Global Environmental Facility

PIMS 3685: Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam

Project Inception Report

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List of Abbreviations and Acronyms

AO	Agent Orange	NPD	National Project Director
CDM	CDM International Inc.	OOG	Office of the Government
CO	Country Office	PAA	Project Accountant and Assistant
DE	Destruction Efficiency	PC	Project Coordinator
EDL	Environmental Decontamination Ltd		
EIA	Environmental Impact assessment	PIS	Project Interpreter and Secretary
GACA	Government Aid Coordination Agency	PM	Project Manager
GEF	Global Environmental Facility	PMU	Project Management Unit
GVN	Government of Viet Nam	POPs	Persistent Organic Pollutants
IPTD	In Pile Thermal Desorption	ppt	Parts per trillion
ISTD	In-Situ Thermal Desorption	ProDoc	Project Document
I-TEQ	International Toxic Equivalent	QA	Quality Assurance
LogFrame	Logical Framework	TS	Technical Specialist
MCD™	Mechano-chemical Destruction	TCDD	Tetra Chloro Dibenzo-Dioxin
MOD	Ministry of Defense	UNDP	United Nations Development Programme
MOF	Ministry of Finance	USAID	United States Agency for International Development
MOFA	Ministry of Foreign Affairs	USEPA	United States Environmental Protection Agency
MONRE	Ministry of Natural Resources and Environment	VAST	Vietnamese Academy of Science and Technology
MOST	Ministry of Science and Technology	VEA	Viet Nam Environmental Administration
MPI	Ministry of Planning and Investment		

1. General Information

Project Title	*PIMS 3685: Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam*
Project Site	*Viet Nam*
Implementing Partner	*Office of National Steering Committee 33/Ministry of Natural Resources and Environment (MONRE)*
Other Cooperating Agencies (if any)	*Ministry of Defense (MOD), Provincial People's Committees of Da Nang, Dong Nai and Binh Dinh*
Project Coverage and Beneficiaries	*The main beneficiaries of the project are the people and communities affected by dioxin contamination in the vicinity of the three hotspots. The health risks for local people will be reduced once the source of the contamination is contained or removed. Local businesses and the airport will also benefit from redevelopment opportunities that arise from remediation. Local officials (province and lower levels) will benefit from some of the training activities in addition to professional development related to the techniques and approaches that are introduced by this project. The officials from MONRE and MOD will be closely involved in at all stages of project preparation, management and implementation.*
Total Project Cost	*US$4,977,000-*
Proponent/ Counterpart Equity	*US$5,300,000- (Government)* *US$450,000- (UNDP TRAC)* *US$52,885,550- (Other resources)* *US$5,700,000- (In kind from Government)*
Project Duration	*2010 – 2014 (4 years)*
Remarks (if any)	*Original Project Document was signed by Minister of MONRE and Resident Coordinator of UN on 28th June 2010*

2. Purpose and Usage of this Inception Report

This report describes inception stage planning work undertaken for a Global Environmental Facility (GEF)-funded Full Size Project in the Socialist Republic of Viet Nam. The project was signed by the Government of Viet Nam and UNDP on 28th June 2010. The inception period of the project focused on the collection of additional information to update the baseline status, stakeholders' views, and activities to be conducted throughout the lifetime of the project. It also provided the timeframe for the Implementing Partner to establish and functionalize the Project Management Unit (PMU). A short-term International Consultant was engaged to conduct a comprehensive review of the Project Document (ProDoc), stakeholders' consultations and the recommendations were compiled into a consultancy report.

The preliminary update of the reviewed & revised project was presented to a wide range of stakeholders at the Inception Workshop held in Ha Noi on 15th December 2010. Further refinement, adjustment, and agreement culminated in this Inception Report. Once approved by both the Implementing Partner and UNDP, the Inception Report will replace the relevant parts of the signed ProDoc and become a guiding document for the Implementing Partner and UNDP.

The Inception Report consists of the updated project description including key changes and new changes in the context; it provides explanations for essential changes in the project log-frame, budget allocations, and implementation arrangements; work progress made during this period; and provides ways forward immediately after the approval of the Inception Report.

3. Project Description

Rationale of the Project

Description on the existing situation and specific problems

Viet Nam has experienced the worst dioxin pollution in the World. A large quantity of herbicide mixtures was used between 1961-1971, in the war in Viet Nam, especially for defoliation of forests. Most of the herbicide mixtures, of which the most well known was “Agent Orange (AO)”, were contaminated with dioxin. The soil dioxin concentration in sprayed areas has declined to background level; however, several sites within the military airbases where the pesticides were stored and/or handled are still highly contaminated. Three military bases, namely Bien Hoa Airbase, Da Nang Airbase and Phu Cat Airbase, have been identified as the main dioxin ‘hotspots’ where contamination levels exceed national and international dioxin limits.

Several barriers have limited Viet Nam in its ability to deal with dioxin hotspots. These include:

- The lack of an overall plan to deal with the hotspots and overall regulatory framework regarding dioxin contamination;
- Limited availability of high quality data on site contamination and effects on environments and risks to people;
- Limited technological capacities for problem analysis and for remediation of dioxin contamination;
- Limited institutional capacities for coordination of national and international partners, and for planning and managing site remediation;
- Insufficient financial resources for remediation according to internationally accepted norms;
- Limited capacities for public education and local land use planning to address the sensitive issue of highly toxic materials near populated areas.

Discussion how these problems and needs can be addressed

The national response to this major ongoing environmental and health issue is being overseen by the National Steering Committee 33 and the supporting coordinating secretariat known as Office 33, which

is based in MONRE. Office 33's mandate covers the chemical impacts associated with the armed conflict, and a major focus of its coordinating efforts is to address the hotspot contamination. The current policy framework for undertaking these efforts is the National Action Plan, which calls for the containment of residual dioxin contamination in excess of internationally accepted standards by 2013 and their remediation by 2015.

The project will effectively contain or remediate the highly dioxin contaminated material in the hotspots and address the technical, institutional, financial as well as social root causes for enabling Viet Nam to address additional sites of concern. It will focus on introducing and building capacity for national stakeholders to apply international standards and to ensuring that the institutional and policy framework is adequate to support action on dioxins.

Brief Project Description

General and specific objectives of the project

The Global Environment Facility (GEF) finances this project to remediate the contaminated hotspots in Viet Nam. The project aims to minimize disruption of ecosystems and health risks for people from environmental releases of dioxin (TCDD) contaminated hotspot, which will contribute to overcome the consequences of toxic chemicals used in the war in Viet Nam.

Expected outputs and outcome to be achieved

It has three key development results as the following:

(1) Dioxin in core hotspot areas contained and remediated;

(2) Land use on and around hotspots eliminates risks and contributes to environmental recovery; and

(3) National regulations and institutional capacities strengthened.

A management result is also included to monitor and evaluate the quality and timeliness of the project management and implementation, which is:

(4) Project management, monitoring and evaluation done in accordance with agreed rules.

A total of 15 Outputs under above-mentioned 4 Outcomes were defined. The updated Logical Framework (LogFrame) including baselines, indicators, targets and assumptions, and is given in Annex I Highlighted major changes to the LogFrame are presented below.

Specific key activities that the project will undertake to achieve expected results

The following key activities should be implemented under the three Development Outcomes in the revised LogFrame:

- **Containment and land use plan at Phu Cat:** Containment covers the previously identified Z3 area and new suspicious areas.

- **Containment and land use plan at Bien Hoa:** Containment has been completed by MOD in the most critical Z1 area. The remaining containment work will be conducted as much as fund allows.
- **Remediation and land use plan at Da Nang:** Actual remediation falls under the scope of a USAID project. The Project plays the role of coordination.
- **Identification of additional contaminated areas at Bien Hoa and Phu Cat:** Preliminary sampling and test pit excavation showed contamination in Bien Hoa at sites not previously identified. At Phu Cat, an additional area (approximately 0.3 ha) with contamination has been identified, about 200m north of the Z3 site. Detailed site assessment of both these new areas along with detailed engineering for their containment is priority activities.
- **Pilot demonstration of dioxin destruction technology in Phu Cat or Bien Hoa:** Updated information on remediation technology availability has become available and will enable pilot scale demonstration in country. The dioxin destruction technologies suitable for the remediation at the hot spots include two potential technologies (Mechano-chemical Destruction, MCD and in situ and/or In-Pile Thermal Desorption/Destruction) in addition to bioremediation. The project will support a pilot scale demonstration of MCD.
- **Bioremediation pilot at Phu Cat or Bien Hoa:** the Viet Nam Academy of Science and Technology (VAST) and the United States Environmental Protection Agency (USEPA) in cooperation with MOD and with funding from the Ford Foundation are undertaking demonstration of bioremediation for dioxin contaminated soil in Da Nang, and VAST with MOD in Bien Hoa (Z1 landfill) supported by the Government. The Project will further explore the applicability of bioremediation for these hotspots, in particular to explore bioremediation as a low cost means for remediation of already contained contaminated soil and sediment.
- **Development of national dioxin laboratory capability:** The project will have program on capacity building for Dioxin laboratories including the laboratory under VEA was established in Hanoi in 2008 with the funding from the Bill and Melinda Gates Foundation and Atlantic Philanthropies; Vietnam-Russian Tropical Center and other from National to Local (particularly Bien Hoa, Danang and Phu Cat). Further capacity strengthening is scheduled to make the facility fully operational.
- **Development of national standards on dioxin:** This Project will be used to initiate a set of key national regulatory measures related to dioxin standards, and the adoption of such standards are expected as a major output.
- **Strengthening Office 33:** GEF resources are allocated to Office 33 capacity building particularly in relation to mobilization of future funding for completing hot spot remediation and addressing dioxin contamination issues beyond the current three hot spots. Enabling the Office 33 to be the central point for dioxin related information, coordination/partnership, knowledge base, etc. is one of the main focuses of this Project.
- **Development and implementation of communication strategy:** This Project serves as a source and vehicle for dissemination of accurate information to wide audiences internationally as well as nationally.

