited in a realistic way; the project correctly identified the issue of the three hotspots as its main target, and indeed the three components (1. Remediation; 2. Land use and communication; 3. Regulatory framework and communication strategies) integrates each other in a very logical and effective way.

2. One shortcoming of the project design – subsequently fixed at inception – was the overly ambitious target set for component 1: *"As a result of the GEF-project and leveraged funds / activities, all contaminated soil at concentrations greater than 1,000ppt and sediment at concentrations greater than 150ppt will have been treated adequately and residual contamination safely land-filled, and thereby 1,736 g I-TEQ dioxin release will be avoided: at Bien Hoa by the end of 2010; at Da Nang by the end of 2012; and at Phu Cat by the end of 2011"* . That target was too optimistic and has been wisely amended at project inception, by limiting the scope of the project to the still very challenging objective of containment and testing of remediation technologies.

3. The project is still highly relevant to the issue of PCDD/F contaminated soil in Vietnam, and to the Strategic Objective of GEF 4 which is "*To reduce and eliminate production, use and releases of POPs*". The project is also relevant to the Objective 1 of the GEF 5 Chemical strategy, as it intends to reduce POPs releases to the environment, to manage POPs contaminated sites in an environmentally sound manner, and to build country capacity.

Project achievements

4. The objective of the project is to remove the barriers that limit Vietnam in dealing with the hotspot contaminated by Dioxin.
5. One of the most important outputs of the project is the development of action plans for the remediation of the hotspots areas. To date, the master plan for Bien Hoa is almost completed, whilst for Da Nang the US government and USAID developed an Environmental Assessment which also includes a planning component. The master plan for Phu Cat has not been carried out, for the reason that under the project, a safe landfill of PCDD/F contaminated soil has been built and filled, and a monitoring plan has been developed and partially implemented.

6. Concerning the overall regulatory framework, recently, under direction of the Office 33, the standard TCVN 8183:2009 – establishing action level of Dioxin in soil and sediments for hotspot and TCVN 9737:2013 – Dioxin discharge standards from the treatment activities for the dioxin contaminated site developed by project were issued. These standards are not compulsory; however these have been applied as reference standard fordioxin management and treatment. QCVN 45: 2012 – National technical regulation on allowed limits of dioxin in soils supported by project has been adopted and this standard is compulsory for the project. Further standards (PCDD/F emission from industrial sources, quality concentration limit in other environmental media) have been proposed under output 3.1 of the project, but not submitted for adoption yet.
7. The project has collected, collated and summarized a large amount of information analytical data and studies on the situation of PCDD/F contamination in the three hotspots.
8. The project, by demonstrating a PCDD/F destruction technology and establishing containment infrastructures in Bien Hoa and a safe landfill in Phu Cat, contributed significantly to the knowledge and the increased technological capacity of the relevant stakeholders for problem analysis and remediation of dioxin contamination.
9. The project provided support to the office 33, which has been recognized by all the national and international stakeholders as an effective coordinating umbrella for leveraging funds and supervising remediation and monitoring actions at the hotspots and in their vicinity.
10. There is the need of improving coordination of the project with main donors (USAID) and MOD. Office 33 is only partially involved in the activities in Da Nang, which is being almost entirely carried out by USAID in coordination with MOD.
11. The project and Office 33 effectively leveraged a significant amount of financial resources for the conduction of remediation under PCDD/F target level internationally recognized.
12. Under the project, a significant number of governmental representatives received training and get familiarized with the complex issues of remediation of PCDD/F areas, and the risk associated with PCDD/F contaminated soil and biota. The project was effective in generating documents and summaries to be circulated at international level; the level of success of the communication with the local people, living either in the hotspots (basically people from the army) or in their vicinity is still low and need further effort.

At mid term, the following outputs have not been completed yet, some of them because activity is still ongoing, and some of them because of objective obstacles hindering the achievement of that outputs:

- Master plans: to date, the master plan for Bien Hoa is almost completed; whilst for Da Nang USAID has developed an Environmental Assessment which also includes a planning component. The master plan for Phu Cat has not been drafted; instead, a monitoring plan has been developed and partially implemented after the building of the landfill. Although a certain level of uncertainty and debates still remain on the master plan drafted for Bien Hoa, it may be affirmed that the project is on track for achieving the objective of providing an overall plan to deal with hotspots.
- Definition of regulatory standards: recently, under direction of the Office No 33, the standard TCVN 8183:2009 – establishing target concentration for of Dioxin in soil and sediments was issued. This standard is not compulsory. Reports proposing additional standards (PCDD/F emission from industrial sources, quality concentration limit in other environmental media) have been drafted under the project, but not yet officially submitted for adoption.
- Land use: this outcome has not been achieved has the overall responsibility of the management of military areas falls under the MOD. Although in one of the project reports is stated that this activity has been completed by MOD, no information on this activity is available.
- Communication. The project seems having carried out communication mostly toward a high level or international audience. At local level, the communication is still low; plans do exist to to implement local communication in the fourth quarter of 2013.

Relevance. The relevance of the project general objectives, of the project outcomes, and of the activities carried out is obviously high. The main objective of the project *"to minimize disruption of ecosystems and health risks for people from environmental releases of TCDD contaminated hotspots"* is highly relevant to the GEF chemical strategy, and to the country needs. The project envisages a specific Outcome (Outcome 3) for

the strengthening of national regulations and institutional capacities; and for improving communication on the Dioxin issue. The overly ambitious objective established at project design (to contain or remediate all the soil with a PCDD/F concentration in excess of 1000 ppt and sediment with a concentration of 150 ppt) was reviewed at inception, when after collating a substantial amount of information it became clear that the complete decontamination of the site would have required a much larger effort and availability of resources.

Effectiveness. As explained above, in general, almost all the project objectives set for mid term were achieved, and some of the terminal objectives were also reached. Therefore the effectiveness of the project has to be considered high. The general objective "*to minimize disruption of ecosystems and health risks for people from environmental releases of TCDD contaminated hotspots"* has been partially addressed already at mid-term, as under the project concrete actions aimed at limiting as much as possible the spreading of TCDD pending implementation of final remediation activities were carried out in Bien Hoa, by means of construction of a barriers / trenches system for limiting the transport of TCDD with runoff water, and in Phu Cat, by placing all the contaminated soil into a specially designed safe landfill. Further monitoring, being established under the project and continuing after project closure, will provide information on the residual risk and the needed countermeasures,including the identification further hotspots to be remediated.

Efficiency. The efficiency of the project has to be considered high in almost all the activities performed. Concern is only to be raised on the efficiency of activities under output 3.1, which spent 2 times the budget allocated (305,000 USD instead of 135,000) without completely achieving yet the goal of "*National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and or human dioxin TDI applicable to general population and vulnerable populations developed and adopted".* On this aspect it has to be kept in due consideration that under output 3.1 a substantial amount of resources has been allocated for carrying out sampling and analysis of environmental and biological media, which was not initially envisaged for this component.

Sustainability. There is a very high country ownership of the project, which is being conducted within the framework of governmental actions aimed at solving the legacy of dioxin contamination. The Office 33, the technical arm of the "Committee 33" which was established by the Vietnamese government to address the issues of PCDD generated by the USA-Vietnam war; examines all the proposed activities related to dioxin and submit these to Committee 33 for approval. The project management unit is indeed established in close relationship with Office 33, and at the same time, provides technical and financial support to it and benefits from the capacity of Office 33 to interact with institutional stakeholders at all levels. The project also benefited from the facts that for several reasons (international relationships, commercial agreements and strategies) international donors were keen to provide technical and financial support to the project. The US government and USAID are currently supporting, both technically and financially, the remediation of the Da Nang site, and committed to do the same for the Bien Hoa site, where currently measures aimed at reducing the release of TCDD in the environment are being established by the project. Other donors already provided a substantial amount of funds and technical assistance related to the numerous needs associated with the remediation of TCDD contaminated sites: laboratory capability (the Ford Foundation, the Bill and Melinda gates Foundation, the Atlantic Philanthropies); monitoring plan and post-remediation monitoring (the Czech government), technology testing (the New Zealand government); their commitment extends longer than the project life and will ensure sustainability of several project outcomes.

Notwithstanding the above, it is clear that the huge financial effort estimated for remediating Da Nang and Bien Hoa (the initial estimate of around 34 million USD for Da Nang raised recently up to around 80 M USD, whilst the governmental estimates for remediating Bien Hoa are in the order of 150 to 180 Million USD) will need a continuous effort in fund raising. That effort must be supported by a proper management, supervision and accounting structure which will have to ensure the compliance of activities carried out with international and national regulations, conventions and standards, and to supervise and report to the government and donors on the use of funds.

There are some risks related to coordination with the main donors due mainly to the specific rules governing the activity in Da Nang. Currently, it seems that the coordination between the activities being carried out in Da Nang and the project PMU are rather limited; a single and shared approach for technology testing and assessment is lacking; indeed it is commonly perceived by all the stakeholders interviewed that the project,

and Office 33 itself, are playing a limited role in the remediation of Da Nang and in the planning of the future remediation in Bien Hoa. Paradoxically, the outstanding success in leveraging funds for DaNang could affect the sustainability of the project if the good results achieved by the project on the other sites, in term of harmonization of monitoring information, further monitoring, technology selection and testing, will not properly continued after project ends in all the sites including DaNang.

Overall project scoring for relevance. The relevance of the project main objectives, outcomes and outputs with the Stockholm Convention objectives and with the GEF strategies on POPs is obviously very high. The project has the potential to destroy or contain an extremely large amount of dioxin (initially estimated in 1.7 kg). Therefore the rating of project in term of relevance is Highly Satisfactory.

Overall project scoring for effectiveness and efficiency. The Marginally Satisfactory scored assigned to Efficiency and Effectiveness is mainly a result of the averaging of the scores for the three components:, component 1, concerning technology testing and containment / remediation of the three sites, rates highly satisfactory; components 2 related to the land use planning of the three sites, was substantially pulled out from the project as it is being carried out under the responsibility of MOD therefore it should be formally cancelled; however, as no formal information have been provided on that intended project modification, that component has been temporarily rate Moderately Unsatisfactory at mid term, pending formal amendment of project structure. Component 3, related mostly to regulation, training and communication, has been rated as Marginally Satisfactory mainly because of the activities to be still carried out on the side of communication at local level, and submission and adoption of proposed regulatory values.

The overall rating of the project, based on the average of the rating of the components above, is "Satisfactory".

2. DESCRIPTION OF THE EVALUATION METHODOLOGY

According to TOR requirements, the evaluation has been carried out both as a descriptive assessment and on the basis of a scoring system.

The evaluation required meetings with all the most relevant stakeholders involved in project implementation, review of most of the technical and administrative documents, mission reports, meeting minutes produced in the course of project activities, and visit to the POPs contaminated sites.

In few cases, when it was not possible to arrange meetings, the interviews were arranged by means of Skype or telephone calls.

The following 6 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**

Ranking were subjectively assigned by the evaluators; however, to ensure consistence, the following criteria has been adopted:

All the project outcomes have been evaluated with 3 different scores with value from 0 to 5 based respectively in the criteria of relevance (R), Efficiency (Eff) and Effectiveness (Ect).

The three criteria were evaluated considering that:

1. Relevance implies close logical relationship with, and importance to, the matter under consideration. As the main objective of the project is "*to minimise disruption of ecosystems and health risks for people from environmental releases of TCDD contaminated hotspots*", a high relevance score was assigned to the activities which if correctly implemented are directly related to the objective, whilst a lowest relevance score has been assigned at activities indirectly related.
2. 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.
3. 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 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.

The three scores obtained with the criteria summarized above were averaged within each output, and then the average score was averaged within outcomes among all the outputs of each outcome. Finally, the numeric values were translated in to the nearest rating criteria.

3. EVALUATION SCOPE AND OBJECTIVES

3.1. GENERAL OBJECTIVES OF THE EVALUATION

The midterm evaluation has been performed in compliance with the objectives listed in the Term of Reference for the Mid Term Evaluation Consultant, namely:

- To review of the project design, planning and implementation;
- To review project performance;
- To assess project impacts;
- To assess sustainability of project outcomes;
- To formulate recommendation and analyze lessons learnt.

3.2. SPECIFIC OBJECTIVES OF THE EVALUATION

With specific reference to the objectives of the project, and in addition to the standard evaluation objectives usually set by Mid Term Evaluation guidelines, the evaluators were required to:

1) Briefly review development and policy relating to regulation on dioxin, commenting on how these might have affected project performance and assess the extent to which the project remains relevant to the needs of its targets;
2) Perform interim assessment of the extent to which the dioxin project has successfully accomplished its targets set for objectives in terms of activities, outputs and outcomes as defined in the agreed Project Document (log frame) and/or inception report, and assess the likelihood of achieving them upon project completion;
3) To identify implementing partner's institutional strengths and weaknesses, and identify potential options for improving the dioxin project, which could include modification of activities, project management responsibilities, schedule of activities, budget allocations, and timeframe among others;

In addition to the above, the evaluators were also required to:

1) provide further considerations on the effectiveness of the technology tested;

2) provide indications concerning the communication strategy proposed and the communication actions undertaken by the project on the issue of PCDD/F contamination;
3) provide suggestion on possible allocation of the remaining budget with the purpose to enhance project success and sustainability of outcome

4. ANALYSIS OF THE SITUATION WITH REGARD TO OUTCOME, OUTPUTS, RESOURCES, PARTNERSHIPS

4.1.ASSESSMENT OF PROJECT DESIGN

4.1.1. Do the project problems to be solved still stand, project responses strategies and project adaptive management measures remain relevant to national priorities and GEF strategies, considering possible changes in context?

The contamination by TCDD in Vietnam is a complex issue involving many aspects of the Vietnamese society: environment, development, health, international relationship, policy. Despite the joint efforts of the government, the international agencies and the donors. The issues will still require several years to be completely addressed. Based on interviews, site visits and analysis of the relevant documents generated by the project and before, it may be affirmed that the project strategies and adaptive management measures remain more and more relevant to national priorities and to GEF strategies, for the following reasons:

1) The potential for PCDD/F destruction in the 3 hotspots is very large, considering that the estimated amount of sol to be cleaned in the 3 hotspots exceeds 250,000 m^3 and the estimated amount of PCDD/F Is in the order of 1736 g I-Teq (1). The project is therefore in line with the GEF strategies on the elimination of POPs; compared to other projects aimed at the destruction / reduction of PCDD/F, the project is potentially more efficient;
2) Vietnam has an urgent need of technologies for disposing POPs. A technology for the destruction of PCDD/F contained in contaminated soil has been thoroughly tested in Bien Hoa, a safe landfill for the temporary storage of PCDD/F contaminated soil has been built in Phu Cat, and measures aimed at containing the spreading of PCDD/F in the environment are being implemented. By carrying out on-site testing of the MCD technology and establishing a methodology for the evaluation of the results, the project provided specific know-how for the assessment of destruction and disposal technologies, applicable to other technologies in to be established in the country.
3) The project had the merit of collecting and systematizing the documentation generated by the governments and international donors in the preceding years. By providing technical and financial support to the Office 33 the project is acting as “catalyst” of the site characterization and cleanup efforts being carried out by the government and the international donors. This is well acknowledged in a report drafted by USAID (2), which stated that “*UNDP's program also provides for an overarching umbrella framework that facilitates donor coordination among those working on environmental remediation of dioxin in Vietnam.*”
4) There is the need for establishing and consolidating the legislation and regulatory framework concerning PCDD/F remediation target. Within the project, a detailed review of the Tolerable Daily Intake adopted by other countries for assessing PCDD/F exposure has been carried out, and emission limits for industrial sources have been proposed, but not submitted for approval yet.

Therefore it may be assumed that there were no significant changes in the context since the beginning of the project, except the positive increase of availability of donor funds – mostly from the US government for the remediation of the Da Nang site.

Possible change in the context. A probable change in the context would be USAID to take charge of the remediation of Bien Hoa – after the project end - in addition to the remediation of Da Nang which is currently in the stage of building thermal desorption facilities. In this sense, it may be considered that the project did the right steps, from one side, in establishing a scientific framework for the assessment of remediation technologies, and from the other side in implementing measures for preventing further spreading of the PCDD/F contamination, pending the selection and implementation of a remediation technology.

GEF strategies. The Strategic Objective of GEF 4 is "To reduce and eliminate production, use and releases of POPs". The expected impacts, in comparison with project achievement at midterm and project activities to be completed after midterm are reported in the Table 1 below:

Table 1: Expected impacts and project relevance with GEF4 indicators.

Expected GEF 4 impacts	Main GEF 4 indicators	Project relevance
GEF-supported countries have strengthened capacity for POPs management and consequently strengthened capacity for the general sound management of chemicals	Regulatory and enforcement capacity in place	The project envisages a specific Outcome (Outcome 3) for the strengthening of national regulations and institutional capacities. This outcome includes: Output 3.1 (completed national regulatory framework); Output 3.2 (Strengthened capacity of Office 33); Output 3.3 (Strengthened institutional and individual capacities for site investigation); Output 3.4 (communication strategies).
The risk of adverse health effects from POPs is decreased for those local communities living in close proximity to POPs wastes that have been disposed of or contained	Reduced risk of exposure to POPs of project-affected people	The project has the main objective to "*to minimise disruption of ecosystems and health risks for people from environmental releases of TCDD contaminated hotspots*", therefore is relevant. The project could however benefit of a more quantitative indicator for assessing the reduction of the exposure of people to dioxin.

By any evidence, the project is of great importance also for achieving objective listed by Objective 1 of the GEF 5 Chemical strategy, as following (Table 2)

Table 2: relevance of the project with the GEF5 chemical strategy

(c) POPs releases to the environment reduced;	By implementing remediation and containment at the hot spots the project pursue the reduction of the release to the environment.
(d) POPs waste prevented, managed, and disposed of, and POPs contaminated sites managed in an environmentally sound manner; and	The project tested environmentally sound technologies for the destruction of PCDD/F in soil, and established a scientifically sound framework for the evaluation of destruction technologies in compliance with SC.
(e) Country capacity built to effectively phase out and reduce releases of POPs.	By demonstrating and implementing destruction technologies and building infrastructures for the containment of PCDD/F, and developing monitoring systems and procedures, the project will increase the country capacity.

In conclusion, it may be affirmed that the answers to the evaluation question 4.1.above are all positive and that the activities to be carried out, which are still relevant to the GEF strategies, are even more significant for addressing the country's need.

4.1.2. Are the project specific outputs and their corresponding indicators as defined in the project logical framework and design and its modification in the Inception report still relevant in the light of the project experience to date? Pinpoint any aspects of the "log frame" that shall be revisited and updated, and, if necessary, provide suggestion for timely changes or adjustment to activities and time-bound targets.

Relevance of project specific outputs and corresponding indicators.

At project inception, some of the project outcome and outputs have been revised to take into account changes occurred on the policy, legislative framework and the increase of leveraged funds – with specific reference to the USAID activities in Da Nang.

In the following Table 3, the differences between results (outcome and outputs) envisaged by the original project and by the review at inception are reported and commented.

In summary, the following further changes could be recommended in addition to the changes already approved at inception:

1) Use the conjunction “or” instead of “and” for outcome 1 (Dioxin in core hotspots area contained **or** remediated) as it cannot be expected remediating (destroy) all the PCDD/F in excess of the regulatory limit within project deadline or with the currently available GEF or leveraged funds. It should be noted that recent estimates for the remediation of Da Nang reached the value of 82 MUSD; a larger amount is very likely needed for the Bien Hoa where the amount of contaminated soil is 2 or 3 times larger. The technology (on-site thermal desorption) for Da Nang was under construction in the course of this evaluation, and based on received information, the cleanup using the thermal desorption technology is expected to last until 2016. Therefore it cannot be expected that even the Da Nang site where the remediation technology is already being implemented would be remediated within project deadline.
2) In the course of evaluation mission, it was reported that component 2 (Land use) cannot be carried out under the project as the hotspots, being military areas, fall under the responsibility and control of MOD. Therefore the project may have little influence on the land use of these sites. This aspect is discussed with further detail in the report, however from the point of view of the project structure, it is proposed to delete component 2 and move the associated budget to other project components.
3) As a consequence of 2 and of the presence of another component for communication, it would be advisable (more for formal than substantial reason) to merge outputs 2.3 and 3.4 in a single output.

Table 3: Results as in the Prodoc originally approved, and revised at Inception

Results	Original Approved ProDoc	Results Revised at Inception Phase	Comments
Outcome 1	Dioxin in core hotspot areas contained and remediated	Dioxin in core hotspot areas contained and remediated	Recommended: Dioxin in core hotspots area contained **or** remediated. The remediation (intended as destruction of PCDD/F down to the target level) is not going to be accomplished in any of the hotspots by project end, whilst containment has already achieved most of the planned results.
Output 1.1	Completed remediation targets and remediation strategy for each hotspot	Containment/remediation targets and remediation action plans for each hotspot completed	
Output 1.2	Trained government personnel in selected remediation technologies	Government personnel trained in selected containment and remediation technologies	
Output 1.3	Spatial delineation of heavily contaminated areas, based on supplementary sample analysis	Spatial delineation of heavily contaminated areas, based on supplementary sample analysis including newly identified areas at Phu Cat and Bien Hoa	The modification at inception is acceptable as it includes the needs for identification of new contaminated area as pointed out by stakeholders in the course of the evaluation mission.
Output 1.4	Pilot scale remediation with the chosen technologies at each site	Pilot scale demonstration of remediation technology for potential use at Bien Hoa and/or Phu Cat	Acceptable as full scale remediation facility is already being established by USAID in Da Nang, and in Phu Cat the PCDD/F

Results	Original Approved ProDoc	Results Revised at Inception Phase	Comments
			contaminated soil has been contained. In Bien Hoa the MCD technology has been tested.
Output 1.5	Implementation plan formulated, funds leveraged, and full scale remediation at all three hotspots implemented to the maximum extent possible	Full containment and/or isolation completed at Phu Cat and Bien Hoa and funding for full scale remediation identified while coordination mechanism functioning at Da Nang based USAID financing	The reviewed results correctly take into account the fact that the remediation ad Da Nang is being carried out as a "turnkey" activity with the financial and technical support provided by USAID, and establishes the need for a coordination mechanism with USAID activities. Common criteria for technology testing and evaluation should be agreed for all the hotspots area under the project.
Output 1.6	Monitoring system to ensure achievement of remediation goals	Monitoring systems operational at all hot spots to ensure performance measurement against containment and remediation goals as applicable	
Outcome 2	Land use on and around hotspots eliminates risks and contributes to environmental recovery	Land use on and around hotspots eliminates risks and contributes to environmental recovery	Activities related to land use are now under the full responsibility of MOD. Information on that are however kept confidential. Therefore Output 2.1 and 2.2 should be deleted and the associated funds made available for other activities.
Output 2.1	Completed overall land use plan (including zoning) and an action plan for environmental recovery in each of the affected areas, based on Environmental Impact Assessment (EIA) recommendations	Overall land use plan (including zoning) and an action plan for environmental recovery in each of the affected areas, based on Environmental Impact Assessment (EIA) recommendations completed	See comment above
Output 2.2	Implemented environmental recovery action plans and other land use measures in and around each of the three hotspots	Environmental recovery action plans and other land use measures in and around each of the three hotspots implemented	See comment above
Output 2.3	Implemented public environmental awareness/ information and education programs in the area surrounding the hotspots	Public environmental awareness /information and education programs implemented	The change established at inception correctly identified the need for a wider scope of the communication effort, not limited to the immediate vicinity of hot spots. Possible overlapping with output 3.4 should be identified and addressed.
Outcome 3	Strengthened national regulations and institutional capacities	National regulations and institutional capacities strengthened	

Results	Original Approved ProDoc	Results Revised at Inception Phase	Comments
Output 3.1	Completed national regulatory framework for maximum permissible dioxin discharges and contamination into/ of soil, water and air and contamination of food products/ animal/ fish feed	National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and/ or human dioxin TDI applicable to general population and vulnerable populations developed and adopted	Indeed, cleanup standard for PCDD/F contaminated soil has been established at project starting (2009). Other regulatory standards have been derived, but not formally submitted to the government for approval.
Output 3.2	Strengthened capacities of Office 33 for coordination, fund mobilization and experience sharing at all levels	Capacities of Office 33 for coordination, fund mobilisation, dioxin contaminated site identification/inventories, dioxin data base operation, and experience sharing at all levels including international cooperation strengthened.	
Output 3.3	Strengthened institutional and individual capacities for site investigation and contamination analysis, participatory/consultative land use planning, and planning and management of cost-effective remediation	Institutional and individual capacities for site investigation, risk assessment, contaminated site land use planning and monitoring, and planning and management of cost-effective remediation strengthened	
Output 3.4	A communication strategy vis-à-vis national and international industries and consumers implemented	A communication strategy vis-à-vis national and international industries, consumers and others implemented	Possible overlaps with output 2.3 should be identified and addressed.
Outcome 4	NA	Project management, monitoring and evaluation done in accordance to agreed rules	
Output 4.1	NA	Programme management and implementation	
Output 4.2	NA	Programme monitoring and evaluation undertaken according to guidelines	

4.1.3. Do the project purposes and objectives remain valid and relevant, or are there items or outcomes in the project design that need to be reviewed an updated?

