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EVALUATION OF DIOXIN PROJECT IMPACT TO ENVIRONMENT AND PEOPLE

FINAL

March 2015

Prepared for: UNDP Viet Nam





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Resilient nations.*

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FINAL

Prepared for:

**UNITED NATIONS DEVELOPMENT PROGRAMME VIET NAM
HANOI
VIET NAM**

Prepared by:

Thomas Boivin

**HATFIELD CONSULTANTS MEKONG
HSE No. 21, KUALOUANG ROAD
NORTH KUALOUANG VILLAGE, CHANTHABOULY DISTRICT
VIENTIANE, LAO PDR**

and

Hang Tran Minh

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TABLE OF CONTENTS

LIST OF TABLES	ii
LIST OF FIGURES.....	ii
LIST OF APPENDICES	ii
LIST OF ACRONYMS.....	iii
ACKNOWLEDGEMENTS.....	iv
DISCLAIMER	iv
EXECUTIVE SUMMARY.....	v
1.0 INTRODUCTION	1
1.1 OBJECTIVES	1
1.2 SCOPE.....	1
1.3 BACKGROUND ON THE AGENT ORANGE ISSUE IN VIET NAM	2
2.0 METHODOLOGY	11
2.1 DATA AND INFORMATION REVIEWED	11
2.2 LIST OF DIOXIN PROJECT ACTIVITIES ASSESSED FOR IMPACTS AND BENEFITS	11
2.3 INTERVIEWS AND SURVEYS	11
2.4 ESTIMATE OF TOTAL DIOXIN MASS AT THE THREE HOTSPOTS.....	12
2.5 ASSESSMENT OF IMPACTS AND BENEFITS	12
3.0 RESULTS AND DISCUSSION	14
3.1 ASSESSMENT OF ACTIVITIES COMPLETED	14
3.2 PCDD/F SOURCE REDUCTION AND ASSOCIATED BENEFIT TO HUMAN HEALTH AND THE ENVIRONMENT	21
4.0 DIOXIN PROJECT TESTIMONIALS	28
4.1 MS. NONG THI HONG HANH.....	28
4.2 COLONEL THAN THANH CONG	29
4.3 MS. VO NIEM TUONG	30
4.4 TAN PHONG COMMUNE	31
4.5 MR. DAM THE SUU AND MRS. PHAN THANH HA	32
4.6 PHU CAT AIRBASE	33
4.7 DONG NAI DIOXIN VICTIMS ASSOCIATION (DONG NAI DVA)	34
5.0 OVERALL ASSESSMENT OF THE PROJECT.....	34
6.0 CONCLUSIONS AND RECOMMENDATIONS.....	37
7.0 REFERENCES	39
8.0 CLOSURE	42

LIST OF TABLES

Table 1	Evaluation criteria for assessing the significance of the impacts from the dioxin project activities.	13
Table 2	Summary of key dioxin project activities completed, impacts and benefits, and limitations.	15
Table 3	Estimates of known areas of contaminated soil volume at Bien Hoa Airbase (UNDP 2013).	21
Table 4	Estimates of known areas of contaminated sediment volume at Bien Hoa Airbase (UNDP 2013).	21
Table 5	Estimates of known areas of contaminated soil volume at Phu Cat Airbase.	22
Table 6	Estimated dioxin mass (g I-TEQ) in soil and sediment at Bien Hoa, Phu Cat and Da Nang.	23
Table 7	Overall assessment of dioxin project impacts and benefits.	36

LIST OF FIGURES

Figure 1	Dioxin-contaminated areas at Bien Hoa Airbase.	6
Figure 2	Dioxin-contaminated areas at Phu Cat Airbase.	10

LIST OF APPENDICES

Appendix A1	Project Log-Frame
Appendix A2	Activities Conducted Under the Dioxin Project
Appendix A3	Interviews and Questionnaires Used for Evaluation of Dioxin Project Impact to the Environment and People
Appendix A4	Quotes and Recommendations Provided During Interviews

LIST OF ACRONYMS

AO	Agent Orange
DONRE	Department of natural resources and environment
DOD	US Department of Defense
DRE	Destruction/remediation efficiency
g I-TEQ	Total dioxin mass
GEF	Global Environment Facility
IPTD	In-pile thermal desorption
MCD™	Mechano-chemical destruction technology
MOD	Ministry of Defence
MONRE	Ministry of Natural Resources and Environment
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Polychlorinated dibenzofurans
TCDD	Tetrachlorodibenzodioxin
TEQ	Toxicity equivalent
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

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DISCLAIMER

The views expressed in this publication are those of the author(s) and do not necessarily represent those of the United Nations, including UNDP, or the UN Member States.

EXECUTIVE SUMMARY

The Global Environment Facility (GEF) and United Nations Development Programme (UNDP) project *PIMS 3685* “Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam” (hereafter also referred to as “dioxin project”) aims to reduce or eliminate the risks to human health and ecosystems due to 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) in each of three hotspot areas: Da Nang, Bien Hoa and Phu Cat. Hotspots have high residual dioxin concentrations in soil, sediment and other contaminated media (such as fish tissues) due to the storage, use and spillage of Agent Orange during the US-Viet Nam war.

The project goals will be achieved through containing and remediating dioxin contamination, introducing land use practices on and around hotspots that eliminate risks of further contamination, and by fostering the technical, institutional and financial capacity of Vietnamese government counterparts to address other contamination sites beyond the identified hotspots.

This report evaluates key project activities over the past four years and the project’s impacts and benefits to the environment and local people surrounding the three main dioxin hotspots of Da Nang, Bien Hoa and Phu Cat.

The 3 Main Dioxin Hotspots

During the US-Viet Nam war, over 80 million litres of herbicide were released over south Viet Nam in a code-named mission called Operation Ranch Hand. Bien Hoa Airbase was the largest and most active Ranch Hand site in Viet Nam with respect to the volume of Agent Orange and other herbicides stored and used. According to US military data, the airbase was used to store and handle 159,000 45-gallon barrels of Agent Orange, Agent White and Agent Blue. At least four major spills occurred and loads of Agent Orange were also jettisoned in areas surrounding Bien Hoa Airbase during the war. Sampling conducted during the dioxin project and from previous studies at various locations within and surrounding the airbase found contamination levels that exceed national and international dioxin limits. A series of interim mitigation measures have been implemented as part of the dioxin project, including physical and hydrological controls and awareness raising activities for local communities.

Da Nang Airport is located within Da Nang City and is used by both the Ministry of Defense (MOD) and the Middle Airports Corporation under the Civil Aviation Administration of Viet Nam. The airport is located within the urban part of Da Nang City and is surrounded by three densely populated districts: Hai Chau, Thanh Khe and Cam Le. In the main hotspot areas of the airport, TCDD comprises more than 90 per cent of the toxicity equivalent (TEQ), indicating Agent Orange as the source of contamination. Remediation is currently being conducted through funding provided by the United States Agency for International Development (USAID). Approximately one-half of the contaminated soil/sediment has been excavated, and an in-pile thermal desorption (IPTD) structure has been filled with the excavated soil/sediment for treatment. The remaining soil and sediment will be excavated and treated in the IPTD structure during a second phase of treatment.

Phu Cat Airfield was an important US military airbase and Ranch Hand site during the US-Viet Nam war, and is currently used for both civil and military purposes. Herbicide storage, loading and plane washing facilities were present at Phu Cat, and runoff from the herbicide wash area eventually enters into a series of small lakes (Lakes A, B and C) used by local inhabitants for raising fish and waterfowl. Interim measures to contain contamination conducted under the dioxin project include a concrete

remediation structure downstream of the main airbase runoff area, a ban on food consumption from the lake and a landfill containing approximately 7,500 m³ of contaminated soil and sediment.

As a result of the high levels of dioxin recorded at these sites, the most significant project activities were conducted at Bien Hoa and Phu Cat. These measures include the construction of interim mitigation measures and awareness raising programmes to reduce dioxin exposure to local communities.

Assessment Methodology

The social and environmental assessment of the dioxin project included an evaluation of the benefits and achievements of the project, and was designed to support the upcoming final evaluation of the project. Evaluation criteria used to assess the significance of benefits and impacts from the dioxin project included: geographic extent, duration and magnitude of impact; project contribution (positive or negative); significance of overall project; and confidence rating for evaluation results. Key project activities assessed include the following:

- Identification and delineation of the contaminated sites from surveys conducted in 2012 and 2013 in Bien Hoa and Phu Cat;
- The completion of interim measures (landfill) to prevent dioxin release into the area surrounding Phu Cat airbase;
- The completion of interim measures to prevent dioxin release to areas surrounding Bien Hoa airbase in early 2014;
- Development of the Remediation Master Plan for Bien Hoa;
- Support provided to the Government on studies and dioxin guidelines issued for different land use purposes; and
- Providing capacity building on dioxin management for government staff and others.

A number of data collection instruments were used to obtain relevant information. Key project documents were reviewed and assessed. A semi-structured questionnaire was developed to collect information and comments regarding dioxin project activities in Ha Noi, Da Nang, Bien Hoa and Phu Cat. Key informant interviews were conducted with local authorities, and relevant secondary data and information were obtained. Direct quotes and information from key interviews have also been included in this report.

Population data from each of the wards and districts surrounding Bien Hoa and Phu Cat airbases was collected as part of the assessment in order to determine the potential number of people and households at risk of dioxin exposure near these two key hotspots. An estimate of the total amount of dioxin contamination was also conducted, using data obtained from the dioxin project and other previous studies. The total dioxin mass (g I-TEQ) was calculated based on the estimated volumes of contaminated soil and sediment at each location in Da Nang, Bien Hoa and Phu Cat, and the average dioxin concentration (ppt) at each site. Results were compared to the baseline estimates of total dioxin mass provided in the project inception report (1,736g I-TEQ).

Results

The dioxin project was successful in meeting its overall objectives and provided significant benefits to a number of key stakeholders, including communities living near the key dioxin hotspots. The

dioxin project was well aligned with the specific objectives of the Government's *National Action Plan on Comprehensive Overcoming of Consequences of Toxic Chemicals used by the US during the War in Viet Nam to 2015 and Orientation Towards 2020*. Beneficial impacts of the interim mitigation measures implemented at Bien Hoa and Phu Cat through the dioxin project include:

- Containment of dioxin-contaminated soil and sediment at the Bien Hoa and Phu Cat airbases;
- A significant reduction in short-term exposure to dioxin contamination for local communities;
- Elimination of the health risk of dioxin exposure through consumption of contaminated fish, dermal contact with contaminated soil and through contaminated airborne particulates;
- Elimination of the environmental risks of dioxin migration through the food chain (including wildlife movement) or through runoff; and
- Improvements in the economic and social security of residents through a reduction in the risk of exposure to dioxin contamination.

In Bien Hoa, a number of key project activities were conducted to help reduce the risk of dioxin exposure for the local population of approximately 870,000 persons (of these, about 120,000 people live on and in the immediate vicinity of the airbase). These measures include the construction of the Z1 landfill by MOD, implementation of surface water controls to manage stormwater that could come in contact with contaminated soil or sediment, erection of fencing and warning signs near lakes to deter access and fishing, fishing bans, and communication programmes providing dioxin information. In addition, a pilot demonstration of a mechano-chemical destruction technology (MCD™) was completed at Bien Hoa Airbase. The demonstration used 150 tonnes of contaminated soil with an average destruction/remediation efficiency (DRE) of 77 per cent. Improved DRE may be possible by extending the reaction time for each treatment.

The Master Plan for Remediation of Bien Hoa Airbase, Viet Nam (UNDP 2013a) included the specific objective to contain and remediate dioxin contamination in core hotspot areas as well as soil and sediment within and around Bien Hoa Airbase to safe levels by 2020, to build capacity in the form of stakeholder engagement meetings, workshops and day-to-day transfer of knowledge, and to ensure the health and safety of remediation workers.

The construction of the Phu Cat landfill and containment of dioxin-contaminated soil at this site was a significant project achievement. Interim remediation efforts implemented at Phu Cat included a landfill which contains approximately 7,500 m³ of contaminated soil and sediment excavated from the former storage area and interim sediment treatment facility. As a part of the dioxin project, representatives from the Ministry of Science and Technology, the Ministry of Natural Resources and Environment (MONRE), international organizations and experts in the field of dioxin remediation shared their knowledge with the construction contractor and the Project Management Unit with respect to design and construction of the landfill. A groundwater monitoring programme was also implemented in Phu Cat in collaboration with the dioxin project.

The ongoing remediation efforts at the three dioxin hotspots in Viet Nam, including interim measures at the Pacer Ivy area in Bien Hoa, the Phu Cat landfill and IPTD treatment at Da Nang, are expected to result in partial or complete polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans PCDD/F reduction of approximately 9,031 g I-TEQ. The total for Bien Hoa and

Phu Cat combined (contained dioxin) is approximately 3,697 g I-TEQ, or approximately double the original estimated 1,736 g I-TEQ envisioned under the dioxin project. When Da Nang IPTD remediation (destroyed dioxin) is included, the total amount of dioxin contained and/or eliminated is five times the original estimated under the project. These are significant amounts of dioxin which are being treated or contained, which will help prevent contamination migration and reduce future risk of dioxin exposure for local communities.

Based on current estimates, over 120,000 people residing in wards near Bien Hoa Airbase and 47,000 persons near Phu Cat Airbase are potential beneficiaries of reduced dioxin exposure from activities conducted under the dioxin project.

OVERALL ASSESSMENT OF PROJECT

Based on the review of available project documentation and inputs received from key stakeholders during the site visit to Da Nang, Bien Hoa and Phu Cat in June 2014, the overall benefits and impacts of the project are deemed to be significant at both national and international levels. Impacts and benefits as a result of the project are:

- Significant due to identification and delineation of the contaminated sites from surveys conducted in 2012 and 2013 in Bien Hoa and Phu Cat;
- Significant due to completion of interim measures (landfill) to prevent dioxin release to the area surrounding Phu Cat Airbase;
- Highly significant due to the completion of interim measures to prevent dioxin release to areas surrounding Bien Hoa Airbase in early 2014;
- Moderately significant due to development of the Remediation Master Plan for Bien Hoa;
- Highly significant due to support provided to the Government on studies and issued dioxin guidelines for different land use purposes;
- Significant due to capacity building provided on dioxin management for government staff and others; and
- Significant due to meeting the overall project objective: *to minimize the disruption of ecosystems and health risks for people from environmental releases of TCDD (dioxin) contaminated hotspots.*

The dioxin project was successful in meeting its overall objective, and provided significant benefits to a number of key stakeholders, especially to communities living near the key dioxin hotspots of Bien Hoa and Phu Cat. The risk of dioxin exposure has been significantly reduced in Bien Hoa and Phu Cat as a result of the project, and the total amount of dioxin contained and/or remediated is two to five times greater than initially envisioned. The dioxin project's overall impacts and benefits are therefore considered to be significant at the local, national and international level.

Recommendations

Short-term

To further limit dioxin exposure, strict enforcement of fishing and aquaculture bans should be implemented in Bien Hoa. Additional fencing and warning signs should be placed near contaminated lakes to restrict access for local people near the airbase.

Short- and long-term monitoring of the effectiveness of the Phu Cat landfill and surface water controls at Bien Hoa are required to ensure that contamination does not enter groundwater (Phu Cat) and sediment and runoff (Bien Hoa).

Involvement of personnel from the departments of natural resources and environment (DONRE) in Da Nang, Phu Cat and Bien Hoa should be increased, particularly in the monitoring and assessment of dioxin contamination in communities downstream of the hotspots, and in awareness raising and communication activities.

Given the sensitivities of the Agent Orange/dioxin issue, additional training and capacity building should be provided to local authorities on appropriate communication methods to local communities. This is especially needed for new migrants to Bien Hoa, Da Nang and Phu Cat who may not be aware of potential dioxin contamination issues in these areas.

Additional research on the health issues related to dioxin exposure should be implemented in each of the three hotspots in order to better understand and plan for longer-term impacts from existing exposure.

Long-term

Long-term solutions are required to completely destroy or eliminate dioxin risk in both Phu Cat and Bien Hoa. The interim solutions conducted under the dioxin project significantly reduced the potential for dioxin exposure in the short-term, but dioxins will remain in the environment until appropriate long-term solutions have been identified.

Additional training should be provided on dioxin sampling and analysis, particularly regarding quality assurance and quality control.

Department of Health personnel requested additional assistance for treatment of people with disabilities and other health affects potentially related to Agent Orange AO/dioxin exposure. Support provided by the dioxin project was appreciated, but more needs to be done to assist families with adults and children suffering from disabilities and other ailments.

1.0 INTRODUCTION

The Global Environment Facility (GEF) and United Nations Development Programme (UNDP) project *PIMS 3685* “Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam” (hereafter referred to as the ‘dioxin project’ or ‘project’) aims to reduce or eliminate the risks to human health and ecosystems due to 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) in each of three key hotspots: Da Nang, Bien Hoa and Phu Cat.

The aim of the project is “to minimize the disruption of ecosystems and health risks for people from environmental releases of TCDD (dioxin) contaminated hotspots.” The project goals will be achieved through containing and remediating dioxin contamination in the three hotspots as well as fostering the technical, institutional and financial capacity of Vietnamese government counterparts to address other contamination sites beyond the identified hotspots.

The project has three main outcomes:

- 1) Dioxin in core hotspot areas is contained and remediated;
- 2) Introduction of land use practices on and around hotspots that eliminate risks of further contamination, contributing to environmental recovery; and
- 3) Strengthening of national regulations and institutional capacities.

This report “Evaluation of dioxin project Impact on the Environment and People” was recommended in the 2013 Mid-Term Evaluation Report to provide as much quantitative data as possible and to investigate *the project’s achievements, particularly highlighting polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/F) source reduction and the associated benefit for human health and the environment.*

1.1 OBJECTIVES

The objective of this report is to evaluate the project’s impact on the environment and local people. The aim of the review is to demonstrate the overall benefits of the project on the environment and local people surrounding the three main dioxin hotspots of Da Nang, Bien Hoa and Phu Cat.

1.2 SCOPE

This report focused on evaluating the overall impacts and benefits achieved from key project activities and outputs. These project activities have been completed over the past four years and are compared to the overall project outcomes listed in the Logical Framework (see Appendix A1).

A significant number of activities were conducted under the project, and it was beyond the scope of this assessment to review each deliverable or report produced in detail. This assessment therefore focused on reviewing the key activities conducted, as well as obtaining comments and feedback from interviews with key stakeholders in June 2014. The assessment was designed to provide information on project activities for the final project review team.

1.3 BACKGROUND ON THE AGENT ORANGE ISSUE IN VIET NAM

During the US-Viet Nam war, over 80 million litres of herbicide were released over south Viet Nam in a code-named mission called Operation Ranch Hand. These herbicide mixtures were predominantly used to defoliate forests and crops, and many of them contained dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin or TCDD). The most infamous of the herbicide mixtures was 'Agent Orange' (AO), although there were a number of other chemical formulations used, including Agent Purple, Agent Blue and Agent White.

Vietnamese people were directly exposed to herbicides during spray missions, and indirectly through contact with contaminated soil, sediment, dust and food products, particularly near former US military bases. U.S., Australian and other veterans were also exposed during their military service in Viet Nam. The impacts associated with AO/dioxin contamination in Viet Nam are well documented in a number of international scientific publications and media stories (see references). Addressing the impacts in Viet Nam is important not only for Viet Nam, but also globally.

Over time, in areas that were sprayed with herbicides, dioxin concentrations in soil have declined below traceable amounts (Dwernychuk et al. 2002). However, in certain military airbases where these herbicides were stored and handled, dioxin contamination remains a major threat to the surrounding environment and human health. Three airbases, Bien Hoa, Da Nang and Phu Cat, have been identified as key dioxin 'hotspots' where dioxin contamination levels remain above national and international standards.

Hotspots have high residual dioxin concentrations in soil, sediment and other contaminated media (such as fish tissues) due to the storage, use and spillage of Agent Orange during the US-Viet Nam war. These airbases were key military installations for implementing Operation Ranch Hand (Dwernychuk 2005; Dwernychuk et al. 2002; Hatfield Consultants and 10-80 Division 1998; 2000; 2006; 2007). These high concentrations have resulted in contamination of the food chain, and ultimately to elevated dioxin levels in humans residing near these airbases (Nguyen et al. 2011).



Bien Hoa, October 1972



Bien Hoa Airbase, April 1969. Inspection of the fluid level of the orange defoliant



Agent Orange Barrels, 1975, Johnston Island

The Government of Viet Nam requested foreign assistance to support remediation efforts through the dioxin project. Clean-up efforts at Da Nang Airport are underway and in the planning stages for Bien Hoa Airbase with support from the US Government through US Agency for International Development (USAID). Bien Hoa Airbase in Dong Nai Province was the primary location for Ranch Hand activities in southern Viet Nam and is the largest of the hotspots.

On 17 April 1970 the use of Agent Orange for military operations in Viet Nam was formally halted, and unused herbicides were placed in storage. The Pacer Ivy mission was launched on 15 September 1971 to consolidate, re-drum and ship all remaining Agent Orange material in South Viet Nam to Johnston Island in the central Pacific Ocean. Because of war-time conditions, clean-up of former Ranch Hand sites was not always undertaken with adequate precautions to minimize the impact on human and environmental health, and concerns remain that herbicides and wastewater used for cleaning were discharged directly into the ground or into groundwater wells.

Due to the ongoing threat to human health and the environment at AO/dioxin hotspots, National Steering Committee 33 has been coordinating Viet Nam's efforts to contain residual dioxin contamination that exceeds international standards by 2013 and to fully remediate this contamination by 2020 (Prime Minister of the Government of Viet Nam 2012).

1.3.1 BIEN HOA

Bien Hoa Airbase was the largest and most active Ranch Hand site in Viet Nam with respect to the volume of Agent Orange and other herbicides stored and used. During Operation Ranch Hand, three large storage tanks were used for herbicide storage at Bien Hoa Airbase; one each for Agent Orange, Agent White and Agent Blue. According to US military data, the airbase was used to store and handle 98,000 45-gallon barrels of Agent Orange, 45,000 barrels of Agent White and 16,000 barrels of Agent Blue (US Department of Defense [DOD], 2007). At least four times between December 1969 and March 1970, major spills occurred at Bien Hoa that likely resulted in releases to the environment. It is estimated that 25,000 litres of Agent Orange and 2,500 litres of Agent White were spilled (US DOD 2007). Loads of Agent Orange were also jettisoned in areas surrounding Bien Hoa Airbase during the war.

Sampling conducted in previous studies and at various locations within and surrounding the airbase as part of the project (UNDP 2012a) found contamination levels that exceed national dioxin limits at three main areas within the airbase (the southwest area, the Pacer Ivy area and the Z1 area), as well as in the northeast and northwest areas. Some areas around the perimeter of the airbase (south, southwest and west of the Pacer Ivy area; the Gate 2 Lake and Bien Hung Lake; and east of the northeast area) were also contaminated with elevated dioxin levels. Sampling conducted in 2012 confirmed the presence of elevated levels of arsenic, suggesting that spills of Agent Blue may also have occurred. Data collected as part of a GEF, UNDP and Ministry of Natural Resources and Environment (MONRE) project was used by experts to develop an estimated volume of contaminated materials at Bien Hoa Airbase. Currently available information estimates approximately 200,800 cubic meters (m³) of contaminated soil and 29,200 m³ of contaminated sediment require remediation (UNDP 2013a). The volume of soil and sediment at Bien Hoa Airbase that requires remediation is estimated at 230,000 m³.

Dioxin contamination levels exceed national and international guidelines and standards in soil, sediment, fish tissues and human tissues. The results of several studies at Bien Hoa have demonstrated elevated dioxin concentrations at depths of up to 4.5 meters and across an area of

approximately 250,000 m² at the airbase (Hatfield Consultants and Office 33 2009 and 2011, UNDP 2012a). Dioxins have entered the food chain primarily through consumption of contaminated fish and aquatic animals raised on the airbase, and elevated levels of dioxins have been recorded in fish tissues, human blood and breast milk. Airbase workers and their families, particularly those who have consumed fish raised in lakes on the airbase, have the highest measured dioxin concentrations in blood and breast milk (Nguyen et al. 2011; Hatfield and Office 33 2011).