Containment is the priority in order to ensure (short term) elimination of health hazards and environmental threats - this is known as Stage 1. Dioxin destruction in Stage 2 will happen when financial and technical means are available. In the situation of Da Nang with USAID support these two

stages are collapsed into one, and containment in a large pile is immediately followed by dioxin desorption and destruction - in this case financing for both these steps is expected to be available. In all other cases the containment in Stage 1 must technically enable the application of comparatively low cost, safe and proven dioxin destruction technologies at a future date, as finance would be available.

The detailed Master Work plan and the budget allocation are given in Annex II.

Implementation and management arrangement

Under the UNDP National Implementation modality as agreed in the Harmonised Programme and Project Management guidelines (HPPMG), 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 will be 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 assumed the role of 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. She/he provides 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. Support service fees will be charged to the Project account.

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 diagram of the implementation and management structure is given in Annex III.

Possible difficulties/challenges during project implementation and the measures to mitigate the adverse impacts

Critical assessment suggests that uncertainty remains and may in fact have increased in respect of the area and volume of highly contaminated material as well as the increased costs of remediation/dioxin destruction. Similarly at a practical level some aspects of remediation technology demonstration and ultimate implementation of such technology still retain significant risks. In particular, unit costs are now recognized as being higher than perhaps optimistically assumed during preparation. The funding available for technology demonstration has been constrained and in particular the proposed dioxin destruction technology demonstration remains high risk in the absence of outside funding for actually performing it. The management responses of original risks are updated and two more new risks are identified and assessed.

Risk Analysis

#	Risk Description	Probability[1] & Impact[2]	Countermeasures / Management response
1	The exact area and volume of highly contaminated material at the hotspots.	Probability: L Impact: M	The revised project design has further reduced the risks associated with uncertainties in delineation of area and volume in areas initially targeted by adopting relatively conservative engineering based estimates for areas that targeted for excavation and containment at Bien Hoa and Phu Cat.
2	The cost estimates are highly dependent on the correctness of the contamination data.	Probability: L Impact: M	Same as above.
3	The costs of remediation (stage 2) are dependent on the outcomes of tests and on the effectiveness of tendering.	Probability: L Impact: L	The overall project design and scope has been re-structured to provide more realistic expectations respecting the demonstration and full scale application of remediation technology, specifically focusing GEF resources on a single demonstration of a dioxin destruction technology and on inclusion of bioremediation as a fall back for long term application.
4	Receptiveness for capacity strengthening and transfer of know-how on POPs contamination and remediation is not guaranteed.	Probability: L Impact: L	Project design and procurement planning maximizes the use of national expertise in GEF funded activities to ensure broad exposure to the issue and substantially expand the knowledge and expertise base.
5	The total funding required for “stage 2” destruction of dioxin contamination or long term containment cannot be fully leveraged through the project.	Probability: H Impact: M	The re-focusing of GEF resources on critical containment at Bien Hoa and Phu Cat maximizes the reduction in contaminant transfer to the environment and associated heath risk. This is enhanced by ensuring isolation of new areas for which co-financing resources have not been identified, particularly at Bien Hoa.
6	Project management risks including project counterpart commitment, coordination capacity, management of fund, and overall project schedule.	Probability: L Impact: L	Restructuring and focusing of the project during inception period generally has served to make achievement of targets more realistically achievable.
7	Uncertainty remains for the implementation arrangement and resource allocation to sustain activities after the completion of the Project.	Probability: M Impact: M	The mitigation measure that can be applied here for Office 33 to maintain a strong priority in promoting the need for the provision funding post 2013 in these areas with the various institutional stakeholders that will assume responsibility for them.

[1] LL: Very unlikely, L: Unlikely, M: Possibly, H: Likely, HH: Almost certain
[2] LL: Adverse effect is marginal, L: Adverse effect is moderate, M: Adverse effect is substantial, H: Project result is severely damaged, HH: Kill the project

The complete information of the Risk Log is given in Annex IV.

Others Perspectives

Local stakeholders having a key input function and/or active roles in the Project implementation

Ministry of Defense (MOD): MOD is the major institutional stakeholder in the project who is envisioned to function at a number of levels in respect to project implementation. They are the official land holder and occupant for all sites and as such can be viewed as the Project's principle "client" in terms of its contaminated site (hotspot) cleanup and ecological/human health objectives which are the Project's primary focus. The following are the roles of MOD in the Project:

- Provision of national co-financing within the overall framework of the Project as it has been done to date and is anticipated to be in the future;
- Acting as the direct beneficiary through which or under whose supervision international co-financing is delivered as will be the case with planned remediation activities financed by the United States at Da Nang Airport;
- Interfacing with Office 33 that has an overall coordination role in the Project, and with other members of Committee 33 on dioxin issues nationally;
- Provision of direct technical inputs, notably through its Department of Science, Technology and Environment and associated institutes to Office 33 and the PMU, in its capacity as a primary source of national technical expertise relevant to the dioxin issue
- Contributing to decision making on issues associated with project scope definition, work plans, development and interpretation of technical information, and technology selection and evaluation;
- Acting as the proponent or applicant for regulatory approvals related to containment and remediation activities, particularly in regard to the required EIA process.
- Contribute to coordinating on-site Project activities related to site assessment, design, hosting and evaluating technology demonstrations, civil works related to physical containment and remediation activities, including site access administration and quality assurance;
- Assumption of the long term operational roles including taking over and sustaining post- Project land use planning, monitoring and environmental recovery activities;
- Partnering in or facilitating the business arrangement that may develop in respect to transfer of remediation technology demonstrated and utilized under the Project; and
- Coordination with local stakeholders, recognizing that local communities and in many cases the affected or at risk populations are army personnel and dependants.

Other Stakeholders:

The institutional stakeholders at the sub-national level follow the administrative and political hierarchy, from provincial and municipal level to district levels of the People's Committees and various state organizations, particularly environmental regulatory bodies. For implementation purposes, the coordination of these stakeholders' inputs and participation in implementation is through focal point

contacts maintained by Office 33 with the respective stakeholder organizations, particularly at the provincial level. The main focus of participation in implementation is anticipated in public consultation and awareness raising of the population directly impacted by the issue and the Project's activities.

Inter-linkages and integration among other development initiatives by other parties; etc.

USAID assistance for Da Nang airbase remediation: This is potentially a large block of key project capital funding from USAID with the actual delivery of the work coming as a package through a USAID contractor. The current arrangement is governed by under a Memorandum of Intent (MOI) between USAID and MOD (Department of Science, Technology and Environment) and is presumed to be formalized in an elaborated legal agreement between the United States and the GVN. There is also a coordinating relationship associated with this funding provided by Office 33 on behalf of MONRE with respect to the EIA process.

Czech Republic Assistance for monitoring planning: The Czech Government is providing assistance through Czech consultants and experts contracted directly under their national procedures but utilizing local experts. The current direct assistance will follow this model, presumably under an agreement with and under approvals from the GVN, and more specifically with MONRE designating Office 33 as the national focal point and coordinating organization.

Dioxin Laboratory developed by US based foundations: Two US based foundations (Bill& Melinda Gates Foundation, Atlantic Philanthropies) have financed the establishment of a high resolution dioxin laboratory capability under VEA within MONRE. This is was developed independent of the GEF Project but falls under its overall framework. This arrangement was directly with Office 33, acting on behalf of MONRE.

Ford Foundation Funding for bioremediation demonstration: This has been disbursed directly to other GVN agencies, notably to the Vietnamese Academy of Science (VAST) for bioremediation remediation technology studies and Vietnamese National University for land use planning studies, as well as through other bilateral programs and Office 33 for international consultant participation in site assessment work.

Budget - Refers to the Total Project Cost

Direct Project Cost: actual activities to be funded under the project

The Project has three development outcomes, i.e. (1) Dioxin in core hotspot areas contained and remediated; (2) Land use on and around hotspots eliminates risks and contributes to environmental recovery; and (3) National regulations and institutional capacities strengthened. Following is the GEF-funded budget structure of these three results:

Total Project Budget for Three Development Outcomes

Outcome	Budget Description		Total (US$)[3]
(1) Dioxin in core hotspot areas contained and remediated			
	71200	International Consultants	95,000.00
	71300	Local Consultants	215,000.00
	71600	Travel	16,000.00
	72100	Contractual Services – Firm	2,744,000.00
	72300	Materials & Goods	9,000.00
	75700	Training, Workshops and Confer	114,000.00
		Total Outcome 1	**3,193,000.00**
(2) Land use on and around hotspots eliminates risks and contributes to environmental recovery			
	71300	Local Consultants	75,000.00
	72100	Contractual Services – Firm	90,000.00
	74200	Audio Visual & Print Prod Costs	20,000.00
	75700	Training, Workshops and Confer	10,000.00
		Total Outcome 2	**195,000.00**
(3) National regulations and institutional capacities strengthened			
	61300	International Personnel	480,000.00
	71300	Local Consultants	79,000.00
	71600	Travel	44,000.00
	72100	Contractual Services – Firm	160,000.00
	72800	Information Technology Equipmt	20,000.00
	74200	Audio Visual & Print Prod Costs	100,000.00
	75700	Training, Workshops and Confer	237,000.00
		Total Outcome 3	**1,120,000.00**
		Total Development Results	**4,508,000.00**

Administrative Cost: personnel salary, coordination and travel costs, communications, etc.

