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ENVIRONMENTAL REMEDIATION AT DA NANG AIRPORT

Gender Assessment

USAID

November 2, 2010

Environmental Remediation at Da Nang Airport

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ACRONYMS AND ABBREVIATIONS

ADS	Automated Directives System
Airport	Da Nang Airport
ARVN	South Vietnamese Army
CAAV	Civil Aviation Agency of Vietnam
CDM	CDM International Inc.
CEDAW	United Nations Convention on the Elimination of Discrimination against Women
CFR	Code of Federal Regulations
d	Day
EA	Environmental Assessment
GAC	Granular activated carbon
GDP	Gross domestic product
GVN	Government of Viet Nam
ha	Hectare
Hatfield	Hatfield Consultants
IPTD	In-pile thermal desorption
ISTD	In-situ thermal desorption
kg bw	Kilogram body weight
km	Kilometer
m^3	Cubic meter
MLA	Former Mixing and Loading Area
MND	Ministry of National Defense, Vietnam
NATO	North Atlantic Treaty Organization
PAVN	People's Army of Vietnam
PCDD	Polychlorinated dibenzo-p-dioxin
pg	Picogram
PISA	Former Pacer Ivy Storage Area
PPE	Personal protective equipment
ppt	Parts per trillion
Project	Environmental Remediation at Da Nang Airport: Assessments and Engineering Planning and Design for Dioxin Containment
SA	Former Storage Area
SVNAF	South Vietnamese Air Force
TEQ	Toxicity equivalent
U.S.	United States
USAF	United States Air Force

USAID	United States Agency for International Development
U.S.C.	United States Code
USG	United States Government
UXO	Unexploded ordnance
VCP	Vietnamese Communist Party
VPHA	Vietnam Public Health Association
WHO	World Health Organization

Section 1. Introduction

In September 2009, the United States Agency for International Development (USAID) awarded a contract to CDM International Inc. (CDM) to implement the project, "Environmental Remediation at Da Nang Airport: Assessments and Engineering Planning and Design for Dioxin Containment" (Project). Under the USAID Automated Directives System (ADS) 201.3.9.3, a Gender Assessment is required to understand how the Project will impact men and women differently, and to identify mitigation strategies for any negative impacts resulting from the Project activities.

The Gender Assessment examines functional labor categories associated with each step of the environmental remediation process at Da Nang Airport (Airport) to determine whether gender-specific measures are necessary. Project beneficiaries, by gender, have been identified to track longer-term Project benefits. The recommendations from the Gender Assessment will be incorporated into the Health and Safety Plan, the On-Site Worker Health and Safety Training Plan, and a Sampling and Analysis and Monitoring Plan to be implemented during the remediation.

1.1. Approach and Methodology

The Gender Assessment is based on a key assumption and previous investigations conducted at the Airport. The key assumption is that the Government of Viet Nam (GVN) will select In-Situ Thermal Desorption/In-Pile Thermal Desorption (ISTD/IPTD) as the preferred Project alternative for remediation of the Airport. Four Project alternatives were considered for remediation of the Airport in the Environmental Assessment (EA) prepared by USAID in compliance with Title 22 United States Code (U.S.C.) of Federal Regulations (CFR) Chapter 216: No Action, Passive Landfill, Active Landfill, and ISTD/IPTD. ISTD/IPTD was selected by USAID in the EA as the preferred alternative because it was found to have the highest treatment effectiveness, the highest feasibility, the lowest potential environmental impact, and a cost in the same range as the other alternatives.[1]

Previous investigations demonstrate dioxin concentrations within hotspot areas of the Airport substantially exceed international and Vietnamese standards for dioxin in both soil and sediment.[2] Uncontrolled access to contaminated areas of the Airport and transport of contaminated soils and sediments has likely resulted in human exposures primarily through agricultural activities and fish consumption. High dioxin and furan levels in breast milk of women in and around the Airport[3] emphasize the need for mitigation measures to protect breast-feeding mothers, infants, and women of childbearing age against dioxin exposure.

USAID is required to plan all projects using a gender perspective, following ADS 201.3.9.3, which states:

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[1] USAID 2010b

[2] TCVN 8183. 2009. Hatfield/10-80 2006; Hatfield/Office 33 2007 and 2009

[3] All breast milk samples analyzed exhibited TEQs exceeding the WHO Tolerable Daily Intake guideline of 4 picograms (pg) TEQ/kilogram body weight (kg bw)/day (d). (Hatfield/10-80 2006; Hatfield/Office 33 2007 and 2009)

> *Gender issues can be central to the achievement of Assistance Objectives. Accordingly, USAID planning must take into account gender considerations. Gender analysis can help to guide long-term planning and ensure desired results are achieved. However, gender is not a separate topic to be analyzed and reported on in isolation. Where appropriate, gender analysis should be applied to the range of technical issues that are considered in the development of Assistance Objectives and activities.* [4]

USAID's approach to conducting a gender analysis focuses on answering two key questions as follows:

1. How will the different roles and status of women and men within the community, political sphere, workplace, and household affect the work to be undertaken?

2. How will the anticipated results of the work affect women and men differently?[5]

The methodology used to answer the two key questions outlined above involved conducting secondary research, information gathering, and interviews to complete the following items:

- Identify the main steps involved in the remediation activities to understand potential contamination risks for the different stakeholder groups;

- Create a gender baseline to understand the roles and status of women to understand how this might affect the Project activities, and the potential risks and benefits for men and women;

- Identify potential stakeholder groups that could be impacted by the Project activities. The potential stakeholders include construction workers, Airport workers and passengers, military personnel working on the Airport, informal workers, and residents living near the Airport property; and

- Develop population profiles for the wards surrounding the Airport property to identify Project beneficiaries and track longer-term Project benefits.

1.2. Document Structure

This report is presented in six main sections:

- Section 1 contains an introduction to the Gender Assessment and a summary of the approach and methodology used in the study.

- Section 2 provides an overview of the Project study area, as well as the main Project activities.

- Section 3 presents a gender baseline for the Project to provide insight into the role and status of women.

[4] USAID 2010a
[5] USAID 2010a

- Section 4 summarizes the stakeholder groups that could potentially be impacted by the Project activities.
- Section 5 outlines the Project beneficiaries through population profiles for the seven wards surrounding the Airport property.
- Section 6 describes the monitoring requirements and mitigation strategies to minimize any negative impacts resulting from the Project activities.
- Section 7 contains the references cited in the preparation of the Gender Assessment.

Section 2. Project Description

2.1. Da Nang City

Da Nang City has a population of approximately 825,000, with an approximate ratio of males to females at 49% and 51%, respectively.[6] The average population density of Da Nang City is approximately 6.4 persons/hectare (ha). The Airport property is located within the urban part of Da Nang City and is surrounded by three urban districts: Hai Chau on the northeast and east; Thanh Khe on the northwest and west; and Cam Le on the southwest, south, and southeast (Figure 1). These three districts are densely populated (population densities ranging from 21 to 181 persons/ha), with most of the land in these districts used for housing, industrial facilities, transportation, and other facilities (Table 1). With the exception of Cam Le District, few areas near the Airport property are used for agriculture, aquaculture, or forestry. These land uses in Cam Le District are generally to the southwest of, and not immediately adjacent to, the Airport property.

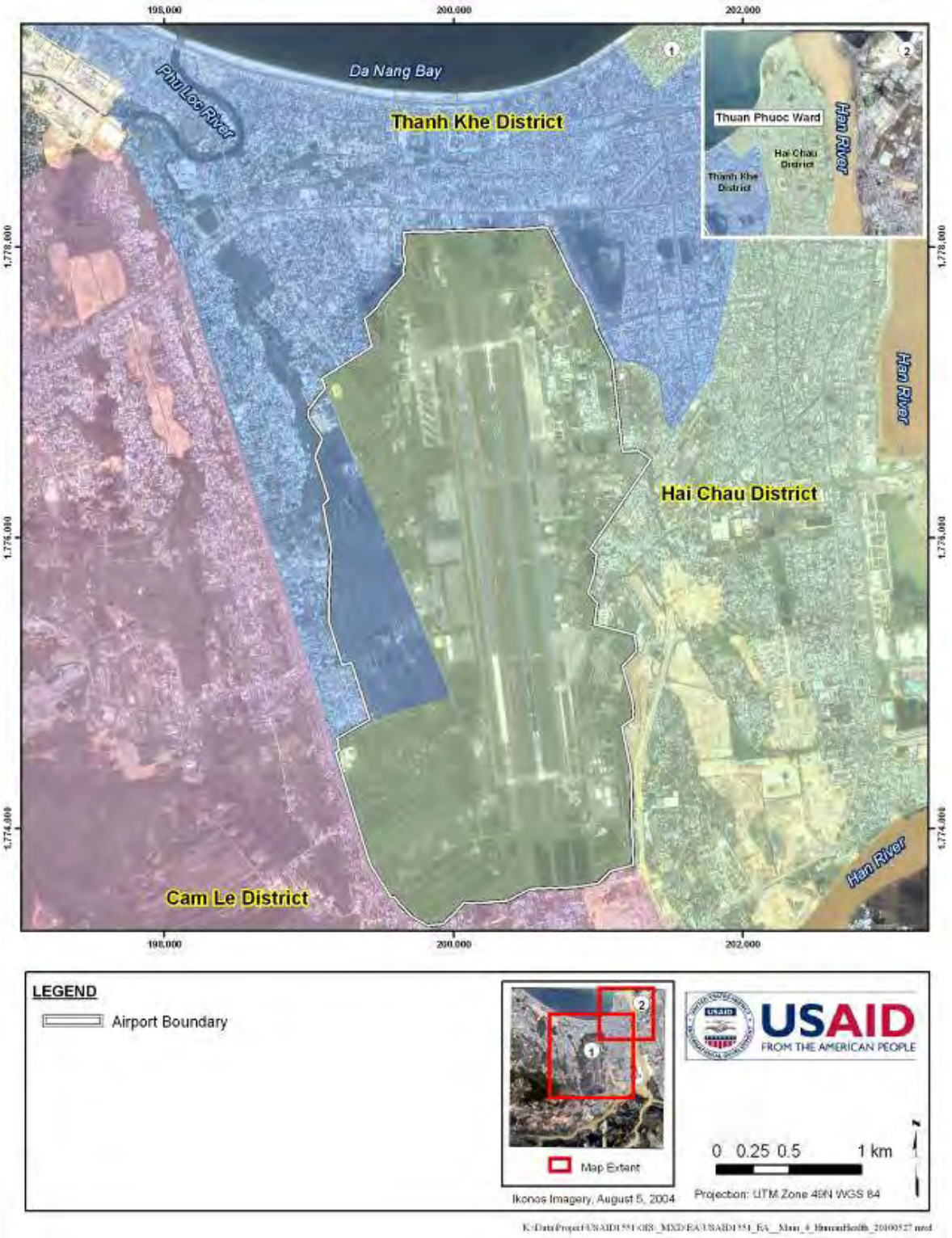
TABLE 1. DA NANG CITY DISTRICTS ADJACENT TO DA NANG AIRPORT[1]

	Hai Chau District	Thanh Khe District	Cam Le District
General			
Area (ha)	2,135	936	3,376
Total Population	196,842	169,268	70,052
Male Population	94,721	83,418	33,993
Female Population	102,121	85,850	36,059
Population Density (persons/ha)	92	181	21
Number of Wards	13	10	6
Land Use (ha, as of 2007)			
Total Agriculture Land	23	18	826
Rice	0	0	536
Other Cultivated Crops[2]	0	10	217
Tree Crops[3]	23	8	73
Aquaculture	0	0	28
Forestry Land[4]	0	0	210
Special Use Land[5]	1,328	388	956
Residential Land	473	454	676
Unused Land	311	76	680

Notes:
1 – Information as of 2008 unless otherwise noted (Da Nang Statistics Office 2008).
2 – Other cultivated crops include beans, groundnut, corn, and other vegetables.
3 – Tree crops include coconut, pepper, and cashew.
4 – Forestry land is defined as land used for the cultivation of trees for timber, other building products, or pulp and paper.
5 – Special Use Land includes roads, industrial zones, retail facilities, and canals.