As a result, Bien Hoa was a key focus area for the dioxin project, and a number of key project activities were conducted to help reduce the risk of dioxin exposure for the local population. The city of Bien Hoa, located in Dong Nai Province, has a population of approximately 870,000 people, with approximately 120,000 people living on and in the immediate vicinity of the airbase. Until at least January 2010, people were harvesting fish, ducks and other aquatic animals from various lakes and ponds within the airbase (Hatfield/Office 33, 2011), and agricultural activities were observed throughout the airbase. These observations, combined with a relatively high population density, have resulted in an assessment that dioxin contamination in the Bien Hoa area poses a risk to human and ecological health.

Several temporary or interim measures have been implemented at the airbase as part of the project and by the Ministry of Defence (MOD) to reduce the risk of exposure to high levels of dioxin. These include construction of containment structures, awareness raising and fishing bans.

In addition to the mitigation measures implemented at Bien Hoa Airbase, a pilot demonstration of mechano-chemical destruction technology (MCD™) has been completed. MCD™ is a method for denaturing the dioxin compounds without the use of chemical additives. The method is based on a tipoplazma effect formation (ultraviolet ray formation), where sufficiently powerful mechanic collisions occur among steel balls in the reactors and quartz in the soil.



Feeding contaminated soil into mechano-chemical destruction technology (MCD™) reactors (Environmental Decontamination Limited, 2012)

The demonstration used 150 tonnes of contaminated soil. Five lots of soil from four locations were excavated and put into 150 soil bags with unique numbering to enable a comparison of MCD™ effectiveness with the original excavation locations. The level of contamination for each lot was classified as high (> 10,000 pg-TEQ/g), medium (between 2,000 and 10,000 pg-TEQ/g) and low (<2,000 pg-TEQ/g). Co-contaminates such as arsenic or heavy metals were noted due to their potential to impact treatment success. A total of 42 treatments were conducted with an average destruction/remediation efficiency (DRE) of 77 per cent. Improved DRE may be possible by extending the reaction time for each treatment.

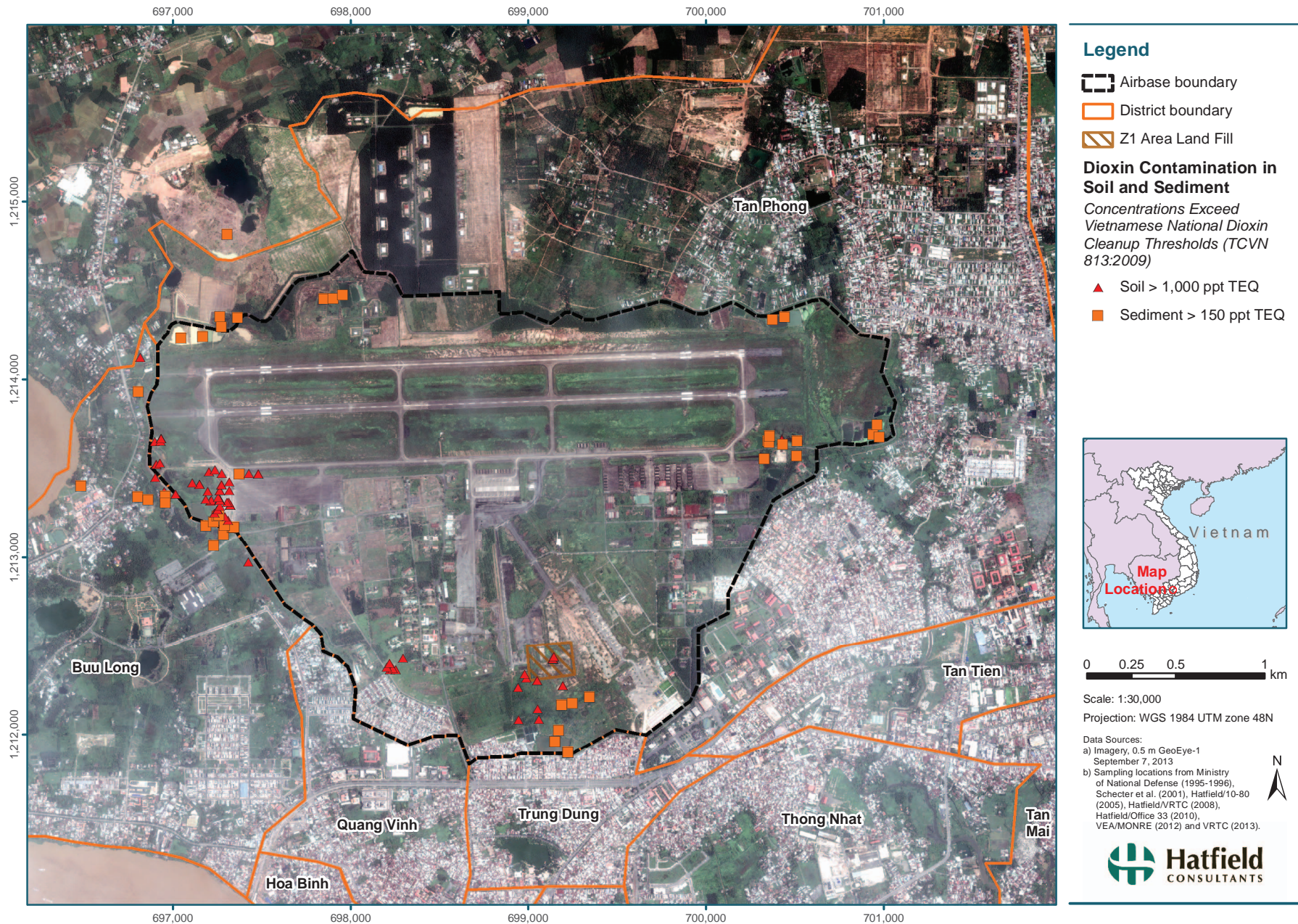
The advantages of this system are that the process does not generate wastewater, and exhaust from reactors and the dryer can be treated before being released to the environment. The challenges include: (1) high amounts of electricity required; (2) dust and odour are emitted during operation; (3) noise within the remediation area is high; and (4) this method requires a lengthy remediation period for large quantities of contaminated materials. Other findings include that MCD™ does not remediate arsenic, and the process significantly alters the physical property of the soil (the final product is loose powdery silt).

The first phases of remediation efforts at Bien Hoa Airbase are underway, with assistance from USAID. These include stakeholder engagement activities, an environmental assessment and a gender assessment. The environmental assessment is expected to identify and address supplemental sampling and analyses; evaluations of containment/remediation alternatives; potential health-related, environmental and social issues associated with implementing activities for remediation of dioxin-containing soil and sediment; and approaches for environmental mitigation and monitoring.



Communities adjacent to Z1 Lake, Bien Hoa (Hatfield, 2008)

Figure 1 Dioxin-contaminated areas at Bien Hoa Airbase.



1.3.2 DA NANG

Da Nang Airport is located within Da Nang City and is used by both the MOD and the Middle Airports Corporation under the Civil Aviation Administration of Viet Nam. Da Nang City has a population of approximately 825,000 persons as of 2008, with an average population density of about 640 persons per square kilometer (km²). The airport property is located within the urban part of Da Nang City and is surrounded by three urban districts: Hai Chau, Thanh Khe and Cam Le. The three districts are densely populated, with most of the land in these districts used for housing, industrial facilities, transportation and other facilities. A number of people reside on the western, northern and northeastern edges of the airport property in close proximity to the active runways, Sen Lake and wetlands. Many of these are military personnel and their families.

The airport has a total area of 820 hectares (ha). It is an international airport, with flights arriving from and departing to cities such as Bangkok, Vientiane, Hong Kong, Phnom Penh and Taipei. The Middle Airports Corporation is currently expanding the airport and requires dioxin removal from the northern area of the airport property to allow for extension of the runway and expanded taxiways (USAID 2010a).

In the main hotspot areas of the airport, TCDD comprises more than 90 per cent of the toxicity equivalent (TEQ), indicating Agent Orange as the source of contamination. Contamination is being remediated in the following areas:

- 1 ha former mixing and loading area
- 8 ha former storage area
- 3.3 ha drainage ditch
- 1.9 ha area between the eastern wetlands and drainage ditch (including the eastern hotspot)
- 10.8 ha Sen Lake and eastern wetland
- 0.3 ha former Pacer Ivy storage area

In order to treat the large volume of contaminated sediment and soil at the airport a two-phased approach has been implemented to treat the soil and sediment incrementally. For Phase I, approximately one-half of the contaminated soil/sediment has been excavated, and an in-pile thermal desorption (IPTD) structure has been filled with the excavated soil/sediment for treatment (sediments were initially stockpiled outside the IPTD structure and allowed to undergo free drainage prior to being placed into the IPTD structure). During Phase II, the remaining soil and sediment will be excavated and treated in the IPTD structure.

The potential interim environmental impact of the project during implementation is substantial as it requires the excavation, transport and deposition of large volumes of dioxin-contaminated soil and sediment from the hotspots to the treatment area. Impacts on wetlands and terrestrial and aquatic biota are unavoidable over the short term, in order to eliminate the possibility of future dioxin exposure to humans and the environment. While the remediation activities are underway, there are potential environmental impacts to air quality, surface water quality, and/or groundwater quality. These impacts could result in potential adverse effects to terrestrial ecosystems, aquatic ecosystems, workers and/or surrounding residents. As a result, mitigation measures have been employed to ensure that the potential environmental impacts during implementation are minimized.

Once remediation is complete, airport development activities will occur, including constructing aprons and taxiways, buildings, parking and roadways over the eastern wetlands and Sen Lake.

1.3.3 PHU CAT

Phu Cat Airfield was an important US military airbase and Ranch Hand site during the US-Viet Nam war, and is currently used for both civil and military purposes. Herbicide storage, loading and plane washing facilities were present at Phu Cat, and runoff from the herbicide wash area eventually enters into a series of small lakes (Lakes A, B and C) used by local inhabitants for raising fish and waterfowl. Due to the known dioxin contamination, a ban on food consumption from the lake was implemented in 2002. In an attempt to initially remediate the contaminated runoff from the airstrip, MOD built a concrete remediation structure downstream of the main airbase runoff area in 2002. The population density around the lake and airfield is limited to a small number of airbase workers and local residents.

According to US military data provided to Viet Nam in 2007, the main storage area for Agent Orange and other herbicides at Phu Cat was in the southeastern corner of the airbase. Records indicate 17,000 drums of Agent Orange, 9,000 drums of Agent White and 2,900 drums of Agent Blue were stored at Phu Cat (US Department of Defense, 2007). There are also a number of drainage canals in the east-central area of the airbase (flowing east from the former washing area to Lakes A, B and C).

Project sampling programmes focused on the east-central portion of Phu Cat Airbase, as well as downstream Lakes A, B and C, into which drainage flows from the airbase (UNDP 2009; UNDP 2011). Given the contamination levels recorded at this site, remediation through construction of containment measures was a priority activity for the project.

Interim remediation efforts implemented at Phu Cat under the dioxin project included a landfill and a groundwater monitoring system.



Phu Cat: Landfill preparation (Vinausen 2012)



Phu Cat: Interministerial field trip (dioxin project Management Unit 2012)



Phu Cat: Landfill construction (Trung Kien 2012)



Phu Cat: Sampling (Nguyen Le Chi 2008)



Phu Cat: Landfill grass (Vinausen 2012)

Figure 2 Dioxin-contaminated areas at Phu Cat Airbase.



2.0 METHODOLOGY

2.1 DATA AND INFORMATION REVIEWED

In the four-year span of the project, a significant number of activities have been conducted and documents produced (see Appendix A2). A review of relevant project materials, related documents and data, and interviews with key stakeholders involved in project implementation have been undertaken as part of this assessment. The review also attempted to determine whether the project objectives outlined in the Logical Framework were met, by referring to the UNDP and GEF project documents, Mid-Term Report and work plans.

2.2 LIST OF DIOXIN PROJECT ACTIVITIES ASSESSED FOR IMPACTS AND BENEFITS

The key project outputs assessed included the following:

- Identification and delineation of the contaminated sites from surveys conducted in 2012 and 2013 in Bien Hoa and Phu Cat;
- The completion of interim measures (landfill) to prevent dioxin release to the area surrounding Phu Cat Airbase;
- The completion of interim measures to prevent dioxin release to areas surrounding Bien Hoa Airbase in early 2014;
- Development of the Remediation Master Plan for Bien Hoa;
- Support provided to the Government on studies and issued dioxin guidelines for different land use purposes; and
- Capacity building on dioxin management provided to government staff and others.

It is important to note that a number of other activities and outputs were produced under the project (see Appendix A2), which were not included in this assessment. For example, a separate report has been produced summarizing the communication activities and publications prepared to provide information to local people and key project stakeholders. Comments on other activities conducted under the project are provided where applicable.

2.3 INTERVIEWS AND SURVEYS

A number of data collection instruments were used to obtain relevant information. A semi-structured questionnaire was developed to collect information and comments about the dioxin project activities, and interviews were conducted in Ha Noi, Da Nang, Bien Hoa and Phu Cat. Key informant interviews were conducted with local authorities, and relevant secondary data and information was obtained. The list of interviews conducted and the questionnaire utilized is presented in Appendix A3. Direct



quotes and information from key interviews have also been included in this report. Population data from each of the wards and districts surrounding Bien Hoa and Phu Cat airbases was collected as part of the assessment, in order to determine the potential number of people and households at risk of dioxin exposure near these two key hotspots.

2.4 ESTIMATE OF TOTAL DIOXIN MASS AT THE THREE HOTSPOTS

An estimate of the total amount of dioxin contamination was conducted, using data obtained from the dioxin project and other previous studies. The total dioxin mass (g I-TEQ) was calculated based on the estimated volumes of contaminated soil and sediment at each location in Da Nang, Bien Hoa and Phu Cat, and the average dioxin concentration (ppt) at each site. Soil and sediment density (kg/m^3) data from Da Nang (USAID 2010) was used to convert volumes to weights (kg or g). Results were compared to the baseline estimates of total dioxin mass provided in the project inception report (1,736g I-TEQ). Given the uncertainties with respect to variability in dioxin concentrations at different soil depths, as well as the volumes of contaminated materials present at each of the three main hotspots, the estimated dioxin mass data presented should be regarded as an approximation only.

2.5 ASSESSMENT OF IMPACTS AND BENEFITS

Overall impacts and benefits of the dioxin project were determined based on the following:

1. Review of project activities conducted, and degree to which they addressed the overall objectives and outcomes listed in the Logical Framework;
2. Review of project documents for general completeness, accuracy and detail, within the time frame for review; and
3. Professional judgment of the review team.

In assessing impacts and benefits, the following areas of enquiry were explored:

- What has changed?
- For whom?
- How significant was it?
- Will it last?
- In what ways did the dioxin project contribute to these changes?
- Are the impacts and benefits felt locally, nationally and/or internationally?

Evaluation criteria were developed to assess the significance of benefits and impacts from the project (Table 1).

Table 1 Evaluation criteria for assessing the significance of the impacts from dioxin project activities.

Criteria		Definition
Geographic Extent of Impact	Local	Effect predicted to occur mainly within or in close proximity to the Bien Hoa, Phu Cat or Da Nang airbases
	Provincial	Effect predicted to occur beyond close proximity to the Bien Hoa, Phu Cat or Da Nang airbases but within the provinces where these airbases are located
	National	Effect predicted to occur beyond the provincial level but within Viet Nam
	Global	Effect predicted to occur beyond the borders of Viet Nam
Duration of Impact	Short	Effect predicted to occur only within the period of the dioxin project
	Long	Effect predicted to occur for 5-10 years after completion of the dioxin project
	Residual	Effect is predicted to occur for a long time after the completion of the dioxin project
Magnitude	Nil	No change from background conditions are predicted
	Low	Effect is predicted to be somewhat above typical background conditions, but within established or accepted protective standards, or to cause no detectable change in environmental conditions
	Moderate	Effect is predicted to be considerably above typical background conditions, but remaining within established or accepted protective standards, or to cause no detectable change in environmental conditions
	High	Effect is predicted to exceed established criteria or thresholds associated with potential adverse effects, or to cause a change in environmental conditions beyond the range of natural variability
Project Contribution	Positive	Net improvement as a result of implementing the dioxin project
	Negative	Net negative effect as a result of implementing the dioxin project
Overall Rating	Insignificant	No significant impact or benefit occurred from dioxin project activities
	Moderately Significant	Some benefit or impact occurred from dioxin project activities on a local scale or to a limited number of beneficiaries
	Significant	Significant impact or benefit occurred from dioxin project activities, at both the local and national scale, to a large number of beneficiaries
	Highly Significant	Highly significant impact or benefit occurred from dioxin project activities, at both national and International scale, with many beneficiaries
Confidence Rating	Low	Based on incomplete understanding of cause-effect relationships and incomplete data or information related to the activity being assessed
	Moderate	Based on good understanding of cause-effect relationships using data from elsewhere or incompletely understood cause-effect relationship using data or information pertinent to the activity being assessed
	High	Based on good understanding of cause-effect relationships and data or information pertinent to the activity being assessed

Note: Where criteria are not applicable to the activity being assessed, 'NA' was applied.

3.0 RESULTS AND DISCUSSION

3.1 ASSESSMENT OF ACTIVITIES COMPLETED

The key activities conducted under the dioxin project are summarized in Table 2. Work completed, impacts, benefits and limitations are summarized for key outputs identified in the project Logical Framework.

The dioxin project was well aligned with the following specific objectives of the Government's *National Action Plan on Comprehensive Overcoming of Consequences of Toxic Chemicals used by the US during the War in Viet Nam to 2015 and Orientation towards 2020* (Prime Minister of the Government of Viet Nam 2012): 1) assess the spatial distribution, contamination level and long-term consequences of toxic chemicals on human beings and the environment; 2) determine and effectively deploy a system of measures for comprehensive treatment of the contaminated environment; and 3) strengthen the domestic and international community's awareness of and capacity to overcome the consequences of the toxic chemicals. The *Master Plan for Remediation of Bien Hoa Airbase, Viet Nam* (UNDP 2013a) included the specific objectives to contain and remediate dioxin contamination in core hotspot areas as well as soil and sediment within and around Bien Hoa Airbase to safe levels by 2020, to build capacity in the form of stakeholder engagement meetings, workshops and day-to-day transfer of knowledge, and to ensure the health and safety of remediation workers. The construction of the Phu Cat landfill and containment of dioxin-contaminated soil at this site was also a significant project achievement, as it helped address one of the top three dioxin hotspots in the country.

The most significant project activities conducted were at Bien Hoa and Phu Cat, including the construction of interim mitigation measures and awareness raising programmes to reduce local communities' exposure to dioxin. The impact and benefit to these two areas in terms of PCDD/F source reduction, and the implications for improved environmental and human health in Bien Hoa and Phu Cat, are discussed in the following section.

Table 2 Summary of key dioxin project activities completed, impacts and benefits, and limitations.

# From Log Frame	Activity	Work Completed	Impacts & Benefits	Limitations
<p><u>Output 1.1</u> Containment/remediation targets and remediation strategy for each hotspot completed</p>	<p>Phu Cat landfill planning, design and implementation completed.</p> <p>Development of the Remediation Master Plan for Bien Hoa.</p> <p>Treatment of dioxin-contaminated areas in Da Nang is underway with USAID support.</p>	<p>Meetings with stakeholders (including Office 33, the Project Management Unit, UNDP and MOD) were held to obtain agreement on objectives, key activities and solidify support from stakeholders on the Bien Hoa Master Plan, Phu Cat Airbase landfill and Da Nang remediation. The Master Plan for Bien Hoa Airbase has been completed. The Phu Cat landfill has also been completed, and Da Nang remediation is underway.</p>	<p>Collaboration between various authorities, experts and international funders enhanced through holding meetings, workshops and knowledge sharing. Improvements to these collaboration methods were facilitated by local and international experts.</p> <p>Contributed to the development of project implementation and planning activities (e.g., remediation and monitoring) at all three airbases.</p>	<p>Phu Cat monitoring requires full implementation. Treatment of soil required in future.</p> <p>Bien Hoa environmental and social impact assessment will need to include extensive additional sampling to characterize all hotspots and to develop a detailed remediation plan.</p>
<p><u>Output 1.3</u> Spatial delineation of heavily contaminated areas, based on supplementary sample analysis including newly identified areas at Phu Cat and Bien Hoa</p>	<p>Identification and delineation of the contaminated sites from surveys conducted in 2012 and 2013 in Bien Hoa and Phu Cat.</p>	<p>Bien Hoa: A total of 111 samples, including 81 soil samples (57 surface soil samples and 24 core samples), 29 sediment samples (22 surface samples and 7 core samples) and one blank sample collected at 87 locations from two main areas at the border areas of Pacer Ivy, near the Dong Nai River. In 2012 and 2013, an additional 155 samples were collected by the project.</p> <p>Phu Cat: 87 samples collected and analyzed.</p>	<p>Improved understanding of contaminated areas.</p> <p>Updated maps and GIS data of known contaminated areas shared with Office 33, MOD and USAID (note: maps and GIS data were unavailable for review during this evaluation).</p> <p>Contributed to development of remediation and monitoring planning activities.</p> <p>Contributed to development of Bien Hoa Remediation Master Plan.</p> <p>Improved understanding of contaminated areas through sampling and analysis and mitigation measures developed.</p>	<p>Extent of dioxin contamination at Bien Hoa may extend to other areas not yet sampled. Contamination is likely widespread, based on the fact that Bien Hoa was the largest Ranch Hand airbase, and access to some sampling locations was limited (for security reasons).</p> <p>Additional surveys are required to characterize all potential dioxin contaminated areas on the airbase.</p>

Table 2 (Cont'd.)

# From Log Frame	Activity	Work Completed	Impacts & Benefits	Limitations
<p><u>Output 1.4</u> Pilot scale demonstration of remediation technology for potential use at Bien Hoa and/or Phu Cat.</p> <p><u>Activity 1.4.1</u> Demonstration of MCD™ technology</p>	<p>MCD™ trials conducted at Bien Hoa.</p> <p>Training and technology transfer provided to government staff and local authorities on potential remediation technologies.</p>	<p>Result 1: Completion of fabrication and installation of the dioxin remediation facility at Bien Hoa Airbase.</p> <p>Result 2: Prepare for the technology evaluation and information sharing workshop in January 2013 and the international workshop in December 2013.</p> <p>Result 3: Technology preparation and demonstration.</p> <p>Result 4: Sampling for analysis to evaluate technology efficiency.</p> <p>Result 5: Arrange an inter-ministerial supervision visit to the demonstration site at Bien Hoa Airbase.</p> <p>Result 6: Complete demonstration activities and reinstate the site for Bien Hoa Airbase.</p>	<p>Improved understanding of the effectiveness and limitations associated with the MCD™ remediation technology.</p> <p>Increased communication and collaboration between various government stakeholders at local, provincial and national levels.</p> <p>Improved understanding amongst government representatives of the issues and requirements for managing dioxin remediation activities (e.g., project planning, stakeholder engagement, sample collection and analysis, monitoring and evaluation, financing, etc.).</p> <p>Two technical staff trained on in-country aspects of MCD™ equipment assembly, operation and dismantling.</p> <p>19 government representatives and academic institutions trained.</p> <p>71 participants attended the technology evaluation and information sharing workshop in January 2013, including 25 government representatives.</p> <p>Over 70 participants at the international workshop in December 2013.</p>	<p>Remediation technology short list yet to be finalized for Bien Hoa and Phu Cat.</p>

Table 2 (Cont'd.)