A management outcome and the associated budget were detailed during the inception period the cost associated with this outcome is summarized below:

Total Project Budget for Management Outcome

Outcome	Budget Description		Total (US$)[4]
(4) Project management, monitoring and evaluation done in accordance with agreed rules			
	71200	Local Consultants	90,000.00
	71400	Contractual Services – Indiv	178,000.00
	71600	Travel	88,000.00
	72200	Equipment and Furniture	17,000.00
	72400	Communication and Audio Visual Equipment	21,000.00
	72500	Supplies	34,000.00
	73200	Premises Modification	2,000.00
	74100	Professional Service	6,000.00
	74200	Audio Visual & Print Prod Costs	1,000.00
	74500	Miscellaneous Expenses	23,000.00
	75700	Training, Workshops and Confer	9,000.00
		Total Management	**469,000.00**

[3] Inclusive of expenditures in 2010
[4] Inclusive of expenditures in 2010

Proponent /Partners Counterpart Equity: the amount of project contribution of the proponent/ partners (co-funding in kind or in cash)

The following co-financing has been secured:

Summary of Co-financing to the Project

#	Sources	Type	Amount (US$)
1	MOD Viet Nam	Parallel	5,300,000.00
2	Government of Viet Nam for remediation	In kind	4,390,000.00
3	Government of Viet Nam for management	In kind	1,000,000.00
4	Local authority (Da Nang)	In kind	200,000.00
5	Office 33	In kind	110,000.00
6	Government of Czech Republic	Parallel	500,000.00
7	US Government	Parallel	41,000,000.00
8	Ford Foundation	Parallel	6,000,000.00
9	Gates Foundation	Parallel	2,685,550.00
10	Atlantic Philanthropies	Parallel	2,700,000.00
11	UNDP	Parallel	450,000.00
	Total		**64,335,550.00**

4. Revisions of the Project

Estimation of the contaminated material and dioxin

To quantify some of the changes in the knowledge base that impact on the project scope, the following provides updated data on the estimates of contaminated materials for the containment and remediation at the hot spots. This serves to define an updated baseline for adjustment of the project results framework, work plan, and cost estimates.

Area and volume of contaminated soil and quantity of dioxin to be addressed

The table titled “Dioxin Contaminated Areas and Volumes” provides a summary of the ProDoc and updated estimates of the area and volume of contaminated material potentially addressed by the Project. The first range of columns is that used in the ProDoc, the second is the estimates developed on a consensus basis by the Office 33 National Expert Group, and the third is the design estimates being used by MOD for Phu Cat and Bien Hoa and by USAID/CDM for Da Nang. The last figure excludes areas that were identified as having low concentration in the ProDoc, but also include engineering considerations in implementing excavation activities which will tend to include at least superficial stripping of areas of low contamination around and between the higher and deeper areas of contamination. Particularly in the case of Phu Cat and Bien Hoa, they also include estimates based on preliminary investigation of new areas. The following are the principles of this estimation:

- **Phu Cat:** Volumes requiring containment at Phu Cat have increased significantly, even when excluding low contamination level sediments that was included in ProDoc estimates, and potentially will involve addressing up to 12,000 m3. For purposes of developing the estimates,

the MOD design estimates will be used based on the minimum estimate for the new area and contingency of 1,000 m3, giving an updated baseline volume of 8,000 m3. This is all soil while the sediment contamination in the lake areas at Phu Cat being excluded given their low contamination level.

- **Bien Hoa:** While the most critical area (Z1) initially identified has been effectively contained, current estimates and preliminary estimates on the newly identified area adjacent to the SW runway area have also significantly increased volumes, with the net result that the overall amount remaining to be contained has not significantly decreased relative to that originally estimated in the ProDoc. The areas remaining can be divided into three categories: i) previously identified areas close to the Z1 area (South Runway, Wetlands/Ponds/Drain) – 21,500 m3; ii) SW runway (Pacer Ivy) area – 20,000 m3, and iii) New area adjacent to the SW Runway area – 60,000 to 100,000 m3. Recognizing that it is unlikely that GEF resources are sufficient to contain all of the areas, the priority recommended is that the South Runway area be addressed as a minimum along with any areas considered necessary to fully remove surface contamination around the Z1 area, and potentially the wetlands/drains area depending on effectiveness of runoff treatment and sustainability of use restrictions on the lakes. Both the Southwest runway area and the new adjacent area likely require excavation and landfill containment but would most effectively been addressed together and would require substantial funding not currently available.
- **Da Nang:** The estimates of overall volumes have decreased from the ProDoc estimates based on additional site assessment and re-assessment of existing data by the USAID contractor. However, two relatively small areas, not originally identified have been added. The USAID/CDM estimates would apply are now embedded in the engineering design.

Dioxin Contaminated Areas and Volumes (updated)

Site/Area	Project Document			Revised Estimation			Current Design Studies[5]			Notes
	Area (m^2)	Mean Conc. (ppt)	Volume (m^3)	Area (m^2)	Mean Conc. (ppt)	Volume (m^3)	Area (m^2)	Mean Conc. (ppt)	Volume (m^3)	
Phu Cat										
Z3-Storage Area	2,200	26,248	1,980	3,000	37,000	3,600	2,200	26,248	6,000	Soil
A: Loading Area	-	261	-	n/incl.	n/incl.	n/incl.	-	261		Soil
B: Perimeter Area	24,000	482	1,440	n/incl.	n/incl.	n/incl.	24,000	482		Soil
C: Washing Area	6,000	25	-	n/incl.	n/incl.	n/incl.	6,000	25		Soil
Perimeter Area Drain/ Sediment Basin	500	122	150	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	Soil/ Sediment
SE Runway Area	4,000	42	-	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	Soil
Lakes	310,000	43	1,550	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	Sediment
New Area (North of Z3)	n/incl.	n/incl.	n/incl.	3,000	> 1,000	3,000	1,000	4,000	1,000 - 6000	Soil
Total Phu Cat	**347,700**		**5,120**	**6,000**		**6,600**	**33,300**		**7,000 - 12,000**	
Bien Hoa										
Z1: Storage/ Loading/ Washing Areas	38,000	15,864	57,000	47,000	15,864	94,000	47,000	15,864	94,000	Soil Placed in Landfill
Z1: Perimeter Area	49,000	893	22,050							

[5] Design: MOD for Phu Cat/Bien Hoa, USEPA for Da Nang

Site/Area	Project Document			Revised Estimation			Current Design Studies[5]			Notes
	Area (m^2)	Mean Conc. (ppt)	Volume (m^3)	Area (m^2)	Mean Conc. (ppt)	Volume (m^3)	Area (m^2)	Mean Conc. (ppt)	Volume (m^3)	
Z1: Wetlands/ Ponds Area/ Drain	41,000	495	-	43,000	495	11,000	25,000	495	12,500	Sediment
South Runway Area	15,000	5,276	18,000	10,000	5,276	10,000	10,000	5,276	9,000	Soil
South West Runway Area	20,000	2,650	24,000	60,000	2,650	60,000	20,000	2,650	20,000	Soil
New Area – SW Runway	n/incl.	n/incl.	n/incl.				60,000	>1,000	60,000 - 100,000	Soil/ Sediment
Total Bien Hoa (Uncontained)	**125,000**		**121,050**	**160,000**		**175,000 (81,000)**	**162,000**		**195,500 - 235,500 (101,500 - 141,500)**	
Da Nang										
A: Storage area	13,400	38,883	20,100	14,000	42,575	21,000	16,200	4,240	8,900	Soil
B: Mixing/ Loading Area	4,700	75,720	7,050	10,000	60,886	10,000	19,600	7,096	19,600	Soil
D: Mixing/ Loading Area	4,800	47,886	7,200							
C: Between Mixing/ Storage Areas	40,000	1,961	7,200	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	
Drainage Canal from A,B.C.D and Sen Lake	2,900	39,772	2,900	6,000	40,925	3,000	35,600	3,095 (soil) / 2,720 (sediment)	8,500	Soil/ Sediment
E: SE of drain, Wetland around Sen Lake	87,000	610	15,660	16,000	12,400	36,000	85,400	1,325	22,800	Soil/ Sediment
F: SW of drain, Wetland around Sen Lake	82,000	52	0							
Lake A (Sen Lake)	56,000	3,161	28,000	56,000						
Lake B	32,000	46	-	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	Sediment
Lake C	43,000	17	-	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	n/incl.	Sediment
Pacer Ivey Area	n/a	n/a	n/a	6,000	20,700	3,000	3,200	1,260	1,400	Soil
Eastern Hot Spot	n/a	n/a	n/a	n/incl.	n/incl.	n/incl.	7,700	1,710	500	Soil
Total Da Nang	**365,800**		**88,110**	108,000		73,500	167,700		61,600	

Amount of dioxin that needs to be addressed

The original project objective targeted the amount of dioxin estimated by a simple calculation of dioxin content in all the areas identified and assessed on all three sites (1,736 g I-TEQ). The target for isolation of dioxin from possible exposure and the target for removal from soil or sediment should be separately discussed. As a base target, an overall level of 1,700 g I-TEQ is recommended as a containment/remediation target such that this amount is eliminated as a near term ecological health threat and the amount actually eliminated (destroyed) be 1,000 g I-TEQ, all at Da Nang. What actually may be achieved should be higher, particularly with respect to dioxin destruction but this will depend on the actual performance of the ISTD/IPTD & Destruction technology at Da Nang, and what destruction contribution the GEF-funded technology demonstrations may make.