[6] 2008 population figures taken from General Statistics Office online database

FIGURE 1. DIOXIN HOTSPOTS IDENTIFIED AT DA NANG AIRPORT



General information on Da Nang City and the districts of Thanh Khe, Cam Le, and Hai Chau is provided in Table 1. A number of people reside on the western edge of the Airport property, between the western boundary and the active runways. These are primarily military personnel, Airport workers, and their families.

2.1.1. The Da Nang Airport

In 1953/1954, the French laid a North Atlantic Treaty Organization (NATO)-standard 7,800-foot asphalt runway at Toluene, later renamed Da Nang. On July 1, 1955 the newly-independent South Vietnamese Air Force (SVNAF) took control of the facility, and the Toluene Airfield was turned over to civilian use. In 1958, the SVNAF re-established a presence at Da Nang, and the South Vietnamese Army (ARVN) also used Da Nang as a ranger training facility.[7]

During the United States (U.S.)-Viet Nam War (1959–1975), the Da Nang Airport was a major U.S. military base. As the fighting in Viet Nam increased in the 1960s, the number of SVNAF units at Da Nang also increased, as did those of the U.S. Air Force (USAF) and U.S. Marine air units, which swelled the base beyond its operational capacity. Covered and open aircraft revetments were constructed on concrete and asphalt parking aprons to protect the assigned aircraft from mortar attacks. In addition to these permanent assigned combat units, the airfield was a cargo facility for the huge C-141s, C-5s, and contract commercial flights of the Military Airlift Command, as well as a civil terminal for the various domestic airlines. It was also one of the main staging areas for Operation Ranch Hand.[8]

For the air war over North Viet Nam, Da Nang was considered the most suitable diversionary airfield in case of emergency. Landings of this nature became commonplace for Thailand-based USAF fighter bombers, reconnaissance aircraft, strike aircraft from the U.S. Navy air-craft carriers stationed in the South China Sea, and damaged aircraft of all air units stationed throughout South Viet Nam. At its peak in the mid-late 1960s, Da Nang Airport was one of the busiest airfields in the world.[9]

The Airport is currently used both by civilian and military aircraft, and is one of the three international airports in Viet Nam. The northern border of the Airport is located approximately 1 kilometer (km) from the sea at Da Nang Bay. The Airport has two runways, including one 3 km paved runway. The Airport has a modern aviation equipment system to handle large aircraft. In 2000, the estimated number of passengers was 1.5 million and is projected to grow to 4 million by 2020.[10] Traffic volume at Da Nang averages 100 to 150 flights every 24 hours. Annual traffic is between 800,000 and 1 million passengers.

2.2. Study Area

The Airport property is located within Da Nang City and is used by both the Ministry of National Defense (MND) and the Civil Aviation Agency of Vietnam (CAAV). It has a total area of 820 ha, of which 150 ha are allocated to civil aviation, and the remaining 670 ha are under

[7] Hatfield/Office 33 2007
[8] Hatfield/Office 33 2007
[9] Hatfield/Office 33 2007
[10] Airport Technology 2010

the jurisdiction of the MND. GVN plans to expand the Airport and requires dioxin removal from the northern area of the Airport to allow for extension of the runway and expanded taxiways.[11]

There are at least 14 lakes on the Airport property that are still used today for fishing and aquaculture. Fishing activities on Sen Lake have been banned since 2007, but this ban has not been implemented on other lakes. As noted in Section 1.1, previous investigations have shown that dioxin contamination is not a concern at the majority of the lakes of the Airport property with the exception of Sen Lake and its adjacent wetlands. During the 1960s, land use in the Da Nang City area was very different, particularly north of the Airport; large tracts of land were used for rice agriculture, and several of the wetlands in the area could be considered as extensions of the Sen Lake ecosystem.[12]

Dioxin hotspots identified in the area[13] are primarily located in the northern portion of the Airport and include the following (Figure 2):

- Former Mixing and Loading Area (MLA);
- Former Storage Area (SA);
- The main Drainage Ditch, associated minor drainage ditches, and the drainage outlet from Sen Lake to the Da Nang storm drain, as well as contaminated soils on either side of the main Drainage Ditch;
- Eastern Hotspot (area between the main Drainage Ditch and the Eastern Wetland);
- Sen Lake and the Eastern Wetland; and
- Former Pacer Ivy Storage Area (PISA) on the southern portion of the Airport property.

Studies conducted to date show that dioxin concentrations within hotspot areas of the Airport substantially exceed international and Vietnamese standards for dioxin.[14] It is clear that dioxin has entered the aquatic and human food chain, and that levels in the human population are above World Health Organization (WHO) standards.[15] Interim mitigation measures implemented in 2007, with financial assistance from the Ford Foundation and the U.S. Government (USG), have helped to reduce dioxin exposure to the local population, although it is recognized that these measures only provide a temporary solution to the problem.[16]

[11] Da Nang Centre for Environmental Technology 2009
[12] Hatfield/Office 33 2007
[13] Hatfield/Office 33 2009
[14] TCVN 8183: 2009; Hatfield/10-80 2006; Hatfield/Office 33 2007 and 2009
[15] Hatfield/Office 33 2009
[16] USAID 2010b

FIGURE 2. DIOXIN HOTSPOTS IDENTIFIED AT DA NANG AIRPORT

Dioxin is a toxic chemical associated with a range of health effects.[17] The GVN has established a national cleanup standard for dioxin of 1,000 parts per trillion (ppt) toxicity equivalent (TEQ) in soil and 150 ppt TEQ in sediment.[18] The estimated volume of contaminated material at the Airport that exceeds these standards is 61,600 cubic meters (m^3); this estimate was calculated using available dioxin concentration data for the Airport collected through January 2010. [19]

2.3. Project Activities

For the purpose of this Gender Assessment, it is assumed the GVN will select ISTD/IPTD as the preferred Project alternative for remediation of the Airport. Four Project alternatives were considered for remediation of the Airport: No Action, Passive Landfill, Active Landfill, and ISTD/IPTD. As documented in the EA, ISTD/IPTD was selected by USAID as the preferred alternative because it was found to have the highest treatment effectiveness, the highest feasibility, the lowest potential environmental impact, and a cost in the same range as the other alternatives.[20] ISTD/IPTD is an innovative dioxin destruction technology that was developed by Royal Dutch Shell.[21] It is the only alternative considered that has been proven to destroy dioxin to levels that meet both soil and sediment GVN national dioxin standards.[22]

Dioxins are particularly recalcitrant to remediation, as they do not partition well into either soil, gas, or groundwater from soil. However, at higher temperatures, the dioxins can be volatilized and either completely oxidized or pyrolized into coke, depending on the presence of oxygen. Dioxins still present in the aqueous phase can be destroyed via hydrolysis or hydrous pyrolysis at higher temperatures. Therefore, thermal treatments can be effective for dioxin destruction.[23]

With the ISTD/IPTD alternative, contaminated soil and sediments from the MLA, SA, Drainage Ditch, Eastern Hotspot, Eastern Wetland, PISA, and Sen Lake would be excavated, stockpiled, and thermally treated to below GVN cleanup standards. The general location of the remediation components (excavation/hotspot areas, stockpile areas, etc.) are shown in Figure 3. It is expected that the ISTD/IPTD alternative would be implemented over a 2-year period.[24]

USAID will be the implementing agency for the Airport remediation and will procure excavation and thermal treatment contractors to conduct the remediation activities. USAID will oversee and manage the construction activities to ensure the remediation is implemented in accordance with the final design and applicable GVN rules and regulations. USAID's oversight of their contractors will also include conducting health and safety training, ensuring and monitoring that health and safety procedures are followed throughout Project activities, and conducting monitoring related to health and safety and specific gender issues.

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[17] Hatfield/Office 33 2009
[18] TCVN 8183: 2009
[19] USAID 2010b
[20] USAID 2010b
[21] http://newsite.terratherm.com/about/history.htm
[22] ENSR 2000, Baker and La Chance 2003, Baker *et al.* 2007 and Heron *et al.* 2010
[23] ENSR 2000, Baker and La Chance 2003, Baker *et al.* 2007 and Heron *et al.* 2010
[24] USAID 2010b

Much of the equipment and technical expertise for ISTD/IPTD will originate from overseas (likely the U.S.). The conceptual design for ISTD/IPTD was presented in the EA and a detailed design has not yet been prepared; hence the Project activities described herein are considered general only. For the purpose of this Gender Assessment, it has been assumed that all expertise other than construction activities (i.e.,, heavy equipment operators, general labourers, etc.) will originate from overseas.

The ISTD/IPTD alternative will include the following activities[25]:

1. Clearing all Project Areas of Unexploded Ordnance (UXO)

    - All existing UXO within the Project area would be detected and cleared prior to the commencement of any Project activities.

2. Equipment, Facilities, Project Setup

    - Procurement of equipment/vendor; and

    - Equipment decontamination station and Project work areas would be constructed and setup in the area of the hotspots. This would include establishing traffic control, health and safety oversight during all phases of work, clearing and grubbing of Project areas, construction of surface water runoff diversions around the main Project work areas to minimize the amount of project-affected water requiring treatment before being returned to existing drainages. It is expected that diverted surface runoff would be conveyed to the natural drainage entering the Eastern Wetland.