As pointed out in chapter 4.1.1, the contamination by PCDD/F in Vietnam is an issue still requiring years to be solved. In general, the objectives and purposes of the project are therefore still valid and relevant as the project is providing significant technological and capacity building inputs in all the most important sectors related to remediation of PCDD/F contaminated sites. In the course of project implementation it became however evident that the project has little intervention power on the land use of military areas, therefore the land use planning of the three hot spot areas is currently completely under the responsibility of MOD. It is therefore suggested to delete outcome 2 (Land use planning) and to move the remaining associate budget to other project components.

Concerning outcome 1.5., the need to reallocate the funds assigned to Da Nang was already addressed at inception: *"As the USAID project at Da Nang progresses, which applies one stage remediation on a turnkey basis, the GEF resources will be focused on Phu Cat and Bien Hoa.".* Obviously, this does not mean that the activities in Da Nang need to be considered external to the project: rather, that this is an almost entirely externally co-financed set of activities requiring a coordination mechanism for ensuring circulation of information, common criteria for monitoring and for evaluation of the technology is adopted. It should be noted however that the time frame for the remediation of Da Nang is longer in comparison with the one of the project, as it will last at least until 2016.

Outcome 2 of the project (land use planning) is obviously relevant: however, as the land use of military areas is under the sole responsibility of MOD, and the activities carried out have been considered confidential by MOD, this component has been pulled out from the project.

4.2.OUTCOME AND OUTPUTS

This section is aimed at answering the following evaluation questions:

- To what extent the project objectives have been met, taking into consideration the "achievement indicators" specified in the project document/inception report and logical framework?
- To what extent have project results (outcomes and outputs) been achieved to date? And how have they been achieved in terms of inputs, timeliness, and cost-effectiveness?
- Is the project on track to achieve its goal of "support to sustainable development in Vietnam through the elimination of POPs from the environment"?
- What were the major factors influencing the achievement/non-achievement of the project objectives/results? What are factors that have facilitated or deterred the achievement of project objectives?
- Do the outcomes/outputs complement and enhance one another, and if yes, to what extent?
- Given the level of achievement of the outputs and activities to date, is the project likely to achieve its objectives and overall target by the end of the project?

4.2.1. To what extent the project objectives have been met, taking into consideration the "achievement indicators" specified in the project document/inception report and logical framework?

The project, as originally approved has the objective to remove the barriers that limit Vietnam in dealing with the hotspot contaminated by Dioxin. A comparison between project general objectives and project achievement is summarized in Table 4 below.

Table 4: Comparison between Project general objectives and Project achievements

Barrier to be removed (Project general objectives)	**Project achievements**
The lack of an overall plan to deal with the hotspots and an overall regulatory framework regarding dioxin contamination;	One of the most important outputs of the project is the development of action plans or master plans for the remediation of the hotspots areas. To date, the master plan for Bien Hoa is almost completed; whilst for Da Nang USAID has developed an Environmental Assessment which also includes a planning component. As far as Phu Cat is concerned, after the completion of the landfill, a monitoring plan has been developed and partially implemented. Although a certain level of uncertainty and debates still remain on the hot spot action plans, it may be affirmed that the project is on track for achieving the objective of providing an overall plan to deal with hotspots.

<table>
<tr><td></td><td>Concerning the overall regulatory framework, recently, under direction of the Office No 33, the standard TCVN 8183:2009 – establishing target concentration for of Dioxin in soil and sediments was issued. This standard is not compulsory; however it has been applied as reference standard for the project.

Q
<table><tr><th>Media</th><th>Threshold</th><th>Analytical method</th></tr><tr><td>Soil</td><td>1.000</td><td rowspan="2">EPA Method 8280B or EPA Method 8290A</td></tr><tr><td>Sedimen t</td><td>150</td></tr></table>Further standards (PCDD/F emission from industrial sources, quality concentration limit in other environmental media) have been proposed under the activity carried out by the project.</td></tr>
<tr><td>Limited availability of high quality data on site contamination and effects on environments and people;</td><td>The project has collected, collated and summarized a large amount of information analytical data and studies on the situation of PCDD/F contamination in the three hotspots. These data are currently being used by the several governmental and non-governmental actors for the drafting of plans and designing of remediation or containments. There is still the need for a quantitative assessment, at least in term of source reduction, of the reduced risk for the population.</td></tr>
<tr><td>Technological capacities (essential equipment, knowledge) for problem analysis and for remediation of dioxin contamination;</td><td>The project, by demonstrating a PCDD/F destruction technology and establishing containment infrastructures and safe landfills, contributed significantly to the knowledge and the increased technological capacity of the relevant stakeholders for problem analysis and remediation of dioxin contamination. Training on remediation technologies and workshops on the hot spot action plans have been performed; the results of the technology testing has been discussed by experts from different institutions, thus ensuring a good circulation of technical know-how and information, which eventually resulted in a substantial technology transfer on the issue of remediation of dioxin hotspots. As for any training activity, there is the need for assessing the effectiveness of the training, by means of proficiency tests and feedbacks.</td></tr>
<tr><td>Institutional capacities for coordination of national and international partners, and for planning and managing site remediation;</td><td>The project provided support to the office 33, which has been recognized by all the national and international stakeholders as a coordinating umbrella for leveraging funds and supervising remediation and monitoring actions at the hotspots and in their vicinity. The coordination between the project, the main donors (USAID), and MOD on the current management of the Da Nang site and on the future management of the Bien Hoa site has to be improved. Office 33 is only partially involved in the activities in Da Nang, which is being almost entirely carried out by USAID in coordination with MOD: the technology evaluation criteria established under the project seem not having being considered in the selection of the technology in Da Nang; there is the concrete risk that the work carried out in evaluating and improving the MCD technology in Bien Hoa would be discontinued if a proper coordination with USAID on the matter is not established. These problems cannot be attributed to the project management or Office 33;</td></tr>
</table>

	instead they derived mostly from the complex institutional and international context under which activities on PCDD/F remediation are being carried out
Financial resources for remediation to internationally accepted norms;	The project and Office 33 effectively leveraged a significant amount of financial resources for the conduction of remediation under PCDD/F target level internationally recognized. Around additional 35,776,000 USD leveraged in addition to the initial co-financing amount of 32.335.550 USD.
Capacities for public education and local land use planning to address the sensitive issue of highly toxic materials near populated areas.	Under the project, a significant number of governmental representatives received training and get familiarized with the complex issues of remediation of PCDD/F areas, and the risk associated with PCDD/F contaminated soil and biota. An annual conference on dioxin is established. And Office 33 participates with a dedicated session in the "Dioxin" workshop. The project was effective in generating documents and summaries to be circulated in the scientific or regulatory community international level; the level of success of the communication with the local people, living either in the hotspots (basically people from the army) or in their vicinity is still low and need further effort.

4.2.2. To what extent have project results (outcomes and outputs) been achieved to date? And how have they been achieved in terms of inputs, timeliness, and cost-effectiveness?

Some of the project outcomes set by the original project document were subsequently redefined at inception. Output 1.5 underwent the most significant changes as the original ambitious results envisaging *"Implementation plan formulated, funds leveraged, and full scale remediation at all three hotspots implemented to the maximum extent possible"* was replaced by the more realistic – but still very demanding - results: *"Full containment and/or isolation completed at Phu Cat and Bien Hoa and funding for full scale remediation identified while coordination mechanism functioning at Da Nang based USAID financing".*

Table 5. Rating of the Relevance, Efficiency and Effectiveness of Project Outcome and Outputs.

	Results Revised at Inception Phase	Indicator	Target	Achievements	Rel.	Effic.	Effect.	Avg	Rating
Outcome 1	Dioxin in core hotspot areas contained and remediated	Volume of contaminated soil and sediment contained and remediated	As a result of the GEF-project and leveraged funds / activities, all contaminated soil at concentrations greater than 1,000ppt and sediment at concentrations greater than 150ppt will have been treated adequately and residual contamination safely land-filled, and thereby 1,736 g I-TEQ dioxin release will be avoided: at Bien Hoa by the end of 2010; at Da Nang by the end of 2012; and at Phu Cat by the end of 2011.	The initial outcome indicator was overly ambitious. Partially revised at inception. At midterm: containment at Bien Hoa partially completed; highly contaminated PCDD/F soil disposed in a safe landfill for temporary containment; in Da Nang a turnkey remediation project based on thermal desorption is being carried out by USAID. In Phu Cat, 7500 m3 of PCDD/F contaminated soil where stored in a safe landfill . The level of contamination of the soil inside the landfill was from 600 ppt to around 250000 ppt. In Bien Hoa, the infrastructures built under the project (interim measures for runoff containment) concerned around 102000 m^3 of soil with a contamination ranging from 3500 to around 50000 ppt, with a peak value of 962500 pptTe.	4.5	4.17	4.17	4.3	HS
Output 1.1	Containment/remediation targets and remediation action plans for each hotspot completed	Existence of action plan for each hotspot	Action plans for each site completed within 4 months of start of project implementation	A draft master plan prepared and discussed in several meetings and a specific workshop for the Bien Hoa airbase. In Da Nang an EA has been developed by USAID. In Phu Cat, a report on the safe landfill technology has been drafted. Reports 1 to 31.	4	4	4	4	S
Output 1.2	Government personnel trained in selected containment and remediation technologies	Number of government personnel trained	At least 50 personnel trained within 12 months of the start of project implementation	A Training course in association of the testing of the MCD technology in Bien Hoa airport has been carried out. Report 32	4	4	4	4	S

	Results Revised at Inception Phase	Indicator	Target	Achievements	Rel.	Effic.	Effect.	Avg	Rating
Output 1.3	Spatial delineation of heavily contaminated areas, based on supplementary sample analysis including newly identified areas at Phu Cat and Bien Hoa	Completed spatial delimitation of contaminated areas	Additional samples collected and analyzed within 12 months of the start of project implementation	A comprehensive report on the contamination status of Bien Hoa, Da Nang and Phu Cat airbases drafted, summarizing all available data and results from previous monitoring. Based on interviews with experts and analysis of available reports, In Bien Hoa we the boundary of contamination has not been completely identified. There are surveys based on different principles (Historical information, regular grid, random, expert judgement, conceptual model). Further analysis being carried out under the activity funded by the Czech government (Dekonta).	4	3	3	3.3	S
Output 1.4	Pilot scale demonstration of remediation technology for potential use at Bien Hoa and/or Phu Cat	Initiation of remediation	Remediation testing initiated at all sites within 8 months of the start of project implementation	The MCD technology has been tested in Bien Hoa on 150 tons of PCDD/F contaminated soil. The test demonstrated the suitability of the technology in treating PCDD/F soil and the needed improvement of operational parameters for treating PCDD/F soil contaminated over 20000 ppt. It also established a procedure for testing new technologies. Report 34 to 37.	5	4	4	4.3	HS
Output 1.5	Full containment and/or isolation completed at Phu Cat and Bien Hoa and funding for full scale remediation identified while coordination mechanism functioning at Da Nang based USAID financing	Existence of plan for any areas not remediated during the life of the project	A plan for any untreated sub-sites is completed at least 6 months before the end of project implementation	In Phu Cat, the planned safe landfill for the containment of PCDD/F soil has been established. In Bien Hoa the construction of infrastructures and trenches for limiting the PCDD/F spreading into the environment under completion (reported completion date June 2013). Reports 26, 38, 29, 40	5	5	5	5	HS

	Results Revised at Inception Phase	Indicator	Target	Achievements	Rel.	Effic.	Effect.	Avg	Rating
Output 1.6	Monitoring systems operational at all hot spots to ensure performance measurement against containment and remediation goals as applicable	Existence of monitoring plan	A monitoring plan is completed no more than 6 months after the start of project implementation	A detailed long term monitoring plan for Phu Cat has been developed by Dekonta under the activities co-funded by the Czech republic. The groundwater monitoring system is being completed. A conceptual model for Bien Hoa containing indications on migration paths for PCDD/F and on risk scenario was also drafted, which will constitute the basis for further monitoring and containment activities. Reports 59-60.	5	5	5	5	HS
Outcome 2	Land use on and around hotspots eliminates risks and contributes to environmental recovery	Existence of action plan for each hotspot	By the end of the project, appropriate land uses have been introduced for at least 10ha at Bien Hoa; 8 ha at Da Nang, and 4ha at Phu Cat	This outcome (outputs 2.1 and 2.2) has not been achieved has the overall responsibility of the management of military areas falls under the MOD. The project has therefore no power to decide on land use of the three sites	4	1.33	1.33	2.2	MS
Output 2.1	Overall land use plan (including zoning) and an action plan for environmental recovery in each of the affected areas, based on Environmental Impact Assessment (EIA) recommendations completed	Existence of plan for any areas not subjected to land-use modification during the life of the project	Action plans for each site completed within 6 months of start of project implementation	Under MOD responsibility – not carried out by the project. Only an informal report available (70)	4	1	1	2	MU
Output 2.2	Environmental recovery action plans and other land use measures in and around each of the three hotspots implemented	Existence of action plan for each hotspot	A plan for any areas not subject to land-use modification during the life of the project is completed at least 6 months before the end of project implementation	Under MOD responsibility – not carried out by the project. Only an informal report available (70)	4	1	1	2	MU
Output 2.3	Public environmental awareness /information and education programs implemented	Number of local residents having access to information	By the end of the project the percentage of local adult residents who do not know about dioxin is less than 1%, while the percentage who receive information from multiple sources is over 60%	High risks were initially communicated to local community living around Bien Hoa airport. A more comprehensive communication strategy was formulated with plan of actions as being merged with 3.4 (stakeholder communication). Implementation of this plan of actions started in May 2013.	4	2	2	2.7	MS

	Results Revised at Inception Phase	Indicator	Target	Achievements	Rel.	Effic.	Effect.	Avg	Rating
Outcome 3	National regulations and institutional capacities strengthened	Assessment of capacity among government officials Assessment of capacity among local communities	By the end of the project, at least 70% of officials have received training or awareness raising on dioxin and less than 5% of officials are unable to access information on policies and laws related to dioxin By the end of the project, less than 15% of respondents are unable to name agencies responsible for management of contaminated areas	To be assessed at project end	5	3.4	3.4	3.9	S
Output 3.1	National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and/ or human dioxin TDI applicable to general population and vulnerable populations developed and adopted	Minimum standards adopted	By the end of the second year of project implementation, a minimum standard of no more than 1000ppt for dioxin contamination of soil and sediment has been officially adopted	A standard of 1000 ppt for PCDD/F contaminated soil and 150 ppt for sediment is currently adopted as target for all the remediation / containment activities. The standards have been officially adopted but are not mandatory. Analysis of existing TDI and of emission limit for PCDD/F from industrial sources has been drafted; emission limit proposed for industrial sources but not for the TDI. Reports from 71 to 76	5	3	3	3.7	S
Output 3.2	Capacities of Office 33 for coordination, fund mobilisation, dioxin contaminated site identification/inventories, and dioxin data base operation, and experience sharing at all levels including international cooperation strengthened.	Number of lessons from pilots disseminated at different levels International funds for remediation leveraged in addition to baseline	By the end of the project, in a survey of officials outside Dong Nai, Da Nang and Binh Dinh provinces, at least 50% are able to report at least one lesson generated by the project By the end of the project funding for completion of remediation against international standards secured	The first of the 2 target has a very low measurability, and will require a rigorous assessment of the baseline. Concerning the second target, it is evident that the project was able to raise interest and coordination among stakeholders, so that a larger amount of funding compared to when project started is now available for remediation of the hot spot sites. However, due to the large budget estimated for completing the remediation, these funds would not be enough yet. The project supported the Office 33 in developing the National Action Plan which has been recently approved. Reports fron 77 to 81.	5	3	3	3.7	S

	Results Revised at Inception Phase	Indicator	Target	Achievements	Rel.	Effic.	Effect.	Avg	Rating
Output 3.3	Institutional and individual capacities for site investigation, risk assessment, contaminated site land use planning and monitoring, and planning and management of cost-effective remediation strengthened	Establishment of new international-standard laboratory	A new laboratory under the auspices of MONRE undertakes state-of-the-art analysis of dioxin contamination and is used by international clients	There are 2 laboratories working for the project: the laboratory of the Vietnam-Russian Tropical Centre, established with the support of the former Soviet Union, which carried out around 200 samples and analysis out of an overall number of 2000 samples; and the VEA Dioxin Lab (under MONRE) , supported by the Bill Gates foundation and the Atlantic Philanthropies, which provided UNDP with the full database of analysis performed.	5	5	5	5	HS
Output 3.4	A communication strategy vis-à-vis national and international industries, consumers and others implemented	Number of domestic communication events Number of reports produced for international dissemination	By the end of the project there have been at least 30 domestic communication events	Several comprehensive thematic reports and newsletters were produced by the project for international dissemination. Two articles were presented in international conferences. Most of the project reporting has been translated or originally drafted in English, being therefore suitable for international dissemination. PMU participates in dedicated sessions in the Dioxin conference, and organize annual international meetings on the Dioxin situation in Vietnam. The national communication events are however still very limited. Reports 90 to 99	5	3	3	3.7	S
Outcome 4	Project management, monitoring and evaluation done in accordance to agreed rules			Quarterly and annual reports made available to the evaluators. Quarterly work plan not available. The PMU has a high technical capacity and understanding of project needs, and is now self - sufficient. PMU has the capacity to interact at international level on the technical issues related to dioxin. Reports 100 to 111	5	3	3	3.7	S
				Overall project rating	**4.63**	**2.98**	**2.98**	**3.5**	**S**

4.2.3. Is the project on track to achieve its goal of "support to sustainable development in Vietnam through the elimination of POPs from the environment"?

The project activities are on track on achieving the goals set with the revision of the results framework carried out at inception, although some revisions of the project scope is still needed. In detail:

Outcome 1: as already said, the objectives set by the original project document in term of remediation were too ambitious, considering the complexity of the contamination by PCDD/F in the three hotspots and the large budget that was required for the containment / remediation of similar, though simpler, cases. Therefore the very demanding targets set originally for Outcome 1 *(As a result of the GEF-project and leveraged funds / activities, all contaminated soil at concentrations greater than 1,000ppt and sediment at concentrations greater than 150ppt will have been treated adequately and residual contamination safely land-filled, and thereby 1,736 g I-TEQ dioxin release will be avoided: at Bien Hoa by the end of 2010; at Da Nang by the end of 2012; and at Phu Cat by the end of 2011)* are overly optimistic and would be hardly reached by the end of the project. On the contrary, if it is accepted – as clarified at inception - that the objective of the project is not to destroy all PCDD/F above 1000 ppt in soil (or 150 ppt in sediment), but instead to contain PCDD/F in the soil contaminated above 1000 ppt, and to avoid spreading of PCDD/F in the environment, pending further remediation activities to be conducted with leveraged funds within project deadline, it may be affirmed that the project is on track and successful, as it did the right steps by:

- limiting as much as possible the spreading of PCDD/F pending implementation of final remediation activities in Bien Hoa, by means of construction of a barriers / trenches system. In view of the possible intervention funded by USAID in remediating Bien Hoa by 2020, as communicated in the course of meeting at Bien Hoa airbase, any action aimed at reducing PCDD/F spreading as much as possible pending final remediation has to be considered technically correct and very necessary;
- establishing a medium-long term containment of PCDD/F in Phu Cat, by placing all the contaminated soil into a specially designed safe landfill, and building a system for the periodic monitoring of groundwater in the vicinity of the landfill.
- successfully testing a remediation technology (the MCD) by adopting a scientifically sound testing scheme. On this point it should be noted that, although some issues on the timely delivering of analytical work affected the testing results, in general the testing scheme was considered valid. A similar testing scheme, with improved sampling and analytical plan for calculating the mass-balance of the technology, and the timely delivery of analytical results (ensuring that the level of contamination o soil to be treated is known before starting the operations) is therefore recommended for evaluating any remediation technology at the sites;
- acting as a "coordinating umbrella" hence facilitating the task of Office 33 in leveraging funds, and facilitating donors in implementing activities related to monitoring and remediation of PCDD/F contaminated sites.

Concerning Outcome 2 (Land use) it was reported that basically this component has been pulled out from the project, as the land use of the military areas is completely under the responsibility of MOD, and as confidentiality issues were raised by MOD. Therefore, based on the fact that there is no information available for this component, it cannot be considered concluded or ongoing.

Outcome 3 envisaged outputs both on the side of regulatory framework and communication. Against the goals set at inception (*National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and/ or human dioxin TDI applicable to general population and vulnerable populations developed and adopted*) the activities carried out in compliance with output 3.1 (regulatory framework) were as following:

- Under direction of the Office No 33, the standard TCVN 8183:2009 – establishing target concentration for of Dioxin in soil and sediments was issued. This standard is not compulsory; however it has been applied throughout all the project remediation and monitoring activities in the three hotspots.

Media	Threshold	Analytical method
Soil	1.000	EPA Method 8280B or EPA Method 8290A
Sediment	150	

- A report “Review and Recommendation of provisional TDI for Vietnamese people” prepared: this report includes a thorough review of PCDD/F level in food in Vietnam compared to other countries from various sources, and a review of the recommended values adopted by several international institutions.
- A report “Dioxin Contamination, Regulations And Standards In Air And Water: Review And Recommendations” was drafted: this report includes a review of PCDD/F level in air and water in Vietnam compared to other countries from various sources, and a review of the recommended values adopted by industry sector. The report proposes industry-sector specific limit values for the release of PCDD/F in the air and in the water.