Adjustment of Project focus and priority

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.

GEF funding allocated to containment over remediation: The increased volumes of material requiring containment and absence of committed co-financing for this require the priority to be placed on containment at Bien Hoa and Phu Cat. This is necessary to preserve the Project's basic objective of mitigating environmental and health impacts directly. It is now unrealistic to pursue the original strategy of demonstrating remediation/dioxin destruction technologies on all sites at a significant scale. GEF resources should now focus on supporting demonstration of one dioxin destruction technology and the demonstration of bioremediation for an initial period, noting that for both to be fully achievable additional co-financing is needed.

Increased emphasis on Office 33 capacity: It is now recognized that the original National Plan objective of full remediation of all sites by 2015 is unrealistic given the expanded requirement and much higher costs, and more dioxin contaminated hotspots likely identified. This has also resulted in adjustments in GEF funding allocations to enhance Office 33's capacity to both mobilize funds for future remediation and to also address the dioxin problems beyond the three airbase hot spots, recognising that addressing the issue is a long term task.

Revised LogFrame with more up-to-date baseline and measurable and achievable indicators

The Project Logical Framework (or LogFrame) in the ProDoc has been critically reviewed and updated, leading to the revised outputs described below. The indicators are generally expanded, made more specific, or clarified where required and possible. The baseline values are similarly updated to reflect the situation at the inception period. The assumptions are substantially elaborated to reflect the increased knowledge base and to better track the various uncertainties and risks. The revised LogFrame is provided in Annex I.

Comparison of Result Statements in the LogFrame

Results	Original Approved ProDoc	Revised at Inception Phase (Changes underlined)
Outcome 1	Dioxin in core hotspot areas contained and remediated	Dioxin in core hotspot areas contained and remediated
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
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
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
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
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
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
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
Outcome 3	Strengthened national regulations and institutional capacities	National regulations and institutional capacities strengthened
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
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
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

Project management structure and accountability with clear roles and responsibilities

New position under revised Project organigram: PC

The ProDoc required establishment of a Project Management Unit (PMU) to include three full time staff (project manager, project Accountant and Administration, and project Interpreter and Secretary). At the project launching it was however agreed that for more effective project management and implementation, a part time project manager and a full time project coordinator (PC) will be recruited instead of having only a full-time project manager. The adjusted project management structure now includes 04 positions (3 full-time positions and a part-time position).

The newly added PC will work closely with the Project Manager (PM), staff from the PMU and international and national consultants and conduct the following tasks:

- Assist the PM in day-to-day planning, management, coordination, and implementation of the project activities in accordance with the project plans;
- Prepare annual and quarterly work-plans and reports for clearance and approval by the PM and NPD and submission to UNDP;
- Coordinate the preparation of TORs for project activities (i.e. personnel, sub-contracts, training, procurement) based on inputs from others and submit these to the PM for clearance, and ensure mobilization of inputs for activities;
- Assist NPD and PM in ensuring that all agreements with implementing agencies are prepared, negotiated and agreed upon;
- With respect to external project implementing agencies/ sub-contractors:
    - ensure that these agencies mobilize and deliver the inputs in accordance with their letters of agreement or contracts, and
    - provide overall supervision and/or coordination of their work to ensure the production of the expected quality outputs in time as planned.
- Work closely with the TS to coordinate all the work by local or international short-term experts/consultants to ensure timely delivery of the quality results as planned;
- Organize review meetings and evaluation missions in coordination with UNDP, including regular meetings with participation of the NPD, PM and UNDP;
- Prepare project progress reports of various types and parts of the final project report as scheduled;
- Assist the NPD/PM in managing the project budget by ensuring that:
    - project funds are made available when needed, and are disbursed properly,
    - expenditures are made in accordance with the project document, Inception Report and (annual, quarterly) project work plans,
    - accounting records and supporting documents are properly kept,
    - required financial reports are prepared,
    - financial operations are transparent and financial procedures/regulations for NIM projects are properly applied; and
- Plan, participate and facilitate the documentation and dissemination of lessons learned from MONRE, knowledge management and advocacy.

5. Work Progress during Inception Period

General cost study for containment and remediation of 3 hotspots

For landfill containment involving material excavated in close proximity to the landfill, a rate of US$50/m3 is assumed to be used based on the actual MOD costs for work completed in 2010 at Bien Hoa. This would also apply to future containment at the known areas in close proximity to Z1 at Bien Hoa where containment would be in a new cell adjacent to the existing landfill in the Z1 area. At Phu Cat, a rate of US$70/m3 is used for the purpose of the study, based on the MOD estimate plus allowance for the landfill being located remotely on the airbase and the need to construct transport infrastructure to it. The same US$70/m3 rate is applied to the SW Runway and new area at Bien Hoa, recognizing that the relatively large volumes involved may require development of a new remote landfill.

The remediation unit costs applied at Phu Cat and Ben Hoa supposed to be US$350/m3 based on informal estimates for MCD supplied by a technology vendor. This would be applicable for a situation in which such dioxin destruction technology would be applied in a one stage process, or as a Stage 2 long term solution. However, lower cost bioremediation in landfills created in Stage 1 as a Stage 2 approach to medium to long term dioxin destruction may be possible, pending results of field level testing.

At Da Nang a rate of US$495/m3 is used based on the overall cost estimated for Da Nang by USAID/CDM, noting that this cost estimate has a -30%/+50% confidence level so the potential for higher remediation costs are considerable. It should also be noted that the estimates at Da Nang are only applicable to remediation to the standard action/cleanup of 1,000 ppt for soil and 150 ppt for sediment. Additional costs for post treatment containment or actual destruction of residual dioxin to some lower level are not accounted for.

The following summarizes the impacts that the above developments will have on the project scope, work plan, funding allocations and results framework:

- The assumption of full responsibility for a single stage remediation program with US support at Da Nang allows the Project to adopt an assumption that the principle project outcomes of completing remediation at Da Nang will occur, allowing GEF resources to be focused on meeting containment and remediation outcomes at Phu Cat and Bien Hoa.

- The increase in overall volumes through identification of additional sites at Phu Cat and Bien Hoa, along with the absence of any further GVN or bilateral funding for containment requires a re-assessment of the balance between containment and remediation technology demonstration that the Project adopts with respect to GEF funding allocation. A strong consensus exists among national experts that containment at these two hot spots is the highest priority (i.e. “Stage 1”) which is consistent with the staged approach summarized in the ProDoc, and will eliminate the

immediate threat of continued transfer of contamination to the environment and resultant human exposure.

General Cost Study for Hotspot Remediation

Site/Area	Contaminated Material Volume (m3)	Containment		Remediation	
		Unit Costs (US$/$m^3$)	Cost (US$)	Unit Costs (US$/$m^3$)	Cost (US$)
Phu Cat					
Z3-Storage Area A: Loading Area B: Perimeter Area C: Washing Area	6,000	70	420,000	350	2,100,000
Perimeter Area Drain/ Sediment Basin	n/incl.				
SE Runway Area	n/incl.				
Lakes	n/incl.				
New Area (North of Z3)	1,000 - 6,000	70	70,000 - 420,000	350	350,000 - 2,100,000
Totals Phu Cat	**7,000 - 12,000**		**490,000 - 840,000**		**2,450,000 - 4,200,000**
Bien Hoa					
Z1: Storage/Loading/ Washing Areas Z1: Perimeter Area	94,000			350	32,900,000
Z1: Wetlands/Ponds Area/Drain	12,500	50	625,000	350	4,475,000
South Runway Area	9,000	50	450,000	350	3,150,000
South West Runway Area	20,000	70	1,400,000	350	7,000,000
New Area – SW Runway	60,000 - 100,000	70	4,200,000 - 7,000,000	350	21,000,000 - 35,000,000
Totals – Bien Hoa (Uncontained)	**195,500 - 235,500 (101,500 - 141,500)**		**6,675,000 - 9,475,000**		**68,525,000 - 82,525,000**
Da Nang					
A: Storage area	8,900			495	30,492,000
B: Mixing/Loading Area D: Mixing/Loading Area	19,600				
C:Between Mixing/Storage Areas	n/incl.				
Drainage Canal from A,B.C.D and Sen Lake	8,500				
E: SE of drain, Wetland around Sen Lake	22,800				
F: SW of drain, Wetland around Sen Lake					
Lake A (Sen Lake)					
Lake B	n/incl.				
Lake C	n/incl.				
Pacer Ivey Area	1,400				
Eastern Hot Spot	500				
Totals: Da Nang	**61,600**				**30,492,000**
Overall Totals (Uncontained)	**264,100 – 309,100 (170,100 – 215,100)**		**7,165,000 - 10,315,000**		**101,467,000 – 117,217,000**

- The potentially large volumes now identified for containment at these two sites, particularly in the new area at Bien Hoa mean that the outcome of at least containment at all sites will be difficult to achieve and prioritization of available GEF resources applied for containment will be required. In this regard, it is recommended that the priority be the containment of all volumes at Phu Cat such that the site is fully secured, and available for the new development/land use that is planned. At Bien Hoa, the priority should be containment of the South Runway area and any residual surface contamination in the Z1 area, plus ensuring hydraulic isolation of the Southwest Runway and adjacent new area to prevent potential off-site impacts.

- The better understanding of available remediation technologies allows the Project to select technologies for demonstrations. Given that ISTD/IPTD will be implemented on a full scale at Da Nang, the focus should now be on MCD and bioremediation.