3. Preparation of Contaminated Soil Stockpile

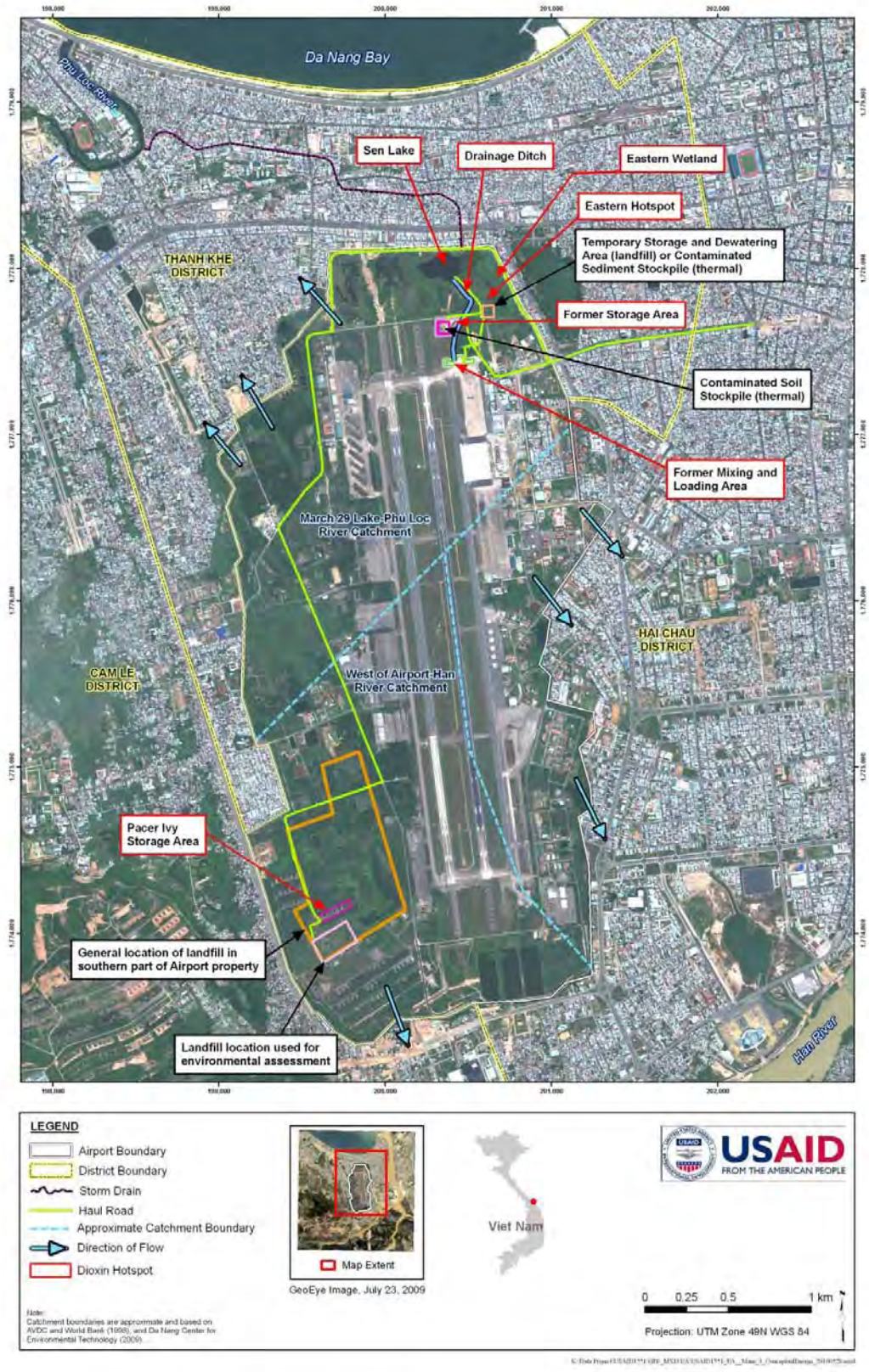
    - The stockpiles would be located on top of a portion of the SA hotspot. The ground would be cleared, grubbed, and leveled, and a drainage system and a sump would be set up to manage any water that drains from the stockpile.

4. Preparation of Contaminated Sediment Stockpile

    - The contaminated sediment stockpile would be located east-northeast of the SA (Figure 3). The area would be cleared, grubbed, and leveled, and a bottom liner with a drainage system and a sump would be laid down to manage the water that drains from the stockpile. In addition, a temporary unpaved haul road would be constructed from Sen Lake to the Contaminated Sediment Stockpile.

[25] USAID 2010b

FIGURE 3. CONCEPTUAL DESIGN OF REMEDIAL ALTERNATIVES PROPOSED FOR THE DA NANG AIRPORT.



5. Excavation of Contaminated Material from the SA, Sen Lake, MLA, PISA, Eastern Hotspot and Eastern Wetland

    - Contaminated soil and sediment would be excavated, transported to, and placed in the Contaminated Soil/Sediment Stockpiles. To minimize the generation of project-affected water from precipitation and groundwater seepage, excavated soil areas would be filled with clean soil as soon as practicable after excavation. Water normally conveyed by the Drainage Ditch would be rerouted to the natural drainage entering the Eastern Wetland.

    - Excavation of contaminated sediments from Sen Lake is expected to proceed using inflatable Aqua Dam bladders to divide it into three separate areas, allowing water from one portion of the lake to be pumped into other parts of the lake, taking care to ensure the flow rate of pumped water does not exceed the conveyance capacity of the Sen Lake outlet and culvert. Sediment would then be excavated from one of the drained portions of the lake and transported to and placed in the Temporary Storage and Dewatering Area. The process would be repeated with the two remaining parts of the lake. It may be necessary to temporarily divert water entering the Eastern Wetland (and therefore the eastern third of the lake) when the eastern third of the lake is drained and excavated. The inflatable Aqua Dam bladders would be removed and required drainage systems restored after excavation, returning the lake to previous conditions, with contaminated sediments. The specific portions of Sen Lake to be excavated and the specific depths to which excavation would be required, will depend on final delineation of specific hotspots areas within Sen Lake and the Eastern Wetland.

6. Importing of Clean Fill to Form Contaminated Soil/Sediment Stockpiles and Creation of Clean Soil Berm

    - The Contaminated Soil and Sediment Stockpiles would require clean fill on all sides and the top to provide stability during the ISTD/IPTD process. This clean fill would be hauled to the Project site from borrow pits off the Airport property.

7. Thermal Treatment of Contaminated Soil/Sediment Stockpiles

    - Thermal treatment of the Contaminated Soil/Sediment Stockpiles would consist of installation of in-pile equipment, thermal treatment, and removal of in-pile equipment. Successful treatment of the dioxins requires soil temperatures be elevated through the use of heater boreholes. The total time estimated for treatment, depending upon the final volume of contaminated material, is 170 days.

    - Approximately 95% of the dioxins would be destroyed in the piles. Recovery of the remaining dioxins would be accomplished via heated vapor extraction wells.

    - Significant air monitoring would be required to ensure emissions do not exceed designated limits. Based on the previous case studies, it is anticipated that the use of multiple granular activated carbon (GAC) units would be sufficient to meet all air emissions regulations.

8. Removal of In-Pile Equipment

    - All the in-pile equipment would be removed after the cool-down phase from the clean soil pile for use in the Contaminated Sediment Stockpile.

9. Site Restoration and Demobilization

    - The treated soil and sediment stockpiles would be disposed of in a location to be determined in consultation with GVN.

    - Site restoration activities would be decided upon in consultation with the Da Nang Airport Authority and would generally consist of returning project-affected areas to pre-Project or better conditions.

    - All Project equipment and facilities would be removed from the Project area.

Section 3. Gender Baseline

3.1. Gender-Specific Regulatory Requirements

Viet Nam has a strong legal framework for gender equality. Men and women are legally entitled to equal rights with respect to economic opportunities, political participation, land tenure, property ownership, marriage and family.[26] The principles of Gender Equality were first expressed in Viet Nam's Constitution of 1946, amended in 1992 and 2002. Article 63 of the Constitution states that "Male and female citizens have equal rights in all fields – political, economic, cultural, social, and family" and "all acts of discrimination against women and all acts damaging women's dignity are strictly banned."[27]

Further to the Constitution, many laws and regulations in Viet Nam outline the principle of gender equality and non-discrimination. These laws and regulations include the following:[28],[29],[30]

- Viet Nam is a signatory to the **United Nations Convention on the Elimination of Discrimination against Women (CEDAW),** an international agreement that establishes standards and norms for laws and policies that should be enforced to eliminate discrimination against women;

- **Law on Education 2005** stipulates that "all citizens, regardless of their ethnicity, religion, belief, gender, family background, social status, or economic conditions are equal in learning opportunities;"

- **Marriage and Family Law 2000** stipulates the basic principles of marriage as "Voluntary, progressive, and monogamous marriage in which husband and wife are equal." The Law prohibits underage and forced marriage or divorce, deception into marriage or divorce, and/or demanding a wedding dowry;

- **Law on National Council Election and Law on People's Council Election** states that women have the right to vote and run for election and participate in State Management;

- **Criminal Code 1999** prohibits acts that violate women's human rights, such as ill-treatment or persecution by family members, forcible marriage, human trafficking, etc. There are also regulations that take into consideration special circumstances of women (e.g., pregnancy, breastfeeding) in relation to criminal proceedings; and

- **Women's Heath Rights:** Women are legally entitled to voluntary abortion, periodic health checks during pregnancy, receive treatment for gynecological diseases, and birth delivery services.[31]

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[26] ADB 2005
[27] Article 63 Constitution 2002
[28] ADB 2005
[29] ILO 2007
[30] Chiongson 2009

Despite the existence of legislated tools, gender inequality still persists in Vietnamese society, due to poverty, lack of empowerment, women's limited knowledge of their rights, cultural norms, as well as poor enforcement of laws.[32] The recently passed Law on Gender Equality Law, discussed in the next section, attempts to address these factors and put forward effective mechanisms to achieve equality in a changing society.

3.1.1. Regulations Specific to the Project Activities

Viet Nam's Labour Code (2002)[33] states that "Every person has the right to work, to choose freely the type of work or trade." The law outlines women's rights in recruitment, salaries, holidays, maternity leave, and education opportunities. There are also provisions under **Viet Nam's Labour Code (2002)** that are designed to protect women from hazardous work environments. Article 113 of Chapter X of the Viet Nam Labour Code states that women may not be hired for "heavy or dangerous jobs which necessitate contact with noxious substances having harmful effects on their reproductive and child-rearing function."

Viet Nam's Law on Gender Equality (2006)[34] lays the foundation for a sound legal system for gender equality in Viet Nam. The law assigns the responsibility to all organizations to work towards the promotion of gender balance, provides an opportunity to evaluate the effectiveness of existing laws, and calls for enhanced supervision of the implementation of laws and policies on gender equality. It also allows specific provisions for protecting the health and safety of women, while still promoting equal opportunities for men and women. Under Article 13, Section 1-3a of Viet Nam's Law on Gender Equality, employers must create safe working conditions for women that may have direct contact with noxious substances. Therefore, the Project will need to ensure that it complies with these legal codes while still attempting to provide equal employment opportunities to women.

If women's access to employment opportunities related to the remediation activities is limited due to health concerns, consideration should be given to alternative income generation activities, as required under the Viet Nam Labour Code. Under Article 109 of Chapter X[35], women should be offered equal employment opportunities to men, even in non-traditional jobs.