In summary:

- Target values for remediation of PCDD/F contaminated soil have been proposed and adopted;
- TDI values were not developed, although a methodology for developing such standards and a summary of TDI values adopted by international institutions have been drafted;
- Emission standards have been developed based on analysis of international practices and technical, environmental and economical consideration; these standards however have not been yet adopted or submitted to the government for discussion.

A more comprehensive assessment of the work carried out on the regulatory framework is reported in chapter 4.3.

4.2.4. What were the major factors influencing the achievement/non-achievement of the project objectives/results? What are factors that have facilitated or deterred the achievement of project objectives?

The issue of dioxin contamination is attached great importance in Vietnam at all level. The Vietnamese government[1] established the so called "Committee 33" which is the national committee having the task to address the issue of PCDD generated by the USA-Vietnam war. The chief of Committee 33 is the Ministrer of MONRE; other members are Science and Technology Department, and representatives from MONRE and MOD. All the policy initiative and planned activities related to the PCDD/F issues in Vietnam have to be go through Office 33 and approved by the Committee 33. The MOD has responsibility to control PCDD/F in the airbases. Therefore it may be affirmed that the project is integrated into governmental activities which already provided a sound institutional framework for managing technical, administrative and political aspects related to the dioxin contamination. This situation obviously facilitated project implementation; the strong support Office 33 received from the project allowed also promoting fund raising.

The project also benefited from the fact that for several reasons (international relationships, commercial agreements and strategies) international donors were keen to provide technical and financial support to the project. From 1995, when the USA-Vietnam relationships started to normalize, there was an increased commitment from the US government to support monitoring and remediation activities. Currently, a formal commitment from US government and USAID to carry out the remediation in Bien Hoa by 2020 has been reported by MOD in the course of one of the evaluation meeting; the Czech government funded the monitoring of Phu Cat and the conceptual modelling of Bien Hoa; non-profit private donors (like the Ford Foundation, the Bill Gates foundation, the Atlantic Philanthropies) provided funding for laboratory equipment and for PCDD/F analysis; the New Zealand government partially funded the pilot testing of the MCD technology. Which such a large commitment, being the project established at the very core of the decision centre of Office 33, it is evident that any project achievement may be immediately communicated and amplified.

The large amount of funds leveraged within the project could however represent also a risk for the project sustainability. It's a fact that the GEF funding, quantitatively, represents a minor part of the overall leveraged funds. The side effect is that there may be a limited willingness from the main donors to coordinate with the project activities-and indeed it is commonly perceived by all the stakeholders interviewed that the project, and Office 33 itself, are playing a limited role in the remediation of Da Nang and in the planning of the future remediation in Bien Hoa. Paradoxically, that could affect the sustainability of the project if the good results achieved by the project, in term of harmonization of monitoring information, further monitoring, technology selection and testing, will not properly continued after project ends. One of the main governmental stakeholders of the project, during a meeting, declared that *"UN is very successful in leveraging funds from other organizations. If UN and US government could have a closer coordination and cooperation the project efficiency would be better"*.

It is also clear that technical difficulties greatly challenged the project implementation. PCDD/Fs are probably the most difficult POPs to deal with: these molecules degrades extremely slowly and can remain stable in the soil for decades; very few technologies proved effective in destroying dioxins, and indeed thermal technologies, if not properly managed, may generate or transfer PCDD/F pollution; the analytical determination of PCDD/F is still expensive, complex, and requires skilled operators and sophisticated technologies, due to the need to quantify very low concentrations. The toxicological profile of PCDD/F has been revised only recently (3), therefore the establishment of risk-based target level also may represent an issue. The three hot spots areas targeted by the project are among the worst contaminated PCDD/F sites in the world. And, finally, communication issues on Dioxin in Vietnam are extremely difficult due to historical legacy of the war which is still perceived by the public as an open wound. Therefore all the project

[1] Decision No. 33/1999/QD-TTg dated March 1, 1999 of the Prime Minister on the establishment of the National Steering Committee to treat with the consequences of toxic chemicals used by the U.S. army in Vietnam war.

components (remediation, monitoring, planning and regulation, communication) had to face technical and political difficulties which slowed down some of the activities

Further, the following difficulties should be mentioned:

1) The limited availability of dioxin laboratories, with the effect to slow down the delivery of analytical results and action depending of the availability of the results
2) The complexity related to the operations to be carried out in sensitive contexts in coordination with the administration of the Ministry of Defence and the related security and political issues.

It is at the light of the above challenges that it is possible to affirm that without the strong commitment from all the project stakeholders, the achievement of the several positive results could not have been possible.

4.2.5. Do the outcomes/outputs complement and enhance one another, and if yes, to what extent?

Notwithstanding the high complexity of the PCDD/F issues in Vietnam, the project structure is very simple and straightforward, as it was arranged in only 3 technical components plus one project management component. At project design the project scope were delimited in a realistic way; the project correctly identified the issue of the three hotspots as its main target, and indeed the three components (1. Remediation; 2. Land use and communication; 3. Regulatory framework and communication strategies) integrates each other in a very logical and effective way. The remediation (component 1) has to be carried out with reference to target regulatory level (component 3) which were not existing in Vietnam before 2009, therefore the integration between components 1 and 3 is crucial; although is unlikely that the formal adoption of regulatory limit for the PCDD/F release in air and water of the destruction technology is adopted before project end. At the same time, the remediation of the hotspots need to be carry out in a very participatory way, and ensuring proper communication at several levels: international, for facilitating the raising of new resources and for coordinating with international donors; institutional, for facilitating the communication among the different governmental bodies involved; and public, for informing people about PCDD/F risks, project benefit, and measures to be adopted.

Synergy between component 2 (land use) and the other components, especially component 1, was established at project design: it is obvious that the remediation of hot-spot areas would have been linked with land use planning of the remediated areas, and that at the same time the planned land use should influence the remediation targets. Unfortunately the component on land use planning cannot be accomplished due to the fact that being the sites military areas, these are under the direct responsibility of MOD that is also opposing confidentiality issues on the land use planning activities foreseen by the project: in other words, MOD would fulfil requirements from MONRE and the related project needs on remediation activities and target, but is rejecting any influence or recommendation on the land use of the three hot-spots as areas under military control.

4.2.6. Given the level of achievement of the outputs and activities to date, is the project likely to achieve its objectives and overall target by the end of the project?

In general, the project seems proceeding at the right pace for completing activities under component 1, There is however an urgent need to carry out a quantitative analysis of the amount of PCDD/F destroyed or contained under the project, to assess the benefit for the population and the environment in term of reduction of risk. The objectives of component 2 (land use) are not going to be achieved, due to the difficulty to overcome the confidentiality issue in military areas. The funds

available under component 2 should therefore be reallocated to other project components. Concerning component 3,it has to be pointed out that under the project a certain number of regulation on cleanup targets and emission limits for PCDD/F have been issued. This component requires a limited reassessment of some of the limits proposed, and very likely the objectives envisaged for component 3 may be reached within project deadline.

4.3. PROPOSED STANDARD LIMITS

PCDD/F emission from industrial sources. The main reference for assessing the project output related to the establishment of environmental standards for dioxins (release limits and concentration limits for the relevant environmental media) is clearly the Stockholm Convention, and particularly the requirements under Article 5 (Measures to reduce or eliminate releases from unintentional production).

With specific reference to the release of unintentional POPs, the Stockholm convention requires that BAT and BEP are phased in “no later than four year after the entry into force of the Stockholm Convention for a Party”.

In this respect the proposed timing for the establishment of the emission standards in Vietnam seems reasonable, as it envisages the immediate adoption of BAT/BEP limits for new industrial sources, whilst the stringer limits for existing sources are gradually enforced by 2020.

Based on the Stockholm Convention, any new regulatory standard for the releases of U-POPs in general and for PCDD/F in particular should be assessed for its efficacy related to the management of such releases (Article 5.a.ii and 5.a.iii of the Convention). The report on the establishment of standards constitutes a first step toward the assessment of the efficacy of the proposed standards in reducing PCDD/F emission. A quantitative evaluation related to the expected reduction of PCDD/F releases should be performed based on the updating of the PCDD/F inventory and its recalculation with the proposed limits.

The strictest standards proposed in the document for emission in the atmosphere (0.1 ng/Nm^3) is general consistent with the international regulation and standards, and with the Stockholm Convention BAT criteria. The limit of 0.1 ng/m^3 for industrial emission is a well established standard in Europe for several types industrial facilities, although most of the recent incinerators and industrial facilities are currently capable to stay stably well below that limit – as is proved for instance by the data reported for the Holcim plant in Vietnam. Higher values (for instance the one proposed for small medical waste incinerators) although high, may be justified based on a tradeoff between the need of reducing emission limit and the lacking of alternative technologies for disposing medical waste.

Environmental limits for PCDD/F in atmosphere and water in the three hotspot sites. Concerning the dioxin emissions limit for the treatment of dioxin residues in the three hotspot sites, the proposed value of 0.5 ng I-TEQ/m^3 for the environment air is obviously too high and is not supported by any risk assessment evaluation. That value is 5 times higher than the accepted BAT for emission limit at the stack, and many thousand times higher than the risk based concentration estimated by US EPA:It is therefore strongly suggested to reassess this limit based on a formal risk assessment procedure. As a matter of reference, the US EPA risk based concentration for 2,3,7,8 TCDD in the atmosphere has been estimated in 6.4×10^{-5} ng/m^3.

More specifically, the document seems to ignore the extensive analysis of dioxin carried out by US EPA since 1986, resulted in 2003 in the “Dioxin reassessment document”, and followed in 2012 by the last release of the “EPA’s Reanalysis of Key Issues Related to Dioxin Toxicity and Response to NAS Comments”.

Indeed, only a generic reference to the USEPA website www.epa.gov is made in one of the two documents submitted. In the document on daily intake there is a statement that “United States Environmental Protection Agency (U.S. EPA) has evaluated and continually re-evaluated the effects of dioxin to the acceptable standard for over 10 years and still no firm conclusions, and the tolerance presence of dioxins in soils is now at 1,000 ppb (parts per billion -10^{-9}). However this statement is not supported by any specific reference. The current value of TCDD 2,3,7,8 established by USEPA as corresponding to an incremental cancer risk of

$1x10^{-6}$ is established at $4.5x10^{-6}$ mg/kg (REF: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)

Beside the reference issue, however, we maintain our view on the limit of 0.5 ngTE/m3 for the environment air is too high.

The US EPA dioxin assessments and reassessments are today among the most comprehensive sources of information related to the environmental behavior, exposure and toxicity of PCDD/F, including also human toxicity assessment derived from the 30 year follow up of the Seveso case and the "The Air Force Health ("Ranch Hands" cohort) study." US EPA also recently issued (2012) a new revision of the TEF values which should be take into account.

It also worthwile noticing that in 2002, the Joint Food and Agriculture Organization of the United Nations (FAO)/WHO Expert Committee on Food Additives (JECFA) established a provisional tolerable intake of 70 pg/kg body weight per month for PCDDs, PCDFs and coplanar PCBs expressed as TEFs, based on reproductive end-points. The value is expressed "per month" to reflect that exposure is cumulative and chronic rather than acute.

The report would also benefit of an updating of UE regulatory sources (i.e. the incineration directive 2000/76/EC25 (incineration of waste) instead of the quoted 94/67/EEC;

4.4.TECHNOLOGIES

4.4.1. BALL MILLING TECHNOLOGY.

This technology has been tested in the Bien Hoa site by treating a number of batches of soil with different concentration of PCDD/F, for an overall volume of 150 tons. The demonstration program was initially designed by the UNDP Resident Expert and Office 33 with input from national experts and formalized at a detailed level in a Work Program prepared initially by EDL and signed off by UNDP and Office 33; the sampling and analytical program was administered by UNDP/Office 33. Before the trial test in Bien Hoa, the technology was tested only on limited amounts of PCDD/F contaminated soil and no information on the commercial scale operation of this technology on PCDD/F contaminated soil were available. The detailed data generated by the proof of performance test have been examined by different experts for assessing the technology performance: the UNDP Independent Evaluation Consultant Mr. Rick Cooke, the UNDP Resident Experts Mr. Saito, and the National Expert Mr. Minh, who leaded the supervision missions on site.

Available documentation and reference documents considered are therefore:

- The vendor's proof of performance test report (4)
- The independent evaluation drafted by Rick Cooke (5)
- The UNDP notes drafted by Mitsugu Saito (6)
- GEF STAP Report on technologies (7)
- The supervision mission reports from the Vietnamese experts.

Description of the technology.

The technology envisages processing of contaminated soil by means of rotary ball mills. The main process parameters are the feed rate (resident time), rotational speed of the mill, size and number of steel balls, use of reagents like quartz sand. The PCDD/F molecules undergo dehalogenation due to the high speed collision of the steel balls with the contaminated soil. Although not completely clarified, it is recognized that the mechanism involves the formation of highly reactive surfaces, a localized "triboplasma" (a plasma with

emission of electrons, ions, photons, electrical discharge) generated by collision and friction, and the formation of highly reactive free radicals undergoing reaction with neighboring compounds. As the process does not depend upon the concentration of other reagents (quartz sand is basically used for increasing reactive surface), it is assumed it follows a first-order kinetic. Before being processed, the soil need to be screened down to a size of less than 10 mm. Due to the characteristics of the process, the soil completely change is texture after the decontamination process, becoming very fine and effectively sterile.

Conduction of the test

The test has been conducted in Bien Hoa by EDL New Zealand from July 30 to September 20, 2012, under the administrative supervision of the PMU. The tests were arranged on the basis of the following protocol: 150 tons of contaminated soils were excavated from Bien Hoa Airbase. 5 lots of soil from 4 locations were excavated and put into 150 big bags with unique numbering system to enable tracking the soil to the original locations. The excavation sites were determined based on the historical point analysis from two different site locations. The contamination level was initially classified as high (> 10,000 pg-TEQ/g), medium (between 2,000 and 10,000 pg-TEQ/g), and low (<2,000 pg-TEQ/g). That was an estimated range of concentration and was not supported by characterization of excavated material nor the actual material treated.

The demonstration was divided into 42 runs with specific control parameters such as feed rate, reactor RPM, soil lot, and with/without additive (i.e. quartz sand). Composite samples (blending bag-to-bag samples into 1 per run) were sent to an international laboratory for chemical analysis.

Results of the trial test:

A table directly extracted from the EDL report and summarizing the result of the trial burn test (4) is reported below:

High Strength (over 10,000 ppt) Runs 1 to 16 totaling 28 tons. The 24 results available in this category showed the following:

	No of Samples	Highest Value pg/g TEQ	Lowest Value pg/g TEQ	Average pg/g TEQ
Untreated	12	111000	51100	74392
Treated	12	49500	11800	23700
% Dioxin Reduction	12	82.5	49.7	67.8

Medium Strength (2,000 to 10,000 ppt) Runs 17 to 38 totaling 90 tons. The 66 results in this category showed the following:

	No of Samples	Highest Value pg/g TEQ	Lowest Value pg/g TEQ	Average pg/g TEQ
Untreated	33	61200	3540	13079
Treated	33	9870	25.8	1043
% Dioxin Reduction	33	99.6	48.3	92.3

Low Strength (below 2,000 ppt) Runs 39 to 42 totaling 23 tons. The five paired results in this category showed the following:

	No of Samples	Highest Value pg/g TEQ	Lowest Value pg/g TEQ	Average Value pg/g TEQ
Untreated	5	19100	394	6692
Treated	5	808	246	448
% Dioxin Reduction	5	96.8	35.3	68.6

The data above proved that the technology was most effective for “Medium Strength” soil, whilst for “High strength” soil and “Low strength” the technology proved less effective. Both the EDL report and the report from Mr. Cooke pointed out that the analytical data on the dioxin concentration in the in-feed soil were not made available before the end of the test, and EDL had to arrange a laboratory on its own for getting these data before the test conclusion; the results arrived only before Run 22, and *“prompted an immediate change*

on operational parameter" Both EDL and the independent evaluator pointed out that if the contractor had received the analytical data before the test, he would have had the possibility to properly configured the system before starting the test with the correct operational parameters.

The maximum dioxin reduction percentage is in the order of 99.6 (average of 92.4%) in the "medium strength" test. At medium and low strength the technology was capable to bring the soil concentration below the required quality standard (1000ppt Teq). However, when high concentration soil was processed, the technology was not able to achieve the regulatory standard, or even the level of 15000 ppt established under the Stockholm and Basel convention for "low POPs waste" (8).

Technology performance

In addition to the POP report drafted by EDL, the technology results have been extensively analyzed by an independent expert (Mr. Cooke report) and to a limited extend by project stakeholders (UNDP expert Mr. Saito, MOIT expert Mr. Minh). Therefore, any detailed consideration on the reliability of this technology should rely on these reports rather than on this evaluation report. Additional consideration on the technologies, are however reported below.

Compliance with the Stockholm Convention: The technology is obviously compliant with the Stockholm Convention requirements, as it allows for the destruction of the PCDD/F contained in soil. There is a limited concern arising from the fact that in some cases and experimental test conditions the technology did not destroy PCDD/F down to a level which may be considered "low POPs content" (15000 ppt Teq), therefore in that cases the treated soil has to be considered as a "high POPs waste" requiring further treatment. In addition, while TCDD/F was generally reduced in low and medium concentration, at high in feed concentrations other congeners increased. It has been indicated that the lower performance in treated highly contaminated soil was at least partially due to the fact that the plant was configured based on initial specification of PCDD/F concentration in the soil which underestimated the real content of PCDD/F. Once the plant was re-configured (increasing mass and number of steel balls, and increase rotational speed) based on actual (and higher) analytical data, it allowed a much higher destruction rate. Overall, as was the objective of the program, operating conditions were identified where destruction levels of both TCCD/F and other congeners apparently formed in the destruction process in total below the "low POPs"level should be readily achievable on a larger scale basis.

Reliability of the technology: the EDL report illustrates a mechanical problem occurred in the course of run 24 to 28 (bearing and sealing problems). The problem resulted in the soil being treated in only 2 of four reactors out of 4. Ball milling plants are subjected to high mechanical stress, therefore at larger scale there is the need to ensure that all the possible mechanical problems which can affect the destruction effectiveness are timely identified and corrected.

PCDD/F emissions: as pointed out in the Mr. Cooke's report, although the PCDD/F emission in the atmosphere where in compliance with provisional national standards, these were *"generally above the PCDD/F emissions typically achieved from current technology commercial POPs destruction facilities"*. The volumetric flow (Nm^3/h) of the flue gas has not been measured; therefore it is not possible to calculate the emission of PCDD/F in term of mass release over time.

Scalability to larger size: considering the large amount of soil to be processed (in the order of 100.000 tons of soil for the Bien Hoa site), one aspect of concern is the scalability of the plant to a size suitable to achieve the treatment of such large amount of PCDD/F contaminated soil in a reasonable time. The pilot plant achieved a throughput of around 1.2 t/hr; a commercial scale plant would require a capacity of at least 5-10 times higher. The full scale proposal described by EDL in its report envisages not only the increase of mills (from 4 to 10) and of the process intensity (increased rotational speed, increased number of balls): it also envisaged improvement in the process like addition of a grinding step, for reducing the in-feed soil particle size to less than 1mm, and the upgrade of the APC section, including the Activated Carbon Columns. Moreover, the commercial upgrading envisages a 24 hours/day continuous process, instead of the 10 hours adopted for the pilot testing: that will require a much more robust configuration to avoid the mechanical drawbacks occurred during the test. In any case, the test was successful for identifying the major shortcoming that need to be addresses for a larger scale plant. In this framework, the evaluator consider a

correct decision the one adopted by the PMU to carry out further testing using a pilot plan on higher concentrations, as that will allow for addressing all the difficulties emerged during the pilot test in Bien Hoa, and to fine tune the technology in its commercial configuration.

Another important aspect that would need to be addressed in the scaling up the plant is obviously the issue of debris and rocks. In the course of the test, around 25-30% of the soil exceeded the maximum allowable size for the treatment, and was therefore not treated. This material is expected to have a surface contamination by dioxin, which although low in term mass concentration, however may still represent a significant pollution source as the dioxin from the surface of debris and rocks may be more easily mobilized. The only viable solutions for this aspect are either a pre-treatment stage with an industrial shredder that however need to be integrated with all the containment measures aimed at avoiding dispersion of contaminated dust. , or landfilling of debris and rocks after the sieving stage.

Concerning treatment costs, the quoted indicative commercial unit service costs provided by EDL for the installed system, excluding housing and external support requirements is US$500/t .

Environmental impact. As only a “basic” unit was delivered for the trial run, countermeasures for addressing environmental impact (odors, dust, noise) where reportedly very limited. A number of suggestions were provided by an expert team lead by Nguyễn Văn Minh after the 2nd supervision trip in Bien Hoa, which included:

- To establish a better system for reducing the atmospheric emission of the facility, and to ensure the periodical characterization of these emissions;
- To verify the saturation limit of the activated carbon column;
- To ensure that the feeding area is airtight to avoid external dispersion.

In addition to that, it has to be noted that the treated soil cannot be directly reused, due to the fact that its texture is extremely fine and the treatment makes the soil substantially sterile. Therefore, a post-treatment stage has to be designed, on the basis of the expected re-use of the treated soil.

4.4.2. IN-PILE THERMAL DESORPTION OF DIOXIN CONTAMINATED SOIL AND SEDIMENT

This technology is being implemented in the Da Nang military airport site. It has not been tested onsite before implementation: only a limited testing at laboratory scale using soil from the Da Nang site has been carried out. The Da Nang site was included in the Project as one of the three sites to be treated under the overall project; however, currently the remediation activity at the Da Nang site is being almost entirely carried out with the financial support of US AID, and under the responsibility of MOD, whilst Office 33 is only involved only for coordination issues. Remediation of the Da Nang is a co-financing activity, and there should be therefore the need of coordinating with other activities of the project; indeed, as stated in the US AID Environmental Assessment (2), “*UNDP's program also provides for an overarching umbrella framework that facilitates donor coordination among those working on environmental remediation of dioxin in Vietnam.*” The framework for technology selection among a portfolio of technologies including active or passive landfilling and mechanochemical treatment is one of the chapters of the Environmental Assessment of the Da Nang site.

The information gathered by the evaluator on this technology consists mainly in the following documents:

- Articles published by TerraTerm in the firm’s website (9) and (10);
- A review of non combustion technologies drafted by US EPA (11)
- The Da Nang Environmental Assessment (2)
- GEF STAP Report on technologies (7)

These documents are mostly summary reports, not as detailed as a thorough evaluation of the technology – which however is beyond the scope of this Mid Term Evaluation - would require.

4.4.3. Description of the technology:

The IPTD process includes three basic elements:

- A system for the application of heat to contaminated media by thermal conduction
- Recovery of desorbed contaminants through vapour extraction and re-adsorption on activated coal;
- Treatment of activated coal.