# From Log Frame	Activity	Work Completed	Impacts & Benefits	Limitations
<p><u>Output 1.5</u> 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 on USAID financing.</p> <p><u>Output 1.6</u> Monitoring systems operational at all hotspots to ensure performance measurement against containment and remediation goals as applicable.</p>	<p>The completion of interim measures (landfill) to prevent dioxin release to the area surrounding Phu Cat airbase in 2013.</p> <p>The completion of interim measures to prevent dioxin release to areas surrounding Bien Hoa airbase in early 2014.</p>	<p>Technical design, environmental impact assessment and project document preparation for civil works in Phu Cat.</p> <p>Completed the landfill for dioxin contaminated soil with over 7,500 m³ of contaminated soil contained in a secure facility.</p> <p>Design for construction of the interim measures approved.</p> <p>Output 1.5 I. Task I (completed) More than 100,000 m³ of dioxin contaminated soil at Bien Hoa's Pacer Ivy area in the southwest part of the airbase has been isolated using a ditch line and water separation wall, preventing surface runoff from running across the contaminated area and allowing secondary contamination to spread. Construction began in March and was completed in September 2013.</p> <p>A stockpile of 5,680 m³ of contaminated soil was contained at Bien Hoa Airbase.</p> <p>Implementation of health and safety plans to ensure health and safety of work crews during all containment work.</p> <p>II. Task II: Additional surveys discovered a total of 16 contaminated lakes. Approximately 73,000 m³ of sediment requires remediation.</p> <p>Interim mitigation measures include:</p> <ul style="list-style-type: none"> ▪ Excavation and transportation of contaminated soil; ▪ Embankments installed around Lakes 3 and 4; ▪ Fencing around Mr. Binh Lake; ▪ Berms constructed in areas surrounding Lakes 3 and 4, Mr. Binh Lake and Triangular Lake to facilitate sedimentation and prevent runoff; ▪ Excavation of lakes in the northwest; ▪ Construction of the inlet system and an overflow dam to retain runoff; and ▪ Overflow dam at gates 1 and 2 in the northeast to retain runoff and promote sediment settlement. 	<p>Spread of dioxin contamination has been reduced at Bien Hoa (104,400 m³ isolated) and Phu Cat (more than 7,500 m³ contained).</p> <p>Dioxin treatment using IPTD technology currently being implemented at Da Nang with USAID support.</p> <p>Reduced dioxin exposure for approximately 47,000 local residents in Phu Cat and 120,000 local residents in Bien Hoa through completion of containment activities.</p> <p>Containment activities completed to date contribute to solidifying estimates for future remediation and monitoring planning through a better understanding of current contamination levels.</p> <p>Contributed to planning for remediation and monitoring activities (e.g., Bien Hoa Remediation Master Plan). This will be conducted under the environmental impact assessment for Bien Hoa being prepared by USAID.</p>	<p>Additional contaminated areas in Bien Hoa may be present, which need to be assessed and remediated.</p> <p>Access to lakes for fishing by local people may still occur in Bien Hoa and Phu Cat.</p> <p>Additional monitoring is required, including full implementation of monitoring plans established by the Czech Republic (including sampling of groundwater and soil in the landfill area and downstream areas).</p> <p>Treatment options at Bien Hoa require refinement. A number of different technologies may need to be employed and further testing may be required.</p> <p>Treatment of contaminated soil at Phu Cat will be required in future, as a landfill's life-span is commonly 30-50 years.</p>

Table 2 (Cont'd.)

# From Log Frame	Activity	Work Completed	Impacts & Benefits	Limitations
		<p>Output 1.6 The monitoring plan has been handed over to MOD by the Czech Republic Development Agency.</p>		
<p>Output 2.3 Public environmental awareness, information and education programmes implemented.</p>	<p>Awareness raising for airbase workers and communities near Bien Hoa Airbase, including public meetings and distribution of information on reducing dioxin exposure.</p> <p>Training for community leaders and media on effective information dissemination.</p> <p>Awareness raising for students, including development of curricula related to dioxin issues.</p> <p>Development of scientific publications, leaflets, brochures, and videos related to the dioxin issue in Viet Nam.</p>	<p>Government and local organization representatives participated in communication training and strategy.</p> <p>Mass media briefing conducted.</p> <p>Airbase workers and residents of wards near Bien Hoa provided with awareness-raising information on how to reduce dioxin exposure.</p>	<p>380 government and local organization representatives attended the training sessions and meetings during the communication strategy implementation.</p> <p>34 reporters participated in the mass media briefing.</p> <p>Improved community awareness of reducing risks of dioxin exposure:</p> <ul style="list-style-type: none"> ▪ Residents living in sections of four wards (Quang Vinh, Buu Long, Tan Phong, and Trung Dung) surrounding Bien Hoa Airbase received leaflets; ▪ Improved awareness in government workers living in and around Bien Hoa Airbase was confirmed through interviews; ▪ Posters displayed in public areas and broadcasts via the local radio systems; ▪ 1,206 pupils at Hung Vuong, Tran Hung Dao and Tan Buu secondary schools received communication materials through curricula (education, biology, chemistry, geography, etc.) and from communication materials (posters, communications cards, timetables); ▪ 1,200 staff working at Bien Hoa Airbase were provided with posters and leaflets by the project. 	<p>A communication strategy should have been developed from the outset, with a roadmap for dissemination of information in a timely manner.</p> <p>Limited baseline data available.</p> <p>Limited public consultation or awareness raising conducted in Phu Cat.</p> <p>Limited involvement of Phu Cat DONRE in project activities, including awareness raising.</p> <p>A number of lakes (e.g., Z1 Lake and Gate 2 Lake) in Bien Hoa currently do not have warning signs.</p>

Table 2 (Cont'd.)

# From Log Frame	Activity	Work Completed	Impacts & Benefits	Limitations
<p><u>Output 2.1</u> Overall land use plan (including zoning) and an action plan for environmental recovery in each of the affected areas, based on environmental impact assessment recommendations completed.</p> <p><u>Output 2.2</u> Environmental recovery action plans and other land use measures in and around each of the three hotspots implemented.</p> <p><u>Output 3.1</u> National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and/or human dioxin tolerable daily intake (TDI) applicable to general population and vulnerable populations developed and adopted.</p>	<p>Land use plans developed in collaboration with MOD.</p> <p>Supported the Government on studies and issued dioxin guidelines for different land use purposes.</p> <p>Developed a set of regulations on dioxin emissions from other industries. The following was conducted:</p> <p>(1) Collected data/information on dioxin emissions from various industries;</p> <p>(2) A comprehensive assessment report on dioxin contamination from industrial sources completed.</p>	<p>Workshops held to contribute to land use planning for Bien Hoa Airbase.</p> <p>Workshops held to share Bien Hoa contamination analyses results with MOD.</p> <p>3.1.1 The final report on TDI and dioxin levels in a number of food items has been completed</p> <p>3.1.2 Dioxin standards on ambient air and water concentrations have been proposed.</p> <p>3.1.2 Developed dioxin emission standards in soil, sediment, air and water at remediation sites and for selected industries.</p> <p>MONRE prepared dioxin emission guidelines for the ambient air and water discharged from dioxin remediation facilities (TCVN 9737: 2013 - Dioxin discharge standards from the treatment activities for the dioxin contaminated sites).</p> <p>Developed by the project and issued:</p> <ul style="list-style-type: none"> ▪ TCVN 8183:2009 establishing action level of dioxin in soil and sediment for hotspots; ▪ TCVN 9737:2013 on dioxin discharge standards from treatment activities for the dioxin contaminated site. <p>Supported by the project:</p> <ul style="list-style-type: none"> ▪ QCVN 45:2012 National technical regulation on allowed limits of dioxin in soil. <p>Proposed by the project:</p> <ul style="list-style-type: none"> ▪ A regulation on allowed limits for emission from industrial sources. 	<p>Future land use plans for airbases contain information essential for effective remediation planning. For example, there are plans for potential commercial enterprises to be constructed on Bien Hoa Airbase. Future land use is important for determining acceptable dioxin contamination levels.</p> <p>Strengthened regulatory environment guiding dioxin remediation targets, discharge limits and industrial emission limits.</p> <p>Guidelines for dioxin emission from other industrial areas developed.</p> <p>Improved understanding of TDI was gained by national organizations and experts working on the TDI report.</p> <p>Establishment of clean-up standards and guidelines for dioxin at hotspots was essential for providing national and international organizations with criteria for developing clean-up goals.</p>	<p>Land use plans remain with MOD and are not publicly available.</p> <p>Lack of information and centralized dataset for existing dioxin emissions throughout the country.</p> <p>A limited number of industries were sampled due to resource constraints.</p> <p>Lack of budget and resources to effectively monitor industrial dioxin emissions.</p>

Table 2 (Cont'd.)

# From Log Frame	Activity	Work Completed	Impacts & Benefits	Limitations
<p><u>Output 3.2</u> Capacities of Office 33 for coordination, fund mobilization, dioxin contaminated site identification/ inventories, dioxin database operation and experience sharing at all levels, including international cooperation, strengthened.</p> <p><u>Output 3.3</u> 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.</p>	<p>Establishment of an effective Project Management Unit for overall project implementation.</p> <p>Providing capacity building on dioxin management for government staff, MOD and local organizations.</p> <p>Key researchers and government staff trained on dioxin assessment, field sampling and laboratory analysis.</p> <p>Establishment of laboratories capable of analyzing dioxins to international standards.</p> <p>Participation in international conferences where dioxin project work was presented to a global audience.</p> <p>Training and capacity building in use of dioxin treatment technologies, including IPTD and MCD™.</p>	<p>3.2.1 Completed additional survey for suspected site of dioxin contamination in Dong Nai Thuong Commune, Cat Tien District, Lam Dong Province.</p> <p>3.2.1 Completed digitalization of the surveyed area in Cat Tien.</p> <p>3.2.1 Updated all available data onto the system, and maintained the system.</p> <p>3.2.2 Arranged short-term courses including effective presentation skills, management and leadership skills development, project management skills, project report and results analysis, and procurement courses.</p> <p>3.2.3 Successfully arranged the session “AO/dioxin in Viet Nam” at the 32nd international symposium on dioxin in Australia.</p> <p>Successfully organized the session “AO/dioxin in Viet Nam” at the 33rd international dioxin symposium in Korea – attended by more than 20 Vietnamese delegates.</p> <p>3.3 Training for technology transfer for dioxin remediation: the MCD™ technology.</p>	<p>Information related to existing contaminated areas is now centralized at Office 33. The database contains analytical results for soil, sediment, groundwater, human tissue and fish tissue samples.</p> <p>Strengthened Vietnamese capacity for sampling and monitoring of dioxin contaminated materials is evidenced by attendance at training programmes and participation in sampling programmes.</p> <p>Strengthened Vietnamese capacity for effective project management, communication and project reporting is evidenced by contributions to project reports.</p> <p>Increased collaboration between Vietnamese and international dioxin specialists through meetings, training, workshops and monitoring programmes.</p> <p>Strengthened Vietnamese capacity for conducting scientifically defensible technology trials.</p>	<p>Dioxin database requires dissemination.</p> <p>ISO certification required for Vietnam-Russia Tropical Centre laboratory.</p>
<p><u>Output 3.2</u> Capacities of Office 33 for coordination, fund mobilization, dioxin contaminated site identification/inventories, dioxin database operation and experience sharing at all levels, including international cooperation, strengthened.</p> <p><u>Activity 3.2.1</u> Identify and survey other sites with possible dioxin contamination nationwide, step by step complete the national database on dioxin.</p>	<p>Participation in numerous international and national meetings (e.g., Joint Advisory Committee meeting and dioxin conferences) with scientists and donor organizations.</p> <p>Surveys conducted in other suspected dioxin hotspots in Viet Nam.</p>	<p>Side event held by Vietnamese delegates at the 33rd international dioxin symposium in Korea (2013) and publications disseminated in order to share new knowledge.</p> <p>Analysis results for Dong Nai Thuong Commune, Cat Tien District, Lam Dong Province (surveyed and analyzed in October 2012) and two other airfields surveyed in November 2013, Pleiku Airbase, Gia Lai Province, and Vam Cong Airfield, Long Xuyen City, An Giang Province, completed in 2014.</p>	<p>Improved understanding of other potential dioxin contaminated areas in Viet Nam.</p> <p>Contributed to development of remediation and monitoring planning activities.</p> <p>Improved Vietnamese capacity for planning and implementation of field sampling programmes.</p> <p>Improved coordination with USAID and other international donors involved in dioxin remediation efforts.</p>	<p>Funding for complete remediation of Phu Cat and Bien Hoa airbases is required.</p> <p>Additional hotspots may exist in Viet Nam which have not been surveyed, including former US military installations.</p>

3.2 PCDD/F SOURCE REDUCTION AND ASSOCIATED BENEFIT TO HUMAN HEALTH AND THE ENVIRONMENT

3.2.1 AMOUNT OF DIOXIN CONTAMINATED MATERIALS

As per the GEF project inception report, “a base level of 1,700 g I-TEQ dioxin was recommended as a containment/remediation target. This amount is considered to have a near-term ecological health threat. The amount actually eliminated (destroyed) at Da Nang was 1,000 g I-TEQ.” The inception report also stated: “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 and destruction technology at Da Nang, and what destruction contribution the GEF-funded technology demonstrations may make”.

As part of the dioxin project, an assessment was made of dioxin contamination at both Bien Hoa and Phu Cat airbases (UNDP 2012a). This information was used to characterize the current extent of contamination at both sites, and to determine and identify interim mitigation measures to be implemented. Sampling programmes focused on the main hotspots at Bien Hoa (e.g., the Pacer Ivy area), as well as areas outside the airbase. At Phu Cat airbase, the key Z3 hotspot area was characterized, and sampling was also conducted at downstream Lakes A, B and C, into which drainage flows from the airbase (UNDP 2012b; UNDP 2011; UNDP 2009). Given the contamination levels recorded at these sites, remediation through construction of a landfill at Phu Cat and interim containment measures at Bien Hoa were priority activities under the project.

Estimates of dioxin contaminated soil and sediment to be remediated at Bien Hoa were developed as part of the Bien Hoa Master Plan (UNDP 2013a), and are presented in Table 3 and Table 4.

Table 3 Estimates of known areas of contaminated soil volume at Bien Hoa Airbase (UNDP 2013).

Location	Estimated Area (m ²)	Estimated Depth (m)	Estimated Volume (m ³)
Z1 Area	49,000	0.4 to 2	94,800
Southwest Area	10,000	0.4	4,000
Pacer Ivy Area	115,000	0.6 to 1.2	102,000
Total	174,000	—	200,800

Table 4 Estimates of known areas of contaminated sediment volume at Bien Hoa Airbase (UNDP 2013).

Location	Estimated Area (m ²)	Estimated Thickness (m)	Estimated Volume (m ³)
Lake 1 in Z1 Area	6,000	0.4	2,400
Lake 2 in Z1 Area	20,000	0.4	8,000
Gate 2 Lake	12,000	0.4	4,800
Pacer Ivy Lakes	35,000	0.4	14,000
Total	73,000		29,200

Estimates of soil and sediment volumes remediated at Phu Cat are provided in Table 5 below.

Table 5 Estimates of known areas of contaminated soil volume at Phu Cat Airbase.

Location	Estimated Area (m ²)	Estimated Volume (m ³)
Z3 Storage Area:		
- Loading Area		
- Perimeter Area	30,000	6,000
- Washing Area		
New Area (north of Z3)	1,000	1,500
Total Contained in Landfill	31,000	7,500

Additional estimates of contaminated soil and sediments present at Bien Hoa Airbase, from the taxiway and end of runway near the Pacer Ivy area, as well as from lakes in the north-east and north-west of the Airbase were also developed by UNDP (2013b and 2014b; see Table 6). Soils from the taxiway and end of the runway were subsequently excavated and placed in the Pacer Ivy containment area as part of interim mitigation measures developed under the dioxin project (UNDP 2014b).

Based on the estimated volumes of contaminated soil and sediment and the average dioxin concentrations (ppt TEQ, derived from a variety of sources), an estimate of the total mass of dioxins (g I-TEQ) in the three hotspots was undertaken (Table 6). It is important to note that these are rough estimates and are subject to a number of uncertainties and assumptions. These include: dioxin concentrations at all three hotspots vary from non-detectable levels to several hundred thousand ppt, depending on sampling media and location; dioxin concentrations also vary with depth, and most samples used in the calculations were from surface layers (0-30 cm); there are other potential areas of dioxin contamination at Bien Hoa which have not been assessed (these will be determined during the ongoing environmental assessment activities at Bien Hoa being conducted by USAID); and, exact volumes of contaminated soil and sediment have not been determined (and will not be fully known, even in the case of Da Nang, until excavation and confirmation sampling has been completed).

Based on our estimates, a total of approximately 26,943 g I-TEQ (~27 kg) of dioxin is present in the soil and sediment in the Bien Hoa, Da Nang and Phu Cat hotspots (Table 6). Approximately 104,400 m³ of contaminated materials have been contained through the interim mitigation measures constructed in the Pacer Ivy area at Bien Hoa Airbase, representing 3,229 g I-TEQ; an additional 5 g I-TEQ in taxiway soils was also contained. The 7,500 m³ of dioxin-contaminated materials contained in the landfill at the Phu Cat airbase represent approximately 463 g I-TEQ (or, ~0.5 kg). Dioxin remediation efforts at Da Nang will result in the destruction of approximately 5,334 g I-TEQ, assuming the IPTD technology is successful. The Bien Hoa landfill, constructed by MOD in 2009, is estimated to contain approximately 17,857 g I-TEQ, which is by far the largest single contributor to the total dioxin mass calculations presented here.

Therefore, the remediation efforts ongoing at the three sites, including interim measures at the Pacer Ivy area in Bien Hoa (including taxiway soils), the Phu Cat landfill and IPTD treatment at Da Nang, are expected to result in partial or complete PCDD/F reduction of approximately 9,031 g I-TEQ. The total for Bien Hoa and Phu Cat combined (contained dioxin) is approximately 3,697 g I-TEQ, or approximately double the original estimated 1,736 g I-TEQ envisioned under the dioxin project. When Da Nang IPTD remediation (destroyed dioxin) is included, the total amount of dioxin contained and/or eliminated is five times the original estimated under the project. These are significant amounts of dioxin which are being treated or contained, and this will help prevent contamination migration and reduce the future risk of dioxin exposure for local communities.

Table 6 Estimated dioxin mass (g I-TEQ) in soil and sediment at Bien Hoa, Phu Cat and Da Nang

Site	Estimated volume of contaminated soil (m ³)	Ave. dioxin concentration (TEQ ppt) in soil	Estimated dioxin mass in soils (kg of TEQ)	Estimated volume of contaminated sediment (m ³)	Ave. dioxin concentration (TEQ ppt) in sediment	Estimated dioxin mass in sediment (kg of TEQ)	GRAND TOTAL Estimated amount of dioxin in soil and sediment (g I-TEQ)
Bien Hoa							
Z1 Area	94,800	115,000	17.847	15,200	558	0.010	17,857
SW Area	4,000	2,965	0.019				19
Pacer Ivy Area	102,000	19,185	3.203	14,000	1,577	0.026	3,229
Taxiway and End of Runway	2,400	1,179	0.005				5
NW Airbase (Double Lakes)				8,011	417	0.004	4
NE Airbase (Triangular Lakes)				22,582	684	0.018	18
Mr. Binh Lakes				4,538	1,682	0.009	9
Mr. Quy Lakes				7,890	570	0.005	5
Total Bien Hoa	203,200		21.074	72,221		0.072	21,146
Phu Cat Landfill	7,500	37,710	0.463	NA	NA	NA	463
Da Nang	58,126	55,605	5.291	74,256	502	0.043	5,334
GRAND TOTAL			26.828			0.115	26,943

NA = Not Applicable

Assumes soil densities = 1,637 kg/m³ and sediment densities = 1,155 kg/m³ based on Da Nang remediation data (USAID 2010)

Average dioxin concentrations calculated from data provided in UNDP & GEF dioxin project reports and previous studies conducted by UNDP, 10-80 Division, Office 33, VRTC, MOD, USAID and Hatfield Consultants (see references). Sediment and soil volumes for Bien Hoa Airbase taxiway and lakes taken from UNDP 2013b and UNDP 2014b.

3.2.2 POPULATIONS AT RISK AND DIOXIN EXPOSURE PATHWAYS

The city of Bien Hoa, located in Dong Nai Province, has a population of approximately 870,000 people, with approximately 120,000 people living on and in the immediate vicinity of the airbase. Until recently, people were harvesting fish, ducks and other aquatic animals from various lakes and ponds within the airbase, and agricultural activities were also conducted throughout the airbase. These observations, combined with a relatively high population density, has resulted in an assessment that dioxin contamination in the Bien Hoa area poses a significant risk to human and ecological health. Risk to human health as a result of consumption of dioxin-contaminated fisheries and aquatic resources has been well documented through dioxin project reports and previous studies (see Durant et al. 2014).

Updated estimates of the potential population at risk of dioxin exposure at Bien Hoa and Phu Cat airbases were determined during this study from interviews with ward and district leaders. Based on current estimates, over 120,000 people residing in wards near Bien Hoa Airbase and 47,000 persons near Phu Cat Airbase are potential beneficiaries of reduced dioxin exposure from activities conducted as part of the dioxin project (see Table 2).

The historical dioxin contamination at the Bien Hoa and Phu Cat airbases, coupled with the close proximity of large numbers of airbase and city residents to the areas of dioxin contamination, poses a risk to human health. Access controls, containment and/or remediation is therefore required to protect human health and the environment.

The following points include the general accepted understanding of dioxin transport and exposure routes at and around the three key hotspots of Bien Hoa, Da Nang and Phu Cat.

- The historical use of Agent Orange and other herbicides at the airbases resulted in surface spills and releases, whereby contaminants came into direct contact with soil, concrete and other materials.
- When released, these extremely hydrophobic compounds became associated with the organic fractions of airbase soil and sediment.
- The contaminated soil and sediment was then subjected to various physical and anthropological transport mechanisms, including rain, surface water flow, wind-induced erosion and sedimentation, and disturbances associated with various land uses (e.g., agriculture, aquaculture and construction).
- The combined effect of these transport processes is very significant heterogeneity in contaminant distribution at the airbases.
- Although dioxins do not volatilize, contaminants present in airborne soil, dust and ash can result in human exposure via inhalation.
- Contaminants present in sediment and soil can also complete exposure to human and ecological receptors via direct dermal contact.
- The contaminants are also integrated into the ecosystem via natural biological processes (e.g., respiration) and aquaculture.

- Once integrated into the food chain, exposure occurs to human and ecological receptors via ingestion. According to synthesis reviews of dioxin and exposure and health datasets from various parts of the world by AEA Technology (1999) and Srogi (2008), consumption of dioxin-contaminated food accounts for more than 90 per cent of the human exposure to dioxins in the general population. This is likely to also be the case with respect to dioxin contamination at the airbases.
- The lipophilic properties of dioxin cause bioaccumulation and exposure to those who consume contaminated food sources.

3.2.3 INTERIM MITIGATION MEASURES

3.2.3.1 Bien Hoa

Several temporary or interim measures have been implemented at the Bien Hoa Airbase to reduce the risk of exposure to high levels of dioxin under the dioxin project and interventions completed by MOD. These measures include the construction of the Z1 landfill, implementation of surface water controls to manage stormwater that could come in contact with contaminated soil or sediment, erection of fencing and warning signs near lakes to deter access and fishing, fishing bans and communication programmes providing dioxin information.

As part of the dioxin project mitigation measures were initially proposed in 2012 to achieve the following three goals:

- Minimize runoff into the contaminated area;
- Prevent flow from the contaminated area to the surrounding uncontaminated areas; and
- Flow through the contaminated area to be retained for settlement of potentially contaminated suspended particles before being discharged.

A network of diversion ditches and culverts have been constructed around 10,000 m² of contaminated land in the Pacer Ivy area. Five hundred and fifty (550) meters of ditches divert water runoff from flowing into contaminated areas and is instead directed to the Dong Nai River and northeast of the airbase, reducing the potential for spreading dioxin contamination. Barriers that are 30 cm high have been constructed along the lower elevation edge of the ditches to prevent overflow into contaminated areas. Engineers have observed that the highest water levels in these ditches during the rainy season reached 80 per cent capacity (Tran Duc Hung, personal communication, June 26, 2014).

Runoff which originates from within the Pacer Ivy area is contained by a 280 m long, 50 cm high retaining wall. Pre-existing ponds within the Pacer Ivy area are used to store this runoff, with an overflow settling pond immediately adjacent to be used during high rainfall events (Tran Duc Hung, personal communication, June 26, 2014).

Three hundred (300) m³ of contaminated materials have been excavated from outside of the isolated Pacer Ivy area and 2,100 m³ from the taxiway, and have been hauled to a stockpile in the Pacer Ivy area. Contaminated materials are separated from the environment and from adjacent soils by 1 mm geotextiles. A 10 cm layer of clean soil has been installed on top of the stockpile and vegetation planted.