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[31] ADB 2005
[32] ADB 2005
[33] Viet Nam Labour Code: Article 113 of Chapter X: The labour user is not allowed to use female labour for heavy or dangerous jobs which necessitate contact with noxious substances having harmful effects on the reproductive and child rearing functions of the women labourer.
[34] Vietnam Gender Equality Law: Article 13, Section 1: *1. Man and woman are equal in terms of qualifications and age in recruitment, are treated equally in the workplace regarding work, payment and bonus, social insurance, labor conditions and other working conditions. 2. Man and woman are equal in terms of qualifications and age in promotion or appointment to hold titles in the title-standard professions. 3. Measures to promote gender equality in the field of labor include: a) To provide for proportion of man and woman to be recruited; b) To train and enhance capacity for female employees; c) Employers create safe and hygienic working condition for female labors in some hard and dangerous professions and occupations or those that have direct contact with noxious substances.*
[35] Viet Nam Labour Code: Article 109 of Chapter X: *The State ensures the right to equality of women with men in all domains of work and shall adopt policies or encouraging labour users to create conditions for women labourersw to have regular jobs. It shall also apply the system of work according to a flexible time schedule.*

In addition, they will need to be paid equally to men, and receive the same benefits, according to Article 111.[36]

Within Vietnamese society, many men and women hold strong beliefs regarding appropriate behavior for women. Women are often required to put their families first, even at the expense of their own health, and are often expected to defer to male authority.[37] This is an important consideration for the Project, because although women are offered health and safety provisions under Viet Nam law, women may not be aware of, or do not exercise, the rights accorded to them by law and policy.

3.2. Role and Status of Women in Viet Nam

The role and status of women in Viet Nam has evolved significantly since the 1950s. During the war years, women in Viet Nam performed traditionally male roles, such as maintaining agricultural production and cooperatives, fighting in the war, carrying food and munitions, repairing roads and bridges, and serving as nurses, couriers, and guides. This continued following the war, due to the prominent demographic imbalance, with women continuing to actively participate in the workforce by engaging in manual labour in road construction and heavy manufacturing.[38]

With time, women's role in society began to progressively shift due to the ongoing conflict between domestic duties and employment. While women were still highly represented in the labor force, the nature of their participation in economic activity began to change.[39] According to a Viet Nam Living Standards Survey conducted by the State Planning Committee and General Statistical Office in 1994, women dominated the following industries: trade and restaurants; agriculture; forestry and fisheries; the manufacturing industry; non-productive activities (such as social and community services); and "other activities." Statistics from 1992/1993 show that one fifth of those in the mining industry and one tenth of those in construction were women; these jobs included administration as well as heavy manual labour. However, with the progression of economic reforms and resultant shift in the nature of economic activity in Viet Nam from agriculture to industry, women's representation in the formal labor force has continually declined.

While lower compared to the periods during and immediately after the war, Viet Nam currently has one of the highest economic participation rates in the world. In 2002, 85% of men and 83% of women between the ages of 15 and 60 were engaged in economic activity.[40] Men and women are typically employed in different sectors of the economy. Men are more

[36] Viet Nam Labour Code: Article 111 of Chapter X: 1. Employers are strictly prohibited from conduct which is discriminatory towards a female employee or conduct which degrades the dignity and honour of a female employee. An employer must implement the principle of equality of males and females in respect of recruitment, utilization, wage increases, and wages.
[37] ADB 2005
[38] Sen and Stivens 1998
[39] Sen and Stivens 1998
[40] World Bank *et al.* 2003

commonly employed in fishing, mining, construction, transport, and communications while female-dominated industries include light manufacturing, health, and social work.

Within the construction industry, women constitute only 12% of the labour force. They also make up 26% of the transport and communications sectors.[41] In 2002, out of 100 female workers, 60 were working in agriculture, 2 in fisheries, 13 in trade and 1 in construction. Comparatively, for every 100 male workers, 52 were working in agriculture, 5 in fisheries, 8 in trade, and 8 in construction.[42]

The informal labour market is an important income source for many men and women in Viet Nam; however, the lack of regulation within the sector can leave workers vulnerable, particularly women. Globally, women make up three quarters of the workers in the informal sector[43]. Although the informal sector is highly significant in terms of income generation in Viet Nam, there are no reliable figures on its exact size.[44] The informal sector comprises mainly unskilled, self-employed workers. Total percentage of the population involved in unskilled labour is 27.3%, and the total percentage of self-employed workers is 35.3%.[45] The percentage of self-employed males and females is estimated at 31.7 and 39.4%, respectively. The percentage of males and females involved in unskilled labour is 30.2% and 23.9%, respectively. Women's participation in the informal sector is relatively higher in urban areas; the percentage of female workers in the informal sectors in Ha Noi and Ho Chi Minh City are estimated at 50.3% and 55.5%, respectively.[46]

Compared to most other developing countries with similar income levels, education statistics in Viet Nam are highly progressive. The country has achieved high literacy rates for both men and women (94%), and high levels of primary school enrollment for both boys and girls (88%).[47] Female adult literacy in Viet Nam is 86.9% in 2007, compared to 93.9% literacy in males.[48] The proportion of girls enrolled in upper secondary school (66%) is greater compared to the proportion of boys enrolled (61%).[49] The percentage of girls completing upper secondary school (85%) is also greater than boys completing upper secondary school (76%).[50] However, significant disparities exist between vocational and job training opportunities available to males and females.[51] In urban areas, 37.2% of men between ages 18-21, and 51.4% of men between ages 22-25 have access to training; this figure is sizably lower for urban females at 26% (between ages 18 21) and 37.8% (between ages 22-25).

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[41] GSO 2003
[42] ILO 2007
[43] World Bank 2003
[44] ADB 2005
[45] UNICEF 2003
[46] Jean-Pierre 2010
[47] UNDP Vietnam 2010
[48] HDR 2009
[49] ADB 2005
[50] GSO 2005
[51] UNICEF 2003

Viet Nam's key development indicators are consistent with other East Asia and Pacific countries (Table 2), many of whom have much higher per capita gross domestic product (GDP).[52]

TABLE 2. VIET NAM'S PERFORMANCE ON KEY DEVELOPMENT INDICATORS, 2002.

	Viet Nam	East Asia and Pacific
Human Development Index 2002	0.704	0.768
Life expectancy at birth	70.5 years	70.5 years
Adult literacy rate (% population aged 15 and above)	90.3%	90.4%
Combined gross enrollment ratio: primary, secondary, tertiary	64%	69%
GDP per capita (PPP adjusted)	$2,490 US	$5,100 US

Source: UNDP, Human Development Report, 2005

Viet Nam has made substantial progress on many gender-related indicators including health, education and political representation. In spite of these achievements, many gender inequalities still prevail (Table 3) including: female-headed households are more vulnerable to poverty; women work longer hours than men and earn less pay; and, women suffer barriers to access resources such as land, property and credit.[53]

TABLE 3. INDICATORS FOR VIET NAM FROM THE GENDER RELATED DEVELOPMENT INDEX.

	Female	Male
Life expectancy at birth	73 years	69 years
Adult literacy rate	87%	94%
Combined gross enrollment ratio: primary, secondary, tertiary	61%	67%
Estimated earned income (PPP adjusted)	$2,026 US	$2,964 US

Source: UNDP, Human Development Report, 2005

[52] ADB 2005
[53] ADB 2005

FIGURE 4. MOTHER AND BABY IN THANH KHE DISTRICT, DA NANG.

Source: Hatfield Consultants

3.2.1. The Role of Women in the Military

The People's Armed Forces of Viet Nam consists of six branches: People's Army of Vietnam (PAVN), which includes the People's Navy Command; Air and Air Defense Force; Border Defense Command; People's Public Security Forces; Militia Force; and the Self-Defense Forces.[54] The 1980 Constitution stipulates that "citizens are obliged to do military service" and "take part in the building of the national defense force." Eighteen years is the required age for compulsory military service for males. The length of the conscript service obligation is 2 years (or 3 – 4 years in the Navy). Females do not have conscript military service obligations, but may volunteer for active duty military service.

According to 2008 estimates, the PAVN consists of 484,000 active troops.[55] Human resources available for military service is approximately equal among men and women aged 16 to 49 at 24.6 million and 24.3 million, respectively.

[54] CIA 2010
[55] CIA 2010

During the war years, Vietnamese women were placed in major military roles by the Vietnamese Communist Party (VCP) cadres.[56] While most women held technical and administrative roles, they also engaged in combat assignments in guerilla units, as well as command assignments.

As Viet Nam's present day military is not highly active, the presence of women in the forces, as well as the intensity of their duties, have declined over the years.

[56] Country Data 1987

Section 4. Gender Issues in Relation to Remediation Activities at Da Nang Airport

The steps involved in the remediation, as described in Section 2.3, involve the contaminated soil and sediments from MLA, SA, Drainage Ditch, Eastern Hotspot, Eastern Wetland, PISA, and Sen Lake being excavated, stockpiled, and thermally treated. During the excavation and transportation of contaminated material, there is a risk of dermal absorption of polychlorinated dibenzo-p-dioxin (PCDD) from soil or sediment, which may occur in situations where certain people contact the soil or sediment during activities such as working on site. Because the surficial soil is contaminated, the finer contaminated particulates may on occasion become suspended in the air due to wind erosion or disturbance by cars and trucks. Airborne particulates carrying PCDDs may then be inhaled, resulting in a portion of the contaminants being absorbed across the respiratory pathway.[57]

Precautions need to be taken to prevent dioxin contamination for all persons who may be impacted by the Project activities. These precautions will be outlined in the Health and Safety Plan. However, due to the increased risk for women who are of reproductive age (especially those who are currently breastfeeding) it is important to identify the role of women within each of the potential stakeholder groups. The stakeholders include construction workers, military personnel, airport workers and passengers, residents and informal labourers working in the vicinity of the Airport. The mitigation strategies are discussed in Section 6.1.

4.1. Construction Workers

The construction industry in Viet Nam is a male-dominated industry with women constituting only 12% of the overall labour force.[58] Detailed information on the role of women within the different industry segments and labour categories was not readily available. As a result, interviews were conducted with four construction companies in Da Nang. Information was gathered regarding the required skills, qualifications, educational requirements, and average daily hours worked in order to understand any gender differences and/or restrictions related to each labour category (Table 4).

Based on the information provided by the construction companies interviewed, women do not hold positions of authority on construction sites. Of the 77 foremen or site manager positions, 100% (n=77) were held by men. The lack of female participation in this labour category could be attributed to the fact it is a male dominated industry, and the fact that women are less likely than men to attend vocational colleges. All the companies interviewed stated that employees worked between 8-10 hours per day and there was no difference in the amount of time worked by men and women.

[57] Hatfield/10-80 2006; Hatfield/Office 33 2007 and 2009
[58] ADB 2005

TABLE 4. GENDER BREAKDOWN BY LABOUR CATEGORY FOR DA NANG CONSTRUCTION COMPANIES.

Job Categories	Men (#)	Women (#)	Total (#)	% Men	% Women	Required Skills	Education/ Requirements
Foremen/ Site Managers	77	0	77	100%	0%	Construction / Design	Engineer/ University/ Vocational
Construction Workers	321	59	380	84%	16%	General Labour/ Mechanical	High school or below/ Vocational
Others (administration, driver)	488	69	557	88%	12%		High school/ Bachelor

Source: Results of interviews conducted with Da Nang Construction Companies, August 2010.

Women play a significant role as construction workers, accounting for 16% (n=59) of the 380 workers involved with physical labour on construction sites. During the excavation and transportation of soil component, there is a risk of dermal absorption of PCDD from soil or sediment for workers on site, which is of particularly concern for women of childbearing age. Mitigation measures to protect construction workers are presented in Section 6.1.1.