In the proposed layout in Da Nang, IPTD uses arrays of electrically powered heaters placed in pipes positioned into the soil piles. The heaters reach temperatures in excess of 700°C and heat contaminated media by thermal conduction. Treatment piles or cells are heated under negative pressure to a minimum target temperature of 335°C. Air is injected in the piles by means of air inlets will ensure a proper flow of vapors toward the vapor extraction wells.

A network of vapour extraction wells is used to recover volatilized contaminants. Contaminant vapours captured by the extraction wells are conveyed to an off-gas treatment system (Granulated Activated Carbon) for treatment before discharge to the atmosphere. The contaminated activated carbon need subsequently to be further treated or disposed. Although thermal desorption is usually classified as a pre-treatment technology, (GEF - UNEP Scientific and Technical Advisory Panel, November 2011), the technology providers claim that in the IPTD configuration, thermal desoprtion is also coupled with thermal destruction when interstitial gases containing dioxin pass through the high temperatore zones close to the heating pipes.

Technology performance

The evaluators consider that some questions related to the feasibility of the technology cannot be answered based on the summary reports gathered. It is likely that these uncertainties may be completely clarified if more detailed analytical and process data - which presumably are already in the hand of the technology contractor - are provided.

A preliminary list of issues that should be clarified based on additional information is reported below.

Compliance with the Stockholm Convention. To ascertain its compliance with the Stockholm Convention it is important to clarify whether the technology results in the destruction of PCDD/F or in their transfer to another media. This because the Stockholm Convention requires that POPs waste (except “low POPs” content waste) are “*disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low”.* With regard to PCDD/F concentration, the Basel Convention guidance documents further clarifies that waste containing a PCDD/F concentration smaller than 15000 ppt may be considered as “low POPs content” (8). This concerns not only the soil, but also the activated carbon used for adsorbing the PCDD/F extracted from the soil. Thermal desorption is usually not classified a destruction technology, as the contaminant are not destroyed or chemically transformed, but simply desorbed from contaminated media, and subsequently recovered either by adsorption on another media, or by condensation. Terratherm however states that a large portion of the PCDD/PCDF (more than 95%) will be thermally destroyed before being extracted from the treated soil, and that due to the negative pressure and long residence time, the target temperature of 335°C may be enough for desorbing PCDD/F from soil even though the boiling temperature of some PCDD/F congeners is much higher. In addition, Terratherm claims that *“Experience has shown that due to the long residence time at temperature using this technology, achieving the boiling point of the contaminant of concern (COC) is not necessary to accomplish thorough desorption and treatment. Based on various field studies, regardless of the type of COC, most (e.g., >95-99% or more) of the SVOCs are destroyed as they pass through the superheated soil in proximity to the heater-vacuum wells, before they arrive at the extraction wells.”*

Mass balance. Therefore a detailed mass balance proving that PCDD/F are not only extracted from the soil but also destroyed should be provided. That would require making available PCDD/F congener specific

concentration data related to a significant number of samples from the following media: soil (in the proximity and far from the extraction pipes), activated charcoal, off-gases, as well as the quantification of any fugitive emission from the piles, either in the course of normal operation or during unexpected shut off of the blowers.

Process temperature: the temperatures ranging from 200 to 450 °C are the most conducive for the forming of PCDD/PCDF by means of de-novo synthesis, with a maximum formation occurring around 350°C (12) . As the IPTD process occurs in presence of oxygen and other gases generated during soil heating, the *de-novo* formation of additional PCDD/F cannot be excluded. The impact of *de-novo* synthesis on the process could be however considered negligible if it can be proved that PCDD/Fs are subsequently destroyed within the piles.

Process pressure: although it is stated that negative pressure will allow for the desorption of PCDD/F at lower temperature (325°C) than the boiling point of 2,3,7,8-TCDD boiling point (420°C-440°C) in none of the documents examined by the evaluators the negative pressure achieved in the piles is reported. Considering the volume of the piles envisaged for Da Nang, it is however unlikely that the required vacuum of less than 50 mmHg based on the graphs reported by TerraTerm (9) can be achieved within the pile only using the blower envisaged in the technology layout. Indeed, it seems that negative pressure is mainly applied to piles prevent fugitive emissions and to ensure the venting of the soil interstitial gas.

Commercial size facility. A full scale treatment with size and concentration comparable with these of Da Nang has been never experienced before. The maximum volume treated in previous full-scale treatment operations with the technology was 12,165 m3, with an average concentration of 18,000 ppt against an expected volume of more than 60,000 m^3 envisaged for the Da Nang site and with an average concentration for the loading and storage area of 105,800 ppt and a maximum concentration of 365000 ppt (13). In addition, it is likely that the PCDD/F pattern of the previous full scale treatment operations is different from the one of the Da Nang site, where the dominant congener is 2,3,7,8-TCDD. A treatability study at laboratory scale (10) has been performed by Kemron (max. concentration 163,000 ppt), however PCDD/F has not been determined in the exhaust gases or in the activated carbon, therefore the treatability study data cannot be used for estimating the mass balance of the technology. Currently, there are not enough information available to the evaluator to assess the treatment cost for this technology.

Need for preliminary testing. Based on the above, the need for performing a preliminary testing of the technology on site, coupled with a sound monitoring plan aimed at quantifying the mass balance of the process, is recommended prior of the full scale implementation of the technology. Preliminary testing will also allow for a more detailed cost estimation of the technology, as currently this cost is completely unknown considering the large volume of soil to be treated and the very specific Vietnamese meteorological conditions.

4.4.4. BIOREMEDIATION

Bioremediation has not been tested under the project, although a preliminary report on the biodegradation of PCDD/F has been produced. The usefulness of bioremediation could be to bring down the concentration of PCDD/F contained in landfill, so that after a certain number of year, the soil in the landfill could be considered remediated, or at least under the concentration threshold (15000 ppt) for landfilling accepted by the SC. The report makes mention of the technology DARAMENd® as one of the possible bioremediation technologies which can be applied to PCDD/F contaminated soil. It has been reported that some preliminary testing of PCDD/F bioremediation was carried out before project starting in Vietnam; however the results were not made available. The technology is also listed in the USEPA document (11) on POPs destruction technologies.

The report on bioremediation is more in the form of a research project, and confirms that this technology is still at an experimental stage: indeed, it proposes an experimental plan rather than a pilot test, to check the effectiveness of this technology. The proposed testing scheme is rather complex and envisages:

1) a series of trials with different inoculums feed;
2) a series of trials with different oxidation and nutrient conditions;
3) a continuous trials for extended period to assess the final reachable concentration level;
4) a biosphere survey to assess the impact of exogenous microorganisms to the ecosystem; etc.

5) one control cell will be provided to calculate the effect of the intervention.

The setting up and completion of this experimental scheme is very uncertain, and the interpretation of data of such an experimental scheme may also prove very complex, given the variability associated with the technology and the difficulty to establish a control cell perfectly representative of the test cells. The inclusion of a "biosphere survey" also make evident that a risk related to the use of exogenous or engineered microorganism may exist.

Given the above, and the short time remaining for the project closure, it is not recommended to carry out any experimental test of bioremediation with the project resources.

4.4.5. CONTAINMENT AND LANDFILLING

For the specific case of containment and landfilling, it has to be recalled that the Stockholm Convention requires that POPs waste (except "low POPs" content waste) are "*disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low".* With regard to PCDD/F concentration, the Basel Convention guidance documents further clarifies that waste containing a PCDD/F concentration smaller than 15000 ppt may be considered as "low POPs content".

Containment and landfills should be therefore considered as temporary solution rather than a final response, if the concentration of the contained / landfilled soil is above 15000 ppt. There is however little doubt that the landfilling of contaminated soil in Phu Cat, and the containment aimed at reducing the spreading of contaminated soil and sediment in Bien Hoa were the right countermeasures to be adopted urgently in conformity with project objectives, with the general results of achieving an immediate reduction of human exposure and environmental contamination pending final remediation of the hot spot areas. There is the need to further explore the capability of available technologies in irreversibly cleanup soils with a concentration of PCDD/F higher than 15000 ppt.

4.5.RESOURCES AND BUDGET

4.5.1. GEF Budget balance (October 2012)

In Table 6, the GEF Budget Balance updated June 2013 is reported. As of June 2013, the remaining budget is limited to 593,386.00 USD. This figure does not include the budget already committed. Outcome 1 has a positive balance of 565,505.51USD, although component 1.1 and 1.3 have respectively a negative balance of 45,260.33 USD and 76,285.69 USD) Whilst most of the remaining balance is under outcome 1 (and more specifically, outputs 1.4 and 1.5, related at the core project activities of containment and remediation, whilst a large part of the remaining budget comes also from Outcome 2, as the outputs related to the land use have not been carried out. Part of the funds originally dedicated to output 2.1 and 2.2 were diverted to communication activities (output 2.3). Larger than planned financial resources were also spent for output 3.1 (305,615.50 USD instead of 135,076.00) 3.3 (25,045.74 USD instead of 0 USD) and 3.4 (253,086.44 instead of 185,000.00), making the whole Outcome 3 out of balance of 166,626.93 USD. Based on information provided by UNDP CO, the PMU received letter of authorisation from PSC for these allocation of funds.

4.5.2. Possible uses of remaining funds

One of the peculiarities of this project is that at mid-term around 88% of the GEF budget was already spent. This means that financially the project has to be considered almost concluded. By interviews with project stakeholders, and examination of the project documentation, the following suggestions may be put forward for the use of the remaining balance:

1) **Master plans.** Based on the relevant project documents, including the comment reports from the experts, it is understood that the activities related to the drafting of the master plans, although near completion, already overspent the allocated budget and did not achieved a final result yet. Indeed, for Phu Cat the need for a master plan is limited as the landfill has been already built, and a detailed monitoring plan has been already drafted, whilst the master plan for Bien Hoa is in the stage of integrating final comments. A verification of the missing activities for completing the Bien Hoa master plan could provide indication of possible needs for additional budget.
2) **Comprehensive report on project results including local risk reduction for humans and ecosystems and global environmental benefits** . What seems to lacking is reporting on results particularly environmental and human health risk reduction .Efforts has to be made to ensure this type of reporting is generated. Considering the complexity of the case (many different population groups exposed at uncertain rate from different sources and with different exposure pathways), a formal risk assessment based on standardized assumption and exposure scenarios, environmental fate models, dose-response relationship and on a quantification of the source reduction can be the proper way to achieve a reasonable estimate of the risk reduction achieved.
3) **Extension of monitoring activities**. Based on the meetings and interviews with project stakeholders, there is the common perception that not all the contaminated areas in the three hotspots (or at least, in Bien Hoa and in Phu Cat, which are the two hotspots which were visited by the evaluators and where meetings with the local Army and DONRE representatives were held) have been identified. Additional monitoring has been also recommended in the report "Summary evaluation of Dioxin residual level in Bien Hoa Airbase" (Newsletter April 2013): *"So far, research, analysis and additional review of dioxin residual level in some points in and out of the airbase must still be carried out, aiming at a more thoroughly assessment of all the areas, the volume of soil and sediment to be handled, for recovery plans in the next years."* A long-term monitoring plan for Phu Cat and Bien Hoa airbases are being developed within the Czech ODA project, which will last until mid 2015. It is therefore considered necessary to provide, within the project duration, support for the coordination activities to be carried out by Office 33 and a partial support of the additional monitoring finalised at identified remaining highly contaminated areas in the two hotspots. It should however be noticed that under output 1.3 funds in excess of 76,000 USD of the planned budget were spent, therefore only a limited amount of fund can be still placed for the extension of this output.
4) **Extension of technology demonstration**. To date, although the results of the MCD technology testing appeared promising, there are still many uncertainties on the actual effectiveness of that technology in treating highly contaminated soil. In addition, there are no direct information on the suitability of the onsite thermal desorption to treat PCDD/F contaminated soil in Vietnam. Whilst it is assumed that the test of the onsite thermal desorption should be carried out in Danang under the USAID project, additional tests aimed at a better understanding of the mass balance of the mechano-chemical process and at verifying the effective capability of the technology to remediate high contaminated soil should be carried out under this GEF project, as the results of this test may be useful not only for the Vietnam case but in general for all the countries which have to deal with PCDD/F contaminated sites. Further analysis should be also carried out for identifying the final fate of the treated soil, which cannot be anymore used as natural soil after the treatment.
5)
6) **Completion of containment measures in Bien Hoa**. Although the containment measures have been almost completed, there is the need to clarify whether additional funds would be necessary for their final completion and testing.
7) **Project management.** There is the need to clarify whether the remaining budget would suffice for ensuring the continuation of project management activities until project end. Expenditures for project management (Output 4.1) already exceeded the available budget of around 23,000 USD. On the opposite, the budget for programme monitoring and evaluation (Output 4.2) has a positive balance of around 78,000 USD, of which however part is already committed for the midterm evaluation; part would be dedicated to the terminal evaluation and part to project monitoring.
8) **Based on the above,** a tentative reallocation plan of the remaining budget is depicted in Table 7.

Table 6: GEF Budget Balance of the project up to June 2013

Expenditure & budget by outcome/output								
		Budget	2010	2011	2012	2013	Total	Balance
Sub-total Outcome 1		**3,212,490.00**	**63,483.39**	**503,891.10**	**1,226,513.00**	**853,097.00**	**2,646,984.49**	**565,505.51**
Outcome 1 Dioxin in core hotspot areas contained and remediated	Output 1.1. Containment/remediation targets and remediation action plans for each hotspot completed.	**216,490.00**	**63,483.39**	**71,341.35**	**81,325.59**	**45,600.00**	**261,750.33**	**(45,260.33)**
	Output 1.2 Government personnel trained in selected containment and remediation technologies	**40,000.00**				**20,000.00**	**20,000.00**	**20,000.00**
	Output 1.3 Spatial delineation of heavily contaminated areas, based on supplementary sample analysis including newly identified areas at Phu Cat and Bien Hoa	**187,000.00**		**163,285.69**		**100,000.00**	**263,285.69**	**(76,285.69)**
	Output 1.4 Pilot scale demonstration of remediation technology for potential use at Bien Hoa and/or Phu Cat	**1,100,000.00**		**120,024.13**	**513,479.99**	**350,497.00**	**984,001.12**	**115,998.88**
	Output 1.5. Full containment and/or isolation completed at Phu Cat and Bien Hoa and funding for full scale remediation identified while coordination mechanism functioning at Da Nang based USAID financing.	**1,669,000.00**		**149,239.93**	**631,707.42**	**337,000.00**	**1,117,947.35**	**551,052.65**
	Output 1.6 Monitoring systems operational at all hot spots to ensure performance measurement against containment and remediation goals as applicable.						-	
Sub-total Outcome 2		**195,000.00**	**-**	**2,015.71**	**-**	**53,000.00**	**55,015.71**	**139,984.29**
Outcome 2 Land use on and around hotspots eliminates risks and contributes to environmental recovery	Output 2.1 Overall land use plan (including zoning) and an action plan for environmental recovery in each of the affected areas, based on Environmental Impact Assessment (EIA) recommendations completed.	**75,000.00**					-	**75,000.00**
	Output 2.2 Environmental recovery action plans and other land use measures in and around each of the three hotspots implemented.	**120,000.00**					-	**120,000.00**
	Output 2.3 Public environmental awareness /information and education programs implemented			**2,015.71**		**53,000.00**	**55,015.71**	**(55,015.71)**
Sub-total Outcome 3		**1,187,076.00**	**-**	**294,991.98**	**428,233.95**	**630,477.00**	**1,353,702.93**	**(166,626.93)**
Outcome 3 National regulations and institutional capacities strengthened	Output 3.1. National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and or human dioxin TDI applicable to general population and vulnerable populations developed and adopted	**135,076.00**		**30,073.96**	**77,064.54**	**198,477.00**	**305,615.50**	**(170,539.50)**
	Output 3.2. Capacities of Office 33 for coordination, fund	**867,000.00**		**234,744.20**	**240,211.05**	**295,000.00**	**769,955.25**	**97,044.75**

Expenditure & budget by outcome/output								
		Budget	2010	2011	2012	2013	Total	Balance
	mobilization, dioxin contaminated site identification/inventories, dioxin data base operation, and experience sharing at all levels including international cooperation strengthened.							
	Output 3.3 Institutional and individual capacities for site investigation, risk assessment, contaminated site land use planning and monitoring, and planning and management of cost-effective remediation strengthened.				25,045.74		25,045.74	(25,045.74)
	Output 3.4 A communication strategy vis-à-vis national and international industries and consumers implemented	185,000.00		30,173.82	85,912.62	137,000.00	253,086.44	(68,086.44)
Sub-total Outcome 4		**458,510.00**	**55,556.42**	**84,638.26**	**106,236.13**	**157,556.00**	**403,986.81**	**54,523.19**
Outcome 4 Project management	Output 4.1 Project Management	**338,510.00**	**49,696.73**	**84,638.26**	**104,716.10**	**122,556.00**	**361,607.09**	**(23,097.09)**
	Output 4.2. Programme monitoring and evaluation undertaken according to guidelines	**120,000.00**	**5,859.69**		**1,520.03**	**35,000.00**	**42,379.72**	**77,620.28**
Total		**5,053,076.00**	**119,039.81**	**885,537.05**	**1,760,983.08**	**1,694,130.00**	**4,459,689.94**	**593,386.06**

Table 7: Proposed reallocation of the remaining budget

PROPOSED REALLOCATION OF THE REMAINING BUDGET	Project	Balance	Redistribution
Outcome 1 Dioxin in core hotspot areas contained and remediated.	3,342,000.00	565,505.51	405,000.00
Outcome 2 Land use on and around hotspots eliminates risks and contributes to environmental recovery.	575,000.00	139,984.29	60,000.00
Outcome 3 National regulations and institutional capacities strengthened.	570,000.00	(166,626.93)	40,000.00
Outcome 4 Project management.	490,000.00	54,523.19	88,386.06
Total	4,977,000,00	593,386.06	593,386.06

4.5.1. What is level of co-financing mobilized to the project till date?

The initial co-financing balance proposed in the project document was 32.335.550 USD, against a GEF grant of4.977,00 USD. Most of the co-financing was committed by US donors (USAID, Ford foundation, Bill & Melinda Gates Foundation, the Atlantic Philanthropies); additional funding were committed since project start by the Czech Republic

The amount of co-financing secured is reported in Table 8. The secured co-financing at 2013 is far larger than the initial co-financing committed. On the side of co-funded activities, the following should be noticed:

1) USAID completed the Environmental Assessment of Da Nang (for an overall cost of around 2MUSD) and started the building of the Therratherm thermal desorption facility. In the Environmental Assessment there is a detailed calculation for the needs of the remediation – estimated in 34 MUSD. Recent estimate however raised that number up to 84 MUSD for the remediation, for a soil volume to be remediated of around 70000 m3.
2) A similar commitment (to carry out the Environmental Assessment and subsequently to complete the remediation) has been made by the US government for the Bien Hoa airbase, for which the amount of soil to be remediated is larger. The timing of that activity is obviously different from the project timing, as it is expected that these activities would start after project closure.
3) The outcome of the meeting with the Dioxin lab supported by US donors confirmed the establishment of the lab and the amount of analytical activities performed by the lab. The overall amount of funds dedicated to the lab is estimated in 6 MUSD.
4) The New Zealand government provided and additional co-financing, not envisaged at project design, of around 200,000 USD for carrying out the testing of the EDL technology in Da Nang.
5) There are a number of ongoing projects, which are not directly related to the GEF project, but which are however coordinated by Office 33, which testify the increasing of partnership for the remediation of the PCDD/F contaminated hotspots.

It would be obviously ungenerous to affirm that the excellent level of co-financing mobilised was entirely mobilised because of the project. Some activities were already in place at project starting, and clearly the diplomatic efforts aimed at re-establish a good relationship between USA and Vietnam started well before the starting of the GEF project and goes beyond the project's scope.

USA cooperation on the dioxin matter indeed started already in 2000 with the establishment of bilateral Joint Advisory Committee (JAC) on Agent Orange/dioxin that was created to coordinate collaborative research; the Bill and Melinda Gates Foundation and the Ford Foundation were providing substantial technical and financial support to dioxin-related activities, including the environmental characterisation of hotspot areas, the adoption of interim measures to reduce risk, and the support to dioxin labs, since 2006.

The merit of the project has been to strengthen the capability of Office 33, and to provide an international and authoritative platform for the coordination of the activities. Using the words of the Da Nang EA report, *"UNDP's program also provides for an overarching umbrella framework that facilitates donor coordination among those working on environmental remediation of dioxin in Vietnam"*.

Table 8: Summary of Co-financing to the Project

#	Sources	Type	Amount committed as Prodoc. (US$)	Updated amount committed Amount	Leveraged funds	Funds Distributed up to June 2013	Balance	Note
1	MOD Viet Nam	Parallel	5,300,000	5,300,000		5,300,000	0	
2	Government of Viet Nam for remediation	In kind	4,390,000	4,390,000			4,390,000	4,390,000 is expected to be distributed in 2014
		Parallel		1,700,000	1,700,000	1,000,000	700,000	Outcome 1: Dioxin remediation in Da Nang
3	Government of Viet Nam for management	In kind	1,000,000	1,000,000		700,000	300,000	Expenseses for management at 3 airbases; travelling to hotspots; Dongnai province has monitoring dioxin contamination nearby airbase since 2011 and so on;
4	Local authority (Da Nang)	In kind	200,000	200,000		200,000	0	Expenses for management at Da Nang airbase and travelling for meetings, discussion on dioxin treatment in Da Nang airbase and other related activities
5	Office 33	In kind	110,000	110,000		110,000	0	Expenses for contributions from Office 33 such as room, members from Science Technology Consultancy Council for Committee 33.
6	Government of Czech Republic							Outcome 3: support to development of dioxin level from many other sources and development of monitoring system and training on dioxin analyse
		Parallel	1,500,000	500,000	-1,000,000	300,000	200,000	
		GEF/UNDP dioxin project		76,000	76,000	76,000	0	
7	US Government	Parallel	8,000,000	43,000,000	35,000,000	38,220,000	4,780,000	Outcome 1: Dioxin remediation in DN
	Ford Foundation	Parallel	6,000,000	6,000,000		6,000,000	0	

9	Gates Foundation	Parallel	2,685,550	2,685,550		3,885,550	1,500,000	
10	Atlantic Philanthropies	Parallel	2,700,000	2,700,000				
11	UNDP	Parallel	450,000	450,000		450,000	0	
	Total		**32,335,550**	**68,111,550**	**35,776,000**	**56,241,550**	**11,870,000**	
	USAID- Asia				50,000	50,000	0	Outcome 1: Support to capacity building on soil contaminated management
	SIDA Sweden				10,000	10,000	0	Outcome 3: Capacity building on risk assessment
	HPC Envirotec, France				5,000	5,000	0	Outcome 3 and 1: on the way to raising fund from EU partner and technology demonstration to find out solution to treat dioxin and other contaminants as As as well.