Additional interim measures constructed and implemented under the dioxin project have been instrumental in containing contamination and helping to prevent local communities from consuming potentially contaminated foods. These measures include:

- Triangle Lake – before remediation, contaminated sediments and water from the eastern runway flowed into this lake and then eventually out the western end of the airbase. An embankment now contains this water to prevent it from leaving the airbase.
- Eastern Lake – two overflow walls were constructed to contain the sediment and water in the lake and prevent it from flowing out of the airbase. A sediment trap was also constructed.
- Signage to warn airbase personnel and local communities of the potential danger from fishing in airbase lakes (a total of eight signs):
 - Northeast area – Triangle Lake, Eastern Lake and a third lake;
 - Pacer Ivy area – three signs: one at Lake 3-4 and another one at the lake within the Pacer Ivy area. The third is placed beside the Pacer Ivy area;
 - Northwest Lake – one sign;
 - Mr. Binh Lake (north area) – one sign.

(No signage was posted at the Z1 Lake or at Gate 2 Lake)

A groundwater monitoring programme has been implemented as part of a long-term monitoring plan designed for the Bien Hoa Airbase with development assistance provided by the Czech Republic (Dekonta 2014). Four monitoring wells were installed around the perimeter of the landfill (one upgradient and three downgradient).

3.2.3.2 Phu Cat

Interim remediation efforts implemented at Phu Cat included a landfill which contains approximately 7,500 m³ of contaminated soils and sediment excavated from the former storage area and interim sediment treatment facility. As a part of the dioxin project, representatives from the Ministry of Science and Technology, MONRE, international organizations and experts in the field of dioxin remediation shared their knowledge with the construction contractor and the Project Management Unit with respect to design and construction of the landfill. The landfill was designed and constructed to national and international standards for hazardous waste containment.

The landfill was excavated to a depth of 3.7 m, covers an area of 45 m² and is filled to a height of 2.5 m above ground. The sides of the landfill are sloped at a 1:3 ratio to prevent slipping. Foundational layers for the landfill include a separation layer strengthened with clay (bentonite), two layers of high density waterproof membrane, the filtering layers for detecting of leachate from the high density waterproof membrane layer and geotextile layers. The internal walls of the containment area are anchored to ensure that the material was not damaged during the backfilling and leveling of the contaminated soil. Leakage detection pipes and a system of pipes were installed in the center of the landfill to collect accumulated water in the landfill (if any). Water from here is pumped out and directed to the treatment system next to the landfill.

A groundwater monitoring programme was also implemented in Phu Cat in collaboration with the dioxin project; five monitoring wells were installed around the perimeter of the landfill (two upgradient and three downgradient).

3.2.4 BENEFITS TO LOCAL COMMUNITIES THROUGH DIOXIN RISK REDUCTION

Beneficial impacts of the interim mitigation measures implemented at Bien Hoa and Phu Cat through the dioxin project include:

- Containment of dioxin-contaminated soil and sediment at the airbases (3,697 g I-TEQ or approximately double the original estimated 1,736 g I-TEQ envisioned);
- Elimination of the health risk of dioxin exposure through consumption of contaminated fish, dermal contact with contaminated soil and through contaminated airborne particulates;
- Elimination of the environmental risks of dioxin migration through the food chain (including wildlife movement) or through runoff; and
- Improvements in the economic and social security of residents through a reduction in the risk of exposure to dioxin contamination.

In order to ensure that these benefits continue in the long-term, the following is required:

- The bans on fishing and aquaculture at all airbase lakes need to be strictly enforced.
- Additional signage and/or fences should be erected around all of the airbase lakes and offsite lakes with known contamination to deter further fishing and aquaculture.
- Continue with communication programmes and public awareness campaigns to provide information on the status of dioxin contamination, exposure pathways and ways to prevent exposure.
- The Bien Hoa southwest area is the only known contaminated area where interim measures have not been implemented. MOD has indicated that contaminated soil in this area will be excavated, hauled and placed in newly constructed landfill cells near the Z1 landfill within the next few years.
- Perform an assessment of surface water controls constructed at Bien Hoa in 2013 and conduct regular monitoring of the Phu Cat landfill in order to evaluate their effectiveness and, if necessary, implement repairs and/or upgrades.

4.0 DIOXIN PROJECT TESTIMONIALS

The following section presents testimonials from selected individuals in Ha Noi, Da Nang, Bien Hoa and Phu Cat regarding the benefits and impacts of the dioxin project. The information presented was recorded during interviews conducted by the project team in June 2014.

4.1 MS. NONG THI HONG HANH

Deputy Director, International Organizations and INGOs Division, Foreign Economic Relations Department, Ministry of Planning and Investment



**The Seventh Annual Bilateral Joint Advisory Committee Meeting
on Agent Orange/Dioxin, 2012**

“This was an important project for the environment of Viet Nam. Given the sensitivity of the subject, and international and national importance, Office 33 was unique in being able to implement the dioxin project. This is a good lesson learned in terms of partnership at advanced levels.”

Ms. Hanh has many years of experience managing international cooperation projects in Viet Nam and is highly respected for her work with the dioxin project. Her contributions towards achieving project goals and facilitating cooperation between government agencies and international partners, has been crucial to the success of the project.

Facilitating effective cooperation is a difficult undertaking at the best of times. The dioxin project presented a high level of complexity due to the sheer number of partners involved. Partners included national, provincial and district/village governments, NGOs, international donors and international experts in topics such as dioxin evaluation, remediation and impact evaluation. Adding to the complexity are the unique socio-economic, physical and environmental conditions found at each hotspot. Each site required its own approach to address the complex issue of dioxin contamination and remediation.

The Project Management Unit established under Office 33 established close linkages with Ministry of Planning and Investment throughout project implementation. Some lasting benefits that Ms. Hanh believes developed as a result of the cooperation between Office 33 and UNDP include:

- UNDP has encouraged national ownership of the project – Office 33 has developed and strengthened internal capacity for project ownership;
- The Project Management Unit has developed good working relationships with UNDP and with other development partners such as the Czech Republic and USAID;
- As a middle-income country, Viet Nam is in a position to take more of a lead on large projects such as this. The dioxin project has been a good lesson learned in terms of developing partnerships at advanced levels; and
- The level of cooperation with relevant agencies required for the project serves as a good example for future projects in Viet Nam in other sectors.

Ms. Hanh stated that, given the sensitivity of the subject and its international and national importance, Office 33 should be commended for their excellent work with UNDP. Ms. Hanh was impressed not only by the achievements of the project but also by the improved capacity at Office 33 for implementing future projects of equal international and national importance.

4.2 COLONEL THAN THANH CONG

Division Head, Airforce – Air Defence Command, Ministry of Defence

Official, Department of Science, Technology and Environment



Phu Cat Airbase landfill construction, photo taken in 2012



Bien Hoa Airbase interim measures construction, photo taken in 2013

“The Phu Cat landfill and containment measures at Bien Hoa Airbase, through providing interim benefit, were the most significant activities of the project. The dioxin project proved the determination of the Government of Viet Nam, the efforts of local organizations, and the attention and support from international communities in addressing the need for remediation of dioxin contaminated areas.”

Dr. Than Thanh Cong, an official from the MOD’s Department of Science, Technology and Environment, played a key role in the success of the dioxin project. According to Dr. Cong, the

most beneficial impacts of the project are the Phu Cat landfill and the interim measures at Bien Hoa. The completion of the Master Plan and estimated budget for remediation of Bien Hoa Airbase is also very important. As a result of this Master Plan, commitment has been received from USAID to conduct an environmental assessment at Bien Hoa – taking Viet Nam one step closer to remediating the site. Also of benefit has been the improved understanding gained from remediation technology demonstrations, which have helped to evaluate possible approaches for future remediation.

In addition to the main achievements, Dr. Cong identified a number of benefits for many of the stakeholders involved with the project, including:

- Management organizations – such as the Department of Military Science and Technology under the MOD – have gained a better understanding of how to conduct dioxin monitoring activities in contaminated areas;
- Implementing organizations such as the High Command for Chemistry, VRTC and the Institute for Military Science and Technology, have improved their capacities for sample collection and dioxin analyses. Representatives from the MOD also benefited from training on dioxin sample collection and analyses. Sampling and analysis equipment and monitoring wells were handed over to the MOD to help with future monitoring programmes;
- Local and national staff from relevant agencies (including Office 33) participated in international dioxin conferences, helping to improve Vietnamese capacity to deal with dioxin related issues; and
- Collaboration amongst and between relevant Vietnamese agencies and international experts has been strengthened.

Thanks to this project, there is a heightened level of commitment and interest from the MOD in dealing with the dioxin issue, and there are now staff from Air Force/Air Defence Command who specialize in the dioxin issue. Previously, the military dealt only with security on the base, but they now have trained personnel who can assist with dioxin sampling and assessment.

4.3 MS. VO NIEM TUONG

Director, Department of Environment Protection, Dong Nai DONRE

“Dong Nai leaders shifted from thinking that information provided about dioxin would only serve to cause anxiety and impact socio-economic investments and tourism to recognizing the benefit of information for the public; leaders are now investing in dioxin monitoring.”

Ms. Vo Niem Tuong, Director of the Department of Environment Protection, Dong Nai DONRE, played a key role in the successful implementation of the dioxin project. Several activities run by the project were conducted by her organization, including conferences, awareness raising workshops, sample collection training courses and sharing data on dioxin monitoring.

During her time with DONRE in Bien Hoa, Ms. Tuong has witnessed much-needed changes of perception, increased knowledge, heightened investment in the dioxin issue and much greater staff capacity.

A budget of 20 billion VND has been allocated for environmental monitoring in Dong Nai Province, of which 2 billion VND is dedicated to annual dioxin monitoring. Dioxin monitoring results are now released publically by DONRE in consultation with provincial leaders, local people have a right to know about dioxin in their communities, and DONRE has made significant advances in raising public awareness on the issue.

Ms. Tuong identified the following benefits of the dioxin project:

- The project has helped prevent the spread of dioxin from contaminated areas to surrounding communities;
- The project has caught the attention of leaders, departments and local people. Dong Nai has established a Provincial Committee on Dioxin to conduct planning of dioxin-related activities, to consult provincial leaders on dioxin issues and to conduct awareness raising activities;
- Information about existing dioxin contamination and exposure prevention has been disseminated to local communities, with significantly improved understanding of the dioxin issue as a result; and
- Training on overcoming the consequences of herbicides/dioxins in Viet Nam offered by the project has improved the capacity of DONRE in dioxin sample collection.

4.4 TAN PHONG COMMUNE

A commune nearby Bien Hoa Airbase



Citizens in Tan Phong Commune participate in a communication programme on dioxin exposure prevention organised by the dioxin project, 2013.

Tan Phong is a ward in Bien Hoa city, located to the south of Bien Hoa Airbase. It has 11 residential areas, primarily consisting of military families. The dioxin project has involved local people and authorities in several activities including workshops, communication on the impact of dioxin to the environment and health, and dioxin exposure prevention methods.

Before 2009, Bien Hoa Airbase did not have a secure fence between the base and residential areas. People could access the airbase to conduct agricultural activities, fish and collecting other food from lakes on the airbase. After receiving information on dioxin contamination from the project, agricultural activities and fishing have been forbidden on the airbase. The fence around the airbase helps to restrict access.

Communication activities by the project, implemented in Tan Phong, have resulted in many benefits to local people. People now have a better understanding of the impacts of dioxin on the environment and health. People have accepted and applied exposure prevention methods. A few years ago, people knew little about dioxin, and no one wanted to buy land or houses in this commune. People now understand more about dioxin, so the price of land and houses has increased.

Local authorities have invested in a loudspeaker system, so dioxin information and prevention methods can reach all people. The budget invested in the loudspeaker system totaled 200 million VND and was supported by enterprises located in Tan Phong Ward. Communication activities on dioxin help local people receive adequate information on dioxin and apply suitable exposure prevention methods.

4.5 MR. DAM THE SUU AND MRS. PHAN THANH HA

A household near the airbase



A local resident reviews communication documents on dioxin exposure prevention as part of the communication programme organised by the dioxin project, 2013

Mr. Dam The Suu and Mrs. Phan Thanh Ha's family live near Bien Hoa Airbase in Residential Area 10. Mr. Suu has worked at the airbase since 1978 and has seen many improvements as a result of the project. He remembers that when he started at the airbase, there were no fences preventing access to the Airbase property. Only a few selected areas were fenced. Community members around the airbase could, and easily did, move freely in and out of the airbase. Mr. Suu remembers many households would supplement their income by growing vegetables on airbase property. Crops included items such as sweet potatoes, peppermint, and water spinach, among others. In fact, growing vegetables was the main source of income for his family at that time. Other

families, including Airbase staff and soldiers, would use ponds in the airbase for aquaculture in order to contribute to their livelihoods.

In 2004, policies were introduced that began limiting agricultural activities in the airbase. Despite losing their income from agriculture, Mrs. Ha and Mr. Suu both recognize their good fortune in protecting their health. They are thankful for having received information as a result of the project's communication activities on dioxin. They, along with their neighbours, now understand the risks to human health associated with dioxin and methods for preventing exposure.

Mrs. Ha has since found alternative employment. She is dedicated to helping others understand dioxin related risks and how to avoid exposure. She collects information materials, particularly about how to prevent exposure, and shares this with her community.

4.6 PHU CAT AIRBASE

"Thanks to the dioxin project, environmental contamination and potential health risks resulting from the release of dioxin are minimized. Soldiers who are working at Phu Cat Airbase and people living in surrounding areas are very happy to know that Phu Cat Airbase has been removed from the list of dioxin hotspots in Viet Nam," Mr. Do Ngoc Tho, Political Division of Phu Cat Airbase.



Phu Cat Airbase landfill, 2013

The Board of Commanders at Phu Cat Airbase includes: Mr. Vu Hung Son, Commander; Mr. Do Ngoc Tho, Political Division; and Mr. Nguyen Van Thanh, Vice-Deputy of the Administrative Section. The airbase maintained an effective working relationship with Office 33 and with the dioxin project in order to facilitate the construction of the landfill and ensure it was in full compliance with national regulations and international standards. After nearly a year working on the landfill, more than 7,500 cubic meters of dioxin-contaminated soil at Phu Cat Airbase have been safely contained in the landfill.

Although Phu Cat Airbase is a military area, the landfill prevents the migration of dioxin to surrounding areas and significantly reduces the risk of exposure to the local population. Staff who are responsible for monitoring the landfill have reported no serious incidents or issues in the excavated areas.

With the support of the Czech Republic and Office 33, Air Defence staff have received training on dioxin monitoring and are now capable of conducting additional dioxin monitoring activities.

4.7 DONG NAI DIOXIN VICTIMS ASSOCIATION

Thanks to the dioxin project, local people feel they are living in a safer environment and feel more open to talk about issues related to dioxin.

The Dioxin Victims Association (DVA) in Dong Nai has been involved with a number of the communication activities conducted by the dioxin project. Before the project, local authorities and local people knew very little about dioxin in Bien Hoa, and many people were worried about the issue. Previously, the only information Dong Nai DVA could disseminate was with respect to policies for AO/dioxin victims. Local people now feel that they are living in a safer environment as a result of what they have learned from the dioxin project. The DVA now feel more confident about conducting simple communication activities on dioxin and exposure prevention.

According to the chair of Dong Nai DVA, the communication products produced by the project are diverse and successfully address the information needs of local people. Thanks to these communication activities, local people are more aware of the impacts of dioxin on human health and how to prevent dioxin exposure. Local authorities are also now more open in talking about and dealing with issues related to dioxin.

5.0 OVERALL ASSESSMENT OF THE PROJECT

Based on the review of available project documentation and inputs received from key stakeholders during the site visit to Da Nang, Bien Hoa and Phu Cat in June 2014, an overall assessment of impacts and benefits of key dioxin project activities is provided in Table 7. The overall ranking is based on the assessment criteria presented in Table 1. The overall benefits and impacts of the project are significant, given the project's contribution to reducing dioxin risk at the local level in Bien Hoa and Phu Cat, and to increasing awareness of the dioxin issue at the national and international levels.

The identification and delineation of dioxin-contaminated areas at Bien Hoa and Phu Cat was an essential first step in determining the areas requiring remediation and the interim mitigation measures to be implemented. While considerable sampling had already been performed in previous studies at Bien Hoa, several areas on and around the airbase required additional sampling and analysis to determine the level/concentration of dioxin contamination (i.e., the nature of dioxin contamination) and the lateral and vertical extent of contamination. The work was conducted to an acceptable level of quality and scientific rigour. However, given that more work needs to be done to completely assess the extent of dioxin contamination at Bien Hoa, the overall confidence rating on the data collected is moderate.

The Phu Cat landfill was perhaps the most important component of the dioxin project, given the scale of the activity and the overall impact on the community. Containment of dioxin-contaminated soil in a secure landfill has virtually eliminated the possibility for continued dioxin exposure to the local population. Lakes A, B and C downstream of the airbase have been shown to contain low concentrations of dioxins, and there is therefore likely to be limited or no risk to local people using these lakes. Assuming the landfill continues to be maintained and monitored, controls are already in place to significantly reduce the exposure potential to dioxin contamination (at least for a period of 30+ years, or the life of the landfill). A longer-term solution is still required for Phu Cat though, including ultimate destruction of dioxin-contaminated soil. Additional awareness raising is also required, given that few local residents were aware of the landfill construction and the reduced dioxin exposure risk. This is a success story from the dioxin project, which should be further communicated to local communities.

The Bien Hoa Master Plan was instrumental in helping to define the scale of the dioxin problem at Bien Hoa, as well as the Government's recommended approach to remediation of this site. Recommendations provided in the master plan allowed for the prioritization of activities to be conducted at Bien Hoa, as well as potential remediation technologies which could be applied.

The establishment of dioxin guidelines for different land use purposes was an extremely important component of the project. Due to the complex nature of the contamination issue at different hotspots, a number of dioxin clean-up levels may be used for different contaminated areas, depending on the different current/future land uses. Previously, Viet Nam relied on international guidelines for addressing dioxin-contaminated sites. Now, the country has its own dioxin guidelines, based on internationally-accepted scientific criteria, which the Vietnamese people can use for managing the legacy of AO/dioxin contamination.

Finally, the capacity building and training component of the project was instrumental in helping to improve the ability of Vietnamese scientists, project managers and local authorities to better understand the AO/dioxin issue, and to develop appropriate responses to address the needs of the general public and impacted communities near the main hotspots.

Table 7 Overall assessment of dioxin project impacts and benefits.

Key Activities	Geographic	Duration	Magnitude	Project	Overall	Confidence
Identification and delineation of the contaminated sites from surveys conducted in 2012 and 2013 in Bien Hoa and Phu Cat	Local	Long	High	Positive	Significant	Moderate
Completion of interim measures (landfill) to prevent dioxin release to the area surrounding Phu Cat airbase	Local	Short	High	Positive	Significant	Moderate
The completion of interim measures to prevent dioxin release to areas surrounding Bien Hoa airbase in early 2014	Local	Short	High	Positive	Highly Significant	High
Development of the Remediation Master Plan for Bien Hoa	National	Short	NA	Positive	Moderately Significant	High
Support to the Government on studies and dioxin guidelines issued for different land use purposes	National	Long	High	Positive	Highly Significant	High
Provision of capacity building on dioxin management for government staff and others	National	Long	High	Positive	Significant	Moderate
Meeting the overall project objective: <i>to minimize the disruption of ecosystems and health risks for people from environmental releases of TCDD (dioxin) contaminated hotspots</i>	National and Global	Residual	High	Positive	Significant	High

NA = Not Applicable

6.0 CONCLUSIONS AND RECOMMENDATIONS

The overall objective of the dioxin project was “to minimize the disruption of ecosystems and health risks for people from environmental releases of TCDD (dioxin) contaminated hotspots.”

The project was successful in meeting its overall objective, and provided significant benefits to a number of key stakeholders, especially to communities living near the key dioxin hotspots of Bien Hoa and Phu Cat. The risk of dioxin exposure has been significantly reduced in Bien Hoa and Phu Cat through construction of interim mitigation measures, and overall awareness of dioxin exposure pathways has been improved as a result of the project. If the interim mitigation measures operate as intended and continue to be maintained, then controls are already in place to significantly reduce the potential for exposure to dioxin contamination for communities near Bien Hoa and Phu Cat.

The dioxin project's overall impacts and benefits are therefore considered to be significant at the local, national and international level.

Overall project benefits and impacts, as well as recommendations, are discussed below in terms of short-term (<5 years) and long-term (5+ years).

Short-term

A significant reduction in short-term exposure to dioxin contamination for local communities has been a clear result from the dioxin project. The total amount of dioxin contained through the interim measures at Bien Hoa and the Phu Cat landfill is approximately 3,697 g I-TEQ, or roughly double the original estimation of 1,736 g I-TEQ. When Da Nang IPTD remediation (5,334 g I-TEQ dioxin) is included, the total amount of dioxin contained and/or eliminated is five times the original estimated. These are significant amounts of dioxin which are being treated or contained, and this will help prevent contamination migration and reduce the future risk of dioxin exposure for local communities.

To further limit the dioxin exposure potential, strict enforcement of fishing and aquaculture bans should be implemented in Bien Hoa. Additional fencing and warning signs should be placed near contaminated lakes to restrict access for local people near the airbase.

Short- and long-term monitoring of the effectiveness of the Phu Cat landfill and surface water controls at Bien Hoa is required to ensure that contamination does not enter the groundwater (Phu Cat) and sediment and runoff (Bien Hoa).

The involvement of DONRE personnel in Da Nang, Phu Cat and Bien Hoa should be increased, particularly in the monitoring and assessment of dioxin contamination in communities downstream of the hotspots, and in awareness raising and communication activities. This is especially needed in Phu Cat, where local DONRE staff stated that they had limited involvement in dioxin project activities related to the landfill construction and proposed future monitoring plans.

Given the sensitivities of the AO/dioxin issue, additional training and capacity building should be provided to local authorities on appropriate communication methods to local communities. This is especially needed for new migrants to Bien Hoa, Da Nang and Phu Cat who may not be aware of potential dioxin contamination issues in these areas. It is important to provide appropriate information, but also to be selective in order to avoid raising concerns in communities and at the national level.

Additional research on the health issues related to dioxin exposure should be implemented in each of the three hotspots in order to better understand and plan for longer-term impacts from existing exposure. Assistance in the form of vocational training and targeted health care should be provided to victims of dioxin exposure through the Dioxin Victims Associations.

Long-term

Long-term solutions are required to completely destroy or eliminate dioxin risk at both Phu Cat and Bien Hoa. The interim solutions conducted under the dioxin project significantly reduced the potential for dioxin exposure in the short term, but dioxins will remain in the environment until appropriate long-term solutions have been identified. Final remediation objectives for each site should be established, and a list of alternatives proposed. An assessment should then be made on the effectiveness of each alternative to achieve the remediation objectives, the feasibility of implementing each alternative should be evaluated, and an estimate of the cost of each alternative should be developed.

Additional training should be provided on dioxin sampling and analysis, particularly regarding quality assurance and quality control. Although significant training was conducted under the dioxin project, this should be considered a long-term activity, requiring additional financial and technical resources.

Department of Health personnel requested additional assistance for treatment of people with disabilities and other health affects potentially related to AO/dioxin exposure. Support provided by the dioxin project was appreciated, but more needs to be done to assist families with adults and children suffering from disabilities and other ailments.

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8.0 CLOSURE

We trust the above information meets your requirements. If you have any questions or comments, please contact the undersigned.

HATFIELD CONSULTANTS:

Approved by:



March 4, 2015

Thomas Boivin
Project Director

Date

APPENDICES

Appendix A1

Project Log-Frame

PROJECT RESULTS 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					
<u>Objective:</u> 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 m ³ has been identified for dioxin contamination of which 94,000 m ³ has been securely contained in a landfill, 41,500 m ³ remains to be contained in three previously identified areas and at least 40,000 m ³ in a newly identified area requires isolation and future containment. At Phu Cat at least 7,000 m ³ has been identified for dioxin contamination and immediate containment including that in previously identified areas and in a newly identified area.	All pre-identified sub-sites in Phu Cat and Bien Hoa (29,000 m ³ of contaminated soil and sediment under latest estimate) will be securely contained (2013) Newly identified contaminated sub-sites (additional 60,000 m ³ under latest estimation) will have exposure reduction measures taken at Phu Cat and Bien Hoa (2013) All identified sub-sites (61,600 m ³ under latest estimation) will be remediated at Da Nang to concentrations	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.