Women are involved to a lesser degree in administrative and other activities, including secretarial and administrative tasks, transportation and security guards. For the companies interviewed, women comprise 12% (n=69) of the 557 people in the 'others' labour category.

Local labour will likely be sourced from construction companies based in Da Nang city for the excavation and transportation of contaminated material. However, the construction companies interviewed stated that for larger jobs, labour is also brought in from Quang Nam, Quang Ngai, and Thua Thien Hue Provinces. Workers are sometimes required to live on site to complete the construction activities if local labour needs are not sufficient for the job. Additional protective measures will need to be taken if workers are residing on the site near the excavation of contaminated soil, particularly if women of childbearing age are part of the labour force.

4.2. Military Personnel

The Airport is an active military airport. Information was not available on the gender breakdown, or role of women, working on the Airport; however, significant numbers of women are known to work in the military. If female military personnel are working on the excavation and transportation portions of the Project, precautions should be taken to limit any potential dioxin exposure for these workers, as outlined in Section 6.1.2.

4.3. Airport Workers and Passengers

There is no expected risk to Airport workers and passengers as a result of remediation activities, provided that environmental mitigation measures (see Section 6.1.3) are in place. However, in the event of a major storm event where airborne particulates may be released from the construction site, there could be a minor risk for passengers crossing the tarmac to board and depart planes, as well as flight crew that travel frequently to the Airport. If this risk is deemed significant in the Health and Safety Plan, then precautions should be taken, particularly for women of childbearing age.

There are eight companies operating at the Airport. The Da Nang Airport Authority listed workers at Da Nang for 2009. Of these workers, 58% are men and 42% are women.[59] Statistics on the gender breakdown for the different labour categories were not available. There may be a minor risk for workers operating outside the terminal, such as baggage handlers, maintenance workers, airport construction workers, air traffic controllers, etc. If this risk is deemed significant during the Health and Safety Plan, precautions should be taken to limit any potential dioxin exposure risk of these workers, with a specific emphasis on women of childbearing age.

4.4. Residents

There is a potential risk of dioxin contamination for the residents in the wards surrounding the Airport during the construction and transportation of contaminated soil and sediment. Exposure pathways for residents include dietary exposure, soil ingestion, dermal absorption and inhalation. The potential increased risk for Da Nang residents from dust and air will be addressed through the Health and Safety Plan. This should consider the possibility of extreme weather, which could increase the risk of contamination for residents.

Understanding the level of knowledge and practices of residents of the wards surrounding the Airport regarding dioxin contamination and measures to prevent dioxin exposure is an important component of understanding the potential risks. Lessons can be learned from the 'Pre-Intervention Baseline Survey' project recently completed by the Vietnam Public Health Association (VPHA). With funding from the Ford Foundation, the VPHA completed a baseline survey in 2009 and 2010 to understand the knowledge, attitude and practice of 400 randomly selected local residents at An Khe, Chinh Gian, Hoa Khe and Thanh Khe Tay wards related to dioxin contamination and measures to prevent dioxin exposure through foods.[60] The results of the baseline survey demonstrated that the respondents in the four wards near the Airport have "limited knowledge and practices to prevent dioxin exposure through consuming contaminated foods." The relevant recommendations resulting from the Pre-Intervention Baseline Survey are presented in Section 6.1.4 and should be considered during remediation of the Airport to ensure protection of residents.

[59] Da Nang Airport Authority, 2009
[60] VPHA/Ford Foundation 2009

4.5. Informal Labourers

The informal sector is an important income source for many; however, the lack of regulation within the sector can leave workers vulnerable, particularly women. Scrap metal mining is part of the informal labour market on the Airport property and in the surrounding area, and as such, the workers engaged in these activities must also be considered as part of the Gender Assessment.

Scrap metal mining activities have been observed in the northern portion of the Airport property for the past 3-4 years at least, and possibly longer. These mining activities appear to be conducted by several men and women and include digging and spreading of soil/sediment using large excavator equipment, as well as hand held shoveling equipment. The excavated material is washed with a high-powered hose, and the scrap metal extracted; soil/sediment are therefore being widely dispersed through this activity, and are coming into direct contact with the workers. The present location of the mining activities appears to be just south of the Eastern Hotspot, on the border of the Eastern Wetland; however, observations during the 2010 calendar year indicate that the activities are also conducted several meters to the north, south, east, and west, although the exact perimeter of mining activities is unknown. There is also evidence that some people related to the mining activities are living on the Airport property near this mining area (in small temporary huts).

In January 2010, while USAID was conducting environmental sampling at the Airport, inquiries were made to onsite MND officials about the nature of the scrap metal mining activities. USAID recommended to the onsite MND officials that scrap metal mining activities be discontinued due to their proximity to known hotspots and the uncertainty regarding the exact boundaries of the hotspots. In May 2010, USAID presented GVN with the January 2010 sampling results, identified the location of the Eastern Hotspot, and recommended that scrap metal mining activities cease. In an October 2010 meeting and site visit with MND and the Airport Authorities, USAID recommended that scrap metal mining activities be discontinued at the airport to ensure the safety of people associated with these activities and to prevent the potential spread of dioxin contaminated material. MND ensured the scrap metal mining activities are not being conducted in areas with elevated dioxin concentrations and ensured the activities would cease during remediation.

The mining activities are taking place near and/or within areas identified as having concentrations of dioxin that exceed GVN established action levels (1,000 ppt soil and 150 ppt sediment). This raises significant health and safety concerns for the people conducting the mining activities and living in the vicinity; the main concern is possible exposure via dermal contact, inhalation, and also possibly through consumption of contaminated food items (i.e., food consumed on the site may be contaminated with small amounts of dioxin from the soil and sediment). It also raises concerns regarding the potential spread of dioxin contamination to non-impacted areas, thereby affecting the plan for remediation. Women workers have been observed conducting these activities, which raises serious health and safety concerns. Due to health and safety concerns, these activities should be suspended until the remediation of the dioxin hotspots at the Airport are completed (see Section 6.1.5), thereby removing the potential risk for exposure to dangerous levels of dioxin and adversely impacting the remediation efforts.

4.6. Fisherfolk

Fishing is an important source of livelihood and nutrition for some residents living near the Airport, but it can also be a potential exposure pathway for dioxin to enter the aquatic and human food chain. There are at least 14 lakes on the Airport property which have been used for fishing and aquaculture. In previous studies of blood and breast milk dioxin levels in residents, eating fish from one lake on the Airport property, Sen Lake, was deemed a significant factor.[61] Following the 2006 investigations at the Airport, interim mitigation measures were implemented in 2007 to protect the local population from continued exposure to dioxins from the Airport. Mitigation measures included banning all fishing and agricultural activities on Sen Lake (see Section 6.1.6).

FIGURE 5. FISHING ON XUAN LAKE (HO XUAN HA), DA NANG.

[61] Hatfield/Office 33 2009

Section 5. Project Beneficiaries

The Project will result in positive impacts for the residents in the nine wards surrounding the Airport (Chinh Gian, Thac Gian, An Khe, Hoa Thuan Tay, Hoa Thuan Dong, Hoa Cuong Bac, Hoa Cuong Nam, Khue Trung, and Hoa Tho Tay). The risk of potential dioxin exposure will be significantly reduced as a result of the successful completion of the remediation activities.

Population profiles were completed for the wards surrounding the Airport to develop indicators and monitor the Project benefits. For each ward, the number of people, number of households, number of males and females, and the age distribution of people living within this area was collected from the Danang Statistics Office (2009).

Based on the population profiles, there are 162,790 potential Project beneficiaries in the nine wards surrounding the Airport, of which approximately 83,790 are women and 79,000 men.

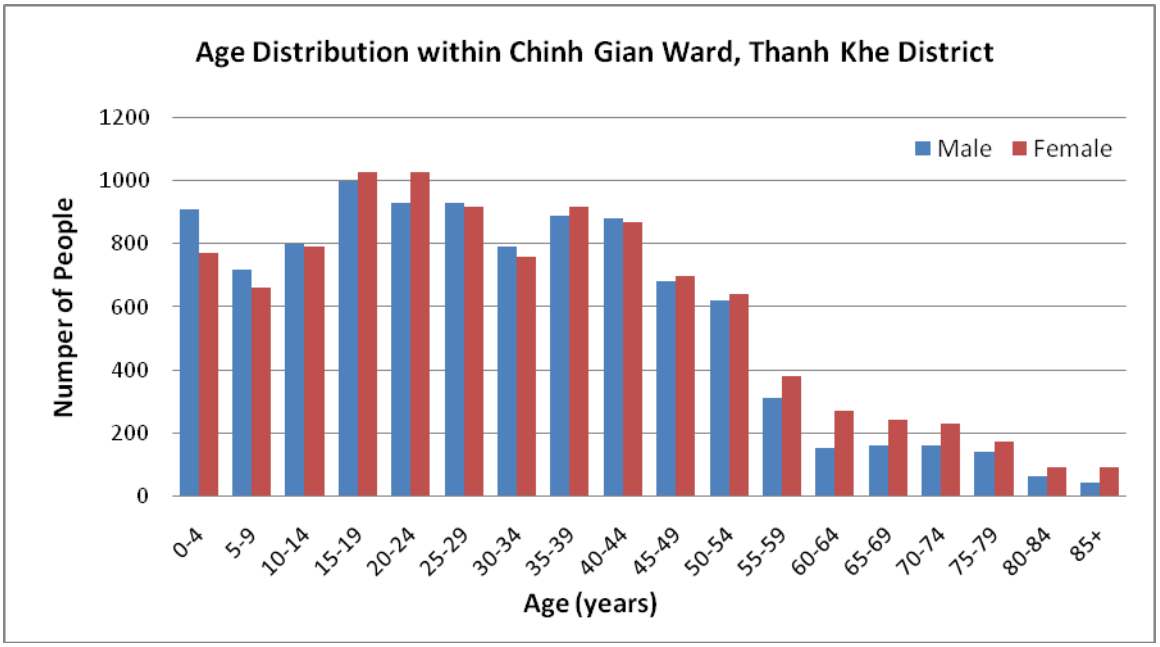
The number of householders and gender breakdown by ward are summarized in Table 5. The age distributions within each of the wards surrounding the Airport are presented in Figures 6-14.