4.6.PARTNERSHIP

4.6.1. Whether the designed institutional arrangement for the dioxin remediation Project has been performing effectively during the project implementation and allocated responsibilities among key stakeholders are still relevant;

At project design, the following institutional arrangement was proposed:

- MONRE as accountable to the Government and UNDP for ensuring (a) the substantive quality of the project, (b) the effective use of both national and UNDP resources allocated to it, (c) the availability and timeliness of national contributions to support project implementation and (d) the proper coordination among all project stakeholders, particularly national parties.
- Office 33 is responsible for mobilizing all national and international inputs to support project implementation, organizing project activities in accordance with the agreed work plan, and reporting to MONRE and UNDP on the progress as well as financial status of the project.
- Project Executive Unit (PEU) including the National Project Director (the head of the Office 33), a representative from UNDP and a representative from Department of International Relations, MONRE. PEU will take the role to make sure that annual planning, quarter planning, budget balance, and budget adjustment as well are suitable to the progress of the project.
- Representatives from GACA (Government Aid Coordination Agencies), to be called on for PSC meetings if deemed necessary.

- Project Management Unit (PMU) which will be responsible for the overall coordination, management, implementation, monitoring & evaluation and reporting of all project activities.
- The UNDP-CO will be doing close quality assurance and supervise the international Technical Specialist, who will support both the UNDP and Office 33. UNDP-CO will assist Office 33 in mobilization of international inputs, upon official request from the NPD. The UNDP CO will provide the services for tendering of packages of activities, procurement of sub-contractors, recruitment of \individual consultants, and contracting, upon the formal request from the NPD. UNDP's prevailing cost recovery policies will apply to these services.

In the course of project implementation, Office 33 and the project PMU worked indeed as integrated structures, as most of the members of the PMU are at the same time members of Office 33, including for instance the National Project Director which is at the same time the head of Office 33. In turn, UNDP CO worked in close relation with PMU.

The activities coordinated by Office 33 are among the most sensitive activities carried out under the responsibility and direct supervision of MONRE. Meeting at MONRE revealed the great importance attached by MONRE to the dioxin issue in general and to the GEF project in particular.

UNDP followed closely the project implementation, and was indeed effective in carrying out the expected task of mobilization of international inputs and even relationships with international donors. In addition UNDP also provided valuable technical input to the project, by mobilizing international consultants and ensuring the continuous participation of UNDP scientists to the Office 33 activities.

Clearly, being the contaminated hotspots military areas under the direct control of MOD, a closer relationship with MOD could have been useful. Coordination with MOD is ensured on a wider framework, which also include project activities, by MONRE. However there is not a direct involvement of MOD in the PSC.

In summary, the designed institutional arrangements carried out the tasks he was assigned, and the allocated responsibilities may be considered relevant and effective.

4.7.PROJECT IMPACT AND SUSTAINABILITY

4.7.1. Short-term and long-term impacts of the project, including efficiency of the project and cost-effectiveness, replication and dissemination of project results within and outside project areas;

Just before project implementation, in February 2009, Office 33 and the United Nations Development Program (UNDP) co-sponsored a roundtable meeting on remediation standards and technology. The meeting was also attended by representatives of the U.S. State Department, USAID, and the U.S. Environmental Protection Agency. The participants agreed on the goal of immediate containment of dioxin contaminated soil in the three hot spots and on a mid-long term plan for treatment of dioxin.

The impact of the project seem currently more oriented at achieving the short term goal above, which are necessary and introductory for the safe implementation of longer term remediation objectives.

The project at MTE already exerted a positive impact: the temporary containment at Bien Hoa was partially completed; in Phu Cat, highly contaminated PCDD/F soil has been disposed in a safe landfill for temporary containment; pending further remediation; in Da Nang a turnkey remediation project based on thermal desorption is being carried out by USAID in coordination with the project. In addition, a remediation technology has been tested, and criteria for testing technologies in compliance with Stockholm convention have been individuated and partially established.

The project constitutes an important platform to provide a substantial input toward the implementation of the Country's policy on the remediation of PCDD/F contaminated area. The project has a catalytic role in facilitating partnership and coordinating donors efforts on the issue related to PCDD/F contaminated sites.

The efficiency of the project has to be considered high in almost all the activities performed. Concern is only to be raised on the efficiency of activities under output 3.1, which spent 2 times the budget allocated (305,000 USD instead of 135,000) without completely achieving the goal of "*National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and or human dioxin TDI applicable to general population and vulnerable populations developed and adopted.* Partially, this may be justified considering that the activity required the conduction of PCDD/F testing in biological samples (food, milk, etc.), aimed at understanding the current status of contamination of the food chain in Vietnam, which is a key starting point for the establishment of a new regulation, was not envisaged at the stage of project design.

As aready stated above, there is the need for reporting on quantitative result in term of risk reduction for the population.

The project has produced a comprehensive communication strategy which covered both output 2.3 (focusing on community living in the surrounding area of hot spots) and 3.4 (targeting other national stakeholders and international community). With a detail plan of actions, the strategy helped to clarify possible confusion between the two outputs, and provided a good tool for achieving desired outputs. However, the communication strategy was formulated rather late in the timeline of the project implementation (August 2012), with first activity (media workshop) organized in April 2013. In terms of timeframe, the project did not meet designed benchmarks for communication activities, and the achievement in the final stage of the project is doubtful given the available time is short.

4.7.2. To determine how the intervention seeks to mainstream gender in development efforts.

The project did not actively mainstream gender in development effort. Although the composition of PMU is balanced in term of gender participation, it seems there is no specific policy in place for mainstreaming

gender. Adequate resources to enhance gender equality in the environmental work or in communication of gender-specific risks associated to dioxin and benefits should be brought by the project.

4.7.3. To determine synergies with other similar projects, funded by the government or other donors.

The demonstration of technologies under the project is synergic to the technology component of the following 2 GEF project being implemented in Vietnam:

- The GEF/UNDP project “Building capacity to eliminate POPs pesticides stockpiles in Vietnam”
- The GEF/WB project “Vietnam PCB management project”
- The recently approved GEF/UNDP “Vietnam POPS and Sound Harmful Chemicals Management Project”
- The GEF/UNDP “Updating Vietnam National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants”

The project is obviously synergic with all the hot-spot relates projects being carried out by different donors in Vietnam, first of all the USAID project for the remediation of Da Nang airbase. The synergy of these projects is ensured by the good level of coordination of PCDD/F related activities under Office 33, which is in turn established under MONRE which has legislative and budgetary responsibility on the wider area of cleanup of contaminated sites.

4.7.4. Has the current project management strategy exploited all opportunities for strengthening collaboration and substantive partnerships with other government bodies, institutes, different associations, other donors, financial sectors with aim to maximizing achievement of projects’ immediate results, and extending the project impacts in the long run beyond the end of the project timeframe?

As the project is being implemented in military areas, the coordination between the PMU, MONRE and MOD is a key strategic component for its successful implementation. In this sense, the fact that component 2 (Land Use) had to be pulled out from the project due to unresolved coordination with MOD rules concerning the land use of military areas could be seen as a project shortcoming – either at project design (rules governing the land use of military area not properly reflected in the project design) or at project implementation (lack of coordination among Institutional bodies involved in the project).In the progress report 2012 it is stated that *“According to the initial plan, several relevant activities within this outcome would be carried out. However, this plan has been completed by the Ministry of Defence. Activities within the logical framework will therefore be considered as completed.”* However no information on the achievements under this component was made available. Indeed, from the numerous meeting in the field it is very evident that MOD is committed to fulfil the environmental rules established by MONRE in remediating military areas; therefore a modality of collaboration between the project and PMU in establishing criteria for land use of the sites contaminated by PCDD/F could well have been defined. The fact that indeed the decision was to dismiss component 2 (as already done by MOD) should be better motivated and supported by official documentation, demonstrating the impossibility to carry out jointly that work given regulatory or management constraints which became evident only after the starting of the project.

The project, on the other side, was very effective in coordinating and integrating the work of the various actors working on the project related activities, of which the most relevant are:

- Laboratories carrying out sampling and analytical work; (the VEA lab, the Vietnam / Russian Tropical center)

- International Firms supported by international donors performing site characterisation, conceptual modelling, sampling and analysis (for instance, the Dekonta company under the Czech co-financed project;
- Firms carrying out testing of disposal technology: testing of EDL technology was partially funded by the New Zealand but the testing was carrying out under coordination of PMU
- USAID, which carried out the Environmental Assessment and the remediation of the Da Nang, site, and which will carry out the same activities in Bien Hoa
- The Hanoi National University, Department of Chemicals, which carried out the consultancy services for establishing standard and emission limits for PCDD/F in the environment.
- International consultants

There is still the need to ensure that he technological testing methodology and the studies carried out by the project in Bien Hoa are properly communicated to USAID in case it would take over of the remediation activities in Bien Hoa, so that common scientific criteria for the selection of the technology, site characterisation and remediation are adopted.

4.7.5. Risks and assumptions that likely affect the persistence of the project outcomes, including financial, socio-political, institutional and environmental risks.

At project design a number of risk and assumptions were identified, and the overall rating of risk for the project was assessed as “Low”

1) The exact area and volume of highly contaminated material at the hotspots.
2) The cost estimates are highly dependent on the correctness of the contamination data.
3) The costs of remediation (stage 2) are dependent on the outcomes of tests and on the effectiveness of tendering.
4) Receptiveness for capacity strengthening and transfer of know-how on POPs contamination and remediation is not guaranteed.
5) The total funding required for “stage 2” destruction of dioxin contamination or long term containment cannot be fully leveraged through the project

At mid term, it is evident that some of the identified risks were more serious than expected, and more specifically:

- Regarding risk 1) above, there are still uncertainties on the extent of contaminated areas in Bien Hoa and Phu Cat, although most of the contaminated areas have been identified;
- Regarding risk 2) and 3) above; based on information received, the cost for the remediation of Da Nang was underestimated by a factor of more than 2, and there are similar concerns for the remediation of Bien Hoa

On the other side, although it is true that capacity strengthening is a long process, the high level of ownership by central and local government is expected to facilitate the capacity transfer and integration of POPs contamination investigation and containment knowledge in local and national institutions, beyond a small circle of engaged experts

Concerning leveraging of funds, the risk of not achieving the total funding required for the remediation of Bien Hoa and Da Nang is high; however it is also clear that the high level of commitment demonstrated by donors, and in particular by US government and US NGOs, is progressively and significantly reducing that risk.

There are some risks that may affect the persistence of the project which were not identified during the project preparation activities:

1) In addition to PCDD/F, other contaminants have been found in contaminates sites that could represent a further complication for the complete rehabilitation of the sites. High levels of arsenic were found at some of the hotspots. The reason has been identified in the fact that arsenic is the main chemical component of Agent Blue, another herbicide used during the past military operation. The contamination level reaches over 50 times as high as the national regulatory limit. The risk

associated with arsenic contamination needs to be appropriately assessed and countermeasures adopted for the remediation activities in future.

2) There is a substantial risk that the methodologies and criteria adopted for evaluating remediation technologies are not well communicated or adopted by the donors. Although the project is perceived as a “coordination umbrella”, it is clear that on the technical side it did not generated yet a common framework for the selection of the technologies. Given the very high financial amount required for site remediation, it is fully understandable that selection criteria may have also strategic or commercial implications. Nevertheless, it is of outstanding importance to ensure that the remediation technology will be selected in compliance with the BAT / BEP requirements established under the Stockholm Convention.
3) The coordination with MOD in the management of contaminated areas should be strengthened. This is also a sensitive issue, and it is fully understood that the land use of military areas cannot be dictated only by environmental considerations. However, there is the risk that, in absence of a proper coordination, communication of risk and implementation of measures for preventing exposure of people living in the hotspots is not fully implemented. Given the right of MOD in deciding the land use in the three airbases, and at the same time the duty to fulfil with the quality criteria for contaminated soil and sediments established by MONRE, a meeting or a platform where project suggestions on the land use of the three hotspots are formally communicated to MOD should be still considered as an option, before totally cancelling the land use component of the project.
4) The first assumption related to stability of the local population did not consider the fact that military personnel have been changing overtime with new arrivals annually. Both Bien Hoa and Dong Nai became two industrialising cities with fast development and high volumn of immigrants. The needs for communication, therefore, could be actually higher than it was expected. In terms of stakeholders participation in the dioxin communication, it seemed that a lack of coordination among Office 33, Ministry of Health and other NGOs (e.g. Ford Foundation and other NGOs) could bring in both overlaps and gaps in communication, especially with local communities surround hot spots.

4.7.6. How strong is the level of ownership of the results by the government?

In 1999, the Prime Minister of Vietnam issued the Decision 33, which established the National Steering Committee 33 and assigned it responsibility for coordination of dioxin-related matters and for development of short-, medium-, and long-term dioxin implementation and research plans. The MoNRE Minister chairs the National Steering Committee, and its multi-sectoral membership includes participants from the Academy of Science and Technology, the Ministry of Defence (MOD), the Ministry of Foreign Affairs, the Ministry of Health, the Ministry of Planning and Investment, the Ministry of Finance, the Ministry of Science and Technology, the Ministry of Justice, the Ministry of Labour, and the Office of Government. The Office of the National Steering Committee 33 (Office 33) was established under MoNRE as the implementing arm of the National Steering Committee 33. Office 33 is the implementing counterpart of the GEF project as well as of other projects like the USAID remediation activities being carried out in Da Nang, the Czech dioxin-related activities, and a number of other projects related to the dioxin related issues

Given the above institutional framework, it follows that the ownership of the project by the Vietnamese government is therefore extremely high, and the project is indeed integrated at the highest decision-making level in the field of dioxin-related activities. All the meetings with government representatives confirmed the high expectations on the project outcomes, among which the most significant are:

1) to provide further insights on the applicability of remediation technologies for PCDD/F contaminated soil. The outcome of this activity is of direct interest to the government also at the light of the several activities related to the remediation of contaminated soil in place. Beside the dioxin issue, it is

noteworthy for instance to recall the existing “National Target Plan”, signed by the government with the decision 1206/QD, allocating 1010 billion Vietnamese Dong (48.475 million USD) for the disposal of obsolete pesticide and cleanup of sites contaminated by pesticides. The testing and establishing of technologies for the sound treatment of soil contaminated by POPs is an urgent need for the Vietnamese government.

2) To provide a scientific framework of general applicability for the testing and evaluation of remediation technologies;
3) to reduce the level of exposure of people (living either within the hot spot areas or in their proximity) to the dioxin contained in soil, sediment, food. Pending remediation activities, there is an urgent need to prevent further spreading of PCDD/F and to establish and communicate the proper restriction (for instance, fishing, growing of vegetables) for the prevention of exposure to PCDD/F; In addition, there is the need to quantify the reduction of risk that has been – may be achieved by the project.
4) to further characterize PCDD/F known contaminated areas and identify new contaminated areas;
5) to ensure proper communication of project results and guidance on technology, risk assessment, risk prevention.

From the several interviews and collection of evidences carried out in the course of the evaluation mission it emerged clearly that the government of Vietnam – at the central and provincial level – has great and urgent expectations on the guidance and outcomes which will be generated by the project.

4.7.7. Availability of financial and economic mechanism to ensure the ongoing flow of benefits once the assistance ends;

Although availability of funding from donors is in place, and there have already been formal commitment on the increase of that funds from the donors (with special reference to the taking over of both the Bien Hoa site and the Da Nang site cleanups by the US government), it seems that there are currently no financial mechanisms to ensure that the ongoing flow of benefits do not stop when the project ends. The needs for remediating soil contaminated with more than 5000 ppt in Bien Hoa have been estimated in 150 to 180 M USD. A document drafted by the NPD under the project (Report on building and management the sources of finance in the master plan for Bien Hoa Airbase) provides some option for fund raising, but do not reveals any specific existing mechanism for ensuring the financial sustainability of the remediation activities of TCDD contaminated sites.

4.7.8. Policy and regulatory framework that will support continuation of benefits

As reported in the Project Document, there are a number of policy and regulatory framework in place which will ensure the project sustainability:

- Decision 155/1999/QD-TTg of the Prime Minister of the Government on promulgating regulation of hazardous waste management. This identifies the control and management of wastes as two of the main priorities for environmental protection and requires activities to implement information gathering on, and supervision of hazardous solid wastes, including dioxins, furans and PCBs.
- In 1999, the Prime Minister of Vietnam issued the Decision 33, which established the National Steering Committee 33 and assigned it responsibility for coordination of dioxin-related matters and for development of short-, medium-, and long-term dioxin implementation and research plans.
- Decision No 64/2003/QD-TTg of the Prime Minister of the Government approving the plan for thoroughly handling establishments which cause serious environmental pollution. This calls for treatment of 439 establishments and sites causing serious environmental pollution, including Bien Hoa, Da Nang and Phu Cat Airbases.

- Decision No. 67/2004/QD-TTg dated 27 April 2004 of the Prime Minister regarding the approval of the Action Plan for the Period of 2004-2010 in Overcoming Consequences Caused by Toxic Chemicals used by the American Army in the Viet Nam War. This Decision includes 2 objectives:
    - For people (support on finance, health and care of victims and affected communities' health)
    - For environment (isolate and treat the areas polluted by dioxin, especially hot spots)
- The Decision covers a number of activities, including supporting victims; isolating contaminated sites; environmental rehabilitation; and collecting evidence of consequences of toxic chemicals. It defines sites affected by Agent Orange that should be remediated, including Bien Hoa, Da Nang, and Phu Cat airbases.
- Decision of the Prime Minister No 184/2006/QD-TTg (8/2006) approving the National Implementation Plan (NIP) of the Stockholm Convention on persistent organic pollutants.
- Beside the government strategies on PCDD/F contaminated sites, there is an increase in country commitment and ownership on the issue of POPs contaminated sites testified by the recent approval of the National Target Plan (14), which is dedicating a substantial amount of technical and financial resources to the issue of POPs waste and contaminated site.
- In December 2010 the government of Vietnam (15) issued the decision 1946 /QĐ-TTg, "*Approving the Plan to treat and prevent environmental pollution caused by pesticides stockpiles all over the nation*". In September 2012, the National Target Program, signed by the government with the decision 1206/QD, allocated 1010 billion Vietnamese Dong (48.475 million USD) for the disposal of obsolete pesticide and cleanup of sites contaminated by pesticides.

4.7.9. How the subjects fit into the partner Government's strategies and priorities; international and country development goals and priorities; and UNDP global, regional or country programmes as appropriate

As testified by all the recent reports on Vietnamese environmental policies, the issue of dioxin contaminated areas is at the top of Vietnam interests. The Government strategies and priorities on dioxin however go beyond the – still extremely important – health and environmental related project targets, as these also involves – among others - the bilateral need for establishing sound relationship among Vietnam and USA governments.

The project clearly fits into UNDP country programmes. As testified by the several project implemented by UNDP – not only related to POPs, UNDP Viet Nam provide critical support in the areas of democratic governance and participation; inclusive and equitable growth; and sustainable development, climate change and disaster risk reduction. UNDP further is entrusted with donor coordinates foreign aid in Vietnam and therefore the role supporting resource mobilization fits well UNDP's mandate. UNDP Vietnam already implemented or is implementing the following POPs related projects in the country:

- Development of National Implementation Plan for Vietnam in the Process of Accession, Implementation and Enforcement of the Newly-signed Stockholm Convention on POPs.
- Building Capacity to Eliminate POPs Pesticides Stockpiles.
- Vietnam POPS and Sound Harmful Chemicals Management Project.
- Environmental Remediation of Dioxin Contaminated Hotspots in Vietnam POPs.
- Updating Vietnam National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants.

5. ANALYSIS OF THE MANAGEMENT AND WORKING METHODS

5.1.1. How effective is the project monitoring and evaluation process to ensure the relevance and effectiveness of the activities and expected results in relation to TORs (RFP) issues, different level of work plans (AWPs an QWPs), and the required outputs? How has

APR/PIR process helped in monitoring and valuating the project implementation and achievement of results?

From the administrative standpoint, the project has been closely monitored thanks also to the good level of coordination and cooperation between the UNDP-CO, the PMU and Office 33. Annual and quarterly progress reports in English and Vietnamese were made available. The quality of the report is good, management and financial information is detailed and follows a standard and consistent format. The exercise of drafting periodical project report and work-plans had obviously beneficial consequences on the project implementation and achievement of results.

From the substantial standpoint, there is the need to ensure a better reporting of the results achieved in term of source reduction.

5.1.2. Does the project take into consideration the likely risks in preparing AWP an QWP with the aim of mitigating negative impacts that could result from unexpected situation or change in the project environment?

Annual and quarterly work plan are very detailed from the administrative standpoint, the last column of the workplan worksheets (challenges and solutions) sometime contains indication on likely risks that may be faced in carrying out specific activities – for instance risk of adverse weather for activities to be carried out on site, delay that may occur due to the time-consuming procurement process, etc. The plans are signed by the Project Coordinator, certified by the Project Manager and approved by the Project Directori

5.1.3. Is the project management arrangement appropriate to the extent of management functions, processes and procedure, in accordance with the staff capacity and reasonable workload?

MONRE is responsible for the implementation and management of the Project. The implementation and management is led by the National Project Director (NPD), appointed by MONRE, and includes a Project Management Unit (PMU) headed by a Project manager. Strategic decisions have been jointly agreed between the NPD and UNDP senior management, sometimes based on formal consultations with other project stakeholders (such as in the case of procurement plans).

The Director of Office 33 has been appointed National Project Director (NPD) and is responsible for overall management and implementation of the Project.

The Project Management Unit (PMU) under the Project Manager (PM) is responsible for day-to-day project implementation including developing budgets, work plans, procurement activities financial management and human resources. The PMU consists of:

- Project Manager (PM): 4-year part-time position recruited with 70% dedication to the Project
- Project Coordinator (PC): 4 year full-time position recruited.
- Project Interpreter and Secretary (PIS): 4 year full-time position recruited.
- Project Accountant and Assistant (PAA): 4 year full-time position recruited.

The Technical Specialist (TS) is a full time Project position contracted by UNDP and based in the PMU. He provided technical advice to NPD and UNDP.The UNDP Viet Nam Country Office (CO) has an overall quality assurance (QA) function and supervises the TS. Another role of the CO is, upon request from the NPD, to provide services for procurement of sub-contractors, recruitment of individual consultants, and other administrative functions.The Council of Science and Technology of Committee 33 provides technical advice and guidance to the Project. The Council comprises of 14 experts in areas such as medicine, environment, ecology chemistry and toxicology.

The management arrangement, envisaging a PMU tightly integrated into the Office 33 structure and cooperating on a day-to-day basis with UNDP worked efficiently. It is recognized by all the stakeholders that the PMU team is well organized and motivated, and all the team staff is use to work independently with clear understanding of their task and responsibility.

The PMU is at the forefront of international cooperation, and together with Office 33 shares a coordinating position with all the other project working in this issue, including, for instance, the USAID project for the cleanup of the Da Nang sites and the monitoring activities carried out by the Czech republic Its tight links with Office 33 makes easier the coordination of co-funded activities

No difficulties on the side of excessive workload have been reported in the course of the meetings with PMU, although in the first annual progress report the need for additional staff for carrying out project activities was clearly stated. Given the final stage of the project, it is therefore assumed that the project management is sufficiently staffed.

5.1.4. Is the project organization chart efficient for conducting and managing the whole project on the technical and administrative perspective?