Discussion of Remediation Technology and its Demonstration

Remediation Technology Requirements

The overall strategy in relation to dioxin hotspots is to adopt a two stage approach where Stage 1 would involve containment of all material above the agreed action/cleanup standard (1,000 ppt soil, 150 ppt sediment) and Stage 2 involving remediation of this material. Stage 1 is expected to be in most cases a landfill instead of leaving the contaminated soil and sediment in situ and isolating it from their surroundings through constructed barriers, although the latter is not excluded. This also means that Stage 1 containment designs must enable known or obviously potential dioxin remediation / destruction technologies and their application in a safe, effective and affordable manner at some point in future. Technologies that would be applicable inside a Stage 1 landfill (pile) will in Stage 2 avoid hauling costs and risks whilst other Stage 2 technologies will require excavation.

The basic performance requirement set for remediation technology is, except for cases where bioremediation is applied, based on its ability to eliminate/destroy dioxins. The target dioxin destruction requirement for the selected technology is to be defined by the destruction efficiency (DE) applied to dioxin in the contaminated material being DE >99.99%, so that the technology is capable that substantively all dioxin would be destroyed. In addition, the application of remediation/dioxin destruction technology is to be confined entirely to the original hot spot sites (as opposed to removal for off-site application of additional treatment destruction processes), i.e. those technologies must be applied on-site and be “closed”. The latter means that all residues and emissions potentially containing dioxins must be contained within the process, and only non-toxic by-products are released in secondary waste streams.

The safeguards requirements that specify due diligence considerations should be satisfied. The most applicable in this case would be clarity of custody and liability issues, need for performance demonstration, and application of stringent occupational health and safety measures.

The issue of commercial viability and sustainability is seen as a particularly important consideration for

the selection of potential remediation technologies. It is now generally recognized that the disposal (destruction) of POPs including dioxins in an environmentally sound manner is not technology limited. There is a wide range of technologies that can provide high levels of performance for POPs destruction and the remediation of POPs contaminated sites. The major limitation on technology selection is now primarily related to having viable commercial and implementation arrangements, to actually place it on the ground and complete the work. On this basis, the following commercial/implementation attributes should be demonstrated and assessed in the course of the selection and evaluation process for remediation technology demonstration and ultimately its full scale application in Viet Nam:

- As a complete package for operational application to the demonstration and ultimately full scale remediation requirements at a predictably capped cost, inclusive of any set up, approvals, pre-treatment, performance monitoring, training and operational supervision required, and with appropriate remediation/dioxin destruction performance guarantees.
- By a legal entity representing a mature technology vendor/ operating licensee business arrangement, free of any dispute over technology ownership or licensee rights, with a demonstrated relevant track record, technical support capacity and financial strength to undertake the proposed work, inclusive of the necessary surety to ensure completion of the contracted obligations.
- Inclusive of necessary local partnerships that would realistically enable performance of the work and which themselves be demonstrated as financially viable and sustainable or otherwise backstopped by the international proponent and/or national public sector.
- Inclusive of a proposal providing for technology transfer and appropriate capacity building that would allow the application of the technology in Viet Nam for future dioxin site remediation and perhaps broader POPs/hazardous waste management applications, all consistent with Vietnamese legislative requirements

Remediation Technology Availability

The Project including its preparation phase has undergone the most comprehensive remediation technology screening and short listing process ever applied to any comparable international POPs project. The independent technology update concluded that the only available practical options are

i) those based on a mechano-chemical principle and more specifically Mechano-chemical Destruction (MCD™) or ball milling supplied by Environmental Decontaminated Ltd (EDL);
ii) in situ/in pile thermal desorption (ISTD/IPTD) with appropriate post-treatment (destruction) technology; and
iii) bioremediation.

New commercial technologies not assessed during Project preparation but identified by USEPA are: i) the Gene Expression Factor bioremediation technology, ii) the Radicalplanet Technology (mechano-chemical principle), and iii) the Sonic technology. The USEPA also provided specifics of the ISTD/IPTD/TerraTherm technology proposed by USAID/CDM for Da Nang. The gene factor technology was considered unsuited to the Viet Nam situation, Radicalplanet was rejected on the basis of cost, scale and rate of treatment, and the Sonic Technology was rejected on the basis of cost. A water soil

washing technology presented to Office 33 by Shimizu was also noted but not considered because of lack of information. No recommendations are made respecting specific bioremediation technologies, notwithstanding their inclusion in the USEPA report and joint work being undertaken by USEPA and VAST in Viet Nam. It should be noted that this Inception Report excludes Copper Mediated Destruction (CMD), preceded by in-vessel Thermal Desorption which was presented in Viet Nam and shortlisted in the ProDoc on the grounds of potential, offered by a firm in the Czech Republic, because it lacks cost effective proven applications.

Mechano-chemical Technologies:

Potentially three commercial vendors would be available to offer a demonstration proposal for this class of technology, as follows:

- **Mechano-chemical Destruction (MCD^{TM})**: MCD^{TM} is offered by two firms, EDL (New Zealand) and Tribochem (Germany), and EDL has submitted its application to the Vietnamese Patent office. EDL have operated a commercial scale facility in New Zeeland and Alaska as well as a number of demonstrations in Japan, the US and small scale pilots on materials from a number of other locations. Experience with dioxin contaminated soils is limited to a few bench scale operation with relatively low dioxin concentrations and some trial resulted over 95% destruction. It is appropriately scaled to do a meaningful on-site demonstration on a reasonably cost effective basis, is readily transportable for on-site applications, and throughput can be scaled up by adding reactors such that it could do the contemplated quantities over a reasonable period. MCD^{TM} is a closed process with no external emissions although it may periodically require a steam release depending on soil moisture content. For optimum operation it does require drying as pre-treatments steps. The level of remediation or DE achieved appears to be a function of reactor residence time such that the process could be calibrated to a specific clean up standard and theoretically offers good potential to achieve DE requirements at reasonable time and cost. The technology also appears to offer the potential to destroy other contaminants simultaneously. EDL have actively promoted their capabilities in Viet Nam including a half day stakeholder seminar in December 2010. EDL have also expressed a willingness to discuss technology transfer/license options depending on commitments, scale and prospects of funding for full scale remediation. The Government of New Zealand has supported the development of this technology and is considering to provide some financial support to a pilot demonstration in Viet Nam.
- **Radicalplanet Technology:** This technology is offered by Radical Planet Research Company Ltd (Japan) with equipment apparently being supplied through Sumitomo Heavy Industries. It operates on essentially the same principle as the MCD^{TM} technology except it is a batch rather than continuous process. The full scale system is able to destroy all types of POPs in various forms, e.g. solid, powder, liquid, PCB in fluorescent ballast, carbon paper, admixture of contaminated soil with pebbles, concrete debris, metals, fly ash from incineration plant, etc. The quoted destruction performance of dioxin is less than 1 pg-ITEQ/g. The output of the treatment is activated powder that can be solidified as hard as concrete in room temperature by adding water. Its main limitations are its relatively small batch size although some variation is obtained depending on equipment sizing. The maximum capacity referenced is 1,200 tons per year by its full size plant. Indicated cost provided by the supplier is extremely expensive, i.e. in a range of US $3,000 - $5,000 per ton, which makes this technology unaffordable in the Vietnamese context.

Thermal Desorption and Destruction of dioxin:

Thermal desorption is a generic process that could be applied by many operators on a non-proprietary basis. It serves to reduce the dioxin (TCDD) content of the soil or dried sediment, while capturing the extracted vapour phase contaminants for subsequent treatment and destruction, usually in an attached thermal oxidation unit or effectively applying a high temperature incineration process unit. This potentially could also be some other form of non-combustion process. Thermal desorption is generally viewed as inherently a "pre-treatment" technology that can produce remediated soil with contaminant levels meeting a reasonable cleanup standard given sufficient time and thermal conditions, but it is not a destruction technology. However, the variant being offered for application in Da Nang will be applied on a full scale basis, partly in-situ but primarily in an engineered containment pile, and will include destruction after desorption. The high temperatures achieved in parts of the pile and sustained long term temperature profile does also offer a prospect of significant dioxin destruction in the pile along with its removal from the contaminated soil for destruction afterwards.

Bioremediation:

Bioremediation is a generic remediation technology that can reduce contamination to a level acceptable in terms of the site specific environmental/heath risks that are involved. In theory, it could achieve DE normally associated with more aggressive destruction technologies given enough time, but the general consensus is that it is practically limited to a destruction of up to 90% of the contaminant. The contaminated area has to be isolated from the surroundings and any land use be discontinued while in situ bioremediation progresses, inclusive of sufficient removal of transfer paths to general environmental media (air, ground and surface water), or bioremediation is applied after excavation and containment in a landfill or similar engineered containment structure to allow the process to work (i.e. a bio-pile or bio-reactor). The selection of an individual bioremediation technology that might be applied is based on the effectiveness of the particular techniques, active biological agents added and control of variables such as moisture, oxygen and temperature within the contaminated soil mass. This can vary from highly sophisticated active processes that can be relatively labour and resource intensive and involve proprietary technologies, through to passive techniques that might be applied without a connection to a particular technology vendor. However, the effectiveness, time required and costs of any approach or specific proprietary technology will be highly site specific and each application will involve an element of experimentation and uncertainty that this entails.

In the context of the Project, the interest in bioremediation is largely based on its long term potential to:

i) serve as a "finishing" technology where contaminated material has been remediated but where retained lower level dioxin content is to be removed – this would a post-Stage 2 application and is a low priority;
ii) be a backup technology in the event that more aggressive remediation/dioxin destruction proves to be unaffordable or cannot be funded – this means application at Stage 2 in landfills created during Stage 1, including the large landfill already created in the Z1 area in Bien Hoa and any other Stage 1 landfill that may be created; and
iii) be a cost effective option for remediating smaller sites with lower but significant dioxin contamination that will likely be identified in the future, or those areas on the three hot spot

Airbases that are not addressed in the Project – this means a combination of Stage 1 and Stage 2, and therefore that the selected bioremediation approach would compete with small scale alternatives such as MCD™.