TABLE 5. POPULATION PROFILE OF THE WARDS SURROUNDING THE DA NANG AIRPORT

Districts	**Wards**	**Number of Households** (thousands households)	**Gender Breakdown** (number of people)		**Total Population per Ward** (number of people)
			Men	**Women**	
Thanh Khe	Chinh Gian	4.99	10,170	10,560	20,730
	Thac Gian	5.06	8,690	9,790	18,480
	An Khe	5.73	10,720	10,900	21,620
Hai Chau	Hoa Thuan Tay	3.84	6,670	6,860	13,530
	Hoa Thuan Dong	3.49	6,860	7,430	14,290
	Hoa Cuong Bac	5.00	11,170	12,390	23,560
	Hoa Cuong Nam	6.40	9,010	9,370	18,380
Cam Le	Khue Trung	5.82	11,050	11,670	22,720
	Hoa Tho Tay	2.53	4,660	4,820	9,480

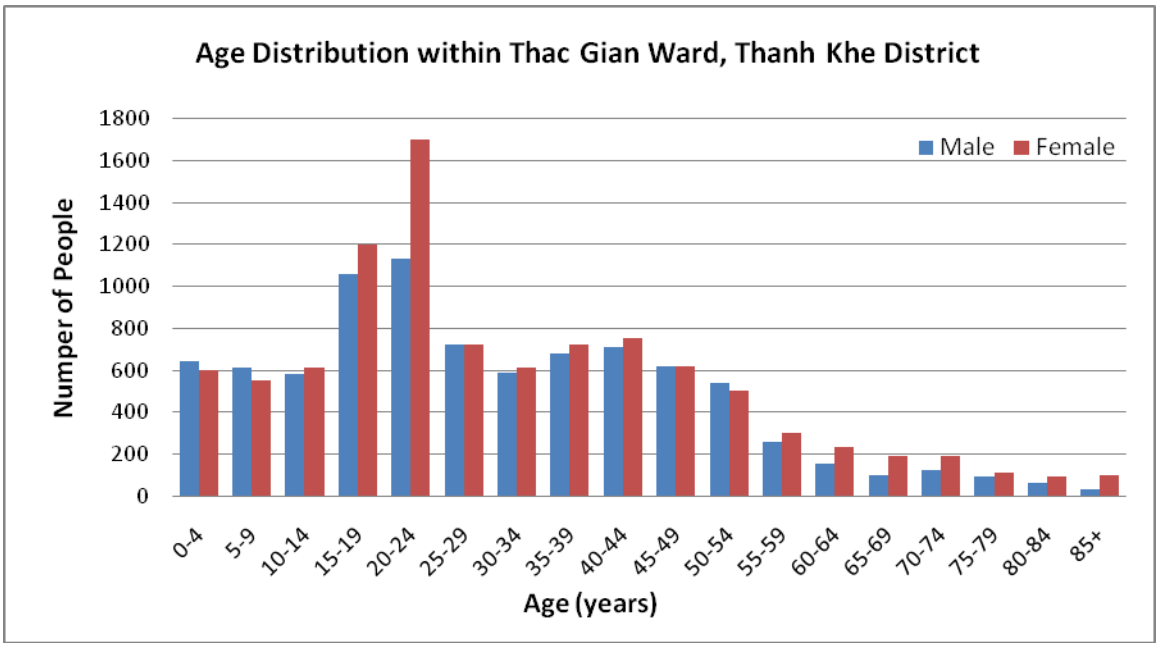
Source: Danang Statistics Office 2009

FIGURE 6. AGE DISTRIBUTION WITHIN CHINH GIAN WARD, THANH KHE DISTRICT.



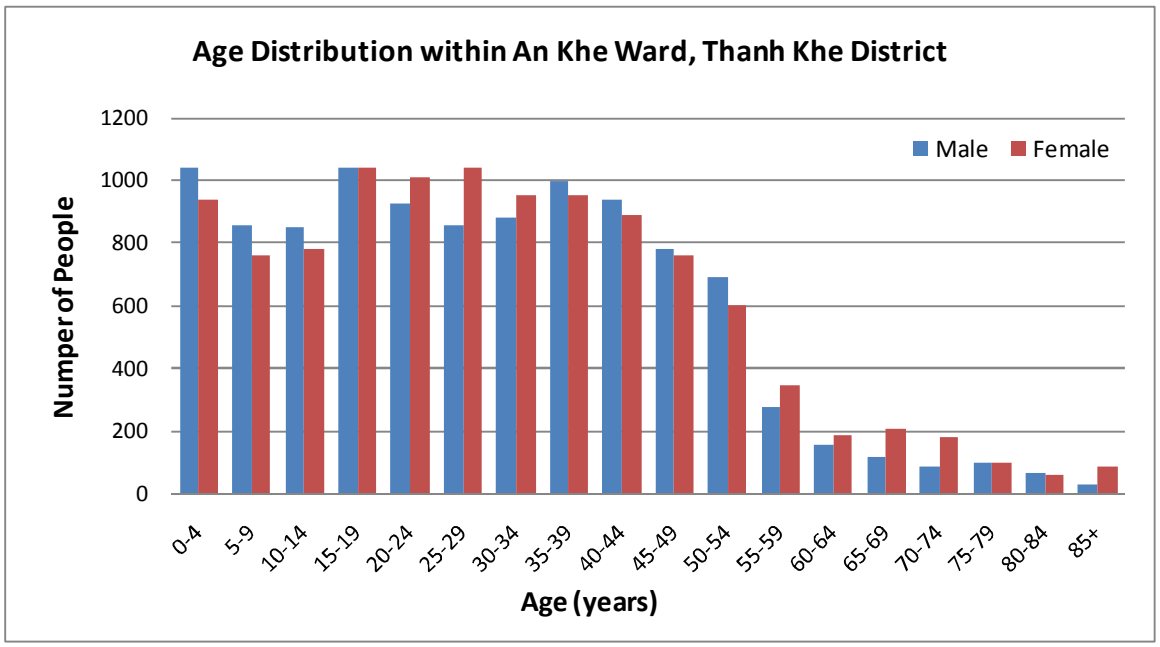
Source: Danang Statistics Office 2009

FIGURE 7. AGE DISTRIBUTION WITHIN THAC GIAN WARD, THANH KHE DISTRICT.



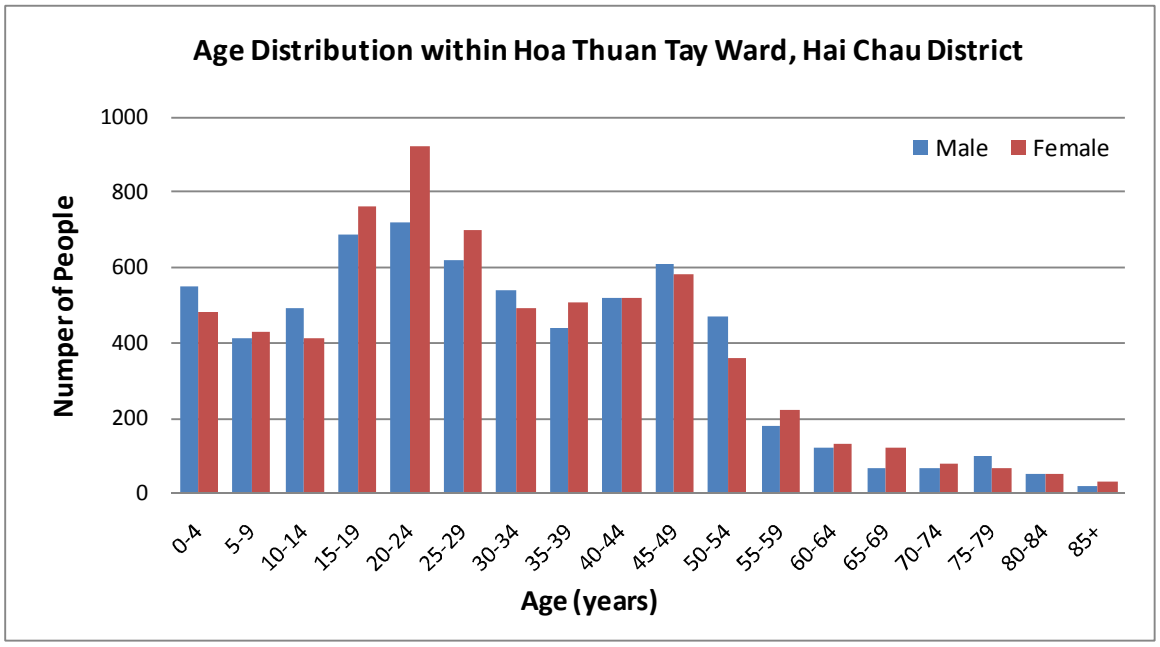
Source: Danang Statistics Office 2009

FIGURE 8. AGE DISTRIBUTION WITHIN AN KHE WARD, THANH KHE DISTRICT.



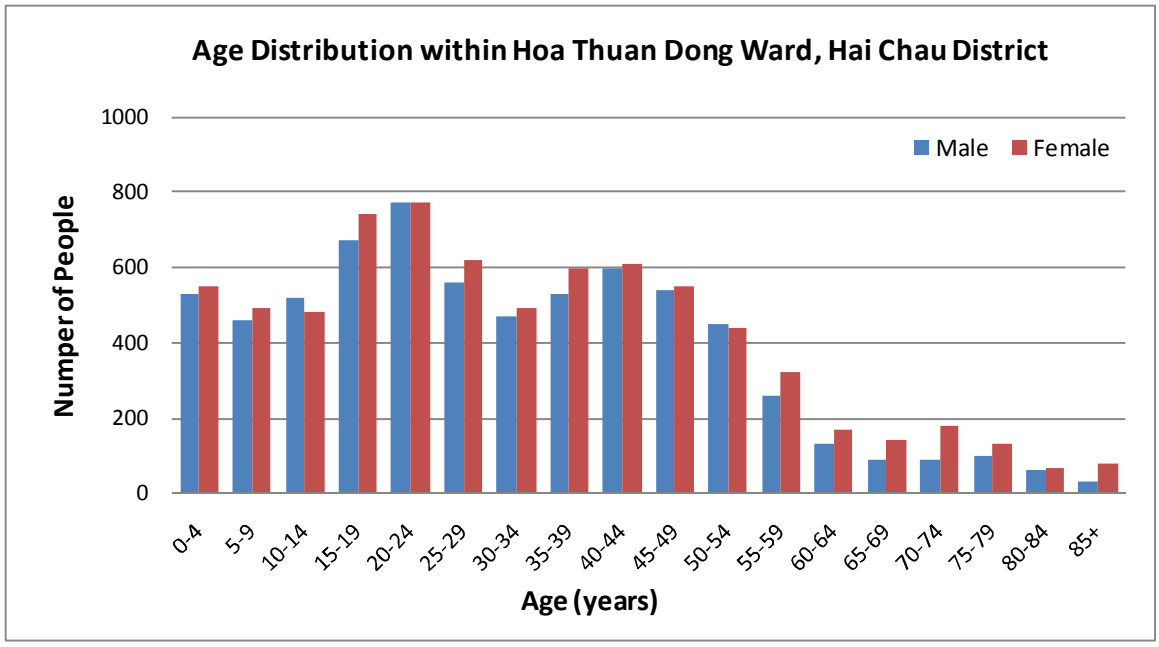
Source: Danang Statistics Office 2009

FIGURE 9. AGE DISTRIBUTION WITHIN HOA THUAN TAY WARD, HAI CHAU DISTRICT.