The project organisation chart, as it emerged at inception, reflects the actual implementation of the project. . No actions / countermeasures for rearranging the organization chart, of for modify the assignment of outcomes to different actors / stakeholders are deemed necessary. At the peripheral level there is probably the need to further integrate communication and coordination with DONRE. (Department of Natural Resource and Environment). The local DONRE are more oriented to the cleanup and monitoring outside the air bases, the need of providing DONRE with more information concerning the status of remediation activities, and of providing more technical support emerged in the course of meeting and interviews with stakeholders.

5.1.5. Financial accountability – extent to which the financial management has been an integral part of achieving project results, with particular reference to adequate reporting, identification of problems and adjustment of activities, budgets and inputs; and

All the work plans and progress reports made available contains financial details of planned and completed disbursements. The work plans and progress reports have been drafted in cooperation with UNDP which provided assistance on the issue. Annual reports contain clear information arranged in a standardised way which facilitates the understanding of project achievements and difficulties. Changes were correctly reported in the progress reports, and budgetary consequences and adjustment anticipated.

5.1.6. Whether timeframe of the project is feasible and practicable?

The project fulfilled most of its expected activities at mid term. Therefore the timeframe for the remaining project life is considered feasible and practicable.

6. KEY FINDINGS AND LESSONS LEARNT

6.1. SUCCESS STORIES

Considering the tremendous difficulties posed by dioxin contamination, in all its faces of technological complexity, scientific uncertainty, environmental risks, health risks for the operators and the population,

socio-economical consequences, and last but not least the political and diplomatic sensitivity in curing a war wound, the sole fact that the project has been conducted with such a large commitment by all the parties involved (MONRE, MOD, UNDP, the US government and the US NGOs, international donors like the Czech government, New Zealand government) should be considered as an outstanding success story. It is clear that the project faced technical, communication and coordination difficulties at its start; however the results achieved until now, and the large funding leverage it helped securing, largely compensated the shortcomings.

It should be considered a success for the project for having been acknowledged as a coordinating "overarching" platform by the several institution and donors operating on the issue of hot spot contaminated areas. In this sense, even though the financial contribution of the project is minimal compared to the amount of funds committed by the donors, and – more important - compared to the huge financial effort which will be needed in the future for completing the remediation of the three hotspots, it may be affirmed that the financial support of GEF and the UNDP role in promoting, supporting and coordinating this project were catalytic in the achievement of the Stockholm Convention objectives on PCDD/F and represented a solid corner stone for the achievement of such demanding tasks. In addition, beside the catalytic effect of the GEF financial contribution, the technical framework of the project – as implemented by UNDP – is oriented at piloting the whole process of cleanup of PCDD/F contaminated sites (from site assessment to technology demonstration and implementation) and has therefore a great potential in term of global benefit of project outputs, scalability and replicability.

Within this general success story, there are specific technical achievements – already mentioned in this report - that should be listed as success stories:

1) the establishment of the Phu Cat landfill, following design criteria compliant with national and international environmental standards, represented a first important step toward the remediation of PCDD/F contaminated hotspots. It is clear that the establishment of this landfill should be seen as a temporary measure, and the risk is that the site is considered "definitively remediated"; however given the project budget and timeframe, that was the correct action to be implemented in Phu Cat pending the individuation of effective ways of remediation. The establishment of a network for the monitoring of groundwater will prevent negative consequences coming from unexpected leaking.
2) the same can be said for the containment of PCDD/F spreading in Bien Hoa: the full enclosure of contaminated soil within a landfill was far beyond the project resources, therefore it was a right choice to prevent the runoff of PCDD/F contaminated soil and sediments by means of building preferential paths for the runoff water. Although the building of this infrastructure was still ongoing at MTE, it is expected to be finished within the year, and it will represent the correct countermeasure for preventing spreading of the pollution pending final remediation.
3) The testing of the ball mill technology was accompanied by extensive discussion, and in some case, by difficult debate. It was reported that there was no agreement on the interpretation of testing results, and indeed delays in the completion of laboratory analysis endangered the conduction of the test. However, upon their examination, both advantages and shortcomings of the test emerged clearly from the three documents made available – the independent assessment report, the EDL report and the short report from UNDP published in the Dioxin newspaper. Shortcomings and advantages of the technologies and of the testing procedure are discussed in detail in other part of the document (section 4.4.1). However, the testing of the technology has to be considered a success for the following reasons: a) for the first time a mechano-chemical technology has been extensively tested on PCDD/F contaminated soil and the testing results constitute the largest database today available on the applicability of that technology to PCDD/F contaminated soil; the testing allowed also to identify sensitive aspect to be addressed in future testing, like better coordination with laboratory analysis and the implementation of a proper mass-balance scheme; the test clearly identified possible improvement on the operational parameters of the technology, to be adopted during the design and operation of a full scale commercial equipment.

6.2. LESSONS LEARNT

In the same way the entire project should be considered as a success story at this stage, it has also to be considered as a sound lesson in carrying out such complex and challenging activities.

The first lesson to be learnt is that project objectives have to be realistic. Remediation of contaminated sites – even the ones contaminated by "conventional" pollutant, like for instance hydrocarbons – very rarely go as planned, because the environmental variables, which usually cannot be completely quantified and controlled, always interact with complex permitting and financial issues; instead, Component 1 of the project had the following target at project design; *"As a result of the GEF-project and leveraged funds / activities, all contaminated soil at concentrations greater than 1,000ppt and sediment at concentrations greater than 150ppt will have been treated adequately and residual contamination safely land-filled, and thereby 1,736 g I-TEQ dioxin release will be avoided: at Bien Hoa by the end of 2010; at Da Nang by the end of 2012; and at Phu Cat by the end of 2011"* . That target was obviously overly optimistic and has been wisely amended at project inception.

A second lesson relates to the sound design and management of technology testing. As explained in detail in the specific section, the testing of the technology had two shortcomings: 1) the late delivery of the analytical determinations of PCDD/F in the in-feed soil, which affected testing result as the input concentration were not known at the time of setting the operational parameter of the technology; and the incomplete "mass-balance" scheme adopted in testing, which prevented the full understanding of technology performance. Notwithstanding these shortcoming, the outcome of the test were sufficiently clear; however, in the design of technology testing (including any further technology to be demonstrated / implemented in Bien Hoa) these 2 aspects must be clearly addressed since test design.

If not a lesson, the relationship between the Environmental and the Military administration is a challenge due to the obvious need of confidentiality and security of military activities; and some of the difficulties found by the project should indeed have been already considered at project design. The project objective to indicate land use in military areas should have been agreed with MOD since the stage of project design. However, as stated in one of the progress report, the final result was that *"several relevant activities within this outcome would be carried out. However, this plan has been completed by the Ministry of Defence. Activities within the logical framework will therefore be considered as completed."* Notwithstanding the above statement, no information on how this component has been accomplished is currently available.

A comprehensive communication strategy was developed as a useful roadmap to achieve desired results. The strategy covered both outputs 2.3 and 3.4, which helped to avoid possible confusion between the two components. However, had the communication strategy been developed at the beginning of the project, there would be more time for implementation of communication activities. Eventually the short timeframe left for the project implementation would make it difficult to realise communication impacts

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. RECOMMENDATIONS

In summary the following recommendations can be drawn for the successful closure of the project:

1. It is recommended to implement as soon as possible a monitoring plan for both Phu Cat and Bien Hoa to check and measure the effectiveness of the containment infrastructures and for the early identification of any residual risk. As the implementation of this monitoring activity need to be continued after project end, the monitoring plan should also identify responsibilities and fund mechanism to ensure the continuation of the monitoring for the time needed.
2. it is suggested to perform a moderate reallocation of the remaining funds to secure the following additional activities, as described in detail in Chapter 4.5.2
   a) Securing additional funding for the completion of master plans if necessary;

b) Securing additional funding for sampling and monitoring to improve site characterisation and monitoring.
c) **Extension of technology demonstration** with proper operational parameters, and a correct mass-balance scheme. It has to be stressed that a sound demonstration of a new technology for treating PCDD/F contaminated soil would represent a global benefit going beyond the boundaries of this project.
d) **Securing necessary funds for the completion of containment measures in Bien Hoa** as necessary

3. **Report, by means of an approach as much as possible quantitative, project achievement particularly highlighting PCDD/F source reduction and the associated benefit for the human health and the environment.**
4. **In case of further testing of the Mechano – Chemical Destruction technology, the complete characterisation of the test soil has to be completed before starting the trial test; the test design must envisage a detailed mas**s-balance scheme by taking appropriate measurement of the exhaust gases emitted by the system and of the dioxin adsorbed on the AC column.
5. It is suggested to draft a guidance document on the methodology for testing and procuring remediation technologies, in agreement with the government and the donors, to be compliant with the Stockholm Convention and the country environmental legislation; this guidance should be discussed in a dedicated workshop after proper circulation to the interested parties:
6. A way to exchange information on the land use issues in military areas should still be pursued. At a minimum, the project should draft a site-specific guidance document, based on the available knowledge, related to the suggested land use of the military areas providing indication to be adopted before, in the course and after remediation.
7. The need for additional support to PMU in the final stage of implementation of the project should be assessed based on the expected workload.
8. While the available timeframe is short (16 months), the communication plan with 67 activities seemed rather ambitious. The project should consider strategic activities for implementation, with proper attention on activities targeting local communities.

ANNEXES TO THE EVALUATION

7.2. QUESTIONNAIRES

Questionnaires were not used in this evaluation. However interviews and meetings with project stakeholder were based on the list of questions required by the TOR.

7.3. LIST AND TIME-TABLE OF STAKEHOLDER CONSULTED AND MINUTES OF MEETINGS

#	Name	Organisation/ Role in the project	Position	Time	Topic of discussion
1.	Nguyen My Hang Nguyen Trung Kien	Office 33/PMU	Head of the Department of International Cooperation cum Project Manager Project Assistant/Interpreter	May 09 14:00 – 15:30 (NC only)	Preparation of the MTE and field trip; Review of project documentation checklist
2.	Dao Xuan Lai Truong Thi Quynh Trang Phan Minh Nguyet	UNDP/Sustainable Development Unit	Head of Unit Portfolio Manager	May 15 13:30 – 15:30	Briefing of the project: history, stakeholders, progress and management Verification of the MTE mission and expected result.
3.	Nguyen My Hang Mick Saito	Office 33/PMU PMU	Head, Department of International Cooperation cum Project Manager Senior Technical Specialist	May 16 15:30 – 17:00	Project structure and progress review
4.	Nghiem Xuan Truong	Vietnam – Russian Tropical Center/Department of Chemistry and Environment	Vice director of the Department Head of Dioxin Lab	May 17 8:00 – 9:00	Sampling and analysis Lab capacity building
5.	Milan Vagner (and his secretary)	Embassy of the Czech Republic	Economic Counselor	May 17 9:30 – 10:30	Contribution to the project: Lab capacity building, Monitoring system
6.	Tu Binh Minh	Hanoi University of Sciences, Vietnam National University	Environmental and analytical chemist (project consultant for the Dioxin target level)	May 17 11:00 – 12:30	The setting of the Vietnamese National Standards on the Dioxin target level; Sampling and analysis
7.	Nguyen Hung Minh	Dioxin Laboratory Project	Lab Manager	May 17 13:30 – 15:30	The establishment and operation of the lab with support from the Bill & Melinda Gates Foundation and Atlantics

#	Name	Organisation/ Role in the project	Position	Time	Topic of discussion
					Philanthropies
8.	Zag Cole Vu Ngoc Ho	New Zealand Consulate in Ho Chi Minh city	Economic Counselor Assistant	May 20 15:00 – 16:30 (IC only)	New Zealand' support for the testing of technology
9.	Nguyen Thi Diep Hoa	National Consultant	Communication strategy	(personal communication – NC only)	The setting of the communication strategy
10.	Site visit in Bien Hoa Airbase			May 21 7:30 – 9:00	Observing the construction of the work for prevention of Dioxin expansion
11.	Do Cong Thanh	Ministry of Finance	Oversee ODA commitment	May 21 8:30 – 8:45 (NC only)	ODA commitments for the project, donor dialogues on Dioxin
12.	Nguyen Dinh Ban	MOD/ Regiment 935 (Air force regiment at Bien Hoa Airbase)	Senior Advisor	May 21st 9:00 – 9:30	Involvement of the regiment on the project
13.	Than Thanh Cong Do Duy Kien	Ministry of Defense/ Department of Sciences, Technology and Environment MOD – Air force/ Division of Sciences and Technology	Head of the Environmental Management Division, Secretary of the Working Group Head of the Division	May 21st 10:00 – 10:30	The role of MOD in the project (note that the discussion was terminated as participants require an official request for meeting and exchange with foreigner to be arranged with MOD through Office 33)
14.	Bach Van Truyen Dang Minh Que Tran Duc Hung	Lam Phat Construction Company Lam Phat Company MOD/Dept. of Chemistry/Institute for Environment and military chemistry	Director (temporary) Head of the construction work Deputy-head of the Division for Environmental Technology & Treatment		Construction of the prevention ditches and walls for prevention of dioxin expansion in Pacer Ivy area of Bien Hoa Health and Safety measures. Design of the work, Involvement of the Center in Dioxin-related activities in Bien Hoa airbase (in the project and for MOD activities)
15.	Vo Van Chanh	Dong Nai Provincial Department of Natural Resources and Environment	Vice Director	May 21st May 21st 11:30 – 12:30	The role of DONRE in the project; DONRE's activities in the area (monitoring of dioxin in surrounding area of Bien Hoa airbase, communication with local community, gaps of capacity needed in the

#	Name	Organisation/ Role in the project	Position	Time	Topic of discussion
					province, etc)
16.	Ngo Vinh Phuc Vu Hong Son Vu Hong Diep Nguyen Quang Nghia	MOD/ Regiment 940 (air force at Phu Cat airbase)	Head of the Regiment; Senior Advisor	May 22nd 8:30 – 10:30	The role of the regiment in the project. Feedbacks and reflect of the project activities. Needs/gaps to be addressed. Site visit
17.	Le Ke Son Nguyen My Hang Mick Saito	MONRE/Vietnam Environment Administration – Office 33	Vice director of VEA, Director of Office 33, Project director; Project Manager; Senior Specialist	May 23rd 15:00 – 16:30	Overall strategy of the project within the framework of Office 33; Verification of initial findings; Request for further documentations
18.	Pham Ngoc Canh	Consultant		May 24th 9:00 – 11:30	Technology testing; History of the project; Overall activities
19.	Eric Frater	US Embassy/ Environment, Technology, Sciences and Health Unit	Chief of the Unit	May 24th 14:00 – 15:00	The participation of USA in the project, the USAID project in Da Nang
20.		GEF – Global Office		(IC only)	
21.	Rick Cooke	UNDP	International consultant	(IC only, several meetings)	Issues related to the testing of the EDL technology.
22.		EDL		(IC only)	
23.	Dao Xuan Lai Truong Thi Quynh Trang	UNDP/Sustainable Development Unit	Head of the Unit Porfolio Manager	May 27th 8:30 – 9:00	De-briefing of the field mission
24.	Balaji (	UNDP Bangkok/		May 27th 9:00 – 9:30	
25.	Bakhodir Bukhanov	UNDP Vietnam	Deputy Country Director	May 27th 9:30 – 10:00	

7.4. AGENDA OF THE FIRST MISSION IN VIETNAM

#	Timing	Activities	Participants
1.	15/05/2013	Arrival of the International Expert	IC (Carlo Lupi)
2.	15:00 – 17:00	Meeting with UNDP	IC, NC, Dao Xuan Lai,
	16/05/2013		
3.	14:00 – 16:00	Meeting with Project Manager and UNDP Specialist	Nguyen My Hang (PM) Mitsugu Saito (Specialist)
	17/05/2013	Meetings with Consultants	Time TBC by PMU
4.	8:00 – 9:30	Vietnam – Russian Center	Mr. Nghiem Xuan Truong
5.	10:00 – 10:30	Embassy of Czech Republic	Milan Vagner, Economic Counselor
6.	11:00 – 12:30	Hanoi National University, Department of Chemicals	Mr. Tu Binh Minh
7.	13:30 – 16:00	Dioxin Laboratory	Mr. Nguyen Hung Minh, Lab Manager
	19/05/2013 (Sun)	Depart to HCM	
	20/05/2013	HCM	
8.	14:00 – 16:00 5:30PM 7:30PM	New Zealand Consulate Depart to Bien Hoa Arrive in Bien Hoa.	Zag Cole Vu Ngoc Ho
9.	8:00PM	Informal meeting with Project Director	Mr. Le Ke Son
	May 21	Meetings in Bien Hoa	
10.	7:30 – 9:30	Joint meeting with PMU (follow team' schedule)	
	10:00 – 11:00	Meeting with 935th Regiment & MOD	
	14:00 – 15:00	Meeting with DONRE Dong Nai	
	May 22	Depart to Quy Nhon Meetings and site visit in QUy Nhon	
11.	May 23	Depart to Hanoi Meeting with USAID	Contact person:
12.	May 24	Meetings with other consultants	
13.	May 27 (AM)	8:30 – 10:30: Debriefing with UNDP and PMU	UNDP, PMU
14.	July 15	Submission of Draft MTE Report for comments	Carlo Lupi, supported by Nghiem Hoa
15.	August 15	Finalise the MTE report based on comments by stakeholders	Carlo Lupi, supported by Nghiem Hoa
16.			

7.5. AGENDA OF THE SECOND MISSION IN VIETNAM

Thanks to the presence of the International Evaluation Consultant in Vietnam in late July, a second mission lasting only for one day was arranged, mainly with the purpose to meet PMU and MOD and to inform UNDP on the status of the evaluation report. The meetings with PMU, MOD and UNDP were all arranged in the afternoon of July 31st in Hanoi.

7.6.PROJECT DOCUMENTS BY OUTPUT AND ACTIVITY

#	Office / Author	Output	Activity	Filename (with link)	Title	Type of document	Language
0E	GEF/UNDP/VEA			Inception Report_GEF Dioxin Project_finalfor print_June 13-EN.pdf	Inception Report		English
0V	GEF/UNDP/VEA			Inception Report_GEF Dioxin Project_finalfor print_June 13-VN.pdf	Baó cáo khởi động dự án		Vietnamese
		1.1 containment/remediation target and action plans					
1	HATFIELD CONSULTANTS	1.1	1.1.1	1.1.1. DRAFT - Bien Hoa Master Plan_20130327_TB+ms.docx	DRAFT MASTER PLAN FOR REMEDIATION OF BIEN HOA AIRBASE, VIET NAM	Technical Report	English
2	Pham Ngoc Canh	1.1	1.1.1	Comments on Bien Hoa Master Plan draft by Dr. Canh,2013.doc	SOME COMMENTS ON THE DRAFT OF "MASTER PLAN FOR REMEDIATION OF BIEN HOA AIRBASE, VIET NAM"	Comment report	English
3	Nguyen Van Minh	1.1	1.1.1	Comments on Bien Hoa Master Plan draft by Dr. Minh.2013..doc	COMMENTS ON THE DRAFT OF MASTER PLAN FOR REMEDIATION OF BIEN HOA AIRBASE, VIET NAM BY HATFIELD	Comment report	English
4	HATFIELD CONSULTANTS	1.1	1.1.1	DRAFT - Bien Hoa Master Plan_20130327_TB Vv.docx	BẢN DỰ THẢO KẾ HOẠCH TỔNG THỂ XỬ LÝ Ô NHIỄM DIOXIN TẠI SÂN BAY BIÊN HÒA, VIỆT NAM	Technical Report	Vietnamese
5	Nguyen Van Minh	1.1	1.1.1	Comments on Bien Hoa Master Plan draft by Dr. Minh.2013..doc	NHẬN XÉT BẢN DỰ THẢO KẾ HOẠCH TỔNG THỂ XỬ LÝ Ô NHIỄM DIOXIN TẠI SÂN BAY BIÊN HÒA, VIỆT NAM CỦA HATFIELD	Comment report	Vietnamese
6	Pham Ngoc Canh	1.1	1.1.1	MỘT SỐ Ý KIẾN NHẬN XÉT VỀ BẢN DỰ THẢO KH BH.canh.2013.doc	SOME COMMENTS ON THE DRAFT OF "MASTER PLAN FOR REMEDIATION OF BIEN HOA AIRBASE, VIET NAM"	Comment report	Vietnamese
7	Nguyễn Minh Sơn	1.1	1.1.2	Minh_Son_ppt[1].pptx	XÂY DỰNG VÀ QUẢN LÝ NGUỒN TÀI CHÍNH TRONG KẾ HOẠCH TỔNG THỂ CHO SÂN BAY	Presentation	Vietnamese

8	Not signed	1.1	1.1.2	Draft Outline of Bien Hoa Master Plan_11.12.12_Vn (1).doc	ĐỀ CƯƠNG: Kế hoạch xử lý tổng thể cho Sân bay Biên Hòa, Việt Nam	Technical Report	Vietnamese
10	Nguyen Xuan Net	1.1	1.1.2	Ban do Bien Hoa_Nguyen Xuan Net.ppt	Ban do Bien Hoa	Presentation	Vietnamese
11	Not signed	1.1	1.1.2	06.annex Concept_demonstration_bioremediation_Vn.doc	Đề cương thử nghiệm sinh học xử lý trầm tích nhiễm dioxin tại Biên Hòa	Technical Report	Vietnamese
12	Pham Ngoc Canh	1.1	1.1.2	03.TÁC ĐỘNG CỦA Ô NHIỄM CHẤT ĐỘC DIOXIN_Pham Ngoc Canh.ppt	TÁC ĐỘNG CỦA Ô NHIỄM CHẤT ĐỘC DIOXIN ĐỐI VỚI MÔI TRƯỜNG VÀ CON NGƯỜI TẠI SÂN BAY BIÊN HÒA	Presentation	Vietnamese
13	Nguyen Xuan Net	1.1	1.1.2	01.Danh gia tong hop dioxin sbbh_Nguyen Xuan Net.ppt	ĐÁNH GIÁ TỔNG HỢP TỒN LƯU DIOXIN Ở SÂN BAY BIÊN HÒA	Presentation	Vietnamese
14	Not signed	1.1	1.1.2	00. Introduction.pptx	CÁC BÀI THUYẾT TRÌNH TIẾNG VIỆT	Presentation	Vietnamese
15	Not signed	1.1	1.1.2	00. Introduction.pptx	Presentations in Englisg	Presentation	English
16	Nguyen Xuan Net	1.1	1.1.2	01.Danh gia tong hop dioxin sbbh_Ev.ppt	OVERALL ASSESSMENT ON DIOXIN RESIDUE AT BIEN HOA AIRBASE	Presentation	English
17	Pham Ngoc Canh	1.1	1.1.2	03.TÁC ĐỘNG CỦA Ô NHIỄM CHẤT ĐỘC DIOXIN_Ev_Pham Ngoc Canh.ppt	IMPACT OF DIOXIN CONTAMINATION ON THE ENVIRONMENT AND HEALTH AT BIEN HOA AIRBASE	Presentation	English
18	Nguyen Minh Son	1.1	1.1.2	04.BÁO CÁO VỀ XÂY DỰNG VÀ QUẢN LÝ NGUỒN TÀI CHÍNH.En.doc	Report on building and management the sources of finance in the master plan for Bien Hoa Airbase	Technical Report	English
19	Not signed	1.1	1.1.2	05DRAF~1.DOC	DRAFT OUTLINE FOR DISCUSSION PURPOSES: Remediation Master Plan for Bien Hoa Airport, Viet Nam	Technical Report	English
20	Not signed	1.1	1.1.2	06.annex Concept_demonstration_bioremediation.doc	Outline of the demonstration of bioremediation to treat dioxin contaminated sediment in Bien Hoa	Technical Report	English
21	Nguyễn Mỹ Hằng, Nguyễn Trung Kiên	1.1	1.1.2	De an workshop for Bien Hoa Interim Measures Dec 2012_Revised.doc	ĐỀ ÁN HỘI THẢO XÂY DỰNG KẾ HOẠCH TỔNG THỂ VỀ XỬ LÝ Ô NHIỄM DIOXIN CHO ĐIỂM NÓNG SÂN BAY BIÊN HÒA	Technical Report	Vietnamese
22	Nguyễn Mỹ Hằng, Nguyễn Trung Kiên	1.1	1.1.2	De an workshop for Bien Hoa Interim Measures Dec 2012.doc	ĐỀ ÁN HỘI THẢO XÂY DỰNG KẾ HOẠCH TỔNG THỂ VỀ XỬ LÝ Ô NHIỄM DIOXIN CHO ĐIỂM NÓNG SÂN BAY BIÊN HÒA	Technical Report	Vietnamese