Result	Indicator	Baseline Value	Target	Means of Verification	Assumptions
		At Da Nang: at least 61,600 m ³ has been identified for dioxin contamination.	less than 1,000ppt and sediment at concentrations less than 150ppt (2013)		
	(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.
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	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	Additional samples collected and analyzed at Phu Cat and Bien Hoa sufficient to support delineation of contaminated	Progress reports; laboratory report; maps; dioxin database	All contaminated sub-sites (areas) accurately identified and captured.

Result	Indicator	Baseline Value	Target	Means of Verification	Assumptions
newly identified areas at Phu Cat and Bien Hoa		<p>identified areas.</p> <p>Contamination delineation generally defined for Z1, drains/wetlands and south runway in Bien Hoa and Z3 in Phu Cat.</p> <p>Spatial delineation at Da Nang now defined for design and remediation purposes.</p>	areas, (2011)		
1.4. Pilot scale demonstration of remediation technology for potential use at Bien Hoa and/or Phu Cat.	(1) Completion of thermal/mechanical remediation demonstration at hot spots	<p>Selection of ISTD/ISPD technology for Da Nang by USAID and completing GVN approvals.</p> <p>Technology for remediation demonstration at Bien Hoa or Phu Cat short list finalized with two top priority technologies including ball milling.</p>	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	<p>Sufficient co-financing from vendors and donors is identified to support/sustain remediation technology demonstrations.</p> <p>Evaluation of on-going bioremediation results at Bien Hoa.</p>
	(2) Completion of Bioremediation demonstration at hot spots	<p>Bioremediation pilot test cell on 3,000 m³ by VAST established at Bien Hoa.</p> <p>Laboratory-scale bioremediation research is undertaken in Da Nang.</p>	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 coordination mechanism functioning at Da Nang based USAID financing.	(1) Percentage of pre-identified contaminated soil contained or remediated in all 3 hotspots	<p>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.</p> <p>No financing yet identified for remediation at Bien Hoa and Phu Cat.</p>	100% of pre-identified contaminated soil and sediment that exceed Vietnamese standard either contained or remediated (2013)	Progress reports; external evaluation report	<p>USAID will secure sufficient funding to complete Da Nang as proposed (by 2013).</p> <p>GVN will backstop any additional costs and streamline its approval process to complete containment as proposed (by 2013).</p>

Result	Indicator	Baseline Value	Target	Means of Verification	Assumptions
		Containment of 94,000 m ³ in a secure landfill for future remediation at Bien Hoa. Hydraulic isolation of previously identified areas at all sites.			
	(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.
Outcome 2: 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	No baseline data available.	Majority of stakeholder population in surrounding	Surveys and interviews.	

Result	Indicator	Baseline Value	Target	Means of Verification	Assumptions
	local communities on and around contaminated sites that support proposed land use plan		communities expresses support to the land use plan (2013)		
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 completed.	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.
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	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	o major immigration of new residents which could distort results.

Result	Indicator	Baseline Value	Target	Means of Verification	Assumptions
		Republic. General public awareness initiatives undertaken locally.			
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 vulnerable populations developed and adopted.	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.
3.2. Capacities of Office 33 for coordination, fund mobilisation, dioxin	(1) Number of regular publications from	Office 33 is publishing 'Toxicology Magazine' ISSN1859-1140.	At least one newsletter on dioxin published regularly (2013)	Progress report	Personnel turnover does not negate impacts of dissemination.

Result	Indicator	Baseline Value	Target	Means of Verification	Assumptions
contaminated site identification/inventories, dioxin data base operation, and experience sharing at all levels including international cooperation strengthened.	Office 33 covering wide range of dioxin issues	Office 33 is regularly updating web site www.office33.gov.vn.			
	(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.

Result	Indicator	Baseline Value	Target	Means of Verification	Assumptions
	(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.
	(2) Number of reports produced for international dissemination	Basic reports on the dioxin issue issued	Several thematic reports and fact sheets produced for international dissemination (2013)	Progress reports and publications	Office 33 assigns a priority to proactive institutional dissemination of project information, results and lessons-learned 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 workplan 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.



Appendix A2

**Activities Conducted Under the
Dioxin Project**



PROJECT ACTIVITIES AND ACHIEVEMENTS

Year 2010

Outcome 1: Dioxin in core hotspot areas contained and remediated

Output 1.1: Containment/remediation targets and remediation action plans for each hotspot completed.

Review current project activities in the approved project document to develop a detailed project workplan for each year and prepare for remediation plan

Result 1: Completed Inception Report

An international consultant and a national consultant were recruited to develop the project Inception report. This report has been completed and is being edited before submitting as part of the National Implementation Plan (NIP) and donor for approval.

Between 20 November 2010 and 17 December 2010 the PMU organized meetings with the international consultant and Vietnamese experts to discuss and gain consensus on Inception Report contents, and approaches and recommendations for project implementation.

The inception workshop was held on 15 December 2010 to publicize project activities and workplan for 2011 – 2013. Project results achieved during the inception phase are:

- Agreed on a timeline for project implementation;
- Agreed on project activities for 2011 – 2013, including schedule and budget allocation;
- Obtained commitment for supporting stakeholders, particularly from the MOD and local authorities.

Output 1.3: Spatial delineation of heavily contaminated areas, based on supplementary sample analysis including newly identified areas at Phu Cat and Bien Hoa.

Update and revise environmental data available for 3 hotspots to support development of remediation targets and strategy

Result 1: Completed comprehensive report on dioxin contamination situation at three hotspots (Phu Cat, Bien Hoa and Da Nang)

The report provides an overview of the current situation at three hotspots regarding environmental and human health issues. Numerous reports had previously been published which contained fragmented data. This report collated existing data and presented them in a consistent format to serve as a reliable information source for management and resource mobilization.

A national consultant was recruited to complete this report with data and other support provided by the PMU. Group discussions among experts at MONRE and MOD were organized to gain consensus on report contents, including:

- Geographic and climatic overview for each area;
- Dioxin contamination data for each hotspot;
- Conclusions and recommendations for each hotspot.

Year 2010

The report, containing approximately 200 pages of content, was published in both Vietnamese and English. A Canadian expert was invited to proof-read the English version of this report. This expert has vast experience on environmental-chemical issues and participated in several related projects in Vietnam.

Result 2: Comprehensive report publication and dissemination

The report has been sent to a publisher for design work and editing. The completed report will be published in January 2011 with 500 Vietnamese copies and 300 English copies. Printed reports will be disseminated to stakeholders.

Output 1.4: Pilot scale demonstration of remediation technology for potential use at Bien Hoa and/or Phu Cat.

Reviewing of remediation technologies currently applied in Vietnam and worldwide

Result 1: Report on remediation technologies currently applied in Vietnam and worldwide

This activity was added to the fourth Quarterly Workplan for 2010 and was approved by both the Implementing Agency and donor. The report is an important reference for future Project activities.

One international consultant and one national consultant were recruited on short-term contracts with the PMU. The report was completed and submitted in December 2010.

Output 1.6: Monitoring systems operational at all hot spots to ensure performance measurement against containment and remediation goals as applicable**Result 1:** Establishment of the PMU and development of operation regulations

- PMU was established under the Decision No. 1325/QD-BTNMT by the Minister of MONRE on 28 July 2010.
- PMU operational by-laws were approved by Decision No. 16/ QD-VP33 on 12 August 2010.

Result 2: Staff recruitment

The PMU, in collaboration with UNDP, carried out recruitment for the following positions:

- Project Manager
- Project Coordinator
- Project Accountant cum Administrator
- Project Interpreter cum Secretary

TORs for each position were attached to the Project Document. Functions and competencies for each position were detailed in the PMU operation regulations.

A long-term Technical specialist was successfully recruited by UNDP in cooperation with PMU. He started working at PMU on 20 December 2010 under a one-year contract.

Year 2011

Outcome 1: Dioxin in core hotspot areas contained and remediated

Output 1.1 Containment/ Remediation targets and remediation strategy for each hotspot completed

Activity 1.1.1 Support the process of selecting a contractor for technical design and EIA for civil works in Phu Cat and Bien Hoa

Completion of pending tasks from 2010 workplan:

1. Completed the report on current situation of dioxin contamination at 3 hotspots in both English and Vietnamese. Publication of the report was completed. Report has been distributed to related parties/agencies and stakeholders

Activity 1.1.1 Technical design/EIA and project document preparation for civil works in Phu Cat and Bien Hoa

Procurement consultancy for bidding package "Technical design and EIA for civil works in Phu Cat"

Activity results:

- Contract with consultants signed and the bidding process completed.

Activity 1.1.2 EIA consultation workshop, finalization and approvals

Technical design/EIA and project document preparation for civil works in Phu Cat

Activity results:

- Contract with contractor signed and the final draft of the technical design submitted for approval.

Activity 1.1.3 Seminar on technical design and finalization

Indicators:

1. Approved action plans for three hotspots

Baseline:

GEF project workplan 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.

EIA consultation workshop, finalization and approvals for Phu Cat; and Seminar on technical design and finalization for Phu Cat.

Activity results:

- The 2 topics were combined in 1 workshop;
- A technical workshop was organized on 29 Sept 2011 with participation of various organization and agencies;
- Comments were provided to contractor for necessary consideration and modification;
- Technical design was sent to 3rd party for review and appraisal.

Targets

1. Action plan with detailed design, EIA including contracting arrangement for Da Nang and Phu Cat completed.

Output 1.3 Spatial delineation of heavily contaminated areas, based on supplementary sample analysis including newly identified areas at Phu Cat and Bien Hoa

Activity 1.3.1 Site assessment

Site assessment

Activity 1.3.2 Recruitment of local technical specialists for taking samples at the new contaminated sites in Phu Cat and Bien Hoa airbases

Activity results:

- A site survey was conducted at three hot spots with participation of local experts, PMU, UNDP, MOD and other stakeholders; a site survey and assessment report was completed.

Activity 1.3.3 Landmine/UXO clearance for additional sampling works in Phu Cat and Bien Hoa

Recruitment of local technical specialists for taking samples at new contaminated sites in Phu Cat and Bien Hoa airbases and implementation of sampling on each site

Activity results:

- A group of 10 experts and technicians were recruited and deployed in the field in May and June, 2011;

Activity 1.3.4 Rental of specialized equipment for taking samples at high depth

Year 2011

Activity 1.3.5 Purchase of sampling tools for taking samples at field (for both Phu cat and Bien Hoa)

Activity 1.3.6 Tendering for supply of chemicals and consumables for sample analysis in laboratory

Activity 1.3.7 Supply of chemicals, and consumables for sample analysis in laboratory (samples from both Phu cat and Bien Hoa)

Activity 1.3.7 Sample analysis at an international laboratory in overseas

1.3.8 Data dissemination workshop

Indicators:

1. Completed spatial delineation of contaminated areas at each hotspot

Baseline:

Spatial delineation uncertain 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.

Targets:

1. Additional samples collected and analyzed at Phu Cat sufficient to support design, EIA and civil contracting for isolation and containment.

2. Contaminated area at SW runway in Bien Hoa delineated.

Additional samples collected and analyzed at Phu Cat and Bien Hoa sufficient to support delineation of contaminated areas.

- An international consultant was hired to review and advise on the sampling procedures. He also directly supervised the sampling team in the field;
- A report on field sampling was completed, submitted and approved;
- 87 samples were collected in Phu cat airbase while 103 samples were collected in a newly found contaminated site in Bien Hoa airbase.

Bidding procedure and purchase of chemicals, and consumables for sample analysis in laboratory (samples from both Phu cat and Bien Hoa)

Activity results:

- Bidding document was completed and a call for proposal from capable bidders to supply chemicals and consumables for dioxin analysis in the laboratory issued;
- Selection of supplier completed;
- Contract was signed with supplier;
- First batch of the chemicals was supplied in the second Quarter, 2011;
- The last delivery of chemicals was completed in the third Quarter, 2011;
- Lab analytical reports were completed and provided to PMU in December 2011.

Recruitment of an international Consultant for QA/QC of field sampling

Activity results:

- An international consultant was hired to review and advise on the sampling procedures. He also directly supervised the sampling team in the field;
- Report on field sampling was completed, submitted and approved.

Sample analysis at an international laboratory

Activity results:

- An international analytical laboratory was selected to carry out QA/QC sample analysis;
- 30 samples were sent to this lab for dioxin analysis;
- QA/QC report was completed, submitted and endorsed by both UNDP and PMU.

Analysis of inorganic and other parameters of collected soil samples

Activity results:

- 15 samples collected in Phu cat and Bien Hoa airbases were sent to local laboratory for analysis of heavy metals and organic/inorganic parameters and a lab report was released.

Data dissemination workshop

Activity results:

- No results achieved.

Year 2011

Output 1.4 Pilot scale demonstration of remediation technology for potential use at Bien Hoa and/or Phu Cat

Activity 1.4.1 Workshop on technologies and requirements for demonstration

Workshop on technologies and requirements for demonstration

Activity results:

- No result achieved.

Activity 1.4.2 Demonstration of a dioxin destruction technology

Indicators:

1. Status of thermal/mechano-chemical remediation at hotspots
2. Completion of thermal/ mechano-chemical remediation demonstration at hot spots
3. Completion of Bioremediation demonstration at hot spots

Site survey for demonstration of a dioxin destruction technology

Activity results:

- Site survey to Bien Hoa airbase was completed;
- Location for technology demonstration was agreed;
- Location and plan for contaminated soil excavation and transport were discussed and agreed upon;
- 2nd visit to Bien Hoa was completed with participation of EDL (contractor for technology demonstration);
- All local requirements for system set-up and operation were discussed and agreed upon.
-

Baseline:

Selected ISTD/IPTD technology for Da Nang by USAID completing GVN approval; Technology for remediation demonstration at Bien Hoa or Phu Cat short listed with two top priority technologies including ball milling.

Bioremediation pilot test cell on 3,000 m³ by VAST established at Bien Hoa. Laboratory-scale bioremediation research is undertaken in Da Nang.

Targets:

1. Pilot technology demonstration of MCD commenced and underway with selected soil.
2. Pilot bioremediation demonstration undertaken and evaluated at either Bien Hoa or Phu Cat

Preparation for demonstration of a dioxin destruction technology

Activity results:

- A local contractor was selected through a national competitive bidding to carry out preparatory works for the demonstration. Contract negotiations underway;

Demonstration of a dioxin destruction technology

Activity results:

- An international call for bids for MCD™ technology demonstration was issued;
- Environmental Decontamination Limited (EDL) from New Zealand was selected and awarded the contract to carry out the MCD™ demonstration;
- Demonstration workplan was developed;
- First field trip of EDL representative to Bien Hoa was successfully conducted;
- Final demonstration workplan was submitted and approved by both UNDP and PMU, in December 2011.

Year 2011

Output 1.5. Full containment and/or isolation completed at Phu Cat and Bien Hoa and funding for full scale remediation identified while coordination mechanism functioning at Da Nang based USAID financing

Activity 1.5.1 Tendering for civil works in Phu Cat and Bien Hoa

Activity 1.5.2 Civil works for containment of dioxin in Phu Cat

Activity 1.5.4 Quality Assurance for the civil works

Preparation and starting "Civil works" (Landfill) for Phu Cat

Activity results:

- Landmine and UXO clearance in Phu Cat was completed; all excavation sites and landfill site are free from landmines and UXO;
- Procurement process for selecting the local civil works contractor was completed; contract was awarded to Vietnam - Australia Environment Jointstock Company (Vinausen);
- Ground breaking ceremony was conducted on 16 December 2011;
- Detailed workplan was completed and submitted by the contractor to PMU;
- Preparation for ground work started in late December 2011.

Indicators:

1. Percentage of pre-identified contaminated soil contained or remediated in all 3 hotspots.
2. Percentage of newly identified contaminated soil contained or remediated in all 3 hotspots

Baseline:

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. No financing yet identified for remediation at Bien Hoa and Phu Cat. Containment of 94,000m³ in a secured landfill for future remediation at Bien Hoa; Hydraulic isolation of previously identified areas at all sites. Spatial delineation uncertain in some areas at Bien Hoa and Phu Cat including newly identified areas.

Targets:

Containment work at Phu Cat commenced and underway; All preparatory arrangements of Da Nang remediation completed. 100% of pre-identified and newly identified contaminated soil and sediment that exceed Vietnamese standard either hydrologically isolated, contained or remediated.

Quality Assurance for the civil works

Site supervision and monitoring for Civil works (Landfill) in Phu Cat

Activity results:

- Procurement process for selecting a local contractor to carry out site supervision and monitoring was completed; and the contract awarded to Center for Environmental Technology and Consultancy;
- Detailed supervision workplan was completed and submitted to PMU by contractor.

Year 2011

Output 2.3 Public environmental awareness /information and education programs implemented

Activity 2.3.1 Public consultation/Awareness

Activity 2.3.1 Material design and publication

Activity results:

- Activity has not started.

Activity 2.3.1 Awareness/ information program implementation

Activity results:

- Activity has not started.

Outcome 3: Strengthened national regulations and institutional capacities**Output 3.1 National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and or human dioxin TDI applicable to general population and vulnerable populations developed and adopted.**

Activity 3.1.1 Develop/adopt human dioxin TDI standards for general population and vulnerable populations

Develop/adopt human dioxin TDI standards for general population and vulnerable populations

Activity Results:

Activity 3.1.2 Develop/adopt national environment and emission standards for dioxin thresholds in water and air

- Completed selection of team which will conduct food sample collections at the hot spots and surrounding areas;
- Two local consultants were hired to carry out situation analysis, including legal and regulatory background information and proposing human dioxin TDI and dioxin level in foods;

Activity 3.1.3 Consultation workshops/seminars on new technical regulations (standards)

- More than 80 samples were collected in Ha Noi, Bac Ninh, Bac Giang, Da Nang and Bien Hoa;
- Samples were preserved and pre-treated as required;

Indicators:

1. National standards adopted for soil, water, air and human receptors

- Completed procurement process for selection of an international lab to analyze dioxin concentration in food samples;

Baseline:

Provisional standards based on international norms in place for soil, sediment, water and air for application to hotspot remediation

- First draft report on the development and adoption of human dioxin TDI and dioxin level in foods was presented and reviewed by a group of local and international experts;

Targets:

1. National standard for TDI drafted and baseline study for environmental and emission standard development completed National standards in place consistent with international practice for soil, water, air and human receptors

- First roundtable was held to facilitate technical discussions on the 1st draft report and obtain comments and input;
- Report revision is underway.

Develop/adopt national environment and emission standards for dioxin thresholds in water and air

Activity results:

- Two Consultants were selected and contracts were signed;
- First and second draft report were completed and submitted;
- Three expert roundtable discussions were held;
- Final draft report is under review.

Consultation workshops/seminars on new technical regulations (standards) held.

Year 2011

Output 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.

Activity 3.2.1 Identification and mobilization of funding for remaining hotspots remediation and addressing other dioxin contaminated sites	Identification and mobilization of funding for remaining hotspots remediation and addressing other dioxin contaminated sites
Activity 3.2.2 Identification, Inventory of other dioxin impacted sites/areas, including sample collection and sample analysis	<p><u>Activity results:</u></p> <ul style="list-style-type: none"> ▪ Various meetings with potential donors and stakeholders were held; ▪ Funding from Czech Republic was secured at the value of approximately \$370K, for a period between 2012 and 2015.
Activity 3.2.3 Development of a national dioxin data base and information system	Identification, Inventory of other dioxin impacted sites/areas, including sample collection and sample analysis
Activity 3.2.4 Management capability improvement	<u>Activity results:</u>
Activity 3.2.5 International technical co-operation	<ul style="list-style-type: none"> ▪ Working with MOD to identify a new site which is suspected to be contaminated in dioxin in Hong Tien commune, Huong Tra District, Thua Thien Hue;
Activity 3.2.6 Long-term international technical advisor	<ul style="list-style-type: none"> ▪ A sample collection team was formed;
<u>Indicators:</u>	<ul style="list-style-type: none"> ▪ Forty (40) samples (soil and sediment) collected;
1. Number of regular publications from Office 33 covering wide range of dioxin issues;	<ul style="list-style-type: none"> ▪ Samples were analyzed in laboratory for dioxin concentration;
2. International and national funds for remediation leveraged in addition to baseline;	<ul style="list-style-type: none"> ▪ Final report was released.
3. Operational centralized database and inventory of AO related dioxin contamination.	Development of a national dioxin data base and information system
<u>Baseline:</u>	<u>Activity results:</u>
Office 33 is publishing 'Toxicology Magazine' ISSN 1859-1140; Office 33 is regularly updating web site www.office33.gov.vn; Initial coordination of USAID EA and technology proposal; At least 2 bilateral/multilateral donor commits additional resources for AO/Dioxin issues; Amount of required funding for completion of remediation against international standards identified; National dioxin data base system operational in Office 33; National dioxin contaminated site inventory updated.	<ul style="list-style-type: none"> ▪ ArcGIS software was installed at PMU office;
	<ul style="list-style-type: none"> ▪ All data on dioxin collected from the past and present are now uploaded in the database;
	<ul style="list-style-type: none"> ▪ User training is on-going.
<u>Targets:</u>	Management capability improvement
1. At least one newsletter on dioxin published regularly;	<u>Activity result:</u>
	<ul style="list-style-type: none"> ▪ Training courses were organized for topics including: effective presentation skills, leadership and management skills, basic procurement, project reporting and outcome analysis, project Management, etc.;
	<ul style="list-style-type: none"> ▪ More than 12 staff of Office 33/MONRE attended training courses, the benefits of which are expected to disperse among additional staff members.
	International technical co-operation
	<u>Activity results:</u>
	<ul style="list-style-type: none"> ▪ Successfully organized the Vietnam Session at the Dioxin conference in Belgium with participation from 13 people (management experts and scientists) from Vietnam (UNDP/GEF provided funding for 6 people);
	<ul style="list-style-type: none"> ▪ A network with international laboratories, suppliers in the field of dioxin analysis and remediation has been

Year 2011

2. US funding of Da Nang remediation secured; established;
3. National dioxin database system operational in Office 33
- Partnership with Korean partners was strengthened;
 - Initial commitment from Korean partners for support in the field of contaminated soil monitoring.
-
- Long-term international technical advisor hired.

Output 3.4 A communication strategy vis-à-vis national and international industries, consumers and others implemented

Activity 3.4.1 Development of a national communication strategy

Development of a national communication strategy

Activity results:

Activity 3.4.2 Development/ dissemination of general and technical information on dioxin issue

- No results achieved as activity has not started.

Development/ dissemination of general and technical information on dioxin issue

Activity results:Indicators:

1. Number of domestic communication events
2. Number of reports produced for international dissemination

- Project information was published in various local newspapers and magazines including "Dai bieu nhan dan", Auditing magazine, Environment magazine, etc.;
- A collection of abstracts presented in Dioxin 2011 conference was published and disseminated;
- The first and second issues of the Project Newsletter were published in both English and Vietnamese.

Baseline:

Informal communication activities undertaken by Office 33; basic reports on the dioxin issues issued.

Targets:

1. Communications strategy developed for the basis of local and international communication events

Outcome 4: Project management and Project evaluation& Monitoring**4.1 Project Management**

Activity 4.1.1 National Staff

National Staff Hired, including:

Indicators:

Percentage of periodical reports received/prepared on time

Project Manager (time allocation 70%)

Target:

More than 80% of periodical reports are developed on time

Project Coordinator

Project Accounting Assistant

Project Secretary cum Interpreter

Year 2012

Outcome 1: Dioxin in core hotspot areas contained and remediated

Output 1.1: Containment/ Remediation targets and remediation strategy for each hotspot completed

Activity 1.1.1 Technical design/EIA and project document preparation for civil works in Phu Cat and Bien Hoa

Result 1. *Obtain agreement on dioxin contamination status at Bien Hoa Airbase, the number of additional samples and proposed some feasible technologies for Bien Hoa*

Six local and international experts were selected to develop a Master Plan for the remediation of Bien Hoa. One international expert acted as the team leader, developed the logical framework and was responsible for compiling reports that contributed content to the master plan. Experts assessed the status of contamination at Bien Hoa Airbase, assessed remediation technology and made recommendations for interim measures; assessed the impact of dioxin contamination on the environment and on human health; developed the financial structure and worked on mobilising feasible fund sources for dioxin remediation at Bien Hoa Airbase; and prioritized projects required for effective remediation.