There are a number of specific bioremediation technology options available for the Project in selecting demonstration of a specific bioremediation technology. These range from supporting follow up to the pilot demonstration / experiment in Da Nang which has shown promising results through to a competitive selection of a proprietary technology that a vendor/operator would set up and operate for the life of the project. The proprietary active bioremediation technologies identified in a recent USEPA review are: a) Anaerobic bioremediation using blood meal (USEPA); b) DARAMEND, and c) Gene Expression Factor. However, it should be noted that this is by no means a comprehensive review of what might be available. All of these involve the use of various amendments/additives to the contaminated soil, usually ex-situ, none have direct demonstration experience on dioxins, and all would require a laboratory pilot investigation prior to undertaking an actual field demonstration.

Bioremediation technology development relevant to the situation at the three airbases based on collaboration of VAST and USEPA on aerobic and anaerobic techniques is important because the reported results for pilot tests at Da Nang show significant reductions in TCDD content in highly contaminated samples. However, these technologies would be in all likelihood be primarily relevant for remediating smaller sites with lower but significant dioxin contamination, since the technologies are not expected to be vastly cheaper than alternatives such as MCD™ and ISTD/IPTD/TerraTherm.

In addition, VAST has also initiated a bioremediation test in the Z1 landfill in Bien Hoa and though results of the test are not yet available this is also relevant. USEPA have expressed interest in developing this test further and is expected to be capable of supporting this “in-kind” with technical advice. Designing and testing bioremediation approaches that would remediate dioxin in a Stage 1 contained landfill, i.e. be applied as a Stage 2 technology would offer a potential cost effective long term dioxin remediation for ii) above. Medium to long-term bioremediation solutions for landfills such as the Z1 landfill in Bien Hoa that are cheap are needed in the absence of funding for destruction technologies such as MCD™ and ISTD/IPTD/TerraTherm – remediation speed is a less important characteristic for this application since environmental spread and human contact with the contaminated soil and sediment is already eliminated.

6. Next Steps

Project Implementation Arrangements – Collaboration with MOD

In general, the progress made by the Project in establishing an effective vehicle for supervising project decision making and implementation and in particular a competent PMU is now operational and equipped to undertake project management activities. Office 33 and UNDP are involving the large network of institutional and external stakeholders. Importantly, the establishment of collaboration with MOD, which is the main stakeholder to the Project, should be prioritised to avoid parallel or conflicting decisions, and parties coordinating co-financing and bilateral donor discussions.

Clarification of targets related to remediation and dioxin destruction

In setting the principle quantified environmental performance targets, it is important to distinguish between what is achieved by containment, remediation and destruction or elimination of the actual dioxin contaminants. The original principle environmental target for release prevention was expressed as an absolute amount of dioxin (1,736 g I-TEQ) based on the amount calculated in all the core area hot spots. This is achievable by containment but not by remediation. The level selected (1,000 ppt-soil, 150 ppt – sediment) is generally appropriate for industrial/commercial land uses but is not necessarily suitable for any use with continuous human exposure. It also implies that significant quantities of dioxin remain in the soil or are removed elsewhere for subsequent treatment, as well as significant amounts outside the cleanup criteria area are not addressed. On the other hand a dioxin destruction criteria based on destruction efficiency (DE) provides assurance that the actual contamination is eliminated. Based on this distinction between containment, remediation, and destruction and current amounts that would be addressed, a more realistic basic environmental target for the Project is 1,700 g I-TEQ contained and 1,000 g I-TEQ eventually destroyed. The evaluation of remediation should therefore include DE as part of judging their ultimate applicability and as a basis for determining the amount of dioxin destroyed or otherwise transformed consistent with Article 6 of the Stockholm Convention.

Approach to Technology Demonstration

The various options for demonstration of a dioxin destruction technology and for bioremediation have been examined. In the case of a dioxin destruction technology, the advantage of the EDL system is obvious and no alternative technologies or vendors have been identified. The MCD^{TM} technology may receive some co-financing from the New Zealand Government which will influence the scale of the demonstration. Recognizing project timing constraints, the option of seeking a waiver of competitive procurement for procurement from this sole source is recommended. In the case of bioremediation, neither time nor sufficient funding is available to undertake a competitive selection of proponents, and the project should pursue supporting existing pilot initiatives by VAST over the project period, especially design and implementation of tests in the Bien Hoa landfill which may also benefit from in-kind technical assistance from USEPA.

ANNEX I Project Result Framework (LogFrame)

Result	Indicator	Baseline value	Target	Means of verification	Assumptions
Goal: To overcome the consequences of toxic chemicals used in the war in Viet Nam					
Objective: To minimise disruption of ecosystems and health risks for people from environmental releases of TCDD (Dioxin) contaminated hotspots	· (1) Estimated volume of dioxin in hotspots that could potentially be released to the environment	· At least 1,736 g I-TEQ identified in 3 hot spot sites. · Landfill Z1 area at Bien Hoa completed (approx. 500 g I-TEQ contained).	· Amount of dioxin with potential release to the environment is negligible as the result of proper treatment (containment, destruction, extraction and isolation) of at least 1,700 g I-TEQ of dioxins (2013)	· Progress reports; on-site monitoring	· Future remediation activities achieve appropriate risk and land use based cleanup standards
	· (2) Percentage of people in local communities who know government actions to address dioxin issues in hotspots	· 44% of local people in or near areas affected by dioxin do not know any agency undertaking the treatment activities at hotspots and their surroundings.	· Significant percentage improvement of surveyed population can at least name one specific action by the Government to address dioxin issues in hotspots (2013)	· Field surveys/interviews	
Outcome 1: Dioxin in core hotspot areas contained and remediated	· (1) Volume of contaminated soil and sediment properly treated by selected technologies at Phu Cat, Bien Hoa and Da Nang	· At Bien Hoa: at least 195,500 m3 has been identified for dioxin contamination of which 94,000 m3 has been securely contained in a landfill, 41,500 m3 remains to be contained in three previously identified areas and at least 40,000 m3 in a newly identified area requires isolation and future containment. · At Phu Cat at least 7,000 m3 has been identified for dioxin contamination and immediate containment including that in previously identified areas and in a newly identified area. · At Da Nang: at least 61,600 m3 has been identified for dioxin contamination.	· All pre-identified sub-sites in Phu Cat and Bien Hoa (29,000 m3 of contaminated soil and sediment under latest estimate) will be securely contained (2013) · Newly identified contaminated sub-sites (additional 60,000 m3 under latest estimation) will have exposure reduction measures taken at Phu Cat and Bien Hoa (2013) · All identified sub-sites (61,600 m3 under latest estimation) will be remediated at Da Nang to concentrations less than 1,000ppt and sediment at concentrations less than 150ppt (2013)	· Project reports; On-site monitoring	· Office 33 effectively coordinates GEF funded activities with MOD and relations with bi-lateral donors. · Commitment of MOD to host and provide land owner/client support at the hotspot sites remains firm. · Operation of containment and site monitoring is sustained by the GVN. · Availability of international and/or GVN financing to proceed with remediation following containment at Bien Hoa and Phu Cat.
	· (2) Number of demonstration of remediation technologies implemented successfully	· Pilot scale testing of bioremediation technology initiated in Bien Hoa and small scale research conducted in Da Nang by VAST. · Potential remediation/destruction technologies short listed for on-site demonstration. · No destruction technology tested in pilot scale.	· At least two remediation technology is demonstrated successfully at either Phu Cat or Bien Hoa (2013)	· Evaluation reports on demonstrated remediation technology	· GVN/MOD defines requirements respecting transfer/acquisition of remediation technology.