23	Nguyễn Mỹ Hằng	1.1	1.1.2	Tham.xls	DANH SÁCH ĐẠI BIỂU THAM DỰ HỘI THẢO XÂY DỰNG KẾ HOẠCH TỔNG THỂ XỬ LÝ Ô NHIỄM SÂN BAY BIÊN HÒA	List of Participants	Vietnamese
24	Nguyễn Mỹ Hằng	1.1	1.1.2	Chuong trinh chuyen di Ha Long thang 12.doc	CHƯƠNG TRÌNH CHUYẾN ĐI HẠ LONG	Agenda of Meeting	Vietnamese
25	Nguyễn Mỹ Hằng	1.1	1.1.2	AGENDA master plan-final_VN.docx	HỘI THẢO XÂY DỰNG KẾ HOẠCH TỔNG THỂ XỬ LÝ Ô NHIỄM DIOXIN TRONG SÂN BAY BIÊN HÒA	Agenda of Meeting	Vietnamese
26	Nguyễn Mỹ Hằng	1.1	1.1.2	AGENDA master plan-final.docx	WORKSHOP OF DEVELOPMENT OF MASTER PLAN FOR BIEN HOA AIRBASE Halong, December 13-15, 2012	Agenda of Meeting	English
26	Nguyễn Mỹ Hằng	1.1	1.1.3	Chuyen de chong lan toa va lua chon cong nghe_Technology selection by NgVMinh_ev.doc	INTERIM MEASURES TO PREVENT DIOXIN SPREADING AND SELECTION OF TECHNOLOGIES FOR DIOXIN REMEDIATION AT BIEN HOA AIRBASE	Technical Report	English
27	Nguyen Minh Son	1.1	1.1.3	Report-Son.doc	Report on Building and Management the Sources of Finance for Master Plan of Bien Hoa Airbase	Technical Report	English
28	Nguyen Minh Son	1.1	1.1.3	Report-Son-estimated cost.xlsx	Report on Building and Management the Sources of Finance for Master Plan of Bien Hoa Airbase	Management Report	English
29	Pham Ngoc Canh	1.1	1.1.3	BÁO CÁO CHUYÊN ĐỀ, Biên Hòa. TS. PHAM NGỌC CẢNH_updated 1.doc	ĐÁNH GIÁ TÁC ĐỘNG Ô NHIỄM CHẤT ĐỘC DA CAM/DIOXIN TAI SÂN BAY BIÊN HÒA ĐỐI VỚI CON NGƯỜI VÀ MÔI TRƯỜNG	Technical Report	Vietnamese
30	Nguyen Van Minh	1.1	1.1.3	Chuyên đề chống lan tỏa và lựa chọn công nghệ_Nguyen Van Minh.doc	CÁC GIẢI PHÁP TẠM THỜI NGĂN CHẶN LAN TỎA DIOXIN VÀ LỰA CHỌN CÔNG NGHỆ XỬ LÝ DIOXIN Ở SÂN BAY BIÊN HÒA	Technical Report	Vietnamese
31	Nguyễn Xuân Nết	1.1	1.1.3	sbbh-bao cao tong the - lan 3.doc	ĐÁNH GIÁ TỔNG HỢP TỒN LƯU DIOXIN TẠI SÂN BAY BIÊN HÒA (SBBH)	Technical Report	Vietnamese
		1.2 Government personel trained in containment and remediation technologies					

32	Not signed	1.2		Form.Bao cao ket qua dao tao (1)Hang_Vv.doc	BÁO CÁO KẾT QUẢ KHÓA TẬP HUẤN NGẮN HẠN VỀ CÔNG NGHỆ NGHIỀN BI	Training report	Vietnamese
		1.3 Spatial delineation of contaminated areas					
		1.4 Pilot scale demonstration of remediation technology					
33	Environmental Decontamination LTD	1.4	1.4.1.a	Revised Draft Vietnam Report 19 Dec 12 - Ev.doc	REPORT ON MCD™ TECHNOLOGY DEMONSTRATION Environmental remediation of dioxin contaminated hotspots in Vietnam	Technical Report	English
34	Environmental Decontamination LTD	1.4	1.4.1.a	Revised Draft Vietnam Report 19 Dec 12 - Vv.doc	REPORT ON MCD™ TECHNOLOGY DEMONSTRATION Environmental remediation of dioxin contaminated hotspots in Vietnam	Technical Report	Vietnamese
35	R. J. Cooke	1.4	1.4.1b	Output 1 Containment, Remediation\Output 1.4\1.4.1b\Executive Summary 130220_Ev.pdf	Executive Summary - Independent Evaluation of MCDTM Technology Demonstrated for Dioxin Contaminated Soil	Technical Report	English
36	R. J. Cooke	1.4	1.4.1b	Task 5 - MCD Technology Evaluation_Report Submission Version 130220_Ev.pdf	Independent Evaluation of MCDTM Technology Demonstrated for Dioxin Contaminated Soil Destruction in Viet Nam.	Technical Report	English
37	R. J. Cooke	1.4	1.4.1b	Output 1 Containment, Remediation\Output 1.4\1.4.1b\Executive Summary 130220_Vv.docx	Tóm tắt Báo cáo Đánh giá độc lập công nghệ MCD	Technical Report	Vietnamese
38	R. J. Cooke	1.4	1.4.1b	Task 5 - MCD Technology Evaluation_Report Submission Version 130220_Vv.pdf	Báo cáo đánh giá độc lập công nghệ nghiền bi	Technical Report	Vietnamese
39	Joint national expert group	1.4	1.4.1c1	Output 1 Containment, Remediation\Output 1.4\1.4.1c\Aug 4. 2012\04.08.2012 Bien Hoa MCD Plant - field mission report.docx	Monitoring report of MCD testing and demonstration 04Aug 2012	Mission report	English
40	Joint national expert group	1.4	1.4.1c1	Output 1 Containment, Remediation\Output 1.4\1.4.1c\Aug 4. 2012\04.08.2012 Bao cao cong tac giam sat thu nghiem cong nghe tai BienHoa-final.docx	Báo cáo giám sát 04/08/2012	Mission report	Vietnamese
41	Joint national expert group	1.4	1.4.1c2	Output 1 Containment, Remediation\Output 1.4\1.4.1c\Aug 30 and 31. 2012\30.08.2012 Bao cao giam sat thu nghiem BienHoa_Ev.docx	Monitoring report of MCD testing and demonstration 30Aug 2012	Mission report	English
42	Joint national expert group	1.4	1.4.1c2	Output 1 Containment, Remediation\Output 1.4\1.4.1c\Aug 30 and 31. 2012\30.08.2012 Bao cao giam sat thu nghiem BienHoa_Vv.docx	Báo cáo giám sát 30/08/2012	Mission report	Vietnamese

43	Joint national expert group	1.4	1.4.1c3	Output 1 Containment, Remediation\Output 1.4\1.4.1c\Sept 17 and 19. 2012\Mission report Sep 17_En.doc	Monitoring report of MCD testing and demonstration Sep 2012	Mission report	English
44	Joint national expert group	1.4	1.4.1c3	Output 1 Containment, Remediation\Output 1.4\1.4.1c\Sept 17 and 19. 2012\Mission report Sep 17.doc	Báo cáo giám sát 30/09/2012	Mission report	Vietnamese
		1.5 Full containment/isolation completed in Phu Cat and Bien Hoa					
		1.5.1.1_Phu Cat					
45	Office 33	1.5	1.5.1.1a1	Thuyet minh HDTV voi VP-33-Toanbosung-Hang040612.doc	Thuyết minh phương án chôn đất nhiễm Dioxin tại sân bay Phù Cát, Bình Định (Design of the Containment in Phu Cat)	Technical Report	Vietnamese
46	Centre for Environmental Technology and Treatment - Department of Chemicals, Ministry of Defense	1.5	1.5.1.1a2	BAI THUYET MINH 33.ppt	Thuyết minh phương án chôn đất nhiễm Dioxin tại sân bay Phù Cát, Bình Định (Design of the Containment in Phu Cat)	Presentation	Vietnamese
47	Vietnam Construction Investment and Authorisation Consulting JSC	1.5	1.5.1.1a3	Tham tra thiet ke Phu Cat.pdf	Biên bản thẩm tra lần I Hồ sơ thiết kế bản vẽ thi công và dự toán công trình Phù Cát (Minutes of Verification on the design of Phu Cat Containment)	Comment report	Vietnamese
48	Project Management Board	1.5	1.5.1.1a4	Báo cáo hội thảo thiết kế Phù Cát_Vn_Final Chi Hang 06.11.2012.docx	Báo cáo hoội thảo thiết kế kỹ thuật và DTM Phù Cát	Minute of Meeting	Vietnamese
49	Office 33	1.5	1.5.1.1a5	phe duyet thiet ke Phu Cat.pdf	Phê duyệt thiết kế Phù Cát (Approval of Phu Cat Containment Design)		Vietnamese
50	Vietnam - Australia Joint Venture	1.5	1.5.1.1b1	Phu Cat_Bao cao tien do thang 1	Báo cáo tiến độ tháng 1 (Monthly Progress report Jan 2012)	Field Activity Report	Vietnamese
51	Vietnam - Australia Joint Venture	1.5	1.5.1.1b2	Phu Cat_Bao cao tien do thang 2	Báo cáo tiến độ tháng 2 (Monthly Progress report Feb 2012)	Field Activity Report	Vietnamese

52	Vietnam - Australia Joint Venture	1.5	1.5.1.1b3	Báo cáo tiến độ tháng 3	Báo cáo tiến độ tháng 3 (Monthly Progress report Mar 2012)	Field Activity Report	Vietnamese
53	Vietnam - Australia Joint Venture	1.5	1.5.1.1b4	Phu Cat_Bao cao hoan cong.doc	Báo cáo hoàn công (Completion report)	Field Activity Report	Vietnamese
54	Environmental Consulting and Technology Center	1.5	1.5.1.1c1	Báo cáo tư vấn giám sát 03/2012	Báo cáo tư vấn giám sát 03/2012	Field Activity Report	Vietnamese
55	Environmental Consulting and Technology Center	1.5	1.5.1.1c2	Báo cáo tư vấn giám sát 04/2012	Báo cáo tư vấn giám sát 04/2012	Field Activity Report	Vietnamese
56	Environmental Consulting and Technology Center	1.5	1.5.1.1c3	Báo cáo tư vấn giám sát 08/2012	Báo cáo tư vấn giám sát 03/2012	Field Activity Report	Vietnamese
		1.5.1.2_Bien Hoa					
57	Centre for Environmental Technology and Treatment - Department of Chemicals, Ministry of Defense	1.5	1.5.1.2	THUYET MINH chong lan toa L5_Final.doc	THUYET MINH chong lan toa L5_Final (Design of isolation work in Pacer Ivy)	Technical Report	Vietnamese
58	Centre for Environmental Technology and Treatment - Department of Chemicals, Ministry of Defense	1.5	1.5.1.2b	Phuong an thiet ke dieu huong dong chay.pdf	Sơ đồ thiết kế phương án điều hướng dòng chảy khu vực pacer Ivy (Map of isolation work in Pacer Ivy)	Technical Report	Vietnamese
		1.6 Monitoring system					
59	DEKONTA – ALS Consortium	1.6	1.6.1.1	Bien Hoa_Conceptual model_FINAL.doc	Conceptual Model Bien Hoa	Technical Report	English

60	DEKONTA – ALS Consortium	1.6	1.6.1.2	Phu Cat_Long-term Monitoring Plan_FINAL_1.doc	Long-term Monitoring plan for Phu Cat	Technical Report	English
61	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.1	SOP air and dust sampling_FIN1.doc	Standard Operation Procedure (SOP) for the air and dust sampling by using high volume air sampler in Phu Cat	Technical Report	English
62	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.1V	SOP_Lay mau khi bang thiet bi HV_Dioxin lab.doc	Quy trình lấy mẫu khí, bụi sử dụng thiết bị lấy mẫu khí thể tích lớn	Technical Report	Vietnamese
63	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.2	SOP GW sampling_Dekonta_Corr_marked changes.doc	SOP (Phu Cat) Ground Water sampling	Technical Report	English
64	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.2V	VN. SOP GW sampling_Dekonta_FINAL.doc	SOP Quy trình lấy mẫu nước ngầm	Technical Report	Vietnamese
65	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.3E	SOP SW sampling_Dekonta.docx	SOP (Phu Cat) SPMD Surface water sampling	Technical Report	English
66	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.3V	VN. SW sampling_Dekonta_FINAL.doc	SOP Quy trình lấy mẫu nước mặt	Technical Report	Vietnamese
67	Dekonta ALS	1.6	1.6.2.4a	Output 1 Containment, Remediation\Output 1.6\1.6.2 Training\Report on training in CR_FINAL.pdf	Training report: Training of Analysts	Training Report	English
68	PMU	1.6	1.6.2.4b	Output 1 Containment, Remediation\Output 1.6\1.6.2 Training\final Danh sach Doan di Sec - Khoa dao tao can bo pt PTN_Revised by VRTC.doc.docx	List of training participants	List of participants	English
69	PMU	1.6	1.6.2.4c	Output 1 Containment, Remediation\Output 1.6\1.6.2 Training\FINAL Scheme on training program in CR-final1.doc	Training Program	Training Report	English
		Outcome 2: Land use					
		2.1	*Overall land use plan*				
70	not stated	2.1	2.1	2.1QH dat diem nong.VP33.tomtat.doc	Quy hoạch sử dụng đất ba điểm nóng (land use plan of three hotspots)	Technical Report	Vietnamese
		2.2	Environmental recovery action plans and other land use measures				
		2.3	Public environmental awareness and education programs				
		Outcome 3: National Regulation and institutional capacity					
		3.1	National Regulatory Standards				

71	not stated	3.1	3.1.1a	Legal document Dioxin VN.doc	Rà soát các công cụ pháp lý hiện có về dioxin tại Việt Nam (Review of existing regulations on dioxin in Vietnam)	Technical Report	Vietnamese
72	Administration of Vietnamese Standards	3.1	3.1.1b	Output 3 Institutions\3.1 Standards\HDTD_01 TCVN VP 33.doc	Biên bản họp hội đồng thẩm định TCVN về Giới hạn dioxin trong nước thải, khí thải từ hoạt động xử lý ô nhiễm dioxin tồn lưu	Minute of Meeting	Vietnamese
73	not stated	3.1	3.1.2	Report food samples Dioxin Analysis Vietnam.doc	Báo cáo tóm tắt lấy mẫu thực phẩm cho phân tích Dioxin	Technical Report	Vietnamese
74		3.1	3.1.3	ALS reportings.rar	ASL sample analysis reports	Technical Report	English
75	Tu Binh Minh et.al.	3.1	3.1.4E	Report TDI Dioxin Vietnam ENG-2012 May.doc	Tolerable Daily Intake (TDI) of Dioxin and Furans: Review and Recommendations of provisional TDI for Vietnamese People	Technical Report	English
76	Tu Binh Minh et.al.	3.1	3.1.4V	Report TDI Dioxin Vietnam VIE-2012 May.doc	Liều nhiễm hàng ngày chấp nhận được (tolerable daily intake -tdi) của dioxin và furan: tổng quan và đề xuất gía trị TDI cho Việt Nam	Technical Report	Vietnamese
77		**3.2**	**Office 33 Capacity**				
78		**3.2**	**3.2.1**	Newsletters			
79	Project Management Board	**3.2**	3.2.1.1	Newsletter 1st edition 2011.pdf	Newsletter No01		English
80	Project Management Board	**3.2**	3.2.1.2	Newsletter 2nd edition.pdf	Newsletter No02		English
81	Project Management Board	**3.2**	3.2.1.3	Newsletter 3rd issue.pdf	Newsletter No03		English
82	Project Management Board	**3.2**	3.2.1.4	Newsletter 4th edition.pdf	Newsletter No04		English
83	Project Management Board	**3.2**	3.2.1.5	Newsletter 5th edition.pdf	Newsletter No05		English
84		**3.2**	**3.2.2**	Funding			

85	Czech Republic Emb	**3.2**	3.2.2.1	Czech co-financing letter 16 Apr09.pdf	Funding commitment letter from Czech Rep	Agreement / MOU / TOC	English
86	AP	**3.2**	3.2.2.2	Grant agreement with AP.pdf	Grant Agreement wit h Atlantic Philanthropies	Agreement / MOU / TOC	English
87	BMGF	**3.2**	3.2.2.3	Grant agreement with BMGF (signed).pdf	Grant agreement with BMGF	Agreement / MOU / TOC	English
88	Ford Foundation	**3.2**	3.2.2.4	UNDP_GEF FF cofin dioxin.pdf	Ford Foundation: letter of support	Agreement / MOU / TOC	English
89	UNDP	**3.2**	3.2.2.5	UNDP-VN GEF Co-financing Dioxin 27 May 09.pdf	UNDP Co-funding commitment letter	Agreement / MOU / TOC	English
90	US Embassy	**3.2**	3.2.2.6	US co-financing letter.pdf	US Funding letter 2009	Agreement / MOU / TOC	English
		3.2	3.2.3	Database			
		3.3	**Institutional Capacity**				
		3.3	3.3.1	Dioxin lab			
		3.3	3.3.2	Training			
91	Nguyễn Mỹ Hằng	**3.3**	3.3.2.1	Output 3 Institutions\3.3.4\09 - 13 07 12 danhsach và chuong trinh.doc	Danh sách tham gia khóa tập huấn Công nghệ nghiền bi và chương trình dự kiến	List of Participants	Vietnamese
92	Nguyễn Mỹ Hằng	**3.3**	3.3.2.2	Output 3 Institutions\3.3.4\Form.Bao cao ket qua dao tao (1)Hang_pics added.doc	Báo cáo kết quả đào tạo (Công nghệ nghiền bi)	Training report	Vietnamese
93		3.4	**Communication Strategy**				
94		3.4	3.4.1aE	ComStrat_10Steps_V12_12Aug2012.docx	Communication Strategy Design: Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam	Technical Report	English
95		3.4	3.4.1bE	Annex1_Planning-Matrix_12Aug2012.docx	Communication plan (annex 1)	Technical Report	English
96		3.4	3.4.1cE	Annex2_Detailed-Implementation-Plan_V8_12Aug2012.xlsx	Detail communication plan	Technical Report	English
97		3.4	3.4.1aV	ComStrat_VN_12Aug.doc	Xây dựng Chiến lược Truyền thông: Xử lý Môi trường tại các Điểm Ô nhiễm Dioxin nặng tại Việt Nam	Technical Report	Vietnamese
98		3.4	3.4.1bV	Annex 1_Ma tran ke hoach_V.doc	Ma trận kế hoạch	Technical Report	Vietnamese
99		3.4	3.4.1cV	Annex 2_Kế hoạch hành động chi tiết_V.xls	Kế hoạch chi tiết	Technical Report	Vietnamese
100		3.4	3.4.2	Output 3 Institutions\3.4.4 Media workshop	Media workshop documents	Presentation	English and Vietnamese

101		3.4	3.4.3	Output 3 Institutions\3.4.4 Media workshop\Bai Bao.22.04.13.rar	Press clips		Vietnamese
		Outcome 4: Project Management					
		4.1	Program Management				
102	Project Management Board		4.1.1	Output 4_managament\Progress reports\Annual report\UNDP- Annual Report 2010_V.doc	Báo cáo tình hình thực hiện kế hoạch 2010	Management Report	Vietnamese
103	Project Management Board		4.1.2	Output 4_managament\Progress reports\Annual report\DIOXIN PROJECT TO UNDP 2011- EN-FINAL 20120223h.doc	Project annual report 2011	Management Report	English
104	Project Management Board		4.1.3	Output 4_managament\Progress reports\Annual report\DIOXIN PROJECT TO UNDP ANNUAL 2012.doc	Report on Activities 2012	Management Report	English
105	Project Management Board		4.1.4	Output 4_managament\Progress reports\Annual report\DIOXIN PROJECT TO UNDP ANNUAL 2012.xls	Logframe report 2012	Management Report	English
106	Project Management Board		4.1.5	Output 4_managament\Progress reports\PIMS 3685_UNDP_GEF_ST_2012_V08_Chemicals-VN dioxin.xls	UNDP Project Implementation Report 2012	Management Report	English
107			4.1.6	DIOXIN PROJECT TO UNDP 2010Q4.xls	Quaterly report 2010Q4	Management Report	English
108			4.1.7	DIOXIN PROJECT TO UNDP 2011Q1.xls	Quaterly report 2011Q1	Management Report	English
109			4.1.8	DIOXIN PROJECT TO UNDP 2011Q2.xls	Quaterly report 2011Q2	Management Report	English
110			4.1.9	DIOXIN PROJECT TO UNDP 2011Q3.xls	Quaterly report 2011Q3	Management Report	English
111			4.1.10	DIOXIN PROJECT TO UNDP 2012Q1.xls	Quaterly report 2012Q1	Management Report	English
112			4.1.11	DIOXIN PROJECT TO UNDP 2012Q2 - 9.07.2012.xls	Quaterly report 2012Q2	Management Report	English
113			4.1.12	DIOXIN PROJECT TO UNDP 2012Q3+Q4.xls	Quaterly report 2012Q3+4	Management Report	English

#	Office / Author	Output	Activity	Filename (with link)	Title	Type of document	Language
	GEF/UNDP/VEA			Inception Report_GEF Dioxin Project_finalfor print_June 13-EN.pdf	Inception Report		English