Local experts began working on the Master Plan in the third Quarter, 2012. Expert meetings were arranged by the PMU to: exchange ideas; discuss key contents and to begin compiling data; consider additional assessments; draft a financial framework; etc. The international expert began work on the Master Plan at the end of the fourth Quarter. The deadline for activity completion is extended to the first Quarter, 2013.

A variety of information contributed to the development of the Master Plan, including the request to call for US participation. Several meetings were organised in Hai Phong and Bien Hoa in the second and third Quarters of 2012 to obtain agreement on the Plan's objectives, key activities and to affirm the support of Office 33, the PMU and UNDP to the MOD (some documents referred to as MND) in developing and completing this Master Plan.

The meeting organised in December, 2012 in Ha Long confirmed that the main contents are agreed upon by local and international experts, the MOD, Office 33 and the donor. The plan is expected to be handed over to the MOD for approval.

Output 1.4 Selection/demonstration of remediation technology (Phu Cat/Bien Hoa)

Activity 1.4.1 Demonstration of MCD™ technology

Result 1. *Completion of fabrication and installation of the dioxin remediation facility at Bien Hoa Airbase*

An international call for bids was issued and a capable agency selected for demonstrating ball milling technology in Vietnam. The selected agency is Environmental Decontamination Limited (EDL), New Zealand.

EDL completed a detailed plan for implementation of the demonstration in 2011. After receiving comments from relevant stakeholders, the plan was revised and submitted to the PMU and UNDP for approval. EDL completed manufacturing of components required for the facility in New Zealand in early 2012 and transported the system to Vietnam during the second quarter of 2012.

Result 2. *Technology preparation and demonstration*

Year 2012

The PMU and MOD, in particular the 935th Regiment, ensured that the site within the airbase was prepared for the demonstration.

A local contractor, the Vietnam Australia Environment Joint Stock Company, was awarded for the contract for site preparation. The hangar (1,200 m²) was repaired. The company excavated contaminated soil (150 tons) which was contained in 150 bags (these bags were sent over by the New Zealand Contractor) and transported to the hangar. Excavated materials came from the football pitch and the Pacer Ivy Area. For the purposes of the demonstration, dioxin concentrations were classified from high to low (from over 10,000 ppt/g to lower than 2,000 pg/g). All these processes were supervised and reported on regularly to the PMU to ensure activities were in line with regulatory requirements.

The official demonstration commenced July 16th, 2012 and finished on October 7th, 2012. Activities associated with the demonstration include 1) preparation of the detailed demonstration design and sampling schedule 2) importation, transportation, installation, and demobilization of the demonstration facility 3) operation of the demonstration facility based on the demonstration design 4) cleanup and safe disposal of the soil used for demonstration 5) training and technical capacity transference; and 6) analysis of demonstration results and preparation of the report.

Result 3. Sampling for analysis to evaluate technology efficiency

Samples collected before the demonstration were analysed for concentrations of dioxin. During the demonstration, samples of treated soil were also collected and analysed. Sample mixing was completed by the Vietnam and Russia Tropical Center. Sample analysis was completed by ALS, Canada. Forty (40) samples were analysed for dioxin concentration before and after remediation; 20 samples were analysed for organic As before and after remediation; and 20 samples were analysed for concentrations of a number of heavy metals such as As, Cd, Cu, Ni, Cr, Hg, Ze.

Result 4. Arrange an interministerial supervision delegation to the demonstration at Bien Hoa Airbase

The supervision delegation for the demonstration was comprised of representatives from the MOD, the Ministry of Science and Technology, the Ministry of Defence, and MONRE. Three supervision trips were completed. Experts contributed valuable comments to EDL as well as recommendations regarding odor and dust and other potential secondary pollution issues.

Experts from MOD collected air and water samples and measured noise levels in order to contribute to the technology evaluation.

Result 5. Demonstration activities completed and the site returned to Bien Hoa Airbase

The demonstration was completed in September, 2012. The entire system was demobilized, removed from the airbase and transported back to New Zealand on October 15th, 2012.

Vietnam Australia Environment Joint Stock Company was the contractor that completed clean-up activities to return it to the airbase. They transported treated soil to designated locations, collected equipment such as PPE and put them into

Year 2012

specialized bags for disposal together with treated soil, and they cleaned up the hangar floor, etc.

Wwater and electrical systems to the hanger were disconnected and contract with the Power department terminated; electrical posts were also removed. The airbase has accepted the return of the site after checking and supervising the site clean-up activities with the PMU.

Result 6. Prepare for the technology evaluation workshop in January 2013 :

Reports are being completed by relevant parties (EDL, International independent evaluation expert) which summarize and evaluate operation process, sample analysis, and technology efficiency. A local expert also provided comments and recommendations during the supervision process. Final conclusions will be communicated during the workshop.

Output 1.5. Full containment and/or isolation completed at Phu Cat and Bien Hoa and funding for full scale remediation identified while coordination mechanism functioning at Da Nang based USAID financing.

The implementation plan has been identified, finance has been mobilised and mass remediation in all three hotspots has been accomplished at maximum level possible

Activity 1.5.1. Tendering for civil works in Phu Cat and Bien Hoa

Activity 1.5.2. Civil works for dioxin containment in Phu Cat

Result 1. Complete the landfill for dioxin contaminated soil at Phu Cat Airbase

The construction of the landfill commenced began in 2011 with the design and construction contractor selected pursuant to the Government of Vietnam Law on Procurement promulgated.

The Phu Cat landfill for contaminated soil is the first landfill for hazardous waste which fully follows local and international regulations (with over 7,500 m³ of contaminated soil). The works also contributes to Vietnam's obligations under the Stockholm Convention in Vietnam.

Construction of the landfill occurred over 8 months and was completed in August, 2012. The Vietnam Environment Administration was in charge of supervising construction. Environmental monitoring was carried out by conducting soil sampling for dioxin analysis to ensure all contaminated soil was excavated. Other factors such as temperature and wind, etc. were also monitored. The Vietnam Environment Administration dioxin laboratory was responsible for dioxin analysis. Materials used to contain the landfill adhered to EPA regulations (e.g. HDPE, geotextile and welds, etc.). Mitigation measures for noise reduction and reduction of contaminated soil spreading were strictly followed. These measures included noise reduction walls, water spraying to reduce dust, minimizing or reuse of contaminated water to wash transportation vehicles or water treatment, etc. Personal protection methods were strictly followed.

Four interministerial supervision trips were carried out during the construction of the landfill. The supervision delegation provided comments and recommendations to the implementing units. Recommendations included the temporary platform for vehicles to enter the landfill. The delegation also had positive feedback regarding compliance to the current regulations.

The acceptance of works panel has highly appreciated the results obtained and agreed to accept the construction works.

The construction audit and documents were filed up on completion of the landfill.

Year 2012

Output 1.5. Full containment and/or isolation completed at Phu Cat and Bien Hoa and funding for full scale remediation identified while coordination mechanism functioning at Da Nang based USAID financing.

Activity 1.5.3 Civil works for containment and isolation of dioxin in Bien Hoa Airbase

Interim Containment for Bien Hoa airbase**Result 1. Complete the UXO detection at Bien Hoa Airbase**

Mine detection and removal on 47 ha of contaminated areas at Bien Hoa Airbase was completed by the 28th Bridgatae under Vietnam Airforce and Air Defence, MOD.

Result 2. Design for construction of the interim measures for Bien Hoa Airbase has been approved

The Center for Environmental Treatment Technology, High Command for Chemistry, MOD was awarded a contract to design the system of interim measures at Bien Hoa Airbase. Based on the results from geological and hydrological surveys completed by an expert hired by the PMU, the Center has conducted additional surveys and designed interim measures accordingly. Interim measures includes a runoff bypass and drainage system, water separation wall, and transportation of contaminated soil to the Pacer Ivy area. Some existing culverts will be upgraded and runoff diverted to prevent water from overflowing from the contaminated area to noncontaminated areas and vice versa.

The design and the activity's cost estimate has been evaluated. All technical design aspects have been approved. The cost estimate was adjusted to ensure the construction unit prices as per the regulations of the Government of Vietnam in general and Dong Nai Province in particular.

Output 1.6 Monitoring systems operational at all hot spots to ensure performance measurement against containment and remediation goals as applicable.

Activity 1.6.1. Monitoring system design for both Bien Hoa and Phu Cat

This activity is implemented by a contractor designated by the Czech Republic Development Agency. The monitoring plan at Phu Cat Airbase has been proposed and the process of collecting feedback from experts is being carried out.

Activity 1.6.2. Development of the monitoring system at Bien Hoa and Phu Cat airbases

Outcome 3: Strengthened national regulations and institutional capacities**Output 3.1. National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and or human dioxin TDI applicable to general population and vulnerable populations developed and adopted**

Activity 3.1.1 Develop/adopt human dioxin TDI standards for general population and vulnerable populations

Result 1. The final report on TDI and dioxin in a number of foods has been completed

Dioxin analysis of food samples began in 2012 and will continue into 2013. The report is recognized as having a significant value to understanding dioxin exposre risks as it is the first time that TDI from food has been discussed.

Activity 3.1.2 Develop/adopt national maximum allowable dioxin technical regulations (standards) for water and air

Result 1. Propose dioxin standards in the ambient air and water

The proposal report that outlines recommended dioxin standards for ambient air and water has been accepted. The report still requires an information on the scientific bases for proposing standards.

Year 2012

The report proposes dioxin standards for industries with a recognized risk for dioxin emissions, such as paper making, detergent production, etc.. The report also proposes a roadmap for promulgating these standards within the context of Vietnam, and given currently available technologies. The document compiles relevant Vietnamese and international legal documents: a valuable reference for both future Project works and for other hazardous waste management activities in Vietnam.

Result 2. Promulgate dioxin levels in the air and water at remediation facilities of dioxin residue

One of the important products of the above stated report is the Vietnam standard (TCVN) for dioxin levels in exhaust and wastewater from remediation facilities of dioxin residue .

This TCVN will play an important role for Vietnam in managing and supervising dioxin remediation at Da Nang which is being implemented by the US partner using thermal absorption destruction. This is also important for evaluating the MCD™ technology demonstration at Bien Hoa Airbase.

The project recruited experts to complete this assignment for compliance of procedures for TCVN issuance. It is estimated that the TCVN will be issued in the first quarter of 2013.

Output 3.2. Capacities of Office 33 for coordination, fund mobilisation, dioxin contaminated site identification/inventories, dioxin database operation, and experience sharing at all levels including international cooperation strengthened.

Activity 3.2.1. Identification and mobilization of funding for remaining hotspots remediation and addressing other dioxin contaminated sites

Result 1. Complete additional survey for suspected site of dioxin contamination at Dong Nai Thuong Commune, Cat Tien District, Lam Dong Province

A preliminary survey was conducted at the temporary airbase at Dong Nai Thuong Commune between on June 6th and 7th, 2012. The survey team included staff from the Vietnam Russia Tropical Center, representative from the 7th military zone and the military command of Cat Tien District. Sampling was completed on October 19th, 2012.

Results show that dioxin concentrations are within acceptable limits for Vietnam (which at the time were below 1,000ppt for soil and 150ppt for sediment).

Result 2. Complete digitalisation of the surveyed area in Cat Tien District, Lam Dong Province

A digital map was created that shows areas surveyed in Cat Tien District, Lam Dong Province. All related data has been uploaded on the map and filed in the central database for the project.

Result 3. Update all available data onto the system, maintain the system

The project completed the purchase and installation of GIS software on the PMU server in 2011. The database for dioxin management was designed and available data (mainly for the 3 hotspots) inputted, updated and maintained. The system allows users to display information about dioxin such as dioxin contaminated areas, sampling locations, and demarcated and remediated areas, etc.

Year 2012

Activity 3.2.3. Development of a national dioxin data base and information system

Result 1. Arrange short term courses

Short term courses were conducted to improve capacity and skills for the implementing partner (Office 33 and MONRE). Courses included effective presentation skills, management and leadership skills, project management skills, project reporting and analysis, procurement, etc.

Activity 3.2.5 International technical co-operation

Result 1. Successfully arrange the session "AO/dioxin in Vietnam" at the 32nd international symposium on dioxin in Australia

In August, 2012, a Vietnamese delegation of 15 people (managers, scientists and experts) participated in the 32nd international symposium on dioxin in Australia. The "AO/dioxin in Vietnam" session was chaired by Associate Professor Dr. Le Ke Son, Director General of Office of National Steering Committee 33, Deputy General Director of Vietnam Environment Administration and co-chaired by Dr. Kido from Kanazawa University (Japan). The session had nearly 100 participants from around the world. Thirteen reports were presented: 5 orally and 8 on computers throughout the symposium. The symposium was a good opportunity for the Vietnamese delegation to gain the latest information about dioxin from around the world. It was also an opportunity to share the issue of dioxin in Vietnam with international colleagues, and to request support in the AO/dioxin effort in Vietnam.

Output 3.3. Institutional and individual capacities for site investigation, risk assessment, contaminated site land use planning and monitoring, and planning and management of cost-effective remediation strengthened.

Activity 3.3.1 Sampling training

Result 1 and 2. Training for technology transference for dioxin remediation: the MCDTM technology

On July 17 and 18th, 2012, training on MCDTM remediation technology was delivered to 18 staff (including dioxin/POPs remediation experts, management, analysis and research staff, etc.) from ministries, industry, PMU, etc.. Training included theory and a field trip to the MCDTM demonstration site. Theory covered system operation, safety, and environmental supervision (including noise, wastewater, exhaust, etc.). Participants were able to exchange ideas with experts from New Zealand and observe the dioxin remediation system in operation.

The training was well organized and provided training materials and lectures which were short, clear and understandable. Participants developed an understanding of the advantages of the system particularly, minimal emissions and potential for dioxin remediation and soil treatment. Participants were invited to provide feedback to the PMU after the training.

Output 3.4. A communication strategy vis-à-vis national and international industries and consumers implemented

Activity 3.4.1 Development of a national communication strategy

Result 1. Communications strategy report completed

International and national experts were recruited by UNDP to develop the Project national communication strategy. National experts conducted surveys and a knowledge, attitude and practices (KAP) assessment. Data collected during as a part of this activity reflect previous understanding of communication needs and practices. Additional data collection

Year 2012

is required to better understand the effectiveness of communication practices in impacting behavioural change, particularly regarding reducing dioxin exposure. Extensive stakeholder validation of the strategy is required since communications on dioxin and Agent Orange involves a wide variety of stakeholders.

Outcome 4: Project Management**Output 4.1 Project Mangement**

Activity 4.1.1 National Staff

Activity 4.1.3 Field trips and travels by PMU

Result 1. Capacity building for staff of the PMU

Staff of the PMU received training in the fundamentals of project management which contributed to improving the efficiency of daily work at the PMU office. Courses included an overview of procurement procedures (organised by UNDP in cooperation with Center for Procurement Support, Department of Procurement Management) and a project management course.

Result 2. Field trips and field supervisions

In 2012, the PMU organised a number of field trips to provide supervision of contractors and to enhance cooperation with local authorities and with MOD units.

The trips also enhanced collaboration between the implementing partner (Office 33/MONRE) , the MOD units responsible for managing airbases, and international organisations who are supporting Vietnam in solving the AO/dioxin contamination issue.

Throughout 2012, the PMU also arranged periodical Project site visits, attended workshops and conferences, technical meetings and meetings with experts and relevant parties, to ensure the project would be implemented according to plan and achieves a high level of quality.

Year 2013

Outcome 1. Dioxin in core hotspot areas contained and remediated**Output 1.1 Containment/ Remediation targets and remediation strategy for each hotspot completed**

Activity 1.1.1 Technical design/EIA and project document preparation for civil works in Phu Cat and Bien Hoa
Development of Master remediation plan for Bien Hoa airbase

Result 1. Handing over the master plan for dioxin remediation at Bien Hoa Airbase to The Ministry of Defence

Local and international experts and relevant agencies under the Ministry of Defence contributed to the development of comprehensive plan for dioxin remediation at Bien Hoa Airbase. The plan includes a summary of previous contamination assessments, describes the exposure risks that exist at Bien Hoa, assesses potential remediation technologies, lists priority projects required for effective remediation and proposes potential sources of financial support. It was recommended in the report that one single remediation technology for may not be sufficient for Bien Hoa due to the complexity of existing contamination. An estimated budget of approximately 150 million USD was recommended. Actual costs be more than this.

With Decision No. 33/1999/QĐ-TTg of the Government of Vietnam, the Ministry of Natural Resources and Environment handed over the master plan for dioxin remediation at Bien Hoa Airbase to the MOD. The MOD is coordinating with the US partner to being implementation of the master plan subject to the national action plan for overcoming the consequences of Agent Orange/dioxin which was approved by the Prime Minister via Decision No. 651/QĐ-TTg.

Output 1.3. Spatial delineation of heavily contaminated areas, based on supplementary sample analysis including newly identified areas at Phu Cat and Bien Hoa

Activity 1.3.1 Site assessment
Additional sampling at Bien Hoa Airbase

Result 1. Completion of additional assessment of dioxin contamination outside Bien Hoa Airbase

Samples were collected outside of Bien Hoa Airbase in Buu Long Ward to identify the spread of toxic chemicals/dioxin from the Pacer Ivy area.

Total 111 samples, including 81 soil samples (57 surface soil samples and 24 core samples), 29 sediment samples (22 surface samples and 7 core samples) and one blank sample was collected from 87 locations in 2 main areas bordering the Pacer Ivy area suspected for the spread of contamination to Dong Nai River. Specifics of this sampling include:

Downslope from the Pacer Ivy Area: Sample sites were selected that were at a lower elevation and downstream from the Pacer Ivy area (groups tở 31, 32, 32B, Cluster 5). 69 samples were collected from 56 locations.

a) Soil samples:

- 35 surface samples (0-30 cm) were collected, including 10 from areas used for annual crops; 3 from areas used for perennial plants; 12 from urban areas and 10 other samples from other types of soil (empty land, hilly area, empty paddies, etc.)
- 12 core samples: including 7 from areas used for annual crops, and 7 samples from areas used for perennial plants. One of these samples was a duplicate, used to ensure quality laboratory analysis procedures.

b) Sediment samples:

Year 2013

- 15 surface sediment samples (0-10 cm)
- 7 sediment core sample (30 cm 1 layer): including one duplicate

2. Adjacent to the Pacer Ivy: This area does not receive runoff from the Airbase and includes area used for paddy fields at Group 5, Cluster 1; Văn miếu Trấn Biên and Bửu Long Tourism area/Bửu Long Ward. 41 samples were collected from 31 locations.

a) Soil samples:

- 22 surface samples (0-30cm) including 4 from an area used for annual crops; 3 from an area used for perennial plants; 2 from urban areas; 3 from areas used for recreation and 10 under other categories of land use (empty land, paddies, etc.).
- 12 core samples: including 6 from areas used for annual crops and 6 from areas used for recreational purposes.

b) Sediment samples:

- 7 surface sediment samples (0-10 cm).

The report's results will be ready in January 2014. This report also includes arsenic analysis results.

Output 1.4 Selection/demonstration of remediation technology (Phu Cat/Bien Hoa)

Activity 1.4.2 Demonstration of a dioxin destruction technology

Result 1. *The dioxin evaluation workshop in Vietnam was successfully delivered:*

Local and international experts contributed comments on the results of the MCD™ demonstration. Comments included:

- The remediation process is continual, which is more advantageous than a technology that requires interruptions.
- Regarding the clean-up limit: The post treatment samples obtaining the concentration below 1,000 ppt TEQ: 13 samples/37 samples, making up 35.13%. If 3 samples number C40, C41 and C42 are taken into account (with pre-treatment dioxin concentration below 1,000 ppt TEQ, the number will be 16 samples /40 samples, accounting for 40%. The number of post treatment obtaining the concentration of below 300 ppt TEQ: 8 samples/37 samples, making up 21.62%. If 3 samples number C40, C41 and C42 are taken into account, there will be 11 samples /40 samples, making up 25%). In which, the Vietnamese regulation No. QCVN 45: 2012/BTNMT (7/11/2012) states that: the maximum content allowed for dioxin in urban land is 300 ng/kg TEQ (ppt TEQ) and in the Vietnamese standard No. TCVN 8183:2009, it is quoted that the dioxin threshold in soil (1,000 ppt TEQ) is set out as a basis for the demarcation and dioxin remediation activities in dioxin contaminated hotspots.
- For samples originally containing 2,000 – 10,000 ppt TEQ to levels within acceptable limits of contamination was 93.3%, although this level of efficiency was not consistent for all samples.
- The addition of quartz had no influence on dioxin destruction efficiency..
- Arsenic contaminated materials require additional remediation..

Year 2013

- Daily environmental monitoring data were collected. Higher than normal dust levels occurred during the demonstration.
- Operational parameters such as rotation speed, infeed rate, reaction duration, and addition of quartz, etc. did not correlate with dioxin destruction efficiency. EDL is researching the optimal conditions required for consistent dioxin destruction using the MCD™ technology.

At the workshop, the representative of USEPA presented the results for biotechnology demonstration.

The conclusions for the workshop on remediation included evaluations of MCD™ and biotechnology). It is unsure whether or not these technologies will be adopted in Vietnam as additional information is required.

Result 2. Obtained agreement on additional technology demonstration

Expected partners include EDL (to continue the MCD™ demonstration), a French partner (to demonstrate a bio-chemical method) and a US partner (to demonstrate thermal destruction desorption).

The project will be in charge of preparatory activities such as sample preparation, selection of international analysis laboratory and sending samples to analytical laboratories.

The key objectives for additional demonstrations are to confirm the technology efficiency to both remediate dioxin and heavy metals, and to determine which remediation technologies are most appropriate for treating contaminated materials in Vietnam. .

Local experts support the project by ensuring that implementation meets scientific and logistical requirements

Output 1.5. Full containment and/or isolation completed at Phu Cat and Bien Hoa and funding for full scale remediation identified while coordination mechanism functioning at Da Nang based USAID financing

1.5.3. The construction of the interim measures in Bien Hoa Airbase

The implementation plan has been identified, finance has been mobilised and mass remediation in all three hotspots has been accomplished at maximum level possible

Result 1. *Interim measures at Bien Hoa Airbase designed and construction begun, expected completion in the first quarter of 2014.*

I. Task I (completed)

An area of approximately 10,000 m² in the Pacer Ivy area containing dioxin contamination has been isolated using a network of diversion ditches and a runoff diversion wall. These measures prevent surface runoff from flowing through contaminated areas and reduces the spread of contamination. Construction of diversion measures began in March and were completed in September. :

Construction of the following is complete and a certificate of construction compliance accepted:

- Construction of a network of 550 m of ditches to gather runoff from the runway and areas immediately south of the runway. Ditches divert water to lower elevations and ultimately to the Dong Nai River. Along the lower elevation edges of the ditches a 30 m high wall guards overflow into the contaminated area.

Year 2013

- Construction culverts discharge collected runoff water from elevations higher than contaminated areas and discharges to lower elevations, ultimately to the Dong Nai River.
- Construction of a 280 m long (50 cm high) wall, collects runoff water in the contaminated area.
- Construction of a 1,350 m long (1.2 m high) mesh fence (B40 mesh) prevents local people, poultry and cattle from gaining access to contaminated areas.
- A 40 cm gate has been constructed at the main outlet to prevent backflow to contaminated area.
- Excavation and transportation of over 300 m³ of contaminated soil at 2 locations east of the K9 culvert. Excavated material was moved to a landfill in the contaminated area, and separated from clean soils using.

II. Task II:

Additional surveys at Bien Hoa Airbase, it was discovered that up to hundred thousand cubic meters of sediment from 16 lakes require remediation. Prevention measures that reduce the spread of contaminants were constructed.

These measures include:

1. Excavation and transportation of 2,100 m³ of contaminated soil, including 750 m³ from the end of the runway. A 5,680 m² area has been isolated using geotextile which covers a 15 cm layer of clean soil. This isolation area is located in the S1 Area.

2. A 266 m long (300 cm wide base) embankment around Lakes 3 and 4. The embankment is strengthened with soil bags and cajuput stakes; and backfilled with soil. These two lakes are adjacent to Pacer Ivy area, a highly contaminated area.

3. Mr. Binh Lake is a heavily contaminated lake (50 times higher than the national standard). A fencing system has been constructed to prevent access and a complete ban for aquaculture is in place.

A 186 m long (100 cm high) embankment has been constructed around Mr. Binh Lake using a B40 mesh fence installed.