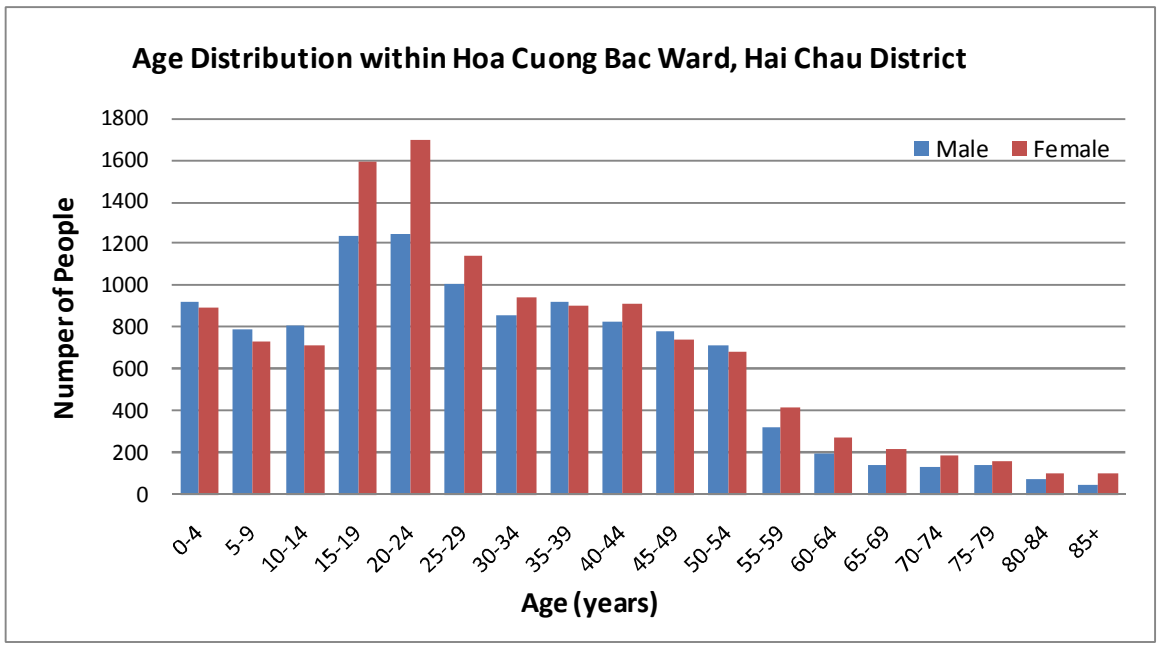
Source: Danang Statistics Office 2009

FIGURE 10. AGE DISTRIBUTION WITHIN HOA THUAN DONG WARD, HAI CHAU DISTRICT.



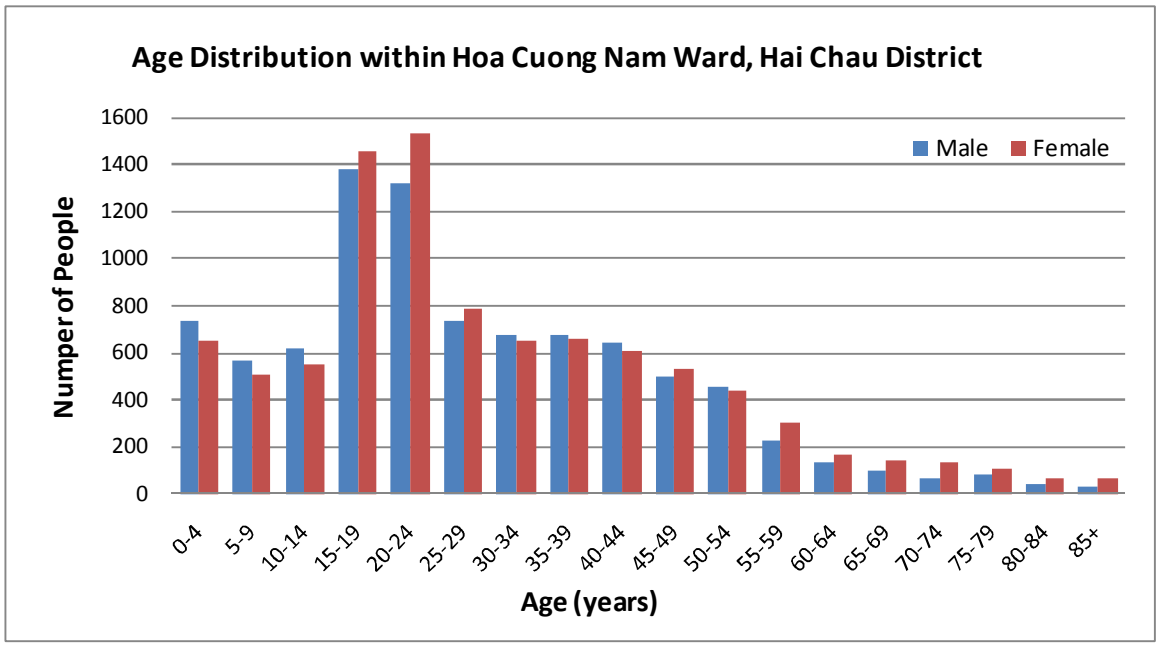
Source: Danang Statistics Office 2009

FIGURE 11. AGE DISTRIBUTION WITHIN HOA CUONG BAC WARD, HAI CHAU DISTRICT



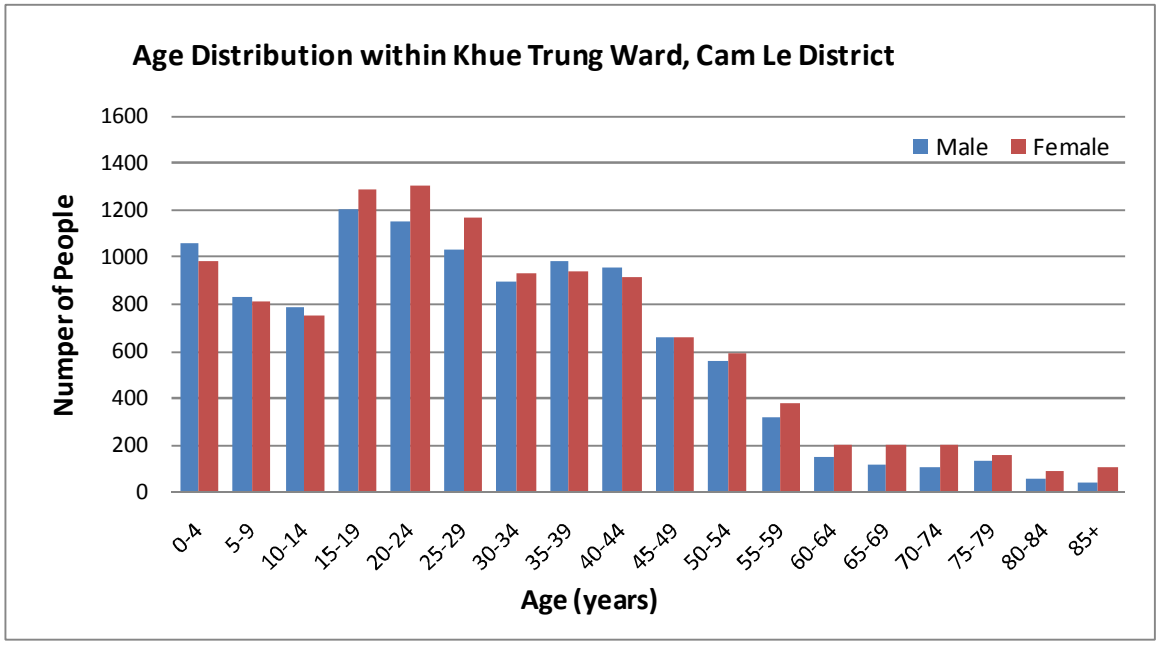
Source: Danang Statistics Office 2009

FIGURE 12. AGE DISTRIBUTION WITHIN HOA CUONG NAM WARD, HAI CHAU DISTRICT.



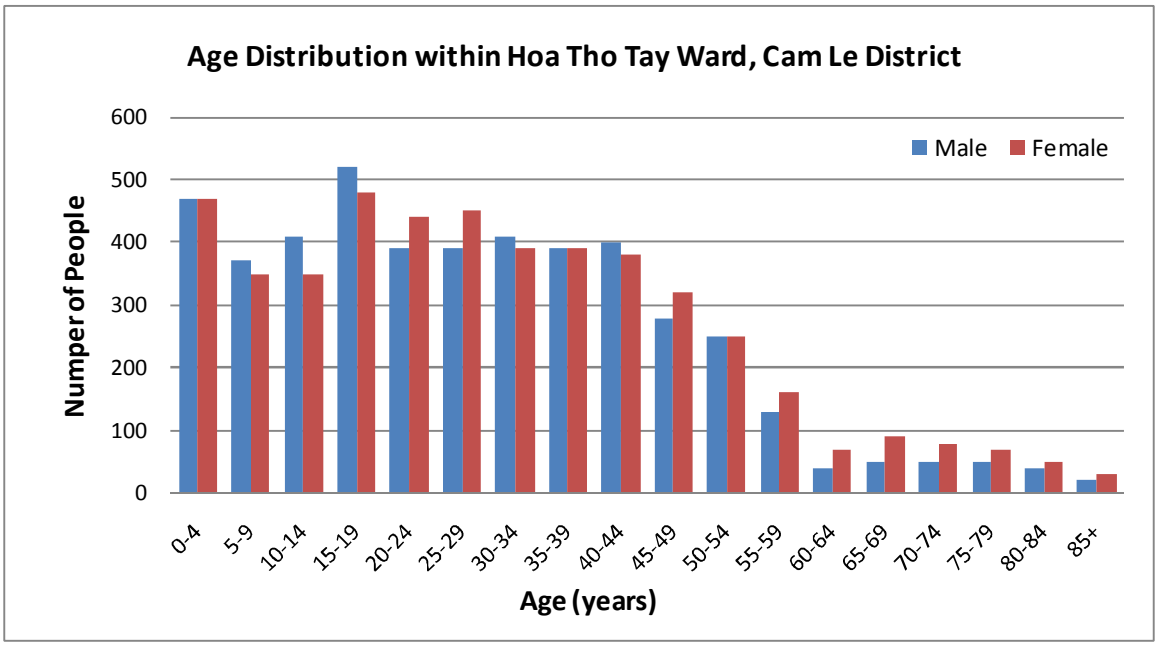
Source: Danang Statistics Office 2009

FIGURE 13. AGE DISTRIBUTION WITHIN KHUE TRUNG WARD, CAM LE DISTRICT.



Source: Danang Statistics Office 2009

FIGURE 14. AGE DISTRIBUTION WITHIN HOA THO TAY, CAM LE DISTRICT.



Source: Danang Statistics Office 2009

Section 6. Mitigation and Management of Gender Issues

6.1. Mitigation of Gender Issues

USAID will work jointly with MND to implement the Airport remediation and will procure excavation and thermal treatment construction contractors to conduct the remediation activities. The USAID procurement documents should require that the construction contractors comply with the applicable Labour Codes described in this Gender Assessment as well as the Health and Safety Plan and other remediation design and planning documents. Failure to comply with these requirements should result in penalty of fine or termination for the contractor.

USAID will oversee and manage the construction contractors to ensure the remediation is implemented in accordance with the final design and applicable GVN rules and regulations. USAID's oversight of their contractors will also include conducting health and safety training, ensuring and monitoring that health and safety procedures are followed throughout Project activities, and conducting monitoring related to health and safety and specific gender issues. It is important that the mitigation measures described in this Gender Assessment are clearly communicated to the contractors, and that they adhere to the recommendations contained in this report.