	GEF/UNDP/VEA			Inception Report_GEF Dioxin Project_finalfor print_June 13-VN.pdf	Baó cáo khởi động dự án		Vietnamese
		1.1 containment/remediation target and action plans					
1	HATFIELD CONSULTANTS	1.1	1.1.1	1.1.1. DRAFT - Bien Hoa Master Plan_20130327_TB+ms.docx	DRAFT MASTER PLAN FOR REMEDIATION OF BIEN HOA AIRBASE, VIET NAM	Technical Report	English
2	Pham Ngoc Canh	1.1	1.1.1	Comments on Bien Hoa Master Plan draft by Dr. Canh,2013.doc	SOME COMMENTS ON THE DRAFT OF "MASTER PLAN FOR REMEDIATION OF BIEN HOA AIRBASE, VIET NAM"	Comment report	English
3	Nguyen Van Minh	1.1	1.1.1	Comments on Bien Hoa Master Plan draft by Dr. Minh.2013..doc	COMMENTS ON THE DRAFT OF MASTER PLAN FOR REMEDIATION OF BIEN HOA AIRBASE, VIET NAM BY HATFIELD	Comment report	English
4	HATFIELD CONSULTANTS	1.1	1.1.1	DRAFT - Bien Hoa Master Plan_20130327_TB Vv.docx	BẢN DỰ THẢO KẾ HOẠCH TỔNG THỂ XỬ LÝ Ô NHIỄM DIOXIN TẠI SÂN BAY BIÊN HÒA, VIỆT NAM	Technical Report	Vietnamese
5	Nguyen Van Minh	1.1	1.1.1	Comments on Bien Hoa Master Plan draft by Dr. Minh.2013..doc	NHẬN XÉT BẢN DỰ THẢO KẾ HOẠCH TỔNG THỂ XỬ LÝ Ô NHIỄM DIOXIN TẠI SÂN BAY BIÊN HÒA, VIỆT NAM CỦA HATFIELD	Comment report	Vietnamese
6	Pham Ngoc Canh	1.1	1.1.1	MỘT SỐ Ý KIẾN NHẬN XÉT VỀ BẢN DỰ THẢO KH BH.canh.2013.doc	SOME COMMENTS ON THE DRAFT OF "MASTER PLAN FOR REMEDIATION OF BIEN HOA AIRBASE, VIET NAM"	Comment report	Vietnamese
7	Nguyễn Minh Sơn	1.1	1.1.2	Minh_Son_ppt[1].pptx	XÂY DỰNG VÀ QUẢN LÝ NGUỒN TÀI CHÍNH TRONG KẾ HOẠCH TỔNG THỂ CHO SÂN BAY	Presentation	Vietnamese
8	Not signed	1.1	1.1.2	Draft Outline of Bien Hoa Master Plan_11.12.12_Vn (1).doc	ĐỀ CƯƠNG: Kế hoạch xử lý tổng thể cho Sân bay Biên Hòa, Việt Nam	Technical Report	Vietnamese
10	Nguyen Xuan Net	1.1	1.1.2	Ban do Bien Hoa_Nguyen Xuan Net.ppt	Ban do Bien Hoa	Presentation	Vietnamese
11	Not signed	1.1	1.1.2	06.annex Concept_demonstration_bioremediation_Vn.doc	Đề cương thử nghiệm sinh học xử lý trầm tích nhiễm dioxin tại Biên Hòa	Technical Report	Vietnamese
12	Pham Ngoc Canh	1.1	1.1.2	03.TÁC ĐỘNG CỦA Ô NHIỄM CHẤT ĐỘC DIOXIN_Pham Ngoc Canh.ppt	TÁC ĐỘNG CỦA Ô NHIỄM CHẤT ĐỘC DIOXIN ĐỐI VỚI MÔI TRƯỜNG VÀ CON NGƯỜI TẠI SÂN BAY BIÊN HÒA	Presentation	Vietnamese

13	Nguyen Xuan Net	1.1	1.1.2	01.Danh gia tong hop dioxin sbbh_Nguyen Xuan Net.ppt	ĐÁNH GIÁ TỔNG HỢP TỒN LƯU DIOXIN Ở SÂN BAY BIÊN HÒA	Presentation	Vietnamese
14	Not signed	1.1	1.1.2	00. Introduction.pptx	CÁC BÀI THUYẾT TRÌNH TIẾNG VIỆT	Presentation	Vietnamese
15	Not signed	1.1	1.1.2	00. Introduction.pptx	Presentations in Englisg	Presentation	English
16	Nguyen Xuan Net	1.1	1.1.2	01.Danh gia tong hop dioxin sbbh_Ev.ppt	OVERALL ASSESSMENT ON DIOXIN RESIDUE AT BIEN HOA AIRBASE	Presentation	English
17	Pham Ngoc Canh	1.1	1.1.2	03.TÁC ĐỘNG CỦA Ô NHIỄM CHẤT ĐỘC DIOXIN_Ev_Pham Ngoc Canh.ppt	IMPACT OF DIOXIN CONTAMINATION ON THE ENVIRONMENT AND HEALTH AT BIEN HOA AIRBASE	Presentation	English
18	Nguyen Minh Son	1.1	1.1.2	04.BÁO CÁO VỀ XÂY DỰNG VÀ QUẢN LÝ NGUỒN TÀI CHÍNH.En.doc	Report on building and management the sources of finance in the master plan for Bien Hoa Airbase	Technical Report	English
19	Not signed	1.1	1.1.2	05DRAF~1.DOC	DRAFT OUTLINE FOR DISCUSSION PURPOSES: Remediation Master Plan for Bien Hoa Airport, Viet Nam	Technical Report	English
20	Not signed	1.1	1.1.2	06.annex Concept_demonstration_bioremediation.doc	Outline of the demonstration of bioremediation to treat dioxin contaminated sediment in Bien Hoa	Technical Report	English
21	Nguyễn Mỹ Hằng, Nguyễn Trung Kiên	1.1	1.1.2	De an workshop for Bien Hoa Interim Measures Dec 2012_Revised.doc	ĐỀ ÁN HỘI THẢO XÂY DỰNG KẾ HOẠCH TỔNG THỂ VỀ XỬ LÝ Ô NHIỄM DIOXIN CHO ĐIỂM NÓNG SÂN BAY BIÊN HÒA	Technical Report	Vietnamese
22	Nguyễn Mỹ Hằng, Nguyễn Trung Kiên	1.1	1.1.2	De an workshop for Bien Hoa Interim Measures Dec 2012.doc	ĐỀ ÁN HỘI THẢO XÂY DỰNG KẾ HOẠCH TỔNG THỂ VỀ XỬ LÝ Ô NHIỄM DIOXIN CHO ĐIỂM NÓNG SÂN BAY BIÊN HÒA	Technical Report	Vietnamese
23	Nguyễn Mỹ Hằng	1.1	1.1.2	Tham.xls	DANH SÁCH ĐẠI BIỂU THAM DỰ HỘI THẢO XÂY DỰNG KẾ HOẠCH TỔNG THỂ XỬ LÝ Ô NHIỄM SÂN BAY BIÊN HÒA	List of Participants	Vietnamese
24	Nguyễn Mỹ Hằng	1.1	1.1.2	Chuong trinh chuyen di Ha Long thang 12.doc	CHƯƠNG TRÌNH CHUYẾN ĐI HẠ LONG	Agenda of Meeting	Vietnamese
25	Nguyễn Mỹ Hằng	1.1	1.1.2	AGENDA master plan-final_VN.docx	HỘI THẢO XÂY DỰNG KẾ HOẠCH TỔNG THỂ XỬ LÝ Ô NHIỄM DIOXIN TRONG SÂN BAY BIÊN HÒA	Agenda of Meeting	Vietnamese

26	Nguyễn Mỹ Hằng	1.1	1.1.2	AGENDA master plan-final.docx	WORKSHOP OF DEVELOPMENT OF MASTER PLAN FOR BIEN HOA AIRBASE Halong, December 13-15, 2012	Agenda of Meeting	English
26	Nguyễn Mỹ Hằng	1.1	1.1.3	Chuyen de chong lan toa va lua chon cong nghe_Technology selection by NgVMinh_ev.doc	INTERIM MEASURES TO PREVENT DIOXIN SPREADING AND SELECTION OF TECHNOLOGIES FOR DIOXIN REMEDIATION AT BIEN HOA AIRBASE	Technical Report	English
27	Nguyen Minh Son	1.1	1.1.3	Report-Son.doc	Report on Building and Management the Sources of Finance for Master Plan of Bien Hoa Airbase	Technical Report	English
28	Nguyen Minh Son	1.1	1.1.3	Report-Son-estimated cost.xlsx	Report on Building and Management the Sources of Finance for Master Plan of Bien Hoa Airbase	Management Report	English
29	Pham Ngoc Canh	1.1	1.1.3	BÁO CÁO CHUYÊN ĐỀ, Biên Hòa. TS. PHAM NGOC CẢNH updated 1.doc	ĐÁNH GIÁ TÁC ĐỘNG Ô NHIỄM CHẤT ĐỘC DA CAM/DIOXIN TAI SÂN BAY BIÊN HÒA ĐỐI VỚI CON NGƯỜI VÀ MÔI TRƯỜNG	Technical Report	Vietnamese
30	Nguyen Van Minh	1.1	1.1.3	Chuyên đề chống lan tỏa và lựa chọn công nghệ Nguyen Van Minh.doc	CÁC GIẢI PHÁP TẠM THỜI NGĂN CHẶN LAN TỎA DIOXIN VÀ LỰA CHỌN CÔNG NGHỆ XỬ LÝ DIOXIN Ở SÂN BAY BIÊN HÒA	Technical Report	Vietnamese
31	Nguyễn Xuân Nết	1.1	1.1.3	sbbh-bao cao tong the - lan 3.doc	ĐÁNH GIÁ TỔNG HỢP TỒN LƯU DIOXIN TẠI SÂN BAY BIÊN HÒA (SBBH)	Technical Report	Vietnamese
		1.2 Government personel trained in containment and remediation technologies					
32	Not signed	1.2		Form.Bao cao ket qua dao tao (1)Hang_Vv.doc	BÁO CÁO KẾT QUẢ KHÓA TẬP HUẤN NGẮN HẠN VỀ CÔNG NGHỆ NGHIỀN BI	Training report	Vietnamese
		1.3 Spatial delineation of contaminated areas					
		1.4 Pilot scale demonstration of remediation technology					
33	Environmental Decontamination LTD	1.4	1.4.1.a	Revised Draft Vietnam Report 19 Dec 12 - Ev.doc	REPORT ON MCD™ TECHNOLOGY DEMONSTRATION Environmental remediation of dioxin contaminated hotspots in Vietnam	Technical Report	English

34	Environmental Decontamination LTD	1.4	1.4.1.a	Revised Draft Vietnam Report 19 Dec 12 - Vv.doc	REPORT ON MCD™ TECHNOLOGY DEMONSTRATION Environmental remediation of dioxin contaminated hotspots in Vietnam	Technical Report	Vietnamese
35		1.4	1.4.1.a	Revised Draft Vietnam Report 19 Dec 12 - Vv.doc	REPORT ON MCD™ TECHNOLOGY DEMONSTRATION Environmental remediation of dioxin contaminated hotspots in Vietnam	Technical Report	Vietnamese
		1.5 Full containment/isolation completed in Phu Cat and Bien Hoa					
		1.5.1.1_Phu Cat					
36	Office 33	1.5	1.5.1.1a1	Thuyet minh HDTV voi VP-33-Toanbosung-Hang040612.doc	Thuyết minh phương án chôn đất nhiễm Dioxin tại sân bay Phù Cát, Bình Định (Design of the Containment in Phu Cat)	Technical Report	Vietnamese
37	Centre for Environmental Technology and Treatment - Department of Chemicals, Ministry of Defense	1.5	1.5.1.1a2	BAI THUYET MINH 33.ppt	Thuyết minh phương án chôn đất nhiễm Dioxin tại sân bay Phù Cát, Bình Định (Design of the Containment in Phu Cat)	Presentation	Vietnamese
38	Vietnam Construction Investment and Authorisation Consulting JSC	1.5	1.5.1.1a3	Tham tra thiet ke Phu Cat.pdf	Biên bản thẩm tra lần I Hồ sơ thiết kế bản vẽ thi công và dự toán công trình Phù Cát (Minutes of Verification on the design of Phu Cat Containment)	Comment report	Vietnamese
39	Project Management Board	1.5	1.5.1.1a4	Báo cáo hội thảo thiết kế Phù Cát_Vn_Final Chi Hang 06.11.2012.docx	Báo cáo hoội thảo thiết kế kỹ thuật và DTM Phù Cát	Minute of Meeting	Vietnamese
40	Office 33	1.5	1.5.1.1a5	phe duyet thiet ke Phu Cat.pdf	Phê duyệt thiết kế Phù Cát (Approval of Phu Cat Containment Design)		Vietnamese
41	Vietnam - Australia Joint Venture	1.5	1.5.1.1b1	Phu Cat_Bao cao tien do thang 1	Báo cáo tiến độ tháng 1 (Monthly Progress report Jan 2012)	Field Activity Report	Vietnamese
42	Vietnam - Australia Joint Venture	1.5	1.5.1.1b2	Phu Cat_Bao cao tien do thang 2	Báo cáo tiến độ tháng 2 (Monthly Progress report Feb 2012)	Field Activity Report	Vietnamese

43	Vietnam - Australia Joint Venture	1.5	1.5.1.1b3	Báo cáo tiến độ tháng 3	Báo cáo tiến độ tháng 3 (Monthly Progress report Mar 2012)	Field Activity Report	Vietnamese
44	Vietnam - Australia Joint Venture	1.5	1.5.1.1b4	Phu Cat_Bao cao hoan cong.doc	Báo cáo hoàn công (Completion report)	Field Activity Report	Vietnamese
45	Environmental Consulting and Technology Center	1.5	1.5.1.1c1	Báo cáo tư vấn giám sát 03/2012	Báo cáo tư vấn giám sát 03/2012	Field Activity Report	Vietnamese
46	Environmental Consulting and Technology Center	1.5	1.5.1.1c2	Báo cáo tư vấn giám sát 04/2012	Báo cáo tư vấn giám sát 04/2012	Field Activity Report	Vietnamese
47	Environmental Consulting and Technology Center	1.5	1.5.1.1c3	Báo cáo tư vấn giám sát 08/2012	Báo cáo tư vấn giám sát 03/2012	Field Activity Report	Vietnamese
48		***1.5.1.2_Bien Hoa***					
49	Centre for Environmental Technology and Treatment - Department of Chemicals, Ministry of Defense	1.5	1.5.1.2	THUYET MINH chong lan toa L5_Final.doc	THUYET MINH chong lan toa L5_Final (Design of isolation work in Pacer Ivy)	Technical Report	Vietnamese
	Centre for Environmental Technology and Treatment - Department of Chemicals, Ministry of Defense	1.5	1.5.1.2b	Output 1_Containment, Remediation\Output 1.5\1.5.1.2 Bien Hoa\Phuong an thiet ke dieu huong dong chay.pdf	Sơ đồ thiết kế phương án điều hướng dòng chảy khu vực pacer Ivy (Map of isolation work in Pacer Ivy)	Technical Report	
		1.6 Monitoring system					
50	DEKONTA – ALS Consortium	1.6	1.6.1	Bien Hoa_Conceptual model_FINAL.doc	Conceptual Model Bien Hoa	Technical Report	English

51	DEKONTA – ALS Consortium	1.6	1.6.2.1	Phu Cat_Long-term Monitoring Plan_FINAL_1.doc	Long-term Monitoring plan for Phu Cat	Technical Report	English
52	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.2	SOP air and dust sampling_FIN1.doc	Standard Operation Procedure (SOP) for the air and dust sampling by using high volume air sampler in Phu Cat	Technical Report	English
53	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.2V	SOP_Lay mau khi bang thiet bi HV_Dioxin lab.doc	Quy trình lấy mẫu khí, bụi sử dụng thiết bị lấy mẫu khí thể tích lớn	Technical Report	Vietnamese
54	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.3	SOP GW sampling_Dekonta_Corr_marked changes.doc	SOP (Phu Cat) Ground Water sampling	Technical Report	English
55	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.3V	VN. SOP GW sampling_Dekonta_FINAL.doc	SOP Quy trình lấy mẫu nước ngầm	Technical Report	Vietnamese
56	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.4	SOP SW sampling_Dekonta.docx	SOP (Phu Cat) SPMD Surface water sampling	Technical Report	English
57	DEKONTA ALS Consortium - VEA Dioxin LAB	1.6	1.6.2.4V	VN. SW sampling_Dekonta_FINAL.doc	SOP Quy trình lấy mẫu nước mặt	Technical Report	Vietnamese
		Outcome 2: Land use					
		2.1	*Overall land use plan*				
58	not stated	2.1	2.1	2.1QH dat diem nong.VP33.tomtat.doc	Quy hoạch sử dụng đất ba điểm nóng	Technical Report	Vietnamese
		2.2	Environmental recovery action plans and other land use measures				
		2.3	Public environmental awareness and education programs				
		Outcome 3: National Regulation and institutional capacity					
		3.1	National Regulatory Standards				
59	not stated	3.1	3.1.1a	Legal document Dioxin VN.doc	Rà soát các công cụ pháp lý hiện có về dioxin tại Việt Nam (Review of existing regulations on dioxin in Vietnam)	Technical Report	Vietnamese
60	Administration of Vietnamese Standards	3.1	3.1.1b	Output 3 Institutions\3.1 Standards\HDTD_01 TCVN VP 33.doc	Biên bản họp hội đồng thẩm định TCVN về Giới hạn dioxin trong nước thải, khí thải từ hoạt động xử lý ô nhiễm dioxin tồn lưu	Minute of Meeting	Vietnamese
61	not stated	3.1	3.1.2	Report food samples Dioxin Analysis Vietnam.doc	Báo cáo tóm tắt lấy mẫu thực phẩm cho phân tích Dioxin	Technical Report	Vietnamese

62		3.1	3.1.3	ALS reportings.rar	ASL sample analysis reports	Technical Report	English
63	Tu Binh Minh et.al.	3.1	3.1.4E	Report TDI Dioxin Vietnam ENG-2012 May.doc	Tolerable Daily Intake (TDI) of Dioxin and Furans: Review and Recommendations of provisional TDI for Vietnamese People	Technical Report	English
64	Tu Binh Minh et.al.	3.1	3.1.4V	Report TDI Dioxin Vietnam VIE-2012 May.doc	Liều nhiễm hàng ngày chấp nhận được (tolerable daily intake -tdi) của dioxin và furan: tổng quan và đề xuất gía trị TDI cho Việt Nam	Technical Report	Vietnamese
		3.2	**Office 33 Capacity**				
		3.2	**3.2.1**	Newsletters			
65	Project Management Board	**3.2**	3.2.1.1	Newsletter 1st edition 2011.pdf	Newsletter No01		English
66	Project Management Board	**3.2**	3.2.1.2	Newsletter 2nd edition.pdf	Newsletter No02		English
67	Project Management Board	**3.2**	3.2.1.3	Newsletter 3rd issue.pdf	Newsletter No03		English
68	Project Management Board	**3.2**	3.2.1.4	Newsletter 4th edition.pdf	Newsletter No04		English
69	Project Management Board	**3.2**	3.2.1.5	Newsletter 5th edition.pdf	Newsletter No05		English
		3.2	**3.2.2**	Funding			
70	Czech Republic Emb	**3.2**	3.2.2.1	Czech co-financing letter 16 Apr09.pdf	Funding commitment letter from Czech Rep	Agreement / MOU / TOC	English
71	AP	**3.2**	3.2.2.2	Grant agreement with AP.pdf	Grant Agreement wit h Atlantic Philanthropies	Agreement / MOU / TOC	English
72	BMGF	**3.2**	3.2.2.3	Grant agreement with BMGF (signed).pdf	Grant agreement with BMGF	Agreement / MOU / TOC	English
73	Ford Foundation	**3.2**	3.2.2.4	UNDP_GEF FF cofin dioxin.pdf	Ford Foundation: letter of support	Agreement / MOU / TOC	English

74	UNDP	**3.2**	3.2.2.5	UNDP-VN GEF Co-financing Dioxin 27 May 09.pdf	UNDP Co-funding commitment letter	Agreement / MOU / TOC	English
75	US Embassy	**3.2**	3.2.2.6	US co-financing letter.pdf	US Funding letter 2009	Agreement / MOU / TOC	English
			3.2.3	Database			
		3.3	**Institutional Capacity**				
		3.3	3.3.1	Dioxin lab			
		3.3	3.3.2	Training			
76	Nguyễn Mỹ Hằng	**3.3**	3.3.2.1	Output 3 Institutions\3.3.4\09 - 13 07 12 danhsach và chuong trinh.doc	Danh sách tham gia khóa tập huấn Công nghệ nghiền bi và chương trình dự kiến	List of Participants	Vietnamese
77	Nguyễn Mỹ Hằng	**3.3**	3.3.2.2	Output 3 Institutions\3.3.4\Form.Bao cao ket qua dao tao (1)Hang_pics added.doc	Báo cáo kết quả đào tạo (Công nghệ nghiền bi)	Training report	Vietnamese
		3.4	**Communication Strategy**				
78		3.4	3.4.1aE	ComStrat_10Steps_V12_12Aug2012.docx	Communication Strategy Design: Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam	Technical Report	English
79		3.4	3.4.1bE	Annex1_Planning-Matrix_12Aug2012.docx	Communication plan (annex 1)	Technical Report	English
80		3.4	3.4.1cE	Annex2_Detailed-Implementation-Plan_V8_12Aug2012.xlsx	Detail communication plan	Technical Report	English
81		3.4	3.4.1aV	ComStrat_VN_12Aug.doc	Xây dựng Chiến lược Truyền thông: Xử lý Môi trường tại các Điểm Ô nhiễm Dioxin nặng tại Việt Nam	Technical Report	Vietnamese
82		3.4	3.4.1bV	Annex 1_Ma tran ke hoach_V.doc	Ma trận kế hoạch	Technical Report	Vietnamese
83		3.4	3.4.1cV	Annex 2_Kế hoạch hành động chi tiết_V.xls	Kế hoạch chi tiết	Technical Report	Vietnamese
84		3.4	3.4.2	Output 3 Institutions\3.4.4 Media workshop	Media workshop documents	Presentation	English and Vietnamese
85		3.4	3.4.3	Output 3 Institutions\3.4.4 Media workshop\Bai Bao.22.04.13.rar	Press clips		Vietnamese
		Outcome 4: Project Management					
		4.1	Program Management				
86	Project Management Board		4.1.1	Output 4_managament\Progress reports\Annual report\UNDP- Annual Report 2010_V.doc	Báo cáo tình hình thực hiện kế hoạch 2010	Management Report	Vietnamese

87	Project Management Board		4.1.2	Output 4_managament\Progress reports\Annual report\DIOXIN PROJECT TO UNDP 2011- EN-FINAL 20120223h.doc	Project annual report 2011	Management Report	English
88	Project Management Board		4.1.3	Output 4_managament\Progress reports\Annual report\DIOXIN PROJECT TO UNDP ANNUAL 2012.doc	Report on Activities 2012	Management Report	English
89	Project Management Board		4.1.4	Output 4_managament\Progress reports\Annual report\DIOXIN PROJECT TO UNDP ANNUAL 2012.xls	Logframe report 2012	Management Report	English
90	Project Management Board		4.1.5	Output 4_managament\Progress reports\PIMS 3685_UNDP_GEF_ST_2012_V08_Chemicals-VN dioxin.xls	UNDP Project Implementation Report 2012	Management Report	English

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