4. Triangle Lake is a heavily contaminated lake, with contamination 20 times higher than the national standard. A 396 m long (50 cm high) embankment will be constructed that prevents spreading.

5. Interim measures in the Northwest Area: Excavation of sediment from a 9,500 m² lake allows for greater water containment, limiting the spread of contamination. Additional features at the containment lake include an inlet system using small receiving hoppers, an overflow dam and an upgraded drainage line of 70 m from the lake to the main outlet in the Northwestern area.

6. Interim measures in the Northeast Area: Construction of an overflow dam at gates 1 and 2 retains runoff from two lakes to allow for settlement of sediments.

Year 2013

Output 1.6 Monitoring systems operational at all hot spots to ensure performance measurement against containment and remediation goals as applicable

Activity 1.6.1 Monitoring system design for both Bien Hoa and Phu Cat This activity was implemented by a contractor designated by the Czech Republic Development Agency. The monitoring plan at Phu Cat Airbase has been handed over to the Ministry of Defence.

Outcome 2. Land use on and around hotspots eliminates risks and contributes to environmental recovery and

Outcome 3. Strengthened national regulations and institutional capacities

Output 2.3. Public environmental awareness /information and education programs implemented and

Output 3.4. A communication strategy vis-à-vis national and international industries and consumers implemented

Activity 2.3.1 Public consultation/Awareness

Awareness raising for community in dioxin exposure prevention

Activity 3.4.2 Development/ dissemination of general and technical information on dioxin issue

Activity 3.4.3 Development of documentary film about dioxin destruction technology demonstration

Activity 3.4.4 Workshops/seminars related to project activities and dioxin issue

Result 1. 380 people have attended training sessions and meetings outlined by the communication strategy. Around 3,800 residents living in 4 wards (Quang Vinh, Bıru Long, Tân Phong, and Trung Dıng) surrounding Bien Hoa Airbase directly benefit from communications activities. Concurrently, local people received leaflets about Project activities and posters were displayed in public areas. Information about preventing dioxin exposure was recorded and broadcasted via the local radio systems. 1,206 pupils at Hung Vuong, Tran Hung Dao and Tan Buu secondary schools received communication materials outlining dioxin risks and how to prevent dioxin exposure through official curricula and from communication materials (posters, communications cards, timetables, all delivered to the schools). 1,200 staff members working at Bien Hoa Airbase benefited from Project communication activities including posters and leaflets. Additionally, 34 reporters participated in the media briefing.

(Output 2.3. This output is the combination outcome of activities related to communications under Output 3.4 A communication strategy vis-à-vis national and international industries and consumers implemented)

Basing on the outcome of the field trip for the communications demand at Bien Hoa in May, the Dioxin Project has developed the communications programme organised in 2013.

This communications programme was carried out in Bien Hoa in October and November and contained 8 key components: 1) a workshop with management organisations, the people's committees at the ward level, communications organizations, some political and social organizations and the representatives from the airbase; 2) a workshop and facilitated team work with collaborators; 3) model communication activities at one ward (Tân Phong Ward) with the participation of the community, collaborators, representatives of some management organisations; 4) a workshop and facilitated teamwork with teachers; 5) a specialized forum and a contest for pupils at Hung Vuong Secondary School (in cooperation with the school to develop the content for a session organized at school); 6) a workshop at the airbase; 7) talk with workers (cooperating with the contractors to organise during the construction of the additional interim measure facility at Bien Hoa Airbase); and 8) installing signage at the contaminated areas in the airbase. Besides, there were also additional sessions organized in wards/and by the collaborators, etc.

Communications materials are assessed as diversified, easy to understand and especially eye catching. These materials include: 1) 50 questions and answers about dioxin: provides basic understanding about dioxin:

Year 2013

2) communications handbook: the content for communications and communications skills; 3) large size posters: delivery to community at residential areas, and schools; 4) leafletes: delivery to households/staff in the airbase; 5) leafletes delivery to construction workers (would be delivered next time); 6) Timetables for pupils with typical pictures to guide dioxin exposure prevention; 7) handbooks or small leafletes delivery to pupil guiding the way to prevent dioxin exposure; 8) legal documents related to dioxin including documents related to environment and healthcare; and 9) signage. Apart from this, the broadcasting content was also provided in CDs to local media organisations.

The main message for this communications programme is: 1) to provide information regarding contamination status at Bien Hoa; 2) pathways and method of prevention; and 3) communications skills. The contents of each session were designed to suit the targeted participants. Up to now, at group meetings, participants had the opportunity for detailed exchanges of information with lots of questions having been answered and thus, it was clear that participants got to know well and understood the message of the programme.

The main requirement of the programme was to affirm that dioxin exposure prevention is possible if completely follow the guidance of the programme and to avoid worry and panic from the community: to understand about dioxin so as to know how to avoid and prevent dioxin exposure.

The follow-up activity of the communications programme:

- The community at 4 wards around the airbase: by the end of November, collaborators delivered leafletes to households;
- Teachers and pupils: Integration of communications programme into the curricula activities.
- Management staff: Support and consultancy as requested by the DONRE in communications activities for the management staff.
- Questionnaire for pupils and collaborators, teachers to assess how well that they understand which would be carried out after the workshop completion on sites.

Some recommendations that the Project received through discussion, observing and organizing the communications programme which are summarized as follows:

- Regarding targeted groups: continue expanding to the community, communications groups and the management organisations (specifically, provide regulations such as not to practice aquaculture and marine products from the airbase, etc.).
- The communications contents and materials: adding maps with specific contaminated sites within and outside the airbase; levels of contamination and related overcoming activities.
- Organising contest for dioxin understanding for pupils; and arranging a number of residential group meetings;
- Long term plans until complete remediation of Bien Hoa Airbase: support local authorities to develop and implement long term plan for communications in Bien Hoa.
- Provide consultancy and support to households with high risk of exposure in Bien Hoa.

Year 2013

- Help to improve life of some families especially those military staff who live on the income from Bien Hoa Airbase.
- Supply clean water to the community within and outside the airbase who are currently using drilled well water.

Result 2. Complete the documentary on AO and other related communications materials

The documentary is highly appreciated in terms of contents, images which ensure the scientific, accurate and comprehensive features with new approach.

Outcome 3: National regulations and institutional capacities strengthened**Output 3.1. National regulatory standards for maximum permissible dioxin discharges and contamination into/of soil, water and air and or human dioxin TDI applicable to general population and vulnerable populations developed and adopted.**

Activity 3.1.1 Develop/adopt human dioxin TDI standards for general population and vulnerable populations

National regulatory standards for maximum permissible dioxin into human dioxin TDI applicable to general population developed and adopted

Result 1. Issuance of dioxin threshold in the ambient air and water at dioxin remediation facilities: TCVN 9737: 2013 - Dioxin discharge standards from the treatment activities for the dioxin contaminated sites

This Vietnamese standard (TCVN) plays an important role for Vietnam in managing and supervising dioxin at Da Nang Airport which is under progress by the US Partner using the thermal destruction absorption technology. It is also significant in ball milling technology evaluation by the Newzealand partner or other potential technologies expected to adopt for Bien Hoa.

Activity 3.1.2 Develop/adopt national environment and emission standards for dioxin thresholds in water and air

Activity 3.1.3 Consultation workshops/seminars on new technical regulations (standards)

Develop and Adopt dioxin emission threshold for ambient air and water

Result 1. Complete the first draft on dioxin emission survey nationwide to be used as the basis for the development and issuance of proper dioxin threshold

By 1/3/2013, Vietnam only had two national technical regulations on medical and industrial solid waste incinerators, which regulate the total maximum dioxin/furan content in exhaust. The Ministry of Natural Resources and Environment (MONRE) is preparing to announce dioxin emission for the ambient air and water discharged from dioxin remediation facilities. Guidelines for similar emission from dioxin from other industrial areas are yet available. To complete and supplement regulations on dioxin emission from other industries, the most challenge is the lack of information and database for dioxin emission, especially actual survey results.

Objectives and contents are to design the surveys, supervisions and arrange surveys on dioxin emission into the environment and ambient air and water from industrial facilities. The actual sampling on sites and analysis of dioxin will be conducted by a technically competent and prestigious organisation in Vietnam. After completing the surveys, sampling, analysis and data processing, it will be possible to calculate dioxin emission rate into the environment from industrial facilities; combining with the references and discussions on the temporary allowable tolerable daily intake (TDI), environmental standards, threshold values for dioxin emissions in the environmental subjects of organisations, countries in the world will be reliable basis to develop an effective legal tools to control environmental quality.

The consultants worked closely with analysis to fulfil 04 tasks: 1) collect data/information and a comprehensive assessment report on dioxin contamination in industrial sources; 2) select the surveys for specific facilities with

Year 2013

possibility of dioxin emission into the ambient air and water; 3) supervise onsite surveys; and 4) Analyse data and prepare final report including summary and recommendations.

Output 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

Activity 3.2.1 Identification and mobilization of funding for remaining hotspots remediation and addressing other dioxin contaminated sites

Activity 3.2.2 Identification, Inventory of other dioxin impacted sites/areas, including sample collection and sample analysis

Identify and survey other sites with possible dioxin contamination nationwide, step by step complete the national database of dioxin

Result 1. Complete additional surveys on the suspected sites for dioxin contamination

At most of the sprayed sites, dioxin concentration has reduced significantly, and do not create impact on the environment and human (Hatfield 2005). However, apart from identified hotspots which are heavily contaminated with dioxin such as Bien Hoa, Da Nang and Phu Cat airbases – those are under the landfill, containment and soil remediation process, there are a number of suspected sites such as Dong Nai Thuong Commune, Cat Tien District, Lam Dong Province (surveyed and analysed in October 2012) and 2 other airfields which were surveyed in November 2013, namely Pleiku Airbase, Gia Lai Province and Vam Cong Airfield, Long Xuyen City, An Giang Province. The analysis results will be available in the first quarter of 2014.

Result 2. Complete GIS design and update all available database onto the system and maintain the system operation

The database for dioxin management has been designed. The system allow users to display relevant information regarding dioxin such as dioxin contaminated sites, sampling locations, areas which have been demarcated and remediated, etc.

Activity 3.2.4 Management capability improvement

Result 1. Arrange short term courses

Short term courses to strengthen capacity building and the skills for the project implementing partners (Office of National Steering Committee & MONRE). Training courses include effective presentation skills, management and leadership skills development, project management skills, project report and results analysis, procurement courses, etc. In 2012, a number of staffs were able to join those courses and this activity would continue in 2013.

Activity 3.2.5 International technical co-operation

Result 1. Successfully organise the session “Agent Orange /dioxin in Vietnam” at the 33rd International Dioxin Symposium in Korea

In August 2013, the Vietnamese delegation including more than 20 members, who are management staffs, scientists and experts participated at the 33rd International Dioxin Symposium in Korea. At this conference, Vietnam delegation successfully organised the session on “Agent Orange /dioxin in Vietnam” with the participation of nearly 100 members from different countries. The conference was a good opportunity for Vietnam to access to latest information about dioxin in the world. It was also the chance for Vietnam to share dioxin issues in Vietnam to international friends, calling for support in the effort to overcoming Agent Orange/dioxin contamination in Vietnam. In the Vietnam Session, 8 reports were presented. In which, 6 were presented directly and the other 3 reports were uploaded on the screensets located at the conference venue.

The Vietnam Session was co-chaired by Assoc. Prof. Dr. Le Ke Son, General Director of Office of National Steering

Year 2013

Committee, Deputy General Director of Vietnam Environment Administration and Dr. Kido from Kanazawa University (Japan).

Result 2. *Successfully organised the business trip to the USA for Office 33, MOD and VEA*

Recommendations and comments collected from the trip are presented below:

- The definitions of environment and environment protection are continuously supplemented and adjusted to suit sustainable development requirements and adapted to the climate change context. The development of the lawframe on environmental protection and its sectoral laws is an inevitable tendency. Hence, it is necessary to have further study the experience from developed countries regarding environmental protection policies and law and preparation of required conditions so as to develop a complete environment protection law.
- As environment is a borderless field between the areas within one country, it is necessary to set up a line organization system so as to solve interregional environmental issues. The national management in environment protection for inter-provincial river basins and regions with close relation in environment and socio-economic development require consideration and proposals of proper steps for the organization structures.
- To solve large scale environmental issues, which are inter-regional and beyond the authority of local governments, it is required to have sufficiently strong financial tool (fund), annually funded by the Government, and is managed by the central environmental management organisation. Under the condition of Vietnam, it is necessary to study and propose the organization model and activities by Vietnam Environment Protection fund at a larger and more effective way.
- Apart from the right to be informed and request for information provision, the right to have dialogue by the community, it is necessary to have a legal regulations to limit a number of sensitive contents which are related to environment protection; it is necessary to establish highly professional organizations in communications and processing related environment information to the communities and enterprises.
- The Vietnam side is to continue to voice and request the US Government to be more proactive and active in participation in dioxin remediation at Bien Hoa Airbase and expand the disabled support program, including those as the Agent Orange/dioxin victims.
- The selection of dioxin remediation technology needs to be carefully carried out due to the cost and technology efficiency. The biotechnology should not be selected under the context that other countries, including the USA do not adopt the technology, especially for contaminated areas in Vietnam with extremely high TCDD contents, the most persistent dioxin congener which makes up a large percentage.

Activity 3.2.4 Management capability improvement

Activity 3.2.5 International technical co-operation

Result 3. *Successful organisation of the workshop on “Sharing experience in dioxin management in Vietnam”*

The workshop was carried out in 2 days with the participation of over 70 representatives from different countries which provided important information on dioxin, POPs from Europe, the USA, Taiwan, Thailand, Malaysia and especially Vietnam. The workshop has helped international participant to better understand the dioxin problem in Vietnam while the local participants also obtained further information on the dioxin research and remediation in the world.

The workshop’s outcome shows that while researching on dioxin as well as other POPs, it is necessary to have a

Year 2013

comprehensive and systematic approach and method. This ranges from identification of emission, control, reduction and remediation of the emission sources, to the identification of pathways to human exposure as well as the TDI and its limit to cause risks for human body.

Reports from France, Sweden, Thailand, Malaysia and Taiwan have provided a huge amount of information regarding the policies, methods of controlling and addressing dioxin/POPs discharging sources. The identification methods of tolerable daily intake, scientific basis to develop and issue dioxin/POPs thresholds in the environment and human are important lessons for Vietnam, especially as a country with the highest and most complicated contamination context in the world; Vietnam is to issue specialised legal documents on dioxin/POPs management. Previous documents, in spite of their diversity, are mainly programmes, plans and researches.

Reports on dioxin technologies share the research results and experience in dioxin/POPs remediation in Vietnam and the USA. It is the fact that there have been no complete technology for remediation in terms of complete remediation, practicability and economical aspect; especially when it is required to remediate an extremely huge amount of contaminants with very high dioxin concentration like the Vietnam's case. The biotechnology attracts a lot of attention from many countries and adoption for remediation of a number of toxic substances such as herbicides, PBs. For dioxin, however, there remain unanswered questions. Vietnam and the USA have conducted various demonstrations, including the combination of containment and bioremediation. Yet, these activities are still the demonstration stage. The Government of Vietnam still requests re-demonstration at larger scale while the US partner concludes that the understanding of biotechnology is not sufficient for the adoption on site. Many people think that there is a need to combine some methods together for dioxin remediation. Yet, this is not that simple as the combination is not a simple plus and should be a multiple. This means the combination should be the method that addresses all disadvantage of other methods during the remediation process or improve the efficiency of other methods.

In this workshop, the impacts of dioxin/POPs on human were not well mentioned, but mainly focusing on hormone metabolism in men, women and children those who live in the exposure areas. There was a lot of important information, providing further understanding about negative impacts of dioxin and paving the way for a new research direction when putting the hormone steroidal metabolism in correlation with other hormones, the immunity mechanism and the other metabolic disorder in those who are exposed to dioxin.

The reports from local participants provided dioxin contamination status in heavily contaminated areas and initial studies on dioxin/POPs from other emission sources. These were also significant basis, suggesting follow-up researches and the possibility of cooperation between Vietnam and the World.

Year 2013

Outcome 4: Project Management

Output 4.1. Project Management

Activity 4.1.3 Field trips and travels by PMU

Result 1. Field supervision trips

In 2013, the PMU organised and completed a number of field trips to supervise and provide guidance to contractors in Project implementation, and promote local cooperation under the Ministry of Defence.

The trips enhanced cooperation between the project implementing partner (Office 33/the Ministry of Natural Resources and Environment) with the Ministry of Defence, especially those directly involved with management of the airbase, and organisations involved with supporting Vietnam in resolving Agent Orange/dioxin contamination issues.

The PMU conducted periodical trips to project sites, workshops and conferences, attended technical and expert meetings and visited relevant agencies, to ensure the project stays on track and activities contribute to high quality outputs.

Result 2. *The project was audited for 2012 and assessed by the Ministry of Finance as having no faults in its financial management of the UN's funds.*

Result 3. *Completion of the project mid-term evaluation*

Mid-term evaluation report was completed. A number of proposals were put forward for completion in 2014.

Appendix A3

Interviews and Questionnaires Used for Evaluation of Dioxin Project Impact to the Environment and People

SCHEDULE FOR EVALUATION OF DIOXIN PROJECT IMPACT TO THE ENVIRONMENT AND PEOPLE – BIEN HOA AIRBASE

VENUE:

Bien Hoa airbase

TIME:

19-20 June 2014

GOAL:

Evaluating impacts and effectiveness of activities of the Project “Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam” to the environment and people in and around Bien Hoa airbase.

METHODS:

Semi-structured interviews, observations, collection of relevant reports and data from local authorities.

Interviewees will be asked a series of specific questions, but will be encouraged to provide additional information through discussions with the Team.

QUESTIONS:

1. What was your involvement with the GEF Dioxin Project?
 - a. Significant
 - b. Limited Involvement
 - c. No Involvement
 - d. Don't know

2. What activities did you participate in (workshops, meetings, training programs, construction of remediation measures) under the Dioxin Project?
 - a. List the activities you participated in:

b. Please provide specific examples:

3. What do you think about overall quality of these training programs?

Participants: _____

Contents: _____

Time: _____

Other: _____

4. How was the overall level of cooperation between your organization and the Dioxin Project (PMU)?

- a. Excellent
- b. Good
- c. Fair
- d. Poor
- e. No Cooperation
- f. Don't know

5. What were the benefits of the Dioxin Project to your organization/local people?

Please provide specific examples

6. How many people in your organization/community were involved with and benefitted from the Dioxin Project?

Please provide specific examples

7. In what areas did your organisation/local communities benefit? (specify)

- a. Environment
- b. Human Health
- c. Livelihoods/Economic issues
- d. Social issues

- e. Capacity building
 - f. Others
8. For each benefit identified, how effective were these benefits to your organization/local people?
- a. Very effective
 - b. Somewhat effective
 - c. Not effective
 - d. Don't know
9. What were the impacts of the Dioxin Project to your organization/local people? (Please provide specific examples)
- a. Environment
 - b. Human Health
 - c. Social issues
 - d. Capacity building
 - e. Others
10. For each impact identified, rank them as follows:
- a. Very Significant
 - b. Significant, Insignificant
 - c. Don't know
 - d. Please provide specific examples:
11. Do people in your community have an improved understanding of dioxin contamination in Bien Hoa as a result of the Dioxin Project?
- a. Significant improvement
 - b. Some improvement
 - c. No improvement
 - d. Don't know
 - e. Please provide specific examples:

12. How would you rank the local people's understanding of dioxin contamination and dioxin impacts compared to 5 years ago?
 - a. Significant improvement
 - b. Some improvement
 - c. No improvement
 - d. Don't know
13. What were the key Lessons Learned from the Dioxin Project?

Please provide specific examples
14. What were the limitations of the Dioxin Project to your organization/local people?

Please provide specific examples
15. What could have been improved under the Dioxin Project?

Please provide specific examples
16. What recommendations do you have for the Dioxin Project team for the future?

Please provide specific examples
17. Please provide any other comments or suggestions:

Time	Activities	Contents	Expected results	Notes
	Meeting with Director of Bien Hoa DONRE	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Project activities implemented in your area + Project’s activities having DONRE involvement ▪ Benefit of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Social issues + Capacity building ▪ Advantages and disadvantages of implementing the project activities. ▪ Cooperation between Bien Hoa DONRE and PMU, Project officers and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving DONRE ▪ Description of overall project benefits and impacts ▪ Reports and data on environmental activities conducted with DONRE under the Project 	Bien Hoa DONRE benefits/impacts from the Project over the last 5 years
	Meeting with Director of Bien Hoa Department of Health	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Project activities implemented in your area + Project’s activities having Bien Hoa DoH involvement ▪ Benefit of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Social issues + Capacity building ▪ Advantages and disadvantages of implementing the project’s activities. ▪ Cooperation between Bien Hoa DoH and PMU, Project officers and related stakeholders.. ▪ Lessons learned from this project ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving DOH ▪ Description of overall project benefits and impacts ▪ Reports and number related to local people’s health and activities cooperated with the Project 	Bien Hoa DOH benefits/impacts from the Project over the last 5 years. Data on chronic diseases in Bien Hoa City and communes surrounding Airport

Time	Activities	Contents	Expected results	Notes
	Meeting with Provincial Preventive Medical Centre	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Project activities implemented in your area + Project’s activities having Bien Hoa PPMC’s involvement ▪ Benefit of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Social issues + Capacity building ▪ Advantages and disadvantages of implementing the project’s activities. ▪ Cooperation between Bien Hoa PPMC and PMU, Project officers and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving PPMC ▪ Description of overall project benefits and impacts ▪ Reports and number related to Preventive Health Care of local people and activities cooperated with the Project 	Bien Hoa PPMC benefits/impacts from the Project over the last 5 years
	Meeting with Mangement of Bien Hoa airbase	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Project activities implemented in your area + Project’s activities having Bien Hoa airbase’s involvement ▪ Benefit of the Project to Bien Hoa airbase: <ul style="list-style-type: none"> + Environment + Improving health and safety of staff working on the airbase + Capacity building ▪ Advantages and disadvantages of implementing the project’s activities. ▪ Cooperation between Bien Hoa airbase and PMU, Project officers and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving Airbase personnel ▪ Description of overall project benefits and impacts ▪ Reports and number related to activities of Bien Hoa’s airbase cooperated with the Project 	Bien Hoa Airbase benefits/impacts from the Project over the last 5 years

Time	Activities	Contents	Expected results	Notes
	Meeting with local commune authorities near Bien Hoa airbase	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area + Benefits and limitations of these activities ▪ Benefits of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Livelihoods/Economic issues + Education + Other social issues + Capacity building ▪ Cooperation between local authorities and the Dioxin Project. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving the local community. ▪ Description of overall project benefits and impacts ▪ Reports and data related to activities conducted by the community under the Project 	The local people and environment benefits/impacts from the Project over the last 5 years
	Meeting with representative of Dioxin victim association (DVA)	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area + Benefits and limitations of these activities ▪ Benefits of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Livelihoods/Economic issues + Education + Other social issues 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving local communities and AO victims ▪ Description of overall project benefits and impacts ▪ Reports and data related to activities conducted by Bien Hoa DVA under the Project 	DVA benefits/impacts from the Project over the last 5 years

Time	Activities	Contents	Expected results	Notes
		<ul style="list-style-type: none"> + Capacity building ▪ Cooperation between Dioxin Victim Association and local authorities and the Project staff. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 		
	Meeting with a household living near by the airbase	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area + Benefits and limitations of these activities ▪ Benefits of the Project to your household and community: <ul style="list-style-type: none"> + Environment + Human Health + Livelihoods/Economic issues + Education + Other social issues ▪ Cooperation between local people, Dioxin Victim Association and local authorities and the Project staff. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ Description of overall project benefits and impacts 	Meeting with a household living near by the airbase
	Meeting with a household living near by the airbase	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area ▪ Benefits of the Project to your household and community: <ul style="list-style-type: none"> + Environment 	<ul style="list-style-type: none"> ▪ Description of overall project benefits and impacts 	

Time	Activities	Contents	Expected results	Notes
		<ul style="list-style-type: none"> + Human Health + Livelihoods/Economic issues + Education + Other social issues ▪ Cooperation between local people, Dioxin Victim Association and local authorities and the Project staff. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 		
	<p>Meeting with a household living near by the airbase</p>	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area ▪ Benefits of the Project to your household and community: <ul style="list-style-type: none"> + Environment + Human Health + Livelihoods/Economic issues + Education + Other social issues ▪ Cooperation between local people, Dioxin Victim Association and local authorities and the Project staff. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ Description of overall project benefits and impacts 	<p>Meeting with a household living near by the airbase</p>

SCHEDULE FOR EVALUATION OF DIOXIN PROJECT IMPACT TO THE ENVIRONMENT AND PEOPLE – PHU CAT AIRBASE

VENUE:

Phu Cat airbase

TIME:

21-22 June 2014

GOAL:

Evaluating impacts and effectiveness of activities of the Project “Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam” to the environment and people in and around Phu Cat airbase.

METHODS:

Semi-structured interviews, observations, collection of relevant reports and data from local authorities.

Interviewees will be asked a series of specific questions, but will be encouraged to provide additional information through discussions with the Team.

QUESTIONS:

1. What was your involvement with the GEF Dioxin Project?
 - a. Significant
 - b. Limited Involvement
 - c. No Involvement
 - d. Don't know
2. What activities did you participate in (workshops, meetings, training programs, construction of remediation measures) under the Dioxin Project?
 - a. List the activities you participated in:
 - b. Please provide specific examples:
3. What do you think about overall quality of these training programs?

Participants:

Contents:

Time:

Other:

4. How was the overall level of cooperation between your organization and the Dioxin Project (PMU)?
 - a. Excellent
 - b. Good
 - c. Fair
 - d. Poor
 - e. No Cooperation
 - f. Don't know
5. What were the benefits of the Dioxin Project to your organization/local people?

Please provide specific examples
6. How many people in your organization/community were involved with and benefitted from the Dioxin Project?

Please provide specific examples
7. In what areas did your organisation/local communities benefit? (specify)
 - a. Environment
 - b. Human Health
 - c. Livelihoods/Economic issues
 - d. Social issues
 - e. Capacity building
 - f. Others
8. For each benefit identified, how effective were these benefits to your organization/local people?

- a. Very effective
 - b. Somewhat effective
 - c. Not effective
 - d. Don't know
9. What were the impacts of the Dioxin Project to your organization/local people? (Please provide specific examples)
- a. Environment
 - b. Human Health
 - c. Social issues
 - d. Capacity building
 - e. Others
10. For each impact identified, rank them as follows:
- a. Very Significant
 - b. Significant, Insignificant
 - c. Don't know
 - d. Please provide specific examples:
11. Do people in your community have an improved understanding of dioxin contamination in Phu Cat as a result of the Dioxin Project?
- a. Significant improvement
 - b. Some improvement
 - c. No improvement
 - d. Don't know
 - e. Please provide specific examples:
12. How would you rank the local people's understanding of dioxin contamination and dioxin impacts compared to 5 years ago?
- a. Significant improvement
 - b. Some improvement

c. No improvement

d. Don't know

13. What were the key Lessons Learned from the Dioxin Project?

Please provide specific examples

14. What were the limitations of the Dioxin Project to your organization/local people?

Please provide specific examples

15. What could have been improved under the Dioxin Project?

Please provide specific examples

16. What recommendations do you have for the Dioxin Project team for the future?

Please provide specific examples

17. Please provide any other comments or suggestions:

Time	Activities	Contents	Expected results	Notes
June 23, 2014				
08:00 – 09:00	Meeting with Manger Board of Phu Cat airbase	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Project activities implemented in your area + Project's activities having Phu Cat airbase's involvement ▪ Benefit of the Project to Phu Cat airbase: <ul style="list-style-type: none"> + Environment + Improving health and safety of staff working on the airbase + Capacity building ▪ Advantages and disadvantages of implementing the project's activities. ▪ Cooperation between Phu Cat airbase and PMU, Project officers and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving Airbase personnel ▪ Description of overall project benefits and impacts ▪ Reports and number related to activities of Phu Cat's airbase cooperated with the Project 	Phu Cat Airbase benefits/impacts from the Project over the last 5 years
10:30 – 11:15	Meeting with director of Phu Cat DONRE	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Project activities implemented in your area. + Project's activities having DONRE involvement. ▪ Benefit of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Social issues + Capacity building ▪ Advantages and disadvantages of implementing the project activities. ▪ Cooperation between Phu Cat DONRE and PMU, Project officers and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving DONRE ▪ Description of overall project benefits and impacts ▪ Reports and data on environmental activities conducted with DONRE under the Project 	Phu Cat DONRE benefits/impacts from the Project over the last 5 years

Time	Activities	Contents	Expected results	Notes
14:00 – 15:00	Meeting with Director of Phu Cat Department of Health	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Project activities implemented in your area + Project's activities having Phu Cat DoH involvement ▪ Benefit of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Social issues + Capacity building ▪ Advantages and disadvantages of implementing the project's activities. ▪ Cooperation between Phu Cat DoH and PMU, Project officers and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving DOH ▪ Description of overall project benefits and impacts ▪ Reports and number related to local people's health and activities cooperated with the Project 	Phu Cat DOH benefits/impacts from the Project over the last 5 years - Data on chronic diseases in Phu Cat City and communes surrounding Airport
15:30 – 16:30	Meeting with Provincial Preventive Medical Centre	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Project activities implemented in your area + Project's activities having Phu Cat PPMC's involvement. ▪ Benefit of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Social issues + Capacity building ▪ Advantages and disadvantages of implementing the project's activities. ▪ Cooperation between Phu Cat PPMC and PMU, Project officers and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving PPMC ▪ Description of overall project benefits and impacts ▪ Reports and number related to Preventive Health Care of local people and activities cooperated with the Project 	Phu Cat PPMC benefits/impacts from the Project over the last 5 years

Time	Activities	Contents	Expected results	Notes
June 24, 2014				
08:00 – 09:00	Meeting with representative of Dioxin victim association	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area + Benefits and limitations of these activities ▪ Benefits of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Livelihoods/Economic issues + Education + Other social issues + Capacity building ▪ Cooperation between Dioxin Victim Association and local authorities and the Project staff. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving local communities and AO victims. ▪ Description of overall project benefits and impacts ▪ Reports and data related to activities conducted by Phu Cat DVA under the Project 	DVA benefits/impacts from the Project over the last 5 years
	Meeting with local commune authorities near Phu Cat airbase	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area + Benefits and limitations of these activities: ▪ Benefits of the Project to your local area: <ul style="list-style-type: none"> + Environment + Human Health + Livelihoods/Economic issues 	<ul style="list-style-type: none"> ▪ List of concrete Project activities involving the local community ▪ Description of overall project benefits and impacts ▪ Reports and data related to activities conducted by the community under the Project 	The local people and environment benefits/impacts from the Project over the last 5 years

Time	Activities	Contents	Expected results	Notes
		<ul style="list-style-type: none"> + Education + Other social issues + Capacity building ▪ Cooperation between local authorities and the Dioxin Project. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 		
	<p>Meeting with a household living near by the airbase</p>	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area + Benefits and limitations of these activities ▪ Benefits of the Project to your household and community: <ul style="list-style-type: none"> + Environment + Human Health + Livelihoods/Economic issues + Education + Other social issues ▪ Cooperation between local people, Dioxin Victim Association and local authorities and the Project staff. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ Description of overall project benefits and impacts 	<p>Meeting with a household living near by the airbase</p>
	<p>Meeting with a household living near by the airbase</p>	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area ▪ Benefits of the Project to your household and community: 	<ul style="list-style-type: none"> ▪ Description of overall project benefits and impacts 	

Time	Activities	Contents	Expected results	Notes
		<ul style="list-style-type: none"> + Environment + Human Health + Livelihoods/Economic issues + Education + Other social issues ▪ Cooperation between local people, Dioxin Victim Association and local authorities and the Project staff. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 		
	<p>Meeting with a household living near by the airbase</p>	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Dioxin remediation activities implemented in your area + Communication of impacts of dioxin to the environment and health in your area + Dioxin exposure prevention methods implemented in your area ▪ Benefits of the Project to your household and community: <ul style="list-style-type: none"> + Environment + Human Health + Livelihoods/Economic issues + Education + Other social issues ▪ Cooperation between local people, Dioxin Victim Association and local authorities and the Project staff. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ Description of overall project benefits and impacts 	

SCHEDULE FOR EVALUATION OF DIOXIN PROJECT IMPACT TO THE ENVIRONMENT AND PEOPLE – HANOI

VENUE:

Hanoi

TIME:

25-26 June 2014

GOAL:

Evaluating impacts and effectiveness of activities of the Project “Environmental Remediation of Dioxin Contaminated Hotspots in Viet Nam” to the environment and people in three hotspots (Danang, Bien Hoa and Phu Cat).

METHODS:

Semi-structured interviews, observations, collection of relevant reports and data from local authorities.

Interviewees will be asked a series of specific questions, but will be encouraged to provide additional information through discussions with the Team.

Time	Activities	Contents	Expected results	Notes
June 25th, 2014				
14:00 – 15:00	Meeting with MONRE/Office 33 representative	<ul style="list-style-type: none"> ▪ Summarize the main activities and achievements of the Dioxin Project. ▪ Benefits and limitations of the Project. ▪ Monitoring, coordinating and reporting. ▪ Advantages and disadvantages of implementing the project's activities. ▪ Cooperation between the sponsor, the project manager, the PMU, and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. ▪ Summarize the main activities and achievements of the Project. ▪ Advantages and disadvantages of the project's activities on: Containment/remediation, Environmental recovery, National regulations and institutional capacities, Planning and Management of project activities. ▪ Changes in 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. ▪ Benefits and limitations of the Project. ▪ Cooperation between the PMU and related stakeholders. ▪ Monitoring, coordinating and reporting. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of main activities and achievements of the Project ▪ Description of overall project benefits and impacts ▪ Lessons learned from this project 	Dr. Lê Kế Sơn
15:30 – 16:30	Meeting UNDP representative	<ul style="list-style-type: none"> ▪ Roles and support activities of UNDP in planning and implementing the Dioxin Project. ▪ Benefits and limitations of these activities. ▪ Monitoring, coordinating and reporting. ▪ Cooperation between UNDP, GEF, the project manager, the PMU, and related stakeholders. ▪ Lessons learned from this project. 	<ul style="list-style-type: none"> ▪ List of roles and support activities of UNDP in planning and implementing the Dioxin Project ▪ Description of overall project benefits and impacts ▪ Lessons learned from this 	Mr. Lai Ms. Trang

Time	Activities	Contents	Expected results	Notes
		<ul style="list-style-type: none"> ▪ Suggestions/recommendations for sustaining the project achievements. 	project	
June 26th, 2014				
08:00 – 09:00	Meeting with USAID representative	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: + Project's activities having USAID involvement. ▪ Benefits and limitations of these activities. ▪ Cooperation between USAID, the Dioxin Project and related stakeholders. ▪ Mutual support and sharing knowledge and information. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ List of main activities and achievements of the Cooperation between the Dioxin Project and USAID ▪ Description of overall project benefits and impacts ▪ Lessons learned from this project 	
09:30 – 10:30	Meeting with MPI representative	<ul style="list-style-type: none"> ▪ Appropriateness of the Dioxin Project. ▪ Roles of MPI in Planning and Implementing the Project activities. ▪ Benefits and limitations of the Project. ▪ Cooperation between MPI and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 	<ul style="list-style-type: none"> ▪ Description of overall project benefits and impacts ▪ Lessons learned from this project 	Ms. Nong Thi Hong Hanh
14:00 – 15:00	Meeting with MOD representative	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: + Project's activities having MOD involvements. ▪ Benefits and limitations of the Project. ▪ Cooperation between MOD, PMU and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 		Mr. Than Thanh Cong
15:30 – 16:30	Meeting with VRTC	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: + Project's activities having MOH involvements. ▪ Benefits and limitations of the Project. 		Mr. Nghiem Xuan Truong

Time	Activities	Contents	Expected results	Notes
		<ul style="list-style-type: none"> ▪ Cooperation between VRTC, PMU and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 		
	Meeting with VNU	<ul style="list-style-type: none"> ▪ Information on the Dioxin Project: <ul style="list-style-type: none"> + Project's activities having MOH involvements ▪ Benefits and limitations of the Project. ▪ Cooperation between VNU, PMU and related stakeholders. ▪ Lessons learned from this project. ▪ Suggestions/recommendations for sustaining the project achievements. 		Dr. Nguyen Hung Minh

DATA COLLECTION FORM AT PEOPLE COMMITTEE AND COMMUNE HEALTH CENTER

1.1

1. Province/city:.....Code <input type="text"/>	2. District:.....Code <input type="text"/> <input type="text"/>
3. Commune:.....Code <input type="text"/> <input type="text"/>	4. Date of investigation: <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/>
	<input type="text"/>
5. Informant:.....	6. Position:.....7. Tel/Mobile:.....

A. GENERAL ADMINISTRATIVE, SOCIO-ECONOMICS AND POPULATION DATA

N0.	Contents	2009	2010	2011	2012	2013
1.	Population					
	<i>Male</i>					
	<i>Female</i>					
2.	Number of households					
3.	Number of poor households					
4.	Number of poor people					
5.	Number of households living within 1 km of the airbase					
6.	Number of people living within 1 km of the airbase					
7.	Number of households living within 5 km of the airbase					
8.	Number of people living within 5 km of the airbase					
9.	Number of women of reproductive age (15-49)					
10.	Number of primary school students					
11.	Number of secondary school students					
12.	Number of high school students					
13.	Number of university students					
14.	Average annual income per capita (thousand dongs)					
15.	Other data:					
16.	Other data:					

N0.	Contents	2009	2010	2011	2012	2013
17.	Other data:					
18.	Other data:					

B. PUBLIC HEALTH GENERAL INDICATORS

N0.	Contents	2009	2010	2011	2012	2013
1.	Number of live births					
2.	Number of deaths					
3.	Number of deaths among newborns under 28 days old					
4.	Number of deaths among children under 1 year old					
5.	Number of deaths among children under 5 years old					
6.	Number of maternal deaths					
7.	Number of children under 5 years old					
8.	Number of children under 5 malnutrition (weight by age)					
9.	Other data:					
10.	Other data:					
11.	Other data:					
12.	Other data:					

C. INCIDENCE OF DISEASES

N0.	Contents	2009	2010	2011	2012	2013
1.	Heart diseases					
2.	High blood pressure					
3.	Thyroid problem					
4.	Respiratory diseases					
5.	Diabetes					
6.	Type II Diabetes					
7.	Cancer					
8.	Pregnancy complications					
9.	Birth defects					
10.	Spina bifida					
11.	Cleft palate					

N0.	Contents	2009	2010	2011	2012	2013
12.	Other birth defects					
13.	Mental disorders					
14.	Intestinal diseases					
15.	Bone-related diseases					
16.	Urinary system related diseases					
17.	Malaria					
18.	Dengue Fever					
19.	Other diseases:					
20.	Other diseases:					
21.	Other diseases:					
22.	Other diseases:					
23.	Other diseases:					
24.	Other diseases:					
25.	Other diseases:					
26.	Other diseases:					
27.	Other diseases:					

...../...../2011

COMMUNE REPRESENTATIVE

(signature)

INVESTIGATOR

(signature and full name)

Appendix A4

Quotes and Recommendations Provided During Interviews

APPENDIX A4: QUOTES AND RECOMMENDATIONS PROVIDED DURING INTERVIEWS

The following is a summary of comments and feedback obtained from interviews with key project stakeholders in Da Nang, Bien Hoa, Phu Cat and Ha Noi in June 2014.

Dr. Le Ke Son, Dioxin Project Director

- In terms of addressing the scientific issues surrounding dioxin in practical and humanitarian ways, I would say the UNDP project is among the most significant in Viet Nam. This project was the first where a prestigious organization like UNDP/GEF conducted a dioxin project in Viet Nam which has practical results, visible to the people. Local people around the major hotspots have gained a better understanding of exposure pathways and ways to prevent exposure.
- Sustainability of the UNDP project is essential. The project was a 'kick-off', seed funding, for future projects. The capacity of local and Airbase authorities have improved. The future of the project will face challenges which include limited time and budget, a large geographic scope and the enormity of the TCDD problem.

Mr. Dang Quang Vinh, Director of the Department of Environment (Da Nang)

- The project will have the following benefits for the local area around Da Nang:
 - Reduced dioxin in the local environment;
 - Remediated of contaminated areas and the land can be reused after treatment;
 - Reduced health risk for local people.
- Sharing knowledge and information on dioxin and remediation is very important.

Dr. Tran Thi Hoa Ban, Da Nang Department of Health (Da Nang)

- A benefit of the Project is reduced health risk for local people, reduced incidences of birth defects and overall improved health for local people.

Mrs. Nguyen Thi Hien, Chair of DVA (Da Nang)

- The project made possible networking opportunities and for DVA to meet sponsors and people who people wish to support AO victims and disabled people.
- The workshops organised by Office 33 provided valuable information, especially on environmental issues related to dioxin.
- Attending these workshops, participants could get more knowledge and information on dioxin, its impact on environment and health and dioxin situation in local area.
- Feeling more self-confident on dioxin knowledge and information, which helps improve communication activities for local people.
- Giving opportunities to meet experts and organizations who can help support to DVA and disabled people.

- A story from meeting UNICEF representative: In a workshop organised by Office 33, Hien (Manager of DVA) met a UNICEF representative. He was impressed by information provided by her in the workshop and visited DVA. After visiting DVA's centre for supporting dioxin victims and disabled people, he decided to provide funding to build a new centre in Hoa Vang District. The centre can help to take care, rehabilitate, and provide vocational training for 70 children, as well as dioxin victims and disabled people.

MA. Ton That Thanh, Provincial Preventative Medical Centre (Da Nang)

- Before having the Dioxin Project, the issue of contaminated dioxin in Da Nang was "sensitive" because of worries on impacts to investment and tourism. The dioxin contamination issue is now more open to discussion, and we have found appropriate solutions to address this problem.

Mr. Vu Duc Trung, Da Nang Airbase staff (Da Nang)

- Local people and staff working in Da Nang airbase have knowledge on impacts of dioxin and prevention of dioxin exposure, so local people don't feel puzzled and anxious anymore.
- After treating dioxin contamination, land can be reused for expanding the airport and improving the airport land use.
- Health of workers and working conditions have been ensured and reached international standards.

Ms. Vo Niem Tuong, Director, Dong Nai DONRE (Bien Hoa)

- The Dioxin Project achieved remarkable results by preventing dioxin spreading from contaminated area in the airbase. However, dioxins had already spread out to areas surrounding airbase for more than 40 years.

Mr. Huynh Cao Hai and Mr Nguyen Xuan Hung, Director of Bien Hoa Department of Health and the Provincial Preventative Medical Centre (Bien Hoa)

- Information on dioxin provided by the Dioxin Project helps local people and authorities to know about dioxin contaminated areas and dioxin exposure prevention measures.
- The Dioxin Project attracts other scientists, sponsors and managers interested in dealing with issues related to dioxin. For example: Military Hospital 103 and a University in Japan cooperate in studying dioxin in mother's milk in people who are living around the airbase. Another project is studying factors related to birth defects implemented by Hanoi Medical University. The Dong Nai DONRE established dioxin monitoring locations. The Czech Project helped to collect some samples to identify dioxin levels in some areas.
- Communication activities conducted by the Dioxin Project and the Vietnam Public Health Association provide documents on dioxin information and prevention of dioxin exposure to local authorities and people who are living around the airbase. A network of collaborators was established and trained to have knowledge and skills on dioxin communications.
- The results of these research and communication programs are remarkable. The results help to improve awareness, knowledge of local authorities and people on dioxin, to change

attitudes on dioxin information and dealing with issues related to dioxin, to provide dioxin exposure prevention methods.

Mr. Dao Xuan Nam, Authority leader of a commune near Bien Hoa Airbase, (Bien Hoa)

- After knowing information on dioxin contamination, agricultural activities have been forbidden on the airbase. The fence around the airbase helps to reduce the number of people who can enter. In general, there is no agriculture activity in the airbase now.
- Thanks to the dioxin communications program, people in other areas understand the situation clearly. Several years ago, people knew little about dioxin; nobody wanted to buy land and houses in our commune. People now have a better understanding of the true situation related to dioxin contamination, so the price of land and houses has increased.
- Before, people in our commune felt anxious about the dioxin issue; local people now feel safer as a result of the Dioxin Project.

Ms. Dao Nguyen, Representative of Dioxin Victim Association (DVA), Bien Hoa

- Before the Dioxin Project was conducted in Bien Hoa, the Dong Nai DVA only implemented communication activities related to policies for AO/dioxin victims. Now, Dong Nai DVA can confidently conduct some simple communication activities on dioxin awareness and exposure prevention.

Dr. Tu Binh Minh, VNU University of Science, Faculty of Chemistry (Hanoi)

- Each dioxin remediation technology has its advantages and disadvantages, and pilot testing was an important component under the Dioxin Project. It is less important whether or not the technology worked – what was more important was going through the process of learning how to select technologies. Perhaps in future the technologies will work better, because they won't just be pilot tested, but will be used under actual remediation conditions.

Dr. Than Thanh Cong, MND (Hanoi)

- Communication activities helped raise awareness of staff and soldiers in Airbases and the communities in general regarding preventing dioxin exposure and orientation (plans) for future dioxin treatment.
- Management organizations (Department of Military Science, environmental management organization under MND) had a better understanding of how to organize monitoring activities for the contaminated areas under the Dioxin Project.
- Project also provided opportunities for us to meet and to work together and discuss the dioxin issue, which was another benefit.
- Helped establish a network between national and international scientists
- Learned about the organization of the PMU and professional ways of organizing activities and events (workshops, etc.).
- Thanks to this project, MND is much more interested and involved in dioxin issue, and there are now staff from Air Force/Air Defense Command who are specialized in the dioxin

issue. Previously, the military only dealt with security of people going on the base, but now they have trained personnel who can assist with sampling and assessment.

Nguyen Xuan Truong, NX VRTC (Hanoi)

- Previously, when we developed standards, we just used existing standards from other countries and adopted them to VN. Now, we collected our own data and information to help develop our own dioxin emission standards. The capacity to do this was developed during the Dioxin Project. VRTC had previously done some industrial sampling before, but we were able to continue this work under the Dioxin project. Our staff capacity was improved as a result of the Project.
- Through the project, we had opportunities to meet other organizations, local and international, as well as industries. We now have better connections for conducting dioxin research, assessment and analysis.

Ms. Nong Thi Hong Hanh, Head of Division, Foreign Economic Relations Department, International Organizations and INGOs Division, Ministry of Planning and Investment (Hanoi)

- The level of national ownership in the Dioxin Project was encouraging. Office 33 was unique in being able to implement this project. Vietnam as a middle-income country is in a position whereby they can take more of a lead on projects such as this. This is a good lesson learned in terms of partnership at advanced levels. This was not a donor project, it was a Vietnamese project. People learned by doing it themselves, not just by having international consultants do it for them.

Mr. Dao Xuan Nam, Authority leader of a commune near Bien Hoa Airbase - June 19-20, 2014

- In areas surrounding Bien Hoa airbase, soils may be contaminated with dioxins, but farmers continue to grow rice and vegetables. The local authorities recommended to the people that they should not grow crops in these areas. However, some migrants and labourers who only recently moved to this area do not know much about dioxin, and they still participate in agricultural activities.

Mr. Nguyen van Thanh, Vice-Deputy of Administrative Section & Mr. Doan Van Thanh, Deputy Advisor of Regiment, Phu Cat Airbase

- Fishing still occurs on lakes near the Airbase. Soldiers still fish there. There have been warnings from the regiment not to fish there, but people still do. There are no signs on the lakes, no regulation on using food from the airbase.
- Need to be careful with communicating project activities so not to affect the thinking of the soldiers here (we don't want them to be afraid). There are also concerns about too much dioxin information getting out, as this may affect tourism, and may affect peoples' decisions about who to marry.

Ms. Ha Thi Thanh Huong, Director & Mr. Dao Huu Quoc, Vice-Head of Pollution Control Office, Quy Nhon

- Support should come from O33 for capacity building of staff to increase knowledge and awareness of dioxin. This would help improve the communication and knowledge to higher levels.
- Need to be trained in how to do the sampling – we don't need a dioxin lab – but we should be trained in sample collection so that we know how to do this ourselves.