

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

Mid Term Evaluation Report



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Project Name	Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam
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Focal Area	POPs
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Strategic Program	CB-1
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Project Status	IA Approved
Executing Agency	UNDP
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's 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 material that bind dioxin and are carried by water currents, wildlife, 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

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 m³) 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 m³

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 for dioxin 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 masterplan 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. KEY FINDINGS AND LESSONS LEARNT

2.1. 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 **Error! Reference source not found.**). 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.

2.2.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