6.1.1. Construction Workers

During the excavation and transportation of contaminated material, there is a risk of dermal absorption of PCDD from soil or sediment, which may occur from workers contacting the soil or sediment at the site. As the remedial system design is still at the conceptual stage, it is not known if Vietnamese workers will be employed during the thermal treatment of the contaminated soil (item #7 in Section 2.3), but if they are there is a risk of dermal exposure.

Based on the findings of the interviews with construction companies, of the potential pool of construction workers, up to 16% would typically be expected to be women. Precautions will need to be taken to protect women of childbearing age against dioxin exposure during the excavation and transportation phases, given the increased dioxin exposure risk for breastfed babies. During the thermal phase, it may be advisable to exclude women from the set-up of the thermal treatment systems, primarily including installation of in-pile equipment as this would be in close contact with concentrated volumes of contaminated material. Women are offered protection under the Viet Nam Labour Code (Article 113, Chapter X) to protect them from hazardous work environments that may have harmful effects on their reproductive and child-rearing ability. However, due to socially defined roles in society, women may not be aware of their rights, or may choose not to exercise them. As a result, the Project team will need to communicate to all workers their rights, as well as consider preventing women of childbearing age from working on the remediation activity. If women's access to construction jobs is limited due to health concerns, then alternative jobs or income generation activities must be offered to them, as required under the Viet Nam Labour Code (Article 109, Chapter X). Women must also be offered alternative employment opportunities if they choose not to work on the construction site, once the potential risks of contamination are communicated to them.

It is not anticipated that construction workers will be required to live on site to complete the construction activities. However, if they are required to live on site, additional protective measures will need to be taken if workers are residing on the site near the excavation of contaminated soil, particularly if women of childbearing age are part of the labour force.

The Health and Safety Plan and Onsite Worker Health and Safety Training Plan will include the training and use of international standard personal protective equipment (PPE) to prevent dioxin exposure. However, due to the cumbersome nature of the equipment, especially in tropical climates, alternative solutions to standard PPE may need to be proposed to ensure the equipment can be used effectively. It is assumed that all workers will adhere to the Health and Safety Plan, including proper use of PPE. Special consideration regarding appropriate PPE may be required for protecting women of childbearing age.

Recommendations to address these issues include the following items:

- Require the construction companies undertaking the remediation activities to comply with the regulations that apply under the Viet Nam Labour Code (Article 109 and 113 of Chapter X). Construction procurement documents should require that construction companies comply with Article 109 and 113 of Chapter X of the Labour Code under penalty of fine and/or termination.

- Conduct training with all construction workers on the importance of, and proper use of, PPE.

- Obtain feedback from workers regarding the appropriateness of the PPE to ensure that they will wear the equipment as it is designed to be worn.

- Construction procurement documents should require that construction companies comply with the site Health and Safety plan under penalty of fine and/or termination.

- Clearly communicate to the construction companies undertaking the remediation activities the potential dioxin pathways, and preventative measures for reducing risk of dioxin contamination in male and female workers.

- In the event that female workers are not hired to conduct the construction activities at a level commonly found in Da Nang construction activities (i.e., 16%), or, if female construction workers choose not to work on the site due to the potential dioxin contamination risks communicated to them, then they must be offered alternative income generation activities to prevent discrimination under the Viet Nam Labour Code.

- During the thermal phase, it may be advisable to exclude women of childbearing age from the set-up of the thermal treatment systems, primarily including installation of in-pile equipment as this would be in close contact with concentrated volumes of contaminated material.

- Contractors instill medical monitoring for employees working on the site.

6.1.2. Military Personnel

As a joint civilian-military Airport, MND will be responsible for overseeing the remediation activities at the Airport. Information was not available on the gender breakdown, or role of women, working on the Airport. If female military personnel are working on the Airport, appropriate precautions should be taken to limit any potential dioxin exposure for these workers, as per the recommendations outlined in Section 6.1.1.

6.1.3. Airport Workers and Passengers

There could be a small risk for passengers crossing the tarmac to board and depart planes, as well as flight crew that travel frequently to the Airport. If this risk is deemed significant in the Health and Safety Plan, then precautions should be taken, particularly for women of childbearing age.

There may be an exposure risk for airport workers operating outside the terminal, such as baggage handlers, maintenance workers, airport construction workers, air traffic controllers etc. If this risk is deemed significant in the Health and Safety Plan, precautions should be taken to limit any potential dioxin exposure risk of these workers, with a specific emphasis on women of childbearing age. Recommendations to address this include the following:

- Conduct education and awareness outreach campaign with male and female airport workers regarding the potential dioxin pathways, and preventative measures for dioxin contamination.

- Conduct education and awareness outreach campaign with female construction workers regarding the rights offered to them under the Viet Nam Labour Code.

6.1.4. Residents

The Project will result in positive impacts for the residents in the wards surrounding the Airport. The risk of potential dioxin exposure will be significantly reduced as a result of the successful completion of the remediation activities; however, caution needs to be exercised in transporting contaminated soil near the wards surrounding the Airport. Exposure pathways include dietary exposure, soil ingestion, dermal absorption and inhalation. The potential increased exposure levels for Da Nang residents from dust and air will be addressed through the Health and Safety Plan.

Remediation planning documents will ensure that the most appropriate route is selected for transportation of contaminated materials to minimize potential impacts to humans. The transportation route should be communicated to Da Nang residents as part of the education and awareness outreach campaign to ensure that they take extra precautions to reduce exposure during transport times, with a specific emphasis on women of childbearing age and children.

Conducting the education and awareness outreach campaign for nearby residents regarding the potential dioxin exposure pathways and risks will help to reduce the risks to both men and women. The campaign will need to specifically emphasize the potential risks to children and

women of childbearing age, specify mitigation measures, and be communicated in a simple manner for local residents.

Recommendations to mitigate any potential gender issues for residents include the following:

- Conduct confirmatory sampling, which should include soil and sediment sampling following excavation and prior to backfilling with clean soil, to ensure concentrations of dioxin in soil and sediment are below GVN cleanup standards (1,000 ppt for soil and 150 ppt for sediment).

- Conduct annual fish tissue sampling for 3-5 years, at a minimum, in Sen Lake.

- Instill best practices for remediation activities to ensure contaminated material does not leave the Project area (e.g., air quality/dust monitoring, ban on fishing in Sen Lake, appropriate decontamination, etc.).

- Conduct an education and awareness outreach campaign for nearby residents regarding the potential dioxin exposure pathways and risks.

Understanding the level of knowledge and practices of residents of the wards surrounding the Airport regarding dioxin contamination and measures to prevent dioxin exposure is an important component of developing a mitigation strategy. The relevant recommendations resulting from the 2009-2010 VPHA Pre-Intervention Baseline Survey are summarized below and should be during remediation of the Airport :

- Education and awareness activities should provide local residents with information on the risk of dioxin exposure within their area, and measures to prevent dioxin exposure.

- The consumption and cultivation of high risk foods at the wards surrounding the Airport should be avoided. High risk foods currently being cultivated include fresh water fish and other aquatic products (especially bottom feeders), free range chicken, duck, geese, beef, pigs, pumpkin, carrot and lotus.

- Most of the households that currently consume self-cultivated foods are located in An Khe Ward; therefore, specific attention should be paid to this ward. To ensure the effectiveness of the intervention activities, strong collaboration and involvement of related stakeholders in the local areas is needed to ensure local people stop consuming (eat, sell, or present others) locally-cultivated foods.

- Training on food safety and selecting safe foods should be provided for local health officials to reduce the risk of exposure to dioxin in foods.

- Local communication channels, such as community meetings, direct consultation and distribution of leaflets at households should be used to help raise awareness.

- The majority of households (82.6%; n=46) without access to tap water did not treat their water before use. Therefore, education and awareness activities should focus

more on the potential risk of dioxin exposure if the local residents use untreated water sources for drinking and other domestic purposes.

6.1.5. Informal Labourers

Scrap metal mining is part of the informal labour market in the area surrounding the Airport, and as such, the workers engaged in these activities must also be considered as part of the Gender Assessment. Due to health and safety concerns, these activities should be suspended until the remediation of the dioxin hotspots at the Airport are completed, thereby removing the potential risk for exposure to dangerous levels of dioxin and adversely impacting the remediation efforts. As well, consideration should be given to alternative income generation or residents to make up for their loss in income.

6.1.6. Fisherfolk

In 2007 interim measures were implemented to protect the local population from continued exposure to dioxins from the Airport. Mitigation measures included banning all fishing and agricultural activities on Sen Lake. This ban should be maintained during the remediation activities.

FIGURE 15. WOMAN HARVESTING SPINACH IN THANH KHE DISTRICT, DA NANG.

Source: Hatfield Consultants

6.2. Monitoring of Gender Issues

The proposed monitoring requirements for the mitigation and management of gender issues identified in the Project are presented in Table 6.

As described in Section 5, the potential Project beneficiaries include the 162,790 residents (approximately 83,790 women and 79,000 men) in the nine wards surrounding the Airport. The risk of potential dioxin exposure will be significantly reduced as a result of the successful completion of the remediation activities. The results of the monitoring activities described in Table 6 will provide indicators to monitor the Project benefits.

TABLE 6. MONITORING REQUIREMENTS FOR THE MITIGATION AND MANAGEMENT OF GENDER ISSUES IDENTIFIED IN THE PROJECT.

GENDER COMPONENT	MONITORING RECOMMENDATIONS
Provide safe working environment for employees	• Contractors instill medical monitoring for employees working on the site. • Monitor the effective and appropriate use of PPE for all workers. • Measure worker's knowledge of potential dioxin pathways and preventive measures. • Measure female worker's knowledge regarding their rights accorded to them under the Viet Nam Labour Code (Article 109 and 113, Chapter X). • Monitor the percentage of female workers involved in the construction activities.
Protect residents from potential dioxin contamination	• Monitor the change in knowledge, attitude and practice of residents to ensure that the education and awareness outreach campaign for residents have been effective. The survey should be conducted before and after the education and awareness outreach campaign is conducted to monitor change in awareness about potential dioxin contamination pathways and risk mitigation strategies. Alternatively, the Project could use the results of the baseline survey conducted by the VPHA in Khe, Chinh Gian, Hoa Khe and Thanh Khe Tay wards as a baseline and conduct a follow-up survey after implementation of the education and awareness outreach campaign and completion of the remediation activities. • Monitor air quality on and around the Airport to reduce the risk of potential dioxin contamination. • Conduct confirmatory sampling, which should include soil and sediment sampling following excavation and prior to backfilling with clean soil, to ensure concentrations of dioxin in soil and sediment are below GVN cleanup standards (1,000 ppt for soil and 150 ppt for sediment). • Monitor annual fish tissue sampling results for 3-5 years, at a minimum, in Sen Lake. • Instill best practices for remediation activities to ensure contaminated material does not leave the Project area (e.g., air quality/dust monitoring, ban on fishing in Sen Lake, appropriate decontamination, etc.). • Monitor adherence to the proposed ban on scrap metal mining on Airport property. • Monitor adherence to the ban on fishing on Sen Lake.

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