Result	Indicator	Baseline value	Target	Means of verification	Assumptions
Outputs for Outcome 1:					
1.1. Containment/remediation targets and remediation action plans for each hotspot completed.	Number of action plans approved by 2012	· GEF Project work plan developed and agreed during the Inception Phase for Bien Hoa and Phu Cat containment. · Remediation technology selection, EA, and preliminary technical design completed for Da Nang Airbase. · Remediation action/clean up standard/targets established.	· Action plans with detailed design, EIA including contracting arrangement for 3 hotspots approved by MONRE and MOD (2012)	· Progress reports; approved action plan; EIA report	· Key stakeholders endorse and support the selected technologies. · Selection and application of containment and remediation technology meets specified environmental performance standards in a cost effective manner.
1.2. Government personnel trained in selected containment and remediation technologies.	· Number of government personnel trained	· No training except in landfill construction. · Remediation technology workshops.	· At least 50 personnel trained (2013)	· Progress reports; training reports	· Personnel turnover does not negate benefits of training. · USAID-funded Da Nang project provides remediation trainings.
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 delineation of contaminated areas at each hot spot	· Spatial delineation uncertain in some areas at SW runway in Bien Hoa and storage area in Phu Cat including newly identified areas. · Contamination delineation generally defined for Z1, drains/wetlands and south runway in Bien Hoa and Z3 in Phu Cat. · Spatial delineation at Da Nang now defined for design and remediation purposes.	· Additional samples collected and analyzed at Phu Cat and Bien Hoa sufficient to support delineation of contaminated areas, (2011)	· Progress reports; laboratory report; maps; dioxin database	· All contaminated sub-sites (areas) accurately identified and captured.
1.4. Pilot scale demonstration of remediation technology for potential use at Bien Hoa and/or Phu Cat.	· (1) Completion of thermal/ mechano-chemical remediation demonstration at hot spots	· Selection of ISTD/ISPD technology for Da Nang by USAID and completing GVN approvals. · Technology for remediation demonstration at Bien Hoa or Phu Cat short list finalized with two top priority technologies including ball milling.	· Pilot technology demonstration undertaken and evaluated on one short listed remediation technology at either Bien Hoa or Phu Cat (2013)	· Progress reports; remediation demonstration evaluation report; external evaluation report	· Sufficient co-financing from vendors and donors is identified to support/sustain remediation technology demonstrations. · Evaluation of on-going bioremediation results at Bien Hoa.
	· (2) Completion of Bioremediation demonstration at hot spots	· Bioremediation pilot test cell on 3,000 m3 by VAST established at Bien Hoa. · Laboratory-scale bioremediation research is undertaken in Da Nang.	· Pilot bioremediation demonstration undertaken and evaluated at either Bien Hoa or Phu Cat (2013)	· Progress reports; remediation demonstration evaluation report; external evaluation report	· Continuation of bioremediation pilot work is supported.
1.5. Full containment and/or isolation completed at Phu Cat and Bien Hoa and funding for full scale remediation identified while	· (1) Percentage of pre-identified contaminated soil contained or remediated in all 3 hotspots	· Financing assurance in the form of a MOU of US$16.9 million committed by USAID with assurance that a total of US$34 million will be available for remediation at Da Nang.	· 100% of pre-identified contaminated soil and sediment that exceed Vietnamese standard either contained or remediated (2013)	· Progress reports; external evaluation report	· USAID will secure sufficient funding to complete Da Nang as proposed (by 2013). · GVN will backstop any additional costs and streamline its approval

Result	Indicator	Baseline value	Target	Means of verification	Assumptions
coordination mechanism functioning at Da Nang based USAID financing.		· No financing yet identified for remediation at Bien Hoa and Phu Cat. · Containment of 94,000 m3 in a secure landfill for future remediation at Bien Hoa. · Hydraulic isolation of previously identified areas at all sites.			process to complete containment as proposed (by 2013).
	· (2) Percentage of newly identified contaminated soil contained or remediated in all 3 hotspots	· Spatial delineation uncertain in some areas at Bien Hoa and Phu Cat including newly identified areas.	· 100% of newly identified contamination hydraulically isolated, contained or remediated (2013)	· Progress reports	
1.6. Monitoring systems operational at all hot spots to ensure performance measurement against containment and remediation goals as applicable.	· Long-term monitoring plan and enabling environment of the institution in charge of the monitoring	· Rudimentary monitoring in place at all hot spots including containment to date (Bien Hoa) and isolation works. · Initial financial commitment to design/training/initial operation for funding from the Czech Republic.	· Site specific detailed long term monitoring plans are completed following the design and EIA processes for each site and implemented upon completion of containment and/or remediation works in Da Nang (2011), Phu Cat (2011), Bien Hoa (2012)	· Progress reports; monitoring plan/design documents; operational monitoring reports	· Monitoring design, equipment supply and training included in the scope of the USAID financed project at Da Nang. · GVN (MOD, MONRE) undertake to sustain monitoring operation in the long term. · Realization of Czech funding.
<u>Outcome 2:</u> Land use on and around hotspots eliminates risks and contributes to environmental recovery	· (1) Percentage area of land where after excavation, containment and/or remediation appropriate land use is introduced based on the level of residual contamination.	· Only measures are prohibition on some land uses, e.g., fishing and cultivation, provision of barriers on contaminated areas, and informal restrictions on any new development on them	· Appropriate land uses have been introduced to 70% of land area in land use plan (2013)	· Progress reports	· Office 33 effectively coordinates GEF funded activities with MOD and relations with bi-lateral donors. · Cooperation between MOD and local authorities remains positive. · Macro-economic trends do not undermine local economic development initiatives.
	· (2) Percentage of stakeholders and local communities on and around contaminated sites that support proposed land use plan	· No baseline data available.	· Majority of stakeholder population in surrounding communities expresses support to the land use plan (2013)	· Surveys and interviews.	
Outputs for Outcome 2:					
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	· Formal approved land use plans for each hotspot and adjacent areas	· Conceptual land use plans for all sites. · Future investment/land use plan/conceptual clean up design scope drafted by MOD. · No formal EIA work linked to land use planning undertaken.	· Land use plans for each site completed for Phu Cat (2012), Da Nang (2012) and for Bien Hoa (2013)	· Project report; land use plan; EIA reports	· Land uses are appropriate to substantially eliminate health risks. · MOD willing to address potentially land within and outside airbases in coordinated fashion.

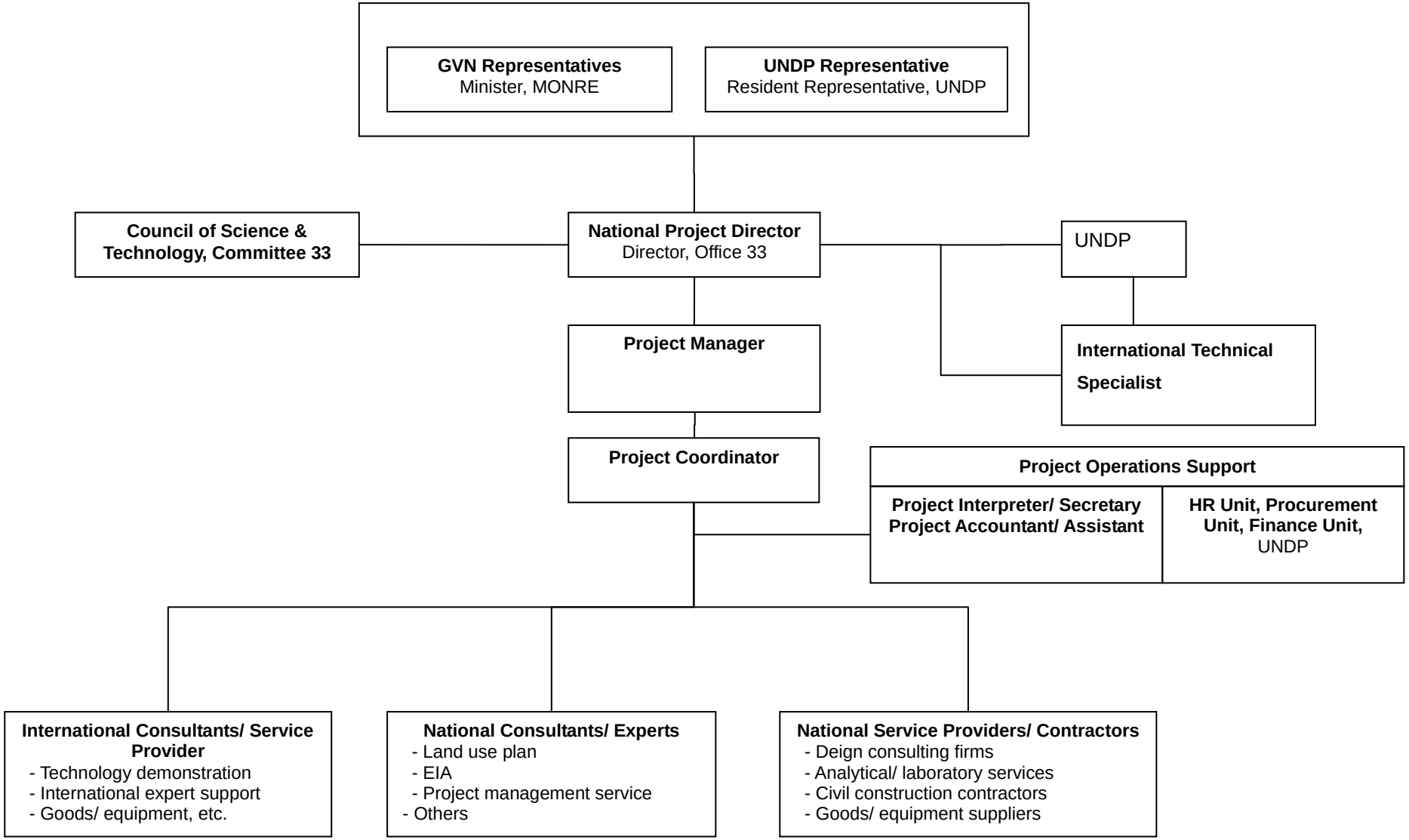
Result	Indicator	Baseline value	Target	Means of verification	Assumptions
completed.					
2.2. Environmental recovery action plans and other land use measures in and around each of the three hotspots implemented.	· Number of pilot scale post-treatment redevelopment and appropriate land use at sub-sites in line with site specific land use plans	· Limited activities only at Bien Hoa.	· At least one sub-site activities completed and more prepared in association with secured external funding during the life of the project (2013)	· Progress reports	· GVN funding of off-site recovery measures as required. · Remediation measures proceed in a timely manner. · Demand for access to potentially contaminated land is constrained until containment and/or remediation is completed.
2.3. Public environmental awareness /information and education programs implemented.	· Percentage of local residents having dioxin related knowledge.	· 4.4% do not know about dioxin; 38% receive information through multiple sources. · Substantive publications of information on the dioxin issue by Office 33. · Initial financial commitment to site specific public awareness for funding from the Czech Republic. · General public awareness initiatives undertaken locally.	· The percentage of local adult surrounding hotspots who do not know about dioxin is negligible, while the percentage who receive information from multiple sources is over 60% (2013)	· Surveys/interviews	· No major immigration of new residents which could distort results.
Outcome 3: National regulations and institutional capacities strengthened	· (1) Percentage of relevant government officials at national and provincial levels who acquired basic knowledge on dioxin issues	· 38% of officials in relevant government agencies have not received training or awareness raising on dioxin, while 29% do not have access to information on policies and laws related to dioxin	· Majority of officials in relevant government agencies have received training or awareness raising on dioxin and officials who are unable to access information on policies and laws related to dioxin are negligible (2013)	· Surveys/interviews	· Office 33 remains well-staffed and develops cooperative arrangement with other stakeholders, particularly MOD for effectively dealing with international funding opportunities.
	· (2) Percentage of local communities who know national/provincial agencies responsible for dioxin issues	· Over 50% of respondents are unable to name agencies responsible for management of contaminated areas	· Most respondents are able to name agencies responsible for management of contaminated areas (2013)	· Surveys/interviews	
Outputs for Outcome 3:					
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	· National standards adopted for soil, water, air and human receptors	· Provisional standards based on international norms in place for soil, sediment, water and air for application to hot spot remediation	· National standards be in place consistent with international practice for soil, water, air and human receptors (2012)	· Project reports; Government regulatory promulgation documents	· Office 33 assigns a priority to proactive institutional dissemination of the results at both national and local levels.

Result	Indicator	Baseline value	Target	Means of verification	Assumptions
vulnerable populations developed and adopted.					
3.2. 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.	· (1) Number of regular publications from Office 33 covering wide range of dioxin issues	· Office 33 is publishing 'Toxicology Magazine' ISSN1859-1140. · Office 33 is regularly updating web site www.office33.gov.vn	· At least one newsletter on dioxin published regularly (2013)	· Progress report	· Personnel turnover does not negate impacts of dissemination.
	· (2) International and national funds for remediation leveraged in addition to baseline	· Initial coordination of USAID EA and technology proposal.	· US funding of Da Nang remediation secured (2011) · At least 2 bilateral/multilateral donor commits additional resources for AO/Dioxin issues (2012) · Amount of required funding for completion of remediation against international standards identified (2013)	· Reports by Office 33 · Funding commitment documentation for future remediation	· Willingness exists to commit funding from remediation funding from national and international organizations.
	· (3) Operational centralized data base and inventory of AO related dioxin contamination	· Inception phase consolidated data base report and system design	· National dioxin data base system operational in Office 33 (2011) · National dioxin contaminated site inventory updated (2013)	· Activity reports; database	
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.	· (1) Establishment/full operation of international-standard high resolution dioxin/POPs laboratory	· One laboratory (VRTC) able to conduct low resolution dioxin analyses. · New international standard laboratory within MONRE established and equipped but not certified or with fully trained staff. · Substantial local expertise base on dioxin contaminated site identification/inventories, dioxin data base operation and remediation technology that can serve as a trainer base.	· A new laboratory under the auspices of MONRE undertakes state-of-the-art analysis of dioxin contamination and is used by national and international clients (2013)	· Progress reports	· Roles and responsibilities of VRTC and VEA Dioxin laboratory clearly determined. · Capacity development activities address actual capacity needs.
	· (2) Number of people received various types of trainings	· Some government officials have basic knowledge on dioxin.	· At least 100 officers are trained (2013)	· Progress report	
3.4. A communication strategy vis-à-vis national and international industries, consumers and others implemented.	· (1) Number of domestic communication events	· Informal communication activities undertaken by Office 33	· 30 domestic communication campaigns and events (2013)	· Progress Reports; event reports	· Mass media do not practice negative campaign against the project. · Office 33 assigns a priority to proactive institutional dissemination
	· (2) Number of reports produced for	· Basic reports on the dioxin issue issued	· Several thematic reports and fact sheets produced for international	· Progress reports and publications	

Result	Indicator	Baseline value	Target	Means of verification	Assumptions
	international dissemination		dissemination (2013)		of project information, results and lessons-leaned at both national and local levels.
Outcome 4: Project management, monitoring and evaluation done in accordance to agreed rules	· Percentage of deviation between approved budget and expenditure	· NA	· At least 80% of approved work plan budget disbursed (2013)	· Annual progress reports	· Project issues escalated to higher authority addressed in timely manner.
Outputs for Outcome 4:					
4.1. Programme management and implementation	· Percentage of periodical reports received/prepared on time	· NA	· More than 80% of periodical reports are developed on time (2011, 2012, 2013)	· Progress reports	· Any gaps and shortcoming of HPPMG properly and timely addressed in collaboration with UNDP CO.
4.2. Programme monitoring and evaluation undertaken according to guidelines	· Percentage of audit management responses addressed	· NA	· At least 90% of auditor's recommendation addressed in management responses (2011, 2012, 2013)	· Audit reports	· Rules, procedures and reporting requirements to GEF remain unchanged.

ANNEX II Project Master Work plan and Budget

ANNEX III Project Implementation Structure



ANNEX IV Updated Project Risks and Actions

New risks and the measures taken are highlighted (underscore) in the risk log below. Risk level was graded based on its probability and potential impact.

#	Description	Date Identified	Type[6]	Probability[7] & Impact[8]	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
1	The exact area and volume of highly contaminated material at the hotspots.	Upon ProDoc development	Strategic	Probability: L Impact: M	Many scientific uncertainties on the extent of contamination have been answered during the project preparatory project funded through non-GEF sources (UNDP-Core). Further investigations will refine the estimates of area, depth and volume, but that is likely to involve mostly low cost analysis of contamination. The revised project design has further reduced the risks associated with uncertainties in delineation of area and volume in areas initially targeted by adopting relatively conservative engineering based estimates for areas that will be targeted for excavation and containment at Bien Hoa and Phu Cat.		NA	Inception report	Continue monitoring
2	The cost estimates are highly dependent on the correctness of the contamination data.	Upon ProDoc development	Financial	Probability: L Impact: M	Same as above.		NA	Inception report	Continue monitoring
3	The costs of remediation (stage 2) are dependent on the outcomes of tests and on the effectiveness of tendering.	Upon ProDoc development	Financial	Probability: L Impact: L	Many uncertainties on technology options have been answered during the project preparatory project funded through non-GEF sources (UNDP-Core), resulting in a shortlist of options. Furthermore, the initial remediation efforts in Da Nang; application of the landfill approach in Bien Hoa; and early testing of the proposed technologies under this Project all offer lessons to ensure cost-effective remediation. Tendering is expected to happen in stages (testing; and if successful up scaling) The overall project design and scope has been		NA	Inception report	Continue monitoring

[6] Environmental, Financial, Operational, Organizational, Political, Regulatory, Security, Strategic or Other
[7] LL: Very unlikely, L: Unlikely, M: Possibly, H: Likely, HH: Almost certain
[8] LL: Adverse effect is marginal, L: Adverse effect is moderate, M: Adverse effect is substantial, H: Project result is severely damaged, HH: Kill the project

#	Description	Date Identified	Type[6]	Probability[7] & Impact[8]	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
					re-structured to provide more realistic expectations respecting the demonstration and full scale application of remediation technology, specifically focusing GEF resources on a single demonstration of a dioxin destruction technology and on inclusion of bioremediation as a fall back for long term application.				
4	Receptiveness for capacity strengthening and transfer of know-how on POPs contamination and remediation is not guaranteed.	Upon ProDoc development	Organizational	Probability: L Impact: L	The capacity transfer and integration of POPs contamination investigation and containment knowledge in local and national institutions, beyond a small circle of engaged experts, is among the most challenging aspects of the project. However, the length of the project intervention will enable a gradual and systematic training of the counterpart institutions. Project design and procurement planning maximizes the use of national expertise in GEF funded activities to ensure broad exposure to the issue and substantially expand the knowledge and expertise base.		NA	Inception report	Continue monitoring
5	The total funding required for “stage 2” destruction of dioxin contamination or long term containment cannot be fully leveraged through the project (ref barrier e)	Upon ProDoc development	Strategic	Probability: H Impact: M	Substantial co-financing is already reported and more is expected, so “stage 1” containment should be completed for all known sub-sites and have eliminated health risks in the short and medium term, whilst testing of “stage 2” destruction of dioxin will happen with known financial resources as well as at least some scaled up remediation. Mitigation of the risk that full destruction (stage 2) will not be fully funded was addressed during project preparation with an analysis of the best fund channelling options (ODA and national funds), and is reflected in the overall remediation strategy agreed between national authorities and international partners, i.e. staging. The project will deliver definite plans including costing for full remediation of all known sub-sites on the three hotspots as well as environmental recovery plans, which should be applicable also when national or international funds become available after the completion of the project.		NA	Inception report	Continue monitoring

#	Description	Date Identified	Type[6]	Probability[7] & Impact[8]	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
					The re-focusing of GEF resources on critical containment at Bien Hoa and Phu Cat maximizes the reduction in contaminant transfer to the environment and associated heath risk. This is enhanced by ensuring isolation of new areas for which co-financing resources have not been identified, particularly at Bien Hoa.				
6	Project management risks including project counterpart commitment, coordination capacity, management of fund, and overall project schedule.	Dec. 2010	Operational	Probability: L Impact: L	Restructuring and focusing of the project during the inception period generally has served to make the targets more realistically achievable.		Rick	Inception report	Initial response developed
7	Uncertainty remains for the implementation arrangement and resource allocation to sustain activities after the completion of the Project.	Dec. 2010	Strategic	Probability: M Impact: M	Office 33 should maintain a strong priority in promoting the need for the provision of funding post 2013 in certain areas with the various institutional stakeholders, so that they will assume responsibility for them.		Rick	Inception report	Initial